Analysis in Support of Comments of the California Air Resources Board on the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks

Docket ID: EPA-HQ-OAR-2018-0283; NHTSA-2018-0067; NHTSA-2017-0069

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Glossary

A/C	air conditioning	**kW**	kilowatt
AB	Assembly Bill (California)	**L**	liter
AC	alternating current	**LBNL**	Lawrence Berkeley National Laboratory
ACC	Advanced Clean Cars	**LEV I**	California's Low Emission Vehicle regulation(1994-2003 MYs)
ADEAC	advanced cylinder deactivation	**LEV II**	California's Low Emission Vehicle regulation (2004-2016 MYs)
AEO	Annual Energy Outlook	**LEV III**	California's Low Emission Vehicle regulation (2017-2025 MYs)
AERO	aerodynamic	**LPM**	Lumped Parameter Model
ANL	Argonne National Laboratory	**LT**	light trucks
AT	automatic transmission	**LTV**	light trucks and vans
BatPaC	Argonne National Laboratory's Battery Pack and Costing Tool	**MMb/d**	million barrels per day
BEV	battery electric vehicle	**MMTCO2e**	million metric tonnes of carbon dioxide equivalent emissions
BISG	belt integrated starter generator	**MOVES**	(EPA's) Motor Vehicle Emission Simulator
BLS	United States Bureau of Labor Statistics	**mpg**	miles per gallon
CAA	Clean Air Act	**MR**	mass reduction
CAFE	Corporate Average Fuel Economy Standard	**MSRP**	manufacturer suggested retail price
CEGR	cooled exhaust gas recirculation	**MVAPCA**	Motor Vehicle Pollution Control Act (California)
CEO	Chief Executive Officer	**MY**	model year

CISG	crank integrated starter generator	**NAAQS**	national ambient air quality standards
CO	carbon monoxide	**NAS**	National Academy of Science
CO_2	carbon dioxide	**NEMS**	National Energy Modeling System
CUV	crossover utility vehicle	**NEPA**	National Environmental Policy Act (United States)
CVRP	California Clean Vehicle Rebate Program	**NHTSA**	National Highway Traffic Safety Administration
CVT	continuously variable transmission	**NMC**	nickel-manganese-cobalt
CY	calendar year	**NO**	nitrogen monoxide
DC	direct current	**NO_2**	nitrogen dioxide
DEAC	cylinder deactivation	**NOx**	oxides of nitrogen
DEIS	Draft Environmental Impact Statement	**NPRM**	Notice of Proposed Rulemaking
DMC	direct manufacturing cost	**NREL**	National Renewable Energy Laboratory
DMV	California Department of Motor Vehicles	**OBD**	on-board diagnostics
DOE	United States Department of Energy	**OMB**	United States Office of Management and Budget
DOHC	dual overhead cam	**ORNL**	Oak Ridge National Laboratory
DOT	United States Department of Transportation	**PC**	passenger car
Draft TAR	2016 Draft Technical Assessment Report	**PCU**	power control unit
E.O.	executive order	**PEV**	plug-in electric vehicle
EIA	United States Energy Information Administration	**PHEV**	plug-in hybrid electric vehicle

EISA	Energy Independence and Security Act (United States)	**PM**	particulate matter
EMA	Engine Manufacturers Association	**PM 2.5**	particulate matter 2.5 microns or smaller
EMFAC2014	California Air Resources Board Emissions Factor (2014) Model	**PM10**	particulate matter 10 microns or smaller
EPA	United States Environmental Protection Agency	**ppb**	parts per billion
EPCA	Energy Policy and Conservation Act (United Stated)	**ppm**	parts per million
ESECA	Energy Supply and Environmental Coordination Act (United States)	**PRIA**	Preliminary Regulatory Impact Analysis
FARS	The Fatality Analysis Reporting System	**PZEV**	partial zero emissions vehicle
FCA	Fiat Chrysler Automobiles	**RPE**	retail price equivalent
FCEV	fuel cell electric vehicle	**SAFE**	Safer Affordable Fuel-Efficient
FOIA	Freedom of Information Act (United States)	**SB**	Senate Bill (California)
FTP	file transfer protocol	**SC-CO_2**	social cost of carbon
g/mi	grams per mile	**SHEVP2**	strong power split hybrid electric vehicle (also called P2HEV)
GDP	gross domestic product	**SIP**	State Implementation Plan
GHG	greenhouse gas	**SOx**	sulfur oxides
GM	general motors	**SULEV**	super ultra-low emissions vehicle
GVWR	gross vehicle weight rating	**SUV**	sport utility vehicle
HC	hydrocarbon	**TIP**	Transportation Improvement Projects

HCR1	high compression ratio level 1	**tpd**	tons per day
HCR2	high compression ratio level 2	**TSD**	Technical Support Document
HEV	hybrid electric vehicle	**UDDS**	urban dynamometer driving schedule
HFC	Hydroflourocarbon	**ULEV**	ultra low emissions vehicle
HWFET	highway fuel economy test	**VMT**	vehicle miles traveled
IACC	improved accessories	**VVL**	variable valve lift
KBB	Kelly Blue Book	**VVT**	variable valve timing
		ZEV	zero emission vehicle

I. Introduction

The proposed Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks is unsafe, unfounded, and illegal. As explained below, this proposal will waste fuel and other natural resources, increase costs for consumers, businesses, and federal, state, and local governments, destroy jobs, increase emissions accelerating climate changes and local health impacts, and break a unified national program for light-duty vehicles in violation of the relevant statutes and contrary to our Constitutional structure of cooperative federalism and shared sovereignty.

The future that the SAFE Rule, or rollback, proposes, on the agencies' own admission, is one in which greenhouse gases (GHG) nearly double from today, further exasperating catastrophic climate change. In that future, according to the world's leading scientists, hundreds of millions of people would be displaced, millions would die, and trillions of dollars of harm would come to what remains of the global economy. Yet, the federal agencies propose to actually make the situation worse, while attacking California's sovereign authority to protect its own citizens. Moreover, the proposed rollback will undermine California's plans to meet federal and state air quality standards, along with those of other states, in stark contrast to the cooperative federalism approach that the federal Clean Air Act directs. The proposed rollback makes the air dirtier and the climate crisis worse. Neither law, the evidence, nor basic decency support these choices.

The National Highway Traffic Safety Administration (NHTSA) and the United States Environmental Protection Agency (EPA), (referred to as the Agencies) must withdraw the SAFE Vehicles proposal.[1] The California Air Resources Board (CARB or the Board) asks that the Agencies heed the overwhelming public outcry and work with California, the other states that have adopted California's standards, and the motor vehicle industry to maintain a national program that achieves real emission and fuel consumption reductions year-over-year, promotes innovation and a competitive national manufacturing base, and serves all of the public.[2]

II. Summary of the analysis.

The proposed rollback departs entirely from the Agencies' governing statutes, on the basis of hastily-assembled and profoundly flawed evidence. EPA is charged with addressing air pollution, including climate change, working with California; instead, the

[1] These comments occasionally refer to the Notice of Proposed Rulemaking as the NPRM. These comments also cite the Preliminary Regulatory Impact Assessment, or PRIA, and page references are to the initial update posted August 27, 2018, docket no. EPA-HQ-OAR-2018-0283-0774.

[2] The California Attorney General has also submitted comments on this rule, in part on CARB's behalf. CARB fully joins these comments and incorporates them by reference. CARB also concurs with the comments submitted by representatives of the "§ 177" jurisdictions which have chosen to join California's programs, and appreciates their continued partnership.

rule vastly increases GHG emissions, worsens air quality, and attacks California authority Congress has preserved and extended. NHTSA is charged with maximizing vehicle fuel economy while paying due regard to other government programs; instead, the proposed rolls back fuel economy standards while proposing to preempt critical public health protections.

Executive agencies are not empowered to rewrite or ignore statutes, much less to reverse their meaning, as the Agencies now propose. That the Agencies rely upon their inverted reading of the statutes to further propose to end a decades-long partnership with California for vehicle regulation that is preserved in both statutes, and reflects a settled Congressional judgment is even more concerning. If the proposal is finalized, Congress cannot be assured that its directives will be followed in any administrative context, and states must be on their guard as to threats from administrative bureaucracies to their sovereign police powers and statutory prerogatives.

The necessity of this comment letter underlines how far off course the Agencies have veered. CARB is a critical part of Congress's plans for national vehicle regulation. California has been regulating vehicle emissions since before EPA existed, and Congress built CARB's role as innovator on vehicle technology into the core of the federal Clean Air Act, repeatedly expanding that role, including by allowing other states to opt into the CARB program. When Congress later enacted fuel economy legislation, it was at pains to clarify that CARB's role would be maintained. More recently, when EPA, NHTSA, and CARB decided to harmonize their relevant greenhouse gas and fuel economy standards to the extent possible, the three agencies collaborated on technical analysis and review, including an extensive mid-term technical assessment report indicating the program was functioning properly. Yet, shortly after this Administration took office, the partnership broken.

Long before the new Federal Administration had identified any new relevant data, and without consulting CARB, the President announced he was "cancelling" the bases of the program. The Federal Administration took this excessive step partly in response to requests from some automobile manufacturers for limited additional flexibilities, ignoring the narrow scope of these (factually unsupported) requests, which the Agencies had previously deemed unfounded. Since that time, the Federal Administration has issued a new "determination" that the standards must be revised, on the basis of no real evidence, and has now moved to this proposal – all while refusing to consult with CARB and its technical staff.

Notably, the Federal Administration has also largely disregarded EPA's own technical experts – many of whom filed comments in the docket showing that the rule does not reflect their views. The Federal Administration also has not consulted experts within the states that follow CARB's standards and rely upon them to meet federal air quality mandates. Instead, it has developed, in compressed time and with no meaningful review, a new set of models within NHTSA that it claims support its views. The Federal Administration has declined to complete the record supporting its claims, or even to

extend the comment period to allow time to properly analyze them.[3] The process followed to develop the national program, and then to conduct the midterm evaluation, was extensive and collaborative. It honored the commitments by the federal agencies to work with CARB.[4] The opportunities for the public to participate in the proposed rollback, and even to review the proposal to comprehend it and prepare meaningful comments, were flatly inadequate. Sixty days to consider a proposal comprising 514 pages of the Federal Register, a preliminary regulatory impact analysis (PRIA) of 1,621 pages that was re-issued twice (including four days before the end of the comment period),[5] and related models, data, and explanatory documents that had not been previously made available for peer review is unreasonable. This outcome-driven approach is contrary to Congress's expectations and dangerous to public health.

Nonetheless, CARB remains an expert vehicle regulator, authorized by Congress and empowered by a sovereign state. The proposed rollback does not stand up to CARB's expert review. That review, here, has been broadened by additional independent expert reviews from noted scientists, engineers, and economists from across the country; their reports, appended to these comments, demonstrate flaws at every stage of the Federal administration's reasoning.

The ubiquity of error is not surprising, because the Agencies are laboring to evade their own well-supported conclusions, offered just two years ago that the combined national program is functioning well, reached after an extensive study. That 2016 "Draft Technical Assessment Report" (Draft TAR) led to EPA's formal mid-term evaluation that concluded that the auto industry was performing well and innovating appropriately to meet the standards. The facts did not appreciably change between the January 2017 formal determination and now; indeed, EPA's more recent determination cites no meaningful new evidence, and the proposal strains mightily to read the facts differently on the basis of poorly constructed, inherently flawed models.

The proposal's new argument is hard to follow, but the central claim appears to be that lower-polluting vehicles will be much more expensive than the Agencies projected just two years ago, and will require a far greater use of electrification technologies than predicted. The Agencies offer two core claims based on this premise: First, they claim that these expenses if the rules are retained in their current form will result in a dramatic expansion of the used car fleet, and that fatalities will sharply increase because purportedly less-safe used cars will remain on the road longer; second, they claim that

[3] See CARB, Request for Documents in Support of: Request for Extension of Comment Period and Additional Public Hearings Regarding Joint Proposed Rule to Roll Back Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards for Model Years 2021-2026 Light-Duty Vehicles, September 11, 2018. Docket Nos. 2018-0067-4166, EPA-HQ-OAR-2018-0283-0883.
[4] See, e.g., 77 Fed.Reg. 62,624, 62,632, 62,784-62,785 (Oct. 15, 2012) [discussing coordination with CARB to develop the standards at issue and for changes to standards].
[5] 83 Fed. Reg. 53,204 (Oct. 22, 2018). (Notice of Proposed Rulemaking or NPRM).

driving in newer cars will dramatically *increase* if fuel economy improves along with emissions reductions, resulting in more fatalities.

Both these claims are unsupported. It presumes without support that the hypothetical increase in vehicles and vehicle durability will necessarily lead to more driving, without explaining why. There is no analysis of what causes people to drive or of why people choose to drive. Moreover, the model supporting the proposal does not relate new vehicle sales to the turnover or retirement of older vehicles. This makes predictions of sales irrelevant to turnover, rendering the asserted connection – and the purported increase in travel - ephemeral.

Thus, the Agencies appear to conclude that the best way to cut vehicle pollution and reduce fatalities is essentially to make new cars cheaper but far less efficient, and in theory reducing the use of older cars and diminishing incentives to drive. Ultimately, the proposal is to chart a course for more polluting cars that cost more to drive, with no evidence of a decline in purchase price.

Even if this dubious analysis could overcome Congress's direction to improve fuel economy and reduce air pollution, it still breaks down at every step. At the most basic level, auto pollution has been falling for years and fuel economy rising, along with car prices, even as the industry has enjoyed record sales and the roads have become steadily safer. Reality just does not correspond to the Agencies' claims.

Worse, the Agencies rely in part on this poor analysis to justify their proposal to reverse decades of law and preempt California's ability to regulate vehicle emissions in many regards, as well as the ability of other states to opt into the California program.

The body of these comments describes in detail how reality and the proposal parted company. Among other flaws:

- The technology analysis artificially forecloses the efficient use of cost-effective vehicle technologies already in use or under substantial development, instead projecting an unlikely reliance on a narrow set of electrification technologies. The costs of these technologies are correspondingly inflated.

- The modeling on technology penetration and use unwisely departs from EPA's emissions models, instead relying entirely on a set of NHTSA tools that are not designed for this purpose and which perform poorly.

- The "scrappage" model that NHTSA created and which it claims shows vastly expanded use of older cars does not pass basic tests of mathematical, statistical, and economic rigor, and greatly inflates apparent costs.

- The "rebound" effect which the Agencies claim will also lead to more driving is likely half that which the Agencies project – according to the study authors whom the Agencies purport to cite for their inflated claim.

• The Agencies' claim that lightweighting vehicles will contribute to fatality increases is rooted in modeling that is not representative of modern intelligent design and is, in any event, not statistically significant – so they are essentially guesses.

• The Agencies' claim that lightweighting vehicles will contribute to fatality increases is rooted in modeling that is not representative of modern intelligent design and is, in any event, not statistically significant – so they are essentially bad guesses.

• The Agencies fail to account for major costs to consumers and the job market as a result of increased climate change risks, declining air quality, technological stagnation, and higher costs to fuel vehicles.

• Once the Agencies' tortured new models are corrected, the facts show just what they showed a few years ago: The program is working, cost-effective, and appropriate.

In sum, the analysis underlying the proposed rollback proposal is inconsistent with empirical information, established economic theory, and logic, and is premised on faulty models of consumer and vehicle manufacturer behavior.

The proposal to withdraw California's waiver for its GHG emissions standards and ZEV regulations, which is packaged with and in part depends upon the Agencies' illogical analysis, is likewise illegal and arbitrary. California's consistent achievements controlling motor vehicle emissions in a cost-effective way has promoted innovation, economic development, jobs, and public health. Numerous states have recognized the benefits of California's program and adopted the standards for its own citizens. California's program has made the federal role easier and more effective by allowing the rest of the nation to benefit from standards after they have been proven. California's program is consistent with, and not a deviation from, Title II of the federal Clean Air Act to control "smog-related air quality problems" and other harmful effects resulting from motor vehicle emissions as human understanding improves. The Agencies wrongly conclude that California's GHG emissions standards and ZEV requirements frustrate "appropriate and maximum feasible fuel economy and [federal] tailpipe CO_2 emission standards." As the Supreme Court has recognized, CARB and EPA have consistently demonstrated these programs can be implemented consistently, and Congress so intended. As set forth in greater detail below, California's GHG and ZEV regulations reflect the natural progression of California's achievements in regulating emissions from motor vehicle emissions.

These comments proceed in several steps. We first describe the basis for CARB's considerable expertise – its long history as a vehicle regulator. We then discuss the ways the Agencies have recently proposed to scrap this cooperative regulatory effort. We then turn to an analysis first of the flawed technology model, and then of the flawed scrappage models, among other errors in the analysis. We then show that the corrected

analysis does not support the Agencies' proposal, going on to explain that the further attack upon California's authority in the proposal is illegal. We also explore other legal flaws and resulting consequences that will follow if the proposal is finalized.[6]

III. CARB has consistently led the nation in regulating emissions from motor vehicles.

The Agencies are proposing not only to flatline their own programs, contrary to law, but to also strip California of its authority to regulate GHG emissions from light-duty vehicles and to require ZEVs to control both criteria pollutants and GHG emissions. California, through CARB, has been regulating vehicle emissions since 1959, ZEVs since 1990, and GHGs since 2009 (the latter, in successful partnership with EPA and NHTSA). Congress has repeatedly preserved and strengthened CARB's authorities as an integral part of the cooperative federalism scheme of the federal Clean Air Act. EPA has developed decades of administrative practice consistent with this Congressional intent, and both California and the states that have opted into its program rely upon its vehicle program, with EPA's approval, to meet federal emissions standards and state law mandates. Millions of people have benefitted as a result. The Agencies' late-breaking proposal to discover, decades later, that California's program is improper in major regards stands in stark contrast to this history.

We therefore begin these comments with a thorough discussion of CARB's long regulatory history. California began regulating, pursuant to the police power authority inherent in its sovereignty (and preserved by the Tenth Amendment) by the 1950s, reacting to persistent problems with vehicle air pollution caused by California's particular circumstances.

When federal law entered this space, Congress appropriately preserved California's authorities. In 1967, Congress deliberated considerations weighing in favor and against allowing only California to establish and implement its own motor vehicle emissions control program, and elected to expressly grant California the authority to "blaze its own trail, with a minimum of federal oversight". Since 1967, Congress has had ample opportunities to reconsider that initial decision, but in each instance has consistently elected to expand California's authority, based on its recognition that California has consistently achieved more stringent emissions controls than the comparable federal program, and has fulfilled its role as the nation's laboratory in advancing the development of increasingly stringent emissions motor vehicle emissions programs.

Moreover, California's unique authority to adopt and implement more stringent motor vehicle emission standards has played a critical role throughout the years in ensuring that the motor vehicle industry continues its efforts to research and develop

[6] We also note that NHTSA's limitation on comments to 15 pages is untenable and precludes effective public participation. See 83 Fed. Reg. at 43,470, citing 49 C.F.R. § 553.21. CARB submits these comments as "attachments" that are not subject to this improper constraint.

advancements in technology needed to further reduce motor vehicle emissions. As discussed below, for instance, when Congress enacted the 1970 Amendments to the Clean Air Act, it directed EPA to promulgate emission standards for 1975 model year vehicles that were 90 percent lower than the corresponding hydrocarbon (HC) and carbon monoxide (CO) emissions standards for 1970 model year vehicles, and standards for 1976 model year vehicles that were 90 percent lower than the corresponding oxides of nitrogen (NOx) standard for 1971 model year vehicles, respectively. However, that statutory mandate was effectively diluted when the motor vehicle industry claimed that it lacked the experience and knowledge to mass produce the catalytic converter technology needed to comply with the specified emission standards, by Congressional concerns that stringent emission standards might adversely impair vehicle fuel economy, and by concerns that catalytic converters might emit harmful levels of sulfuric acid mist. Consequently, the emission standards that were initially intended to apply to 1975 and 1976 model year vehicles were not implemented on federal vehicles until the 1981 model year.

Fortunately, by virtue of its unique authority under section 209(b) of the Clean Air Act, California was able to continue to promulgate and implement more stringent emission standards that required manufacturers to equip nearly all California vehicles with catalytic converters four years before the corresponding federal emission standards would require catalytic converters on federal vehicles. Those California requirements led to the development of the three-way catalytic converter, and demonstrated that vehicle manufacturers could comply with comparably stringent federal emission standards on a nationwide basis. As the EPA Administrator recognized in 1973, requiring manufacturers to comply with more stringent California requirements before imposing those requirements on a nationwide basis was fully consistent with California's practices of continually establishing more stringent emission standards than comparable federal emission standards, and with the waiver provisions of the Clean Air Act in which Congress expressly authorized California to adopt and enforce more stringent state standards.

As discussed below, California has also led the nation in promulgating other categories of emission standards and emission related requirements, including requirements for on-board diagnostic systems, and criteria and GHG emission standards for 1994 and subsequent model year light-duty motor vehicles, and EPA and Congress have largely relied upon information demonstrating that vehicle manufacturers are capable of complying with California requirements in subsequently promulgating federal requirements that largely mirror the earlier promulgated California emission standards. Professor Ann E. Carlson[7] has explained that California's motor vehicle emissions

[7] "Ann Carlson is the Shirley Shapiro Professor of Environmental Law, and the inaugural Faculty Director of the Emmett Institute on Climate Change and the Environment at the UCLA School of Law. She is also on the faculty of the UCLA Institute of the Environment. [She] is one of the country's leading scholars of climate change law and

control program comprises a crucial and integral component of the larger federal motor vehicle emission control program because it directly fosters the sustained enactment of increasingly stringent emission standards across the nation, as exemplifying "iterative federalism."

Professor Carlson defines "iterative federalism" as encompassing the repeated, sustained and dynamic lawmaking efforts by both certain states that have been effectively delegated a "super regulator status" by federal law, and by the federal government. Under this scheme, a governmental actor initially enacts regulations that results in the second governmental actor adopting a subsequent set of regulations, and that further triggers action by the initial regulator. Professor Carlson explains that Congress' decision to exempt only California from the preemptive effects of the Clean Air Act effectively grants a California a "superregulator" status that allows California to engage in policy experimentation and risk taking that has ultimately benefited other states and the federal government. For instance, allowing California to regulate in advance of the federal government allows EPA to avoid imposing regulations that California first determines impose higher compliance costs than initially anticipated, and further allows California to promulgate more stringent state emission standards even as directives to promulgate more stringent federal emission regulations stagnate, as directly evidenced by the events occurring after the enactment of the 1970 Amendments to the Clean Air Act.

> *Here, instead, the unique iterative federalism structure enacted in 1967 allowed public choice pathologies at the federal level to be corrected at the state level. Furthermore, the iterative federalism structure allowed a state to experiment with potentially costly regulations prior to widespread federal adoption, without imposing multiple regulatory schemes on a nationwide industry. When federal law appeared to be too rigid or politically unpalatable, California's regulatory activity gave the EPA something to follow.*
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> Ann E. Carlson, *Iterative Federalism and Climate Change*, 103 NW. U. L. Rev. 1097, 1117-1118 (2009).

The more detailed discussion below demonstrates that California's unique authority to establish its own distinct motor vehicle emissions control program has not impaired or hindered EPA's ability to promulgate effective a federal motor vehicle emissions control

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policy. Two of her articles, Iterative Federalism and Climate Change and Takings on the Ground, have been selected by the Land Use and Environmental Law Review as among the top five environmental articles of the year, and her work has been published in leading journals including the UCLA, California, Northwestern and Michigan law reviews. She is co-author (with Daniel Farber and Jody Freeman) of a leading casebook, Environmental Law (8th ed.). She recently served on a National Academy of Sciences panel, America's Climate Choices: Limiting the Magnitude of Future Climate Change, and she is currently serving on an American Academy of Arts and Sciences panel studying the future of America's energy systems." *See* https://law.ucla.edu/faculty/faculty-profiles/ann-e-carlson/.

program. Instead, that authority has enabled California to create an innovative motor vehicle emissions control program that has both significantly reduced pollution from motor vehicles in California, and that has benefitted the nation by demonstrating the feasibility of attaining more stringent state standards in California, thereby providing EPA a foundation upon which it can base comparable federal standards that have already been tested in California.

California has consistently led the nation in regulating motor vehicle emissions, and any implication that its motor vehicle emissions control program could potentially hinder the development of more protective federal emission standards is simply incorrect, and is not consistent with the developments of air pollution law since Dr. Haagen-Smit first identified the causal link between motor vehicle emissions and the smog impairing Los Angeles' air quality. Now is not the time to repeal that progress, or ignore Congress's considered and repeated decisions to preserve it.

A. The nation's control of motor vehicle pollution began in California.

CARB pioneered regulating emissions from motor vehicles. Dr. Arie Haagen-Smitt, a professor from the California Institute of Technology, first identified the causal link between the exhaust emissions from motor vehicles and the smog in the air above Los Angeles. Dr. Haagen-Smit conducted a series of experiments in the 1950s that demonstrated ozone – a primary component of the smog affecting residents of Los Angeles – was produced when the hydrocarbon and NOx components of automotive exhaust reacted in the atmosphere in the presence of sunlight.

> *Through investigations initiated at Caltech, we know that the main source of this smog is due to the release of two types of material. One is organic material – mostly hydrocarbons from gasoline – and the other is a mixture of oxides of nitrogen. Each one of these emissions by itself would be hardly noticed. However, in the presence of sunlight, a reaction occurs, resulting in products which give rise to the typical smog symptoms.*
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> A.J. Haagen-Smit, Smog Control – Is it just around the corner?, 26 Engineering and Science, 9, 10 (1962).

Recognizing this public health threat, and exercising its inherent authority to protect public welfare, California enacted legislation in 1959 requiring the Department of Public Health to determine, by February 1, 1960, "the maximum allowable standards of emissions of exhaust contaminants from motor vehicles which are compatible with the preservation of public health including the prevention of irritation to the senses."

Pursuant to that directive, the Department of Public Heath adopted tailpipe emission standards that required reductions of new motor vehicle emissions of HC and CO of 80 percent and 60 percent, respectively, compared to the average emissions of current (uncontrolled) motor vehicles. Expressed numerically, those standards were: 275 parts per million by volume, (as hexane) for HC emissions, and 1.5 percent by volume for CO.

In 1960, California's legislature enacted the Motor Vehicle Pollution Control Act (MVPCA). The MVPCA established the Motor Vehicle Pollution Control Board (MVPCB) within the Department of Public Health, and authorized the MVPCB to, among other specified duties, "determine and publish criteria for approval of motor vehicle pollution control devices." The MVPCB was directed to approve motor vehicle pollution control devices that it found met the emission standards adopted by the Department of Public Health.[8] However, the installation of approved motor vehicle pollution control devices on new motor vehicles was not required until one year after the date that the MVPCB certified two devices.

The MVPCB certified four motor vehicle pollution control devices for use on new motor vehicles in June 1964, and therefore, under the existing law, the installation of such devices on new motor vehicles became mandatory starting in 1966. It is notable that the three major domestic auto manufacturers were able to certify 1966 model year vehicles without the use of the certified motor vehicle pollution control devices; instead, they were able to meet the applicable exhaust emission standards solely by incorporating engine modifications such as carburetor adjustments, timing changes, and air injection systems.

In 1967, California's legislature enacted the Mulford-Carrell Air Resources Act which abolished the MVPCB, established the State Air Resources Board (CARB), and authorized CARB to, among other things, adopt motor vehicle emission standards. The Mulford-Carrell Air Resources Act expressly required 1966 and newer model year motor vehicles to be equipped with certified devices to control crankcase and exhaust emissions, and further required, effective December 1, 1967, that 1968 or newer model year passenger vehicles, 1967 or newer model year commercial motor vehicles under 6,001 pounds maximum gross vehicle weight rating (GVWR), and 1969 or newer model year trucks, truck tractors or buses not powered by diesel fuel, to be equipped with certified devices to control emissions of pollutants from the crankcase and exhaust. California Governor Ronald Reagan appointed Dr. Arie Haagen-Smit the first Chairman of CARB.

B. Early federal and California control of motor vehicle emissions recognized the role of both authorities.

1. The Federal Motor Vehicle Air Pollution Control Act was enacted in 1965.

Unfortunately, California was not the only state adversely affected by the suffocating effects of air pollution caused by motor vehicles during the 1950s and the 1960s. In 1965, the United States Congress enacted the Motor Vehicle Air Pollution Control Act (MVAPCA) to address, on a national level, the broad and intractable harm presented by motor vehicle emissions. The legislative history of the MVAPCA indicates that

[8] Pursuant to Cal. Hlth. § Saf. Code § 426.5.

Congress was fully aware that motor vehicles and motor vehicle engines were a significant source of air pollutants that were harming the public's health and welfare, and that a comprehensive nationwide approach was required to reduce such emissions.

> *Motor exhaust is the only major source of air pollution not under some degree of local or Federal regulation. The time for such regulation is now. Motor vehicles already dump 92 million tons of carbon monoxide alone into the air. Within the next decade, the number of automobiles trailing this lethal gas and other harmful pollutants along our roads and highways will increase by a third. The air around us is an exhaustible resource which must be protected and conserved. To prevent increasing damage to property and health from exhaust fumes and to insure that our children and grandchildren will have clean air to breathe, we must begin the moves needed to stop this fouling of our environment now.*
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> Hearings on H.R. 463, H.R. 2105, H.R. 4001, H.R. 7065, H.R. 7394, H.R. 7429, H.R. 8007, H.R. 8398, H.R. 8723, H.R. 8800, and S. 306 before the Subcomm. on Public Health and Welfare of the House Comm. on Interstate and Foreign Commerce, 89th Cong., 1st Sess. (Cong. Long, pp. 98-99).

Section 202(a) of the MVAPCA required the Secretary of Health, Education, and Welfare to:

> *[P]rescribe as soon as practicable standards, applicable to the emission of any kind of substance, from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause or contribute to, or are likely to cause or contribute to, air pollution which endangers the health or welfare of any persons, and such standards shall apply to such vehicles or engines whether they are designed as complete systems or incorporate other devices to prevent or control such pollution.*
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> Pub. L. 89-272, 79 Stat. 992-993.

Although Congress was fully aware of California's motor vehicle emissions program when it enacted the MVAPCA, it did not enact provisions in MVAPCA to preempt states from promulgating their own vehicle emission standards, and several states subsequently proceeded to enact legislation regarding controls of motor vehicle emissions. As discussed below, Congress subsequently acted to preempt almost all states from controlling new motor vehicle emissions, but also authorized only California to continue to develop and adopt emission standards for new motor vehicles that were distinct from otherwise applicable federal new motor vehicle emission standards.

2. To balance national consistency with state sovereignty to protect public welfare, congress expressly preserved only California's authority to control motor vehicle emissions.

In 1967, Congress enacted the Air Quality Act of 1967 that, in pertinent part, expressly preempted nearly all of the states from adopting separate new vehicle emission standards. The automotive industry maintained that it should only be subject to a

single, nationwide standard, and that it would be unduly disruptive to subject manufacturers to a patchwork of federal and multiple state standards. However, Congress was also fully aware that California was experiencing significant air pollution problems because of compelling and extraordinary circumstances, and also recognized that California was leading the nation in regulating motor vehicle emissions. For instance, as previously discussed, California adopted the first tailpipe emission standards for new 1966 model vehicles, and EPA subsequently adopted essentially those same emission standards for federal 1968 model year vehicles on March 30, 1966.

California's Senator Murphy was able to convince his colleagues from across the nation that allowing California to continue its pioneering efforts to control emissions from motor vehicles, and to essentially serve as a laboratory for innovation that might lead to new developments in control systems and designs, would ultimately benefit the nation.

> *The amendment permits California to continue a role of leadership which it has occupied among the States of this Union for at least the last two decades. As I said in general debate, it offers a unique laboratory, with all of the resources necessary, to develop effective control devices which can become a part of the resources of this Nation and contribute significantly to the lessening of the growing problems of air pollution throughout the Nation.*
>
> 113 Cong. Rec. H14428 (Nov. 2, 1967) (statement of Cong. Moss)

In essence, the nation as a whole would benefit from California's efforts, without having to duplicate those efforts.

The preemptive provision of the Air Quality Act of 1967 consequently reflected a compromise between the desire of the motor vehicle industry to be subject to a single set of emission standards, and California's interest in maintaining its preexisting authority, under state law, to establish motor vehicle standards needed to address the pollution resulting from its unique conditions.

> *SEC. 208. (a) 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 title. 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.*
>
> *(b) The Secretary 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, unless he finds that such State does not require standards more stringent than applicable Federal standards to meet compelling and extraordinary conditions or that such State standards and accompanying enforcement procedures are not consistent with section 202(a) of this title.

(c) Nothing in this title shall preclude or deny to any State or political subdivision thereof the right otherwise to control, regulate, or restrict the use, operation, or movement of registered or licensed motor vehicles.

Pub. Law 90-148, § 208, 81 Stat. 485, 501 (1967)

Although Section 208(b) did not explicitly refer to California, the legislative history clearly indicated that provision was solely applicable to California. Congress accordingly explicitly authorized and directed California to forge ahead of the nation in order to continue its pioneering role of establishing more stringent motor vehicle emissions controls that would necessarily spur advancements in motor vehicle emissions control technology that would ultimately benefit both California and the United States.

3. California obtained its first waiver in 1968.

Once Congress enacted the provision in the Air Quality Act of 1967 that authorized California to adopt separate new motor vehicle emission standards, CARB did not hesitate in requesting a waiver for new motor vehicle emission standards. On July 11, 1968 the Secretary of Health, Education, and Welfare granted California a waiver for several California emission standards, including exhaust emission standards for 1969 model gasoline-powered motor vehicles, evaporative emission standards for 1970 model year vehicles at and below 6,000 lbs GVWR, and associated test procedures.[9]

The waived exhaust emission standards for 1969 model year gasoline-powered motor vehicles at or below 6,000 lbs GVWR, and with engine displacement above 140 cubic inches were: 1) hydrocarbons, 275 parts per million (ppm) by volume (as hexane), and 2) carbon monoxide, 1.5 percent by volume.

4. California continued its progress with the Pure Air Act of 1968 and emissions standards for the 1970 model year.

Although California had already enacted the most stringent motor vehicle emission controls in the nation, it continued its long-standing efforts to seek and attain further reductions of motor vehicle emissions. In 1968, California's legislature enacted the Pure Air Act of 1968, which, among other provisions, established specific exhaust emission standards for new 1970 through 1974 and newer model year gasoline

[9] 33 Fed.Reg. 10160 (July 16, 1968).

powered motor vehicles. Notably, that legislation also established the first emission standards for oxides of nitrogen (NOx) beginning with 1971 model year passenger vehicles. The legislation also specified exhaust emission standards for new 1970, 1971, and 1972 and newer heavy-duty gasoline powered heavy-duty trucks. California's legislature stated that these standards had been determined "to be technologically feasible and capable of implementation with reasonable economic cost by a technical advisory panel of nine California engineers, scientists, and air pollution experts." CARB was also authorized to adopt emission standards that were more stringent than the numerical standards specified in the legislation, if CARB determined such standards were necessary and technically feasible, and to adopt emission standards for other pollutants that CARB found were necessary and technically feasible.

CARB developed test procedures applicable to the above-mentioned exhaust and evaporative emission standards, and requested a waiver for the exhaust and evaporative emission standards as specified in the Pure Air Act of 1968 and the accompanying test procedures. EPA granted that waiver on May 2, 1969.[10]

The California exhaust emission standards for gasoline-powered motor vehicles under 6,001 lbs maximum GVWR are set forth below in units of grams of pollutant per mile (g/mi).

Table III-1 California Exhaust Emissions Standards for 1970 through 1973 Model Year Light-Duty Motor Vehicles

Model Year	Hydrocarbons (g/mi)	Carbon Monoxide (g/mi)	NOx (g/mi)
1970	2.2	23	N/A
1971	2.2	23	4.0
1972 and 1973	1.5	23	3.0
1974 and newer	1.5	23	1.3

5. Federal motor vehicle emissions standards for 1970 adopted California's standards.

In June of 1968, the federal Department of Health, Education and Welfare (HEW) adopted federal exhaust emission standards for 1970 and newer light-duty vehicles that were identical to the corresponding California exhaust emissions standards for 1970 model year light-duty vehicles. On November 2, 1970, the Department of HEW adopted federal exhaust emission standards of: 3.4 g/mi of hydrocarbons, and 39.0 grams per mile for carbon monoxide for 1972 through 1974 light-duty vehicles. These standards applied through the 1974 model year.

[10] 34 Fed.Reg. 7348 (May 6, 1969).

C. Federal and California air pollution law developed in the 1970s.

The early history of the federal/state relationship preserved under federal law set a repeating theme: California continued to press forward with stringent standards, while national standards moved more slowly, or in stops and starts. Despite these contrasts, neither Congress nor EPA suggested anything was improper about California's actions; on the contrary, EPA repeatedly affirmed them, and ultimately adopted California's choices into national standards.

EPA also expressly affirmed, in granting California a waiver for 1979 and subsequent model year light-duty vehicles, that the Clean Air Act authorizes California to regulate emissions of methane, a climate altering pollutant.[11] EPA's affirmance is consistent with legislative history indicating Congress did not limit California's authority to regulate emissions of pollutants to only those categories of pollutants that would contribute to the formation of smog.

> *California's particular problem is that of photochemical smog, the constituent components of which are hydrocarbons and nitrogen oxide. However, the total program for control of automotive emissions is expected to include the control of many other pollutants including carbon monoxide, lead, and particulate matters.*
>
> 113 Cong. Rec. H 30951 (daily ed. Nov. 2, 1967) (Cong. Herlong).

1970 ushered in two events that would significantly affect the federal motor vehicle emissions control program. First, President Nixon established the United States Environmental Protection Agency (EPA). The EPA assumed the responsibility to administer the National Air Pollution Control Administration program previously administered by the Department of the HEW.

1. The Clean Air Act was amended in 1970.

The second event was Congress' enactment of the 1970 Amendments to the Clean Air Act, which again affirmed California's authorities. Congress determined that significant reductions in motor vehicle emissions were required to protect the public health, and accordingly amended the Clean Air Act to require EPA to adopt regulations that achieved specified reductions in emissions from new motor vehicles. Specifically, EPA was required to adopt regulations that required new 1975 light-duty vehicles to emit 90 percent less hydrocarbons and carbon monoxide emissions than the corresponding standards for 1970 model year vehicles, and was further required to establish emissions standards for NOx for new 1976 light-duty vehicles that were at least 90 percent lower than the average emissions of NOx emitted from 1971 light-duty vehicles that were not subject to any federal or state emissions standards for NOx. Affected

[11] 43 Fed.Reg. 25,729; 25,735 (June 14, 1978).

vehicles were required to comply with such standards for a specified period of use (useful life), defined as five years or 50,000 miles, whichever first occurs. Those statutory directives corresponded to emissions standards of 0.41 g/mi of hydrocarbons and 3.4 grams per mile for carbon monoxide for 1975 vehicles, and 0.4 g/mi of NOx for 1976 model year vehicles.

Congress recognized that the statutorily mandated emissions reductions comprised aggressive, technology forcing requirements, and accordingly also enacted safety valve provisions that allowed vehicle manufacturers to request the EPA Administrator to suspend the effective dates of the statutorily prescribed emission standards for one year. The EPA Administrator could only grant a suspension request if he or she determined that the suspension was essential to the public interest, that the applicant had made good-faith efforts to meet the standards, and if the applicant established that the necessary control technology was not available for a sufficient period of time to achieve compliance. Moreover, Congress authorized the National Academy of Sciences (NAS) to assess the technical feasibility of achieving the statutorily mandated emission standards, and specified that the EPA Administrator could not grant a suspension request if the "study and investigation" of the NAS indicated that the requisite control technology was available. If the Administrator granted a request to suspend the statutory emission standards, he or she was required to simultaneously prescribe interim emission standards.

The stringent emission reductions mandated by the 1970 Amendments effectively required most vehicle manufacturers to install catalytic converters on their 1975 model year vehicles in order to reduce the quantities of hydrocarbon and carbon monoxide present in vehicle tailpipe exhaust to acceptable limits. However, vehicle manufacturers asserted that they did not possess extensive knowledge or experience regarding the capabilities of catalytic converter technology to reduce vehicular emissions, and further expressed doubts whether advancements in catalytic converter technology could be developed and successfully implemented in time to permit them to install sufficiently robust converters on all of their 1975 model year production vehicles.

2. CARB and EPA adopted exhaust emission standards for 1973 and subsequent model year light-duty vehicles.

With statutory authorities firmly in place, CARB again led the way, with EPA affirming from the start that more stringent California standards were appropriate even as it moved slowly on federal standards.

In 1971, EPA adopted the first federal emission standards for oxides of nitrogen (NOx), 3 g/mi, for 1973 and 1974 model year light-duty vehicles. The federal exhaust emission standards for 1973 and 1974 model year light-duty vehicles were subsequently adjusted to reflect later modifications of test procedures to: 3.0 g/mi HC, 28.0 g/mi CO, and 3.1 g/mi NOx.

CARB adopted emissions standards and associated test procedures for 1973 through 1976 model year light-duty vehicles, and requested a waiver for the 1973 through 1975 model year standards. The California emissions standards for 1973 and 1974 model year light-duty vehicles were: 1.5 g/mi HC, 23 g/mi CO, and 3.0 g/mi NOx (1973), and 1.5 g/mi HC, 23 g/mi CO, and 2.0 g/mi NOx (1974), respectively. The EPA Administrator granted a waiver for the emissions standards applicable to 1973 and 1974 model year vehicles, but withheld a decision regarding the 1975 model year standards "pending development of additional information by the Environmental Protection Agency."[12]

3. Vehicle manufacturers requested and were granted suspensions of statutory federal 1975 hydrocarbon and carbon monoxide emission standards.

In 1972, vehicle manufacturers requested that the EPA Administrator suspend the statutory hydrocarbons and carbon monoxide emission standards for 1975 model year vehicles for one year, primarily asserting that the catalytic converter technology needed to ensure that 1975 model year vehicles would comply with the statutory emission standards would not be available within the time needed to ensure compliance with the standards. The EPA Administrator denied the requests, and the manufacturers appealed the denial to the U.S. Court of Appeals for the District of Columbia Circuit. The court held that the EPA Administrator had not sufficiently supported his determination that the catalytic converter control technology needed to comply with the emission standards would be available in the needed time, and remanded the matter to the EPA Administrator for further consideration.

The EPA Administrator subsequently conducted public hearings, determined that a suspension of the standards was warranted, and accordingly granted the manufacturers a one year suspension of the statutory 1975 emission standards. During the second round of the EPA hearings, vehicle manufacturers stated that catalyst technology was not sufficiently robust to ensure that their 1975 model year vehicles could comply with the statutory 1975 emission standards, and that even if they could equip vehicles with catalysts and certify those vehicles to the 1975 emission standards, the requirement to equip all production vehicles with catalytic converters would result in massive production problems.

The Administrator determined that although catalytic converter technology needed to meet the 1975 model year standards appeared to be "effective, durable, and reasonably inexpensive," neither the automotive nor the catalyst industry had significant experience in mass producing the needed quantity of catalysts, which presented a risk that the nationwide production of vehicles could be terminated, due to inabilities to procure acceptable catalysts, assembly-line problems, or both. The Administrator further found that overall, the automotive industry could only meet the 1975 standards with 66 percent

[12] 37 Fed.Reg. 8,128 (April 25, 1972).

of vehicle sales, which was not sufficient to meet the basic market demand for the vehicles, and accordingly granted manufacturers a one year suspension from the 1975 model year emission standards.

a. EPA authorized California to require catalytic converters on 1975 model year vehicles.

As previously discussed, the 1970 Amendments required that if the Administrator granted a suspension of the statutory emission standards, he or she was required to simultaneously prescribe interim emission standards for 1975 model year vehicles that "reflected the greatest degree of emission control … achievable by the application of technology which the EPA Administrator determines is available, giving appropriate consideration to the cost of applying such technology within the period of time available to manufacturers." The EPA Administrator determined it was appropriate to establish two separate sets of interim standards – national interim standards that would not require manufacturers to install catalysts on vehicles certified in all states other than California, and a more stringent set of interim standards that would require manufacturers to equip all of the vehicles they intended for sale in California with catalysts. The interim national 1975 model year emission standards were 1.5 g/mi hydrocarbon, 15 g/mi carbon monoxide, and 3.1 g/mi NOx.

The EPA Administrator implemented the more stringent interim standards in conjunction with also granting California a waiver for its 1975 model year light-duty vehicle emission standards, therefore authorizing California to enforce emission standards of 0.9 g/mi hydrocarbon, 9.0 g/mi carbon monoxide, and 2.0 g/mi of NOx. CARB subsequently requested that EPA grant it a waiver allowing California to enforce the waived 1975 model year emission standards to 1976 model year vehicles. EPA granted that waiver request on September 16, 1974.

The Administrator reasoned that this approach (of establishing less stringent national interim standards and more stringent California interim standards) comprised the most reasonable means of ensuring that the requisite compliance technology would be developed and installed on motor vehicles to meet the statutory standards. Requiring manufacturers to equip their California vehicles with catalysts before mandating nationwide installations of catalysts was entirely consistent with both California's trend of establishing more stringent emission standards than comparable federal emission standards, and with the waiver provisions of the Clean Air Act that expressly authorized California to adopt and enforce more stringent state standards. Manufacturers would be provided the opportunity to gain experience with the mass production of catalytic converters for their full range of motor vehicles, which would therefore maintain the industry's momentum towards achieving advances in improving and installing catalytic converters on their nationwide fleet of vehicles, while also facing minimized levels of risk. This momentum would "lay the necessary foundation for full-scale of catalysts in 1976." Representatives from Ford and General Motors testified that limiting the more stringent interim standards to California vehicles would allow their companies to test the

necessary mass production processes on a more limited scale, which would enable better quality control and the ability to remedy identified deficiencies, and to address in-use failures of catalysts.

The Administrator specifically noted California's expertise in regulating motor vehicles as a factor in his determination. "The selection of California for initial introduction of catalytic converters has other advantages as well. Because of California's history of leadership in emission control, that State has in existence a legal and regulatory framework for implementing and enforcing a set of standards different from those applicable outside California." Furthermore, authorizing California to implement more stringent requirements would continue to spur advancements in emissions control technology that could benefit the nation. The Administrator specifically noted that two Japanese manufacturers planned to market vehicles that did not require catalytic converters to meet stringent emission standards. Notably, Honda had developed a Compound Vortex Controlled Combustion engine that had demonstrated a capability of complying with the 1975 statutory standards without requiring a catalytic converter, but the available information indicated it would require more than five years for other vehicle manufacturers to modify their production lines to install that technology on their vehicles. The EPA Administrator stated his conviction that "the best way to accelerate development and use of a superior technology is to put strict emissions control requirements into effect as soon as they are technologically feasible. … When this happens, other companies will be spurred by competitive forces to adopt it." "Where regulatory requirements for emission control challenge conventional technology to its limits, the marketplace will in my judgment provide a strong lever for causing a shift into any superior technology."

Finally, the EPA Administrator considered and rejected claims that catalytic converters would significantly adversely affect fuel economy and vehicle driveability. Information submitted during the hearing indicated that catalytic converters would reduce fuel economy on 1975 model year vehicles by more than 4 percent, and further indicated that 1975 model year vehicles would not exhibit degraded driveability compared to 1973 model year vehicles.

4. EPA suspended the 1976 statutory standard for NOx.

Approximately three months later, the EPA Administrator granted vehicle manufacturers a requested one-year suspension of the 1976 statutory NOx emission standards, largely based on his determination that the technology needed to comply with the statutory emission standards for NOx (a reducing catalyst) would not be available by the 1976 model year. Information indicated that reducing catalysts required more precise control of air to fuel ratios, and were less durable than the oxidation catalysts required to control hydrocarbon and carbon monoxide emissions. As required by the 1970 Amendments, the Administrator simultaneously issued interim NOx standard for 1976 model year vehicles of 2.0 g/mile. However, as discussed below, these standards were further postponed until the 1978 model year.

5. The national energy crisis led Congress to delay the statutory 1975 and 1976 exhaust emission standards until 1977 and 1978.

In 1974, the nation experienced an energy crisis that led Congress to enact legislation (the Energy Supply and Environmental Coordination Act of 1974 (ESECA)), to "…assist in meeting the essential needs of the United States for fuels, in a manner which is consistent, to the fullest extent practicable, with existing national commitments to protect and improve the environment, and (2) to provide requirements for reports respecting energy resources." ESECA, in pertinent part, delayed and weakened the federal vehicle emission standards promulgated by the 1970 Amendments of the Clean Air Act. Notably, as described in greater detail below, California continued to promulgate increasingly stringent vehicle emission standards during this period, with EPA support. Moreover, Congress expressly noted California's demonstrated progress in reducing vehicle emission standards when it enacted the 1977 Amendments to the federal Clean Air Act.

Section 5 of ESECA extended the applicability of the interim 1975 model year standards for hydrocarbon and carbon monoxide emissions to 1976 model year vehicles, and delayed the applicability of the statutory 1975 model year standards for hydrocarbon and CO emissions until 1977. ESECA also delayed the applicability of the statutory 1976 model year standards for NOx emissions until 1978, extended the applicability of the interim 1976 model year NOx standards to both 1975 and 1976 model year vehicles, and decreased the stringency of the 1977 model year NOx emission standard to 2.0 g/mile. Finally, ESECA authorized manufacturers to request that the EPA Administrator suspend the hydrocarbon and carbon monoxide emission standards for 1977 model year vehicles for one year, and required the EPA Administrator to promulgate interim emission standards if he or she granted such suspension requests. These provisions notably did not extend to California's vehicle emission standards or to the waiver provisions of Clean Air Act sections 209(a) or 209(b), and as discussed below, CARB continued to promulgate more stringent standards even as Congress delayed and relaxed the stringency of federal emission standards through its enactment of ESECA. Section 10 of ESECA directed the EPA Administrator and the Secretary of Transportation to conduct a joint study and subsequently issue a report regarding the "the practicability of establishing a fuel economy improvement standard of 20 per centum for new motor vehicles manufactured during and after model year 1980." The study and report were required to address factors including, but not limited to, technological problems and economic costs of meeting such standard, and the impact of applicable emission standards.

6. Congress enacted the Energy Policy and Conservation Act (EPCA) in 1975, building upon the foundation laid by ESECA.

The following year, Congress enacted the Energy Policy and Conservation Act (EPCA), which established a comprehensive and systematic national energy policy that sought to achieve increasing domestic energy production and supply, reducing energy demand,

and the more efficient use of energy. EPCA expressly expanded upon the energy policies of prior energy legislation, including ESECA.

Title III of EPCA authorized the Secretary of Transportation to prescribe fuel economy standards for automobiles, and statutorily prescribed average fuel economies beginning at 18 miles per gallon for 1978 model year automobiles and leading to 27.5 miles per gallon for 1985 model year automobiles.

Section 509(a) of EPCA stated "[w]henever an average fuel economy standard established under this part is in effect, no State or political subdivision of a State shall have authority to adopt or enforce any law or regulation relating to fuel economy standards or average fuel economy standards applicable to automobiles covered by such Federal standard." However, section 502(d) allowed any vehicle manufacturer to apply to the Secretary of Transportation for a modification of an average fuel economy standard for model years 1978 through 1980 if it could show the likely existence of a "Federal standards fuel economy reduction." As NHTSA acknowledges in the NPRM, "Federal standards fuel economy reduction" was defined as including California vehicle emission standards that had been granted a waiver by EPA pursuant to Clean Air Act section 209(b).[13]

In *Green Mountain Chrysler Plymouth Dodge Jeep, et. al. v. Crombie*,[14] a federal district court determined that it need not address plaintiffs' claim that EPCA preempted a Vermont regulation that adopted GHG emission standards for 2009 and newer model year passenger vehicles. The court reasoned that Congress, in enacting section 502(d) of EPCA, did not intend to restrict California's preexisting authority to adopt and enforce separate vehicle emission standards when it enacted EPCA, but rather intended that NHTSA must take California emission standards that have been issued a waiver under section 209(b) of the Clean Air Act into account when it promulgates fuel economy standards.

7. EPA suspended hydrocarbon and carbon monoxide emission standards for 1977 model year vehicles for one year.

On May 20, 1975, the EPA Administrator, acting pursuant to the authority of section 5(c) of ESECA, granted an industry request to suspended the federal hydrocarbon and CO emission standards for 1977 model year vehicles for one year, and simultaneously promulgated interim 1977 model year emission standards of 1.5 g/mi hydrocarbon, 15 g/mi CO, and 2.0 g/mi NOx.

During the hearing to consider the suspension of the 1977 standards, information was presented indicating that the oxidation catalysts needed to control hydrocarbon and carbon monoxide emissions also converted sulfur in gasoline to sulfuric acid, which could result in harmful levels of sulfuric acid mist near freeways and other facilities that

[13] 83 Fed.Reg. 42986, 43210 (Aug. 24, 2018).
[14] 508 F.Supp.2d 295 (D. Vt. 2007).

attract large numbers of vehicles. This posed a concern that the harmful effects of sulfuric acid mist would outweigh the benefits associated with the reductions of hydrocarbons and carbon monoxide, and the EPA Administrator therefore determined that the nation's interests would be best served by maintaining the interim 1977 standards until the sulfuric acid mist question was resolved.

8. EPA granted the waiver for California's 1977 model year emission standards, recognizing the statutory directive to defer to California.

During this time period, as both Congress and EPA were delaying and weakening the stringency of motor vehicle standards, CARB was continuing to promulgate more stringent California vehicle emission standards. CARB adopted California 1977 model year standards of 0.41 g/mi hydrocarbon, 9.0 g/mi CO, and 1.5 g/mi NOx, and requested a waiver for these standards on March 26, 1975. EPA granted CARB's waiver request on May 20, 1975.[15]

In considering that waiver request, EPA Administrator Train discussed the legislative history associated with Congress' enactment of the waiver provision of Section 209(b) of the Clean Air Act, and stated that history supported three major points: (1) Congress believed that California was experiencing 'compelling and extraordinary' conditions that justified a waiver from the preemption from Section 209(a) of the Clean Air Act, (2) Congress intended that the federal government would not second-guess the wisdom of state policy in order to preserve the California motor vehicle emission control program in its original form; and (3) that Congress intended that the standard of EPA's review of California's request for a waiver is narrow.

Administrator Train then noted that EPA's waiver decisions were consistent with the aforementioned Congressional intent, and that former EPA Administrator Ruckelhaus had stated:

> *The law makes it clear that the waiver request cannot be denied unless the specific findings designated in the statute can properly be made. The issue of whether a proposed California requirement is likely to result in only marginal improvement in air quality not commensurate with its cost or is otherwise an arguable unwise exercise of regulatory power is not legally pertinent to my decision under section 209, so long as the California requirement is consistent with section 202(a) and is more stringent than applicable Federal requirements in the sense that it may result in some further reduction in air pollution on California.*
>
> 40 Fed.Reg. 23102, 23104 (citing 36 Fed.Reg. 17458 (Aug. 31, 1971).

[15] 40 Fed.Reg. 23102, 23103 (May 28, 1975).

Administrator Train then stated that, consistent with the above mentioned considerations, he would not deny California's waiver based on the possibility that California's standards could result in the emissions of sulfuric acid mist.

> *Accordingly, I do not view arguments of increased cost or fuel economy penalties, or only marginal improvements in air quality, advanced by some as arguments against the waiver, as controlling in my decision here. For similar reasons, I do not view the question whether the proposed California standards may result in emissions of sulfuric acid mist as controlling given the current state of our knowledge. The structure and history of the California waiver provision clearly indicate both a Congressional intent and an EPA practice of leaving the decision on ambiguous and controversial matters of public policy to California's judgment. As I indicated in my suspension decision, any assessment of the magnitude of the automobile sulfate risk and measures to deal with it clearly falls under that heading.*
>
> 40 Fed.Reg. 23102, 23104 (May 28, 1975)

The EPA Administrator found that he could not make any of the findings that would compel him to deny California's request for a waiver, and consequently granted the waiver despite concerns expressed by vehicle manufacturers that the California 1977 model year standards would adversely affect drivability, experience an 8 to 24 percent decrease in fuel economy, and reduce new vehicle sales as a result of the waiver decision.

9. Congress, in 1977, amended the Clean Air Act.

In 1977, Congress enacted significant amendments to the Clean Air Act. In enacting the 1977 Amendments, Congress had the opportunity to restrict the Clean Air Act's waiver provision. However, Congress – at the height of its consideration of fuel economy statutes and their relationship to air quality -- instead elected to expand California's ability to adopt and implement its own complete program to control motor vehicle emissions. Congress expressed in the House Committee report for the 1977 Clean Air Act Amendments that "[t]he Committee amendment is intended to ratify and strengthen the California waiver provision and to affirm the underlying intent of that provision, i.e., to afford California the broadest possible discretion in selecting the best means to protect the health of its citizens and the public welfare."

Prior to the 1977 Amendments, the EPA Administrator was required to grant California a waiver unless he or she found that California did not require state standards that were more stringent than applicable federal standards to meet compelling and extraordinary conditions, or unless he or she found such state standards and accompanying enforcement procedures were not consistent with section 202(a) of the Clean Air Act. The 1977 Amendments modified the waiver criteria to require the Administrator to grant California a waiver unless *California,* not the Administrator, determined that its state standards are, *in the aggregate*, at least as protective as applicable federal standards.

Congress explained that its intent in promulgating these modifications was to accommodate California's concern with regulating emissions of NOx, which California regarded as a more serious concern than emissions of carbon monoxide. California wanted to establish vehicle emission standards for NOx that were more stringent than the comparable federal emission standard for NOx, but technological constraints appeared to require that the California emission standard for carbon monoxide would then be less stringent than the comparable federal carbon monoxide emission standard. California would not be able to obtain a waiver in this situation because the then applicable waiver criteria required each California standard to be more stringent than the corresponding federal standard. Congress therefore amended the criteria to require the EPA Administrator to "grant a waiver for the entire set of California standards, unless he finds that California acted arbitrarily or capriciously in concluding that its set of standards are at least as protective of the public health and welfare as the Federal standards."

Congress also enacted section 177 of the Clean Air Act, which allows other states that are noncompliant with federal ambient air quality standards to adopt California's new motor vehicle emissions standards that have been granted a waiver, provided such state standards are identical to California's standards, and provided both California and other state adopt the standards at least two years before the first model year of affected vehicles. This provision therefore allows other states to benefit from California's pioneering efforts to control vehicle emissions.

a. Congress recognized California's achievements in controlling motor vehicle emissions.

While Congress was contemplating the 1977 Amendments to the Clean Air Act, it expressly noted that California's experiences in adopting and implementing more stringent emission standards for 1977 model year vehicles effectively refuted the concerns expressed by vehicle manufacturers relating to purported technical difficulties of complying with the statutory emission standards prescribed by the 1970 Amendments to the Clean Air Act. CARB submitted test data to Congress that indicated "cars in all weight classes on the road in California are already achieving emission levels at or very near to .41 gpm hydrocarbon; 3.4 gpm carbon monoxide; and 1.0 gpm NOx or below, despite the requirement to meet weaker standards of .41/9.0/1.5."

Congress also noted both foreign and domestic vehicle manufacturers had equipped their California vehicles with three-way catalysts (that simultaneously control emissions of hydrocarbons, carbon monoxide, and oxides of nitrogen) to meet California's 1978 motor vehicle emission standards, and that three-way catalysts accordingly were not only considered "proven technology," but also demonstrated the ability to comply with a 0.4 g/mi NOx standard while simultaneously increasing the vehicle's fuel economy. Indeed, California's experience demonstrated that California compliant vehicles did not necessarily incur reductions of fuel economy, but could in certain instances, experience increases of fuel economy. Congress also noted that the National Academy of

Sciences had determined that catalytic converters could both reduce vehicle emissions and improve fuel economy of motor vehicles.

Congress further noted that subsequently acquired data and information indicated that prior concerns that catalyst equipped vehicles would emit sulfuric acid mists were "grossly overestimated" based on information including a National Academy of Sciences report that concluded "the statutory hydrocarbon, carbon monoxide, and probably NOx standards can be met in 1978 with at least one technology (the three-way catalyst) with no increase in emissions of sulfuric acid emissions from uncontrolled vehicles," and that dual catalyst systems would achieve "little or no increase" in sulfuric acid emissions. The National Academy of Sciences stated that "relaxing the statutory hydrocarbon, carbon monoxide, and NOx standards in itself is unlikely to result in reduction of sulfuric acid emissions below levels from 1975 model automobiles. Vehicle manufacturers may well choose to continue use of present catalyst systems, even if the standards are relaxed, for reasons of fuel economy and their investment in catalyst technology."

Finally, Congress noted that EPA had expressed frustration because EPA believed that manufacturers had been withholding information regarding their development of new emission control technologies "that would have dramatic impacts on both emissions and fuel economy," and were only providing EPA information that served the manufacturer's own interests. EPA opined that manufacturers had deliberately slowed their efforts to achieve compliance with a 0.4 g/mi NOx standard due to manufacturers' hopes that "Congress may act to abolish the NOx standard," and noted that vehicle manufacturers "calculations concerning potential fuel efficiency problems, as well as potential problems of technological and economic feasibility of any set of emission standards have been consistently overstated."

b. Congress delayed the statutory vehicular emission reduction goals of the 1970 amendments to the Clean Air Act.

The 1977 Amendments to the Clean Air Act had other effects. On the one hand, Congress carefully and deliberately expanded and broadened California's authority to adopt and implement its own distinct and more stringent vehicle emissions control program, and it also determined that the technology needed to achieve more stringent emission standards was available and would not adversely impact either fuel economy or result in significant emissions of sulfuric acid mists. Nevertheless, the 1977 Amendments also set federal motor vehicle emission standards that effectively provided manufacturers further extensions and relaxations of the vehicle emission reduction goals established by the 1970 Amendments of the Clean Air Act, largely to accommodate manufacturer claims that postponement of those light-duty vehicle emission standards was needed to avert an industry shutdown.

Congress accordingly extended the hydrocarbon emissions standard for 1975 model year vehicles as initially established by the 1970 Amendments to the Clean Air Act (0.41 g/mi) until the 1980 model year, extended the carbon monoxide emissions standard for

1975 model year vehicles as initially established by the 1970 Amendments to the Clean Air Act (7.0 g/mi) until the 1981 model year, and relaxed the NOx emissions standard for 1976 model year vehicles as initially established by the 1970 Amendments to the Clean Air Act from 0.4 g/mi to 1.0 g/mi, and extended the effective date of that standard to 1981 model year vehicles. Congress also enacted provisions allowing manufacturers to request waivers of the carbon monoxide standard for 1981 and 1982 model year vehicles, and allowing qualifying small manufacturers to certify 1981 and 1982 model year vehicles to a 2.0 g/mi NOx standard.

The following table compares the federal emission standards enacted by the 1977 Amendments to the Clean Air Act and the corresponding California emission standards for model year 1977 through 1981 light-duty motor vehicles:

Table III-2 1977 through 1981 Primary Light-Duty Motor Vehicle Emission Standards
(all standards expressed in grams/mile)[16]

	Federal			California		
Model Year	Hydrocarbon	Carbon Monoxide	NOx	Hydrocarbon	Carbon Monoxide	NOx
1977	1.5	15	2.0	0.41	9.0	1.5
1978	1.5	15	2.0	0.41	9.0	1.5
1979	1.5	15	2.0	0.41	9.0	1.5
1980	0.41	7.0	2.0	0.41	9.0	1.0
1981	0.41	3.4	1.0	0.41	3.4	1.0
1982	0.41	3.4	1.0	0.41 0.41	7.0 7.0	0.4 0.7[17]

This table illustrates that the federal emissions standards for NOx do not become sufficiently stringent to require the installation of oxidation catalytic converters until 1981 – four years after California's 1977 model year standards took effect. The table also demonstrates that even as both Congress and EPA relaxed and delayed the federal light-duty vehicle emission standards, CARB continued its long established practice of adopting more stringent emission standards and other emission related requirements in order to address the compelling and extraordinary conditions affecting California.

[16] California standards for 1977 and 1978 model year – Title 13, California Administrative Code (CAC) § 1955.1 (1983); for 1979 model year vehicles in 13 CAC 1959.5, (1988) for 1980 model year vehicles in Title 13, California Code of Regulations (CCR) § 1960 (2013), and for 1981 and 1982 model years, 13 CCR §§ 1960.1(a) (2013), 1960.1(b) (2013). Federal standards for 1977 through 1979 model year vehicles are set forth at 40 Fed.Reg. 32906, 32911 (June 28, 1977) [40 CFR §077-8 (1977)], 40 Fed.Reg. 32906, 32930 (June 28, 1977) [40 CFR § 078-8].
[17] This set of standards is optional. A manufacturer must select either the primary or optional set of standards for its entire product line of 1981 and 1982 models.

D. California continued to lead the nation in developing more stringent motor vehicle emission requirements throughout the 1980s.

1. California's motor vehicle emission standards for 1982 model year light-duty vehicles required compliance with a 0.4 g/mi NOx emission standard.

That pattern continued through the 1980s; California moved the nation forward, and both Congress and EPA moved more slowly, while supporting California's continued authorities.

EPA granted CARB a waiver for the California 1979 and subsequent model year light-duty motor vehicle emission standards in 1978. CARB adopted those standards to address the "peculiar oxidant and NO^2 air quality problems in the California South Coast Air Basin." Although certain vehicle manufacturers testified that they lacked the technology needed to meet the primary 1982 model year standards, CARB testified that two manufacturers had already demonstrated compliance with the 1982 model standards with 1977 certification data. Acting EPA Administrator Blum stated she could not find that the technology needed to meet the 1982 model year standards could not be developed and applied in the lead time provided, or that the costs of compliance were sufficiently excessive, and accordingly granted the waiver.

The stringent 0.4 g/mi NOx emission standard associated with the California 1982 model year standard required motor vehicle manufacturers to equip vehicles with increasingly sophisticated emission control and fuel metering systems, including three-way catalytic converters, fuel injection systems, and oxygen sensors. It is especially notable that California was able to require the introduction of such controls years before the federal light-duty motor vehicle standards became sufficiently comparable in stringency to California's standards. In fact, the federal light-duty motor vehicle emission standards did not prescribe a 0.4 g/mi NOx standard until the 1994 model year. This example, particularly when viewed in the context of the continued delays and weakening of the federal motor vehicle emissions standards as discussed above, illustrates the benefits resulting from California's ability to establish its separate motor vehicle emissions control program that is free from the constraints of the federal motor vehicle emissions control program, and is also consistent with the benefits resulting from EPA Administrator Train's decision in 1973 to allow California to manufacturers to equip their vehicles with catalytic converters despite manufacturers' claims that catalytic converter technology was not sufficiently developed or available in the quantities needed for installation on all production vehicles. As previously discussed, that California requirement enabled manufacturers to gain experience and knowledge with catalytic converters, and provided CARB information regarding the capability of future technical advancements needed to achieve even more stringent future emissions requirements, such as the primary 1982 model year emissions standards. It is difficult to imagine how CARB would have obtained the knowledge and information needed to

support its assessment of technical feasibility of equipment needed to comply with the 1982 model year standards if it was subject to the same constraints imposed on EPA. Recall that EPA previously expressed that it was largely dependent on information supplied by vehicle manufacturers regarding the status and capability of future emission control technologies, and that it believed manufacturers were deliberately stalling their efforts to develop compliant technologies based on hopes that Congress would abolish the 0.4 g/mi NOx standard.

2. CARB adopted diesel particulate matter standards for 1985 model year diesel-fueled light-duty vehicles.

In 1982, CARB amended California's exhaust emission standards for 1985 and subsequent model year diesel powered light-duty vehicles to ensure that more stringent particulate matter standards would be in effect in California 1985. EPA was also considering the adoption of essentially equivalent federal particulate matter emission standards for diesel-powered vehicles, but decided to delay a 0.2 g/mi particulate matter standard from the 1985 to the 1987 model year.

EPA determined that the requisite technology (trap oxidizer systems) would be widely available by the 1986 model year, but decided to delay the 0.2 g/mi particulate matter standard to 1987. CARB also determined that trap oxidizer systems would be available by the 1986 model year, but elected to adopt a 0.2 g/mi particulate matter standard for 1986 through 1988 model year vehicles. CARB further adopted a 0.08 g/mi particulate matter standard for 1989 and subsequent model year vehicles, and requested that EPA grant California a waiver for such standards. Motor vehicle manufacturers opposing California's waiver request asserted that California did not meet waiver criterion of Clean Air Act section 209(b)(1)(B), that California needs "such State standards to meet compelling and extraordinary conditions".

In considering CARB's waiver request, EPA extensively discussed the "compelling and extraordinary" criterion of Clean Air Act section 209(b)(1)(B). EPA determined that its traditional interpretation of this criterion, that it concerns California's need for its own motor vehicle program, as opposed to its need for the particular standards at issue in the waiver, was supported by both the statutory text and legislative history indicating that Congress, in enacting the initial waiver provision, was expressly aware that by authorizing California to enact its own motor vehicle program, it would require the automotive industry to comply with two separate sets of requirements. EPA accordingly concluded that "[t]he 'need' issue thus went to the question of standards in general, not the particular standards for which California sought [a] waiver in a given instance," and further noted: "It is evident from this history that "compelling and extraordinary conditions" does not refer to levels of pollution directly, but primarily to the factors that tend to produce them: geographical and climatic conditions that, when combined with large numbers and high concentrations of automobiles, create serious air pollution problems."

EPA then considered arguments advanced by manufacturers that Clean Air Act section 209(b)(1)(B) applies to California's need for the particular particulate emission standards. EPA determined that even under this alternative interpretation, the manufacturers did not meet their burden of demonstrating that California did not satisfy the compelling and extraordinary criterion.

EPA expressly rejected manufacturer claims that the section 209(b)(1)(B) criterion is limited to emission standards for pollutants that are related to California's smog problem (i.e., hydrocarbons and oxides of nitrogen), and that consequently California's standards for particulate emissions should not be afforded the "benefit of the Congressional presumptions which supported all prior waivers."[18]

> *If Congress had been concerned only with California's smog problem, however, it easily could have limited the ability of California to set more stringent standards to hydrocarbons and oxides of nitrogen—the only two regulated automotive pollutants substantially contributing to that phenomenon. Instead, Congress took a broader approach consistent with its goal of allowing California to operate its own comprehensive program.*
>
> 49 Fed.Reg. 18887, 18890 (May 3, 1984)

EPA cited legislative history indicating Congress, in enacting the waiver provision, was aware that California might seek to control non-smog pollutants including carbon monoxide, lead, and particulate matter.[19]

EPA also rejected claims that California must demonstrate that it suffers from a "unique" particulate problem (i.e., one that is demonstrably worse than the problem experienced in the rest of the country) to qualify for a waiver for its particulate emission standards. "However, as CARB points out, there is no indication in the language of section 209 or the legislative history that California's pollution problem must be the worst in the country, for a waiver to be granted."

EPA further rejected claims that California failed to establish the necessity of its particulate standards because the State's emissions standards would allegedly produce only minor reductions of particulate matter emissions.

> *Arguments concerning … the marginal improvements in air quality that will allegedly result [from implementation of the standards], and the question of whether these particular standards are actually required by California …fall within the broad area of public policy. The EPA practice of leaving the decision on such controversial matters of public policy to*

[18] 49 Fed.Reg. 18887, 18890 (May 3, 1984).
[19] Ibid.,113 Cong. Rec. 30591 (Nov. 2, 1967) (Rep. Herlong).

> *California's judgment is entirely consistent with the Congressional intent ….*
>
> 49 Fed.Reg. 18887, 18891 citing 41 Fed.Reg. 44209, 44210 (October 7, 1976).

EPA additionally noted that CARB had established that California was experiencing unique limited visibility problems resulting from diesel particulate matter, and that diesel particulate matter, in combination with the high levels of ozone and oxides of nitrogen concentrations found in areas such as the South Coast Air Basin, potentially posed at least three unique public health problems. EPA then concluded that even if its finding "regarding the existence of 'compelling and extraordinary conditions' were focused only upon California's particulate problem, [it] could not find that the opponents of the waiver had met their burden of proof to show that such conditions do not exist".

EPA also found that CARB's determination that trap oxidizers needed to meet the 0.2 g/mi particulate standard would be available in California by model year 1986 was not inconsistent with its own determination that trap oxidizers would be available in 1987. EPA's forecast was based on the availability of trap oxidizers on a nationwide basis, whereas CARB's forecast was based on availability of trap oxidizers in California. EPA noted it had historically granted California waivers that allowed California to require new technology prior to the nationwide implementation of that technology, and that this approach was consistent with EPA's rationale in authorizing California to enforce requirements necessitating the use of catalytic converters on 1975 model year vehicles a year before they were required on federal vehicles, as that approach would ensure that trap oxidizers would be successfully implemented on a nationwide basis the following year.

EPA granted California a waiver for the 1975 and subsequent model year standards that included a 0.2 g/mi particulate standard for California 1986 through 1988 model year vehicles, and a 0.08 g/mi particulate matter standard for 1989 and subsequent model year vehicles. EPA subsequently adopted a federal 0.2 g/mi particulate standard for 1987 model year vehicles and would later adopt a 0.08 g/mi standard that would be fully required on 1995 model year vehicles.

3. California required On-Board Diagnostic (OBD) systems.

As CARB continued to adopt and implement more stringent motor vehicle emissions standards and other emissions related requirements, vehicle manufacturers increasingly relied on three-way catalytic converters to meet those emission standards. Because three-way catalytic converters are most effective if vehicles operate within a relatively narrow range of air to fuel ratio, manufacturers also began implementing fuel feedback systems to more precisely meter fuel into engines and also increasingly equipped their vehicles with emissions control equipment that was controlled by computers on the vehicles. Although new motor vehicles could demonstrate compliance with stringent emission standards when they were new, it was also critically important that those vehicles demonstrate compliance with the standards throughout the period that they

were actually operated. In 1985 CARB therefore first adopted regulations that required manufacturers to equip 1988 and newer model year vehicles equipped with three-way catalysts and feedback fuel systems to be equipped with on-board diagnostic (OBD) systems (OBD I systems).

OBD systems are primarily comprised of software that is used by a vehicle on-board computer to detect emission control system malfunctions as they occur. OBD I systems were required to detect malfunctions of the fuel metering system, exhaust gas recirculation system valve, on-board computer, and of emission control components that provided inputs into the on-board computer, and to notify the operator of such malfunctions by illuminating a light on the vehicle dashboard. EPA determined that the OBD I system requirements were within the scope of prior waivers issued to California in 1986.

Since 1988, both OBD systems and vehicle emission controls have become increasingly sophisticated. In 1989, CARB adopted more comprehensive OBD regulations that required all 1996 and newer model year light-duty vehicles and medium-duty vehicles and engines to be equipped with OBD systems (referred to as OBD II). The OBD II regulation prescribes much more comprehensive and detailed monitoring requirements than the OBD I regulation. For instance, OBD II systems must monitor for malfunctions including engine misfire, catalysts, oxygen sensors, evaporative systems, exhaust gas recirculation systems, secondary air systems, fuel systems, and all electronic powertrain components that can affect emissions when malfunctioning - virtually every component and system on a vehicle that can cause increases in emissions. OBD II systems must further timely notify the vehicle operator of a detected malfunction, and store a code in the computer that will aid a technician in identifying the likely cause of the malfunction. OBD II systems help to ensure that motor vehicles comply with applicable emission standards in real-world use throughout their entire life, not just when the vehicle or engine is being certified. CARB has regularly updated the OBD II regulation to amend the monitoring requirements of OBD II systems, and to establish OBD II specific enforcement requirements. EPA has granted California waivers for both the initial OBD II regulation and for subsequent amendments to the OBD II regulation.

EPA promulgated federal OBD requirements for federally certified light-duty vehicles and trucks in 1993, and later amended these requirements to require OBD systems on medium-duty vehicles by the 2008 model year. EPA's final rule with the latest modifications of the OBD requirements was published on February 24, 2009. A central part of the federal regulation is that, for purposes of federal certification of vehicles, EPA will deem California-certified OBD II systems to comply with the federal regulations. Historically, virtually every vehicle sold in the United States is designed and certified to California's OBD II requirements, in lieu of the federal OBD requirements.

E. Congress strengthened the Clean Air Act in 1990.

In 1990, Congress enacted significant amendments to the Clean Air Act, including provisions that expressly authorized EPA to regulate new non-road engines and vehicles, and which further expanded California's vehicle regulatory authorities. Once again, after a decade of experience with California as a co-regulator, Congress decided to preserve state innovation, and to expand CARB authority.

Non-road engines are internal combustion engines that are not used in motor vehicles or vehicles used solely for competition, or that are subject to standards promulgated under section 111 of the Clean Air Act (standards of performance for new stationary sources) or section 202 of the Clean Air Act (standards for on-road mobile sources). EPA's authority to regulate new non-road sources differs in several respects from its authority to regulate new motor vehicles and engines. Significantly, Congress conclusively preempted states and their political subdivisions from adopting or enforcing any standard or other requirement relating to the control of emissions from certain categories of new non-road engines: new engines less than 175 horsepower used in farm and construction equipment and vehicles, new engines used in new locomotives, and new locomotives.

Congress generally preempted states and political subdivisions from adopting or enforcing standards or other emission related requirements for any other categories of non-road engines or equipment. However, as it had previously provided in the context of emission standards for new on-road vehicles and engines, Congress authorized only California to initially adopt and enforce standards and other emission related requirements from new and in-use non-road engines that are not expressly preempted by section 209(e)(1) if EPA authorizes California to adopt and enforce such standards and requirements pursuant to section 209(e)(2). The criteria for obtaining an authorization are nearly identical to the criteria for obtaining a waiver for motor vehicles. It is notable that Congress has entrusted only California with the authority to establish standards and emissions related requirements from in-use non-road engines and equipment; as it has only authorized EPA to adopt standards and emission related requirements for new non-road engines and equipment.

Congress also enacted a provision in Clean Air Act section 209(e)(2)(C) that is analogous to Clean Air Act section 177, in that it allows other states to adopt and enforce California non-road standards that have been granted an authorization, provided the other state's standards and implementation and enforcement are identical to the authorized California standards, and provided California and the other state adopt the subject standards at least 2 years before commencement of the period for which the standards take effect.

In *Engine Mfrs Ass'n v. U.S. E.P.A (EMA)*,[20] the U.S. Court of Appeals for the District of Columbia Circuit noted that Congress understandably authorized only California to adopt and enforce its own non-road emission standards and other emission-related requirements based on Congress' experience with California's success in implementing its own motor vehicle emissions control program.

> *Given the indications before Congress that California's regulatory proposals for non-road sources were ahead of the EPA's development of its own proposals and the Congressional history of permitting California to enjoy coordinate regulatory authority over mobile sources with the EPA, the decision to identify California as the lead state is comprehensible. California has served for almost 30 years as a "laboratory" for motor vehicle regulation. See [Motor & Equip. Mfrs. Ass'n, Inc. v. EPA ("*MEMA I*"), 627 F.2d 1095, 1110]. Its severe air pollution problems, diverse industrial and agricultural base, and variety of climatic and geographical conditions suit it well for a similar role with respect to non-road sources. As was the case when Congress first regulated motor vehicle emissions, California was already in the lead on non-road sources in 1990.*

88 F.3d 1075, 1090 (D.C. Cir. 1996)

F. California's Advanced Clean Cars Program brought together comprehensive emission control and advanced technology to maximum benefit.

With this long history behind us, we turn to the modern light- and medium-duty vehicle programs. California's existing light-duty vehicle motor vehicle emission control program utilizes a comprehensive approach to address both criteria and GHG emissions, and assures the development of environmentally superior vehicles that will continue to deliver the performance, utility, and safety that vehicle owners have come to expect. CARB refers to that set of regulations as the California Advanced Clean Cars Program, and has most recently obtained a waiver for that program in 2013. However, EPA has repeatedly granted waivers for its component part since the early 1990s. The components of the program function together to reduce criteria air pollutant risks, reduce climate risk, and support continued innovation in vehicle emission controls, just as Congress intended.

A more detailed description of each element of the Advanced Clean Cars regulation is provided below. As also described below, EPA has largely also adopted elements of California's motor vehicle emissions control program into the corresponding federal motor vehicle emissions control program.

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[20] 88 F.3d 1075 (D.C. Cir. 1996).

1. The ACC program included criteria emissions standards.

a. California's Low Emission Vehicle program.

In 1990, CARB adopted the first phase of California's low-emission vehicle (LEV) program (LEV I). The LEV I program required vehicle manufacturers to introduce progressively cleaner light- and medium-duty vehicles with more durable emission controls during model years 1994 through 2003, and consisted of three primary elements: tiers of exhaust emission standards for increasingly stringent categories of low-emission vehicles; requirements that manufacturers phase-in a progressively cleaner mix of vehicles each year, with separate fleet average requirements for passenger cars and light-duty trucks, and the option of banking and trading credits; and a requirement that specified percentages of passenger cars and lighter light-duty trucks be zero-emission vehicles (ZEVs), which have no exhaust or evaporative emissions. EPA granted California a waiver for the LEV I regulation emission standards applicable to passenger cars and light-duty trucks in 1993, and granted California a waiver for the LEV I regulation emission standards applicable to medium-duty vehicles in 1998.

In 1999, CARB adopted the second phase of the LEV regulation, known as the LEV II regulation. The LEV II regulation primarily increased the stringency of emission standards for all light- and medium-duty vehicles beginning with the 2004 model year, and expanded the light-duty truck category to include vehicles up to 8,500 lbs. gross vehicle weight rating (GVWR) so that most sport utility vehicles, mini-vans and pick-up trucks were subject to the same low-emission vehicle standards as passenger cars. EPA granted California a waiver for the LEV II emission standards in 2003, and confirmed that CARB's subsequent amendments to the LEV II regulation fell within the scope of the LEV II waiver.

In 2012, CARB adopted further amendments to the LEV program to achieve further emission reductions from the California light- and medium-duty fleet (LEV III Criteria). The primary elements of the LEV III Criteria: (1) reduce fleet average emissions of new vehicles to super ultra-low-emission vehicle (SULEV) levels by 2025, which represents an approximate 75 percent reduction of emissions from 2010 levels; (2) establish additional light-duty vehicle emission standard categories, such as ULEV70, ULEV50, and SULEV20 to provide vehicle manufacturers additional options for complying with the SULEV fleet average; (3) establish more stringent particulate matter emission standards for light- and medium-duty vehicles; (4) establish essentially zero evaporative emission standards for passenger cars and light-duty trucks, and (5) increase full useful life durability requirements from 120,000 miles to 150,000 miles. EPA granted California a waiver for the LEV III Criteria when it granted California's waiver request for the Advanced Clean Cars program in 2013.

b. The federal Low Emissions Vehicle program.

The comparable federal motor vehicle emissions control program for 1994 and subsequent model year light- and medium-duty vehicles has largely established criteria

emission standards that are consistent with those in California's LEV regulations. The 1990 Amendments to the Clean Air Act required EPA to prescribe emission standards for 1994 and subsequent model light-duty vehicles and light-duty trucks. EPA adopted such standards, designated the federal Tier 1 standards, in 1991. The Tier 1 standards were comparable to, but less stringent than California's LEV I standards. EPA subsequently adopted federal Tier 2 standards in 2000 that established average passenger car standards of 0.07 g/mi NOx beginning in 2004, and Tier 3 standards in 2014. The Tier 3 standards are closely coordinated with California's LEV III Criteria regulation, but delay the implementation dates of the federal standards for light-duty vehicles. The federal Tier 3 standards apply to 2017 and subsequent model light-duty vehicles, whereas California's LEV III Criteria standards apply to 2015 model year light-duty vehicles.

2. Greenhouse gas emissions standards.

a. California adopted the first vehicle GHG emission standards in the nation.

In 2002, California's legislature adopted, and the Governor signed California Assembly Bill (AB) 1493[21] that authorized and directed CARB to adopt the maximum feasible and cost-effective reductions in greenhouse gas (GHG) emissions from light-duty vehicles.

Pursuant to the directives of Assembly Bill 1493, CARB adopted the first GHG emissions standards for light-duty vehicles in the nation. California's regulations apply to 2009 to 2016 and later MYs vehicles, and require a 17 percent overall reduction in GHG emissions from the light-duty fleet by 2020, and a 25 percent overall reduction by 2030. EPA granted CARB's waiver request on July 8, 2009. California's regulations formed the foundation for EPA's comparable federal GHG program for 2012 through 2016 model year light-duty vehicles.

b. EPA adopted comparable federal vehicle GHG emission standards after protracted litigation.

In 2003, EPA denied a rulemaking petition to regulate greenhouse gas emissions from new motor vehicles under section 202 of the Clean Air Act. The EPA's denial of the rulemaking petition ultimately proceeded to the U.S. Supreme Court, which held that EPA had improperly denied the rulemaking petition.[22] The Court first held that the Clean Air Act's definition of "air pollutant" in section 302(g) unambiguously encompasses compounds that contribute to climate change, including carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons, and that section 202(a)(1) of the Act authorizes EPA to regulate greenhouse gases emitted from motor vehicles if EPA "forms a 'judgment' that such emissions contribute to climate change."[23]

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[21] Cal. Stats. 2002, Ch. .; Cal. Health & Saf. Code § 43018.5.
[22] *Massachusetts v. EPA*, 549 U.S. 497 (2007).
[23] *Massachusetts v. EPA*, 549 U.S. 497, 528 (2007).

The Court then held that EPA also improperly denied the petition under the alternative basis (that even if EPA had the statutory authority to regulate greenhouse gases, it would be unwise to do so at this time). The Court noted that Clean Air Act section 202(a)(1) conditions EPA's discretion to regulate air pollutants upon a judgment that "must relate to whether an air pollutant "cause[s], or contribute[s] to, air pollution which may reasonably be anticipated to endanger public health or welfare,"[24] and then determined that EPA's "laundry list of reasons not to regulate" in this case did not meet the Clean Air Act's clear statutory directive requiring EPA to justify not taking further action "only if it determines that greenhouse gases do not contribute to climate change or if it provides some reasonable explanation as to why it cannot or will not exercise its discretion to determine whether they do."[25] The Court expressly rejected EPA's argument that it lacked the authority to regulate GHG emissions from motor vehicles, because regulating those emissions would effectively require EPA to increase vehicle fuel efficiencies, a task that EPA argued was solely assigned to the Department of Transportation (DOT) by EPCA:

> *[T]hat DOT sets mileage standards in no way licenses EPA to shirk its environmental responsibilities. EPA has been charged with protecting the public's 'health' and 'welfare', [citation omitted], a statutory obligation wholly independent of DOT's mandate to promote energy efficiency… The two obligations may overlap, but there is no reason to think the two agencies cannot both administer their obligations and yet avoid inconsistency.*
>
> 549 U.S. 497, 532.

In response to the *Massachusetts v. EPA* decision, EPA subsequently determined that six greenhouse gases in the atmosphere may reasonably be anticipated to endanger both public health and public welfare, and further determined that

> *the emissions of such greenhouse gases from new motor vehicles and new motor vehicle engines contribute to the greenhouse gas air pollution that endangers public health and welfare under Clean Air Act section 202(a).*[26]

These EPA determinations were upheld by the U.S. Court of Appeals for the District of Columbia Circuit in *Coalition for Responsible Regulation v. EPA*,[27] (affirmed in part, and reversed in part on unrelated grounds by *Utility Air Regulatory Group v. EPA*,[28]).

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[24] *Massachusetts*, 549 U.S. 497, 532-533.
[25] *Id.* at 533.
[26] 74 Fed.Reg. 66,496 (Dec. 15, 2009).
[27] 684 F.3d 102 (D.C. Cir. 2012).
[28] 134 S. Ct. 2427 (2014).

c. California enacted the California Global Warming Solutions Act, and U.S. Congress amended EPCA by enacting the Energy Independence and Security Act of 2017.

In 2006, California's legislature adopted, and the Governor signed California Assembly Bill 32, the California Global Warming Solutions Act.[29] Assembly Bill 32 charges CARB with the responsibility of monitoring, regulating, and reducing GHG emissions in the State, and directs CARB to prepare a Scoping Plan outlining the State's strategy to achieve the maximum feasible and cost-effective reductions in furtherance of reducing GHG emissions to 1990 levels by 2020. Measure T1 of the Scoping Plan anticipates an additional 3.8 million metric tons carbon dioxide equivalent ($MMTCO_2e$) reduction by 2020 from the subject regulatory amendments, beyond the GHG reductions arising from the 2009-2016 Assembly Bill 1493 standards.

In 2007, Congress enacted the Energy Independence and Security Act of 2017 (EISA) which amends EPCA by mandating the Secretary of Transportation to prescribe annual fuel economy increases for 2011 model year automobiles that ultimately require a combined fuel economy fleet average of at least 35 miles per gallon by model year 2020.

In enacting EISA, Congress expressed its intent, as it did when it enacted EPCA, to preserve California's authority to adopt more stringent vehicle emission standards. Specifically, section 3 of EISA[30] broadly preserves California's authority to develop and administer its own motor vehicle emissions control program.

> *Except to the extent expressly provided in this Act or an amendment made by this Act, nothing in this Act or an amendment made by this Act supersedes, limits the authority provided or responsibility conferred by, or authorizes any violation of any provision of law (including a regulation), including any energy or environmental law or regulation.*
>
> § 3, Pub. L. 110-140, 121 Stat. 1492, 1498 (codified at 42 U.S.C. § 17002).

This intent is also clearly evidenced by the pertinent legislative history. Senator Diane Feinstein, the original sponsor of EISA's provisions to increase fuel economy standards, testified that those provisions would not prevent California from establishing tailpipe emission standards.

> *The legislation increasing the fuel economy standards of vehicles by 10 miles per gallon over 10 years does not impact the authority to regulate tailpipe emissions of the EPA, California, or other States, under the Clean Air Act.*

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[29] Cal. Assem. Bill 32, stats. 2006, ch. 488.
[30] Pub. L. 110-140, § 3, 121 Stat. 1492, 1498.

The intent was to give NHTSA the ability to regulate fuel efficiency standards of vehicles, and increase the fleet-wide average to at least 35 miles per gallon by 2020.

There was no intent in any way, shape, or form to negatively affect, or otherwise restrain, California or any other State's existing or future tailpipe emissions.

The two issues are separate and distinct.

As the Supreme Court correctly observed in Massachusetts v. EPA*, the fact "that DOT sets mileage standards in no way licenses EPA to shirk its environmental responsibilities. EPA has been charged with protecting the public's health and welfare, a statutory obligation wholly independent of DOT's mandate to promote energy efficiency. The two obligations may overlap, but there is no reason to think the two agencies cannot both administer their obligations and yet avoid inconsistency."*

I agree with the Supreme Court's view of consistency. There is no reason to think the two agencies cannot both administer their obligations and yet avoid inconsistency.

The U.S. District Court for the Eastern District of California in Central Valley Chrysler-Jeep v. Goldstone *has reiterated this point in finding that if approved by EPA, California's standards are not preempted by the Energy Policy Conservation Act.*

Title I of the Energy Security and Independence Act of 2007, H.R. 6, provides clear direction to the Department of Transportation, in consultation with the Department of Energy and the Environmental Protection Agency, to raise fuel economy standards.

By taking this action, Congress is continuing DOT's existing authority to set vehicle fuel economy standards. Importantly, the separate authority and responsibility of the U.S. Environmental Protection Agency to regulate vehicle greenhouse gas emissions under the Clean Air Act is in no manner affected by this legislation as plainly provided for in section 3 of the bill addressing the relationship of H.R. 6 to other laws.

I fought for section 3. I have resisted all efforts to add legislative language requiring "harmonization" of these EPA and NHTSA standards. This language could have required that EPA standards adopted under section 202 of the Clean Air Act reduce only the air pollution emissions that would already result from NHTSA fuel economy standards, effectively making the NHTSA fuel economy standards a national ceiling for the reduction of pollution. Our legislation does not establish a NHTSA ceiling.

> *It does not mention the Clean Air Act, so we certainly do not intend to strip EPA of its wholly separate mandate to protect the public health and welfare from air pollution.*
>
> *To be clear, Federal standards can avoid inconsistency according to the Supreme Court, while still fulfilling their separate mandates.*
>
> 153 Cong. Rec. 15386 (daily ed. Dec. 13, 2007).

This Congressional intent is further reinforced in light of legislative history that indicates certain members of Congress in fact actively sought to enact provisions in EISA that would explicitly preempt EPA's ability to establish greenhouse gas tailpipe emission standards. Those provisions would have required the Administrator of EPA to consult with the Secretary of Transportation before promulgating regulations for GHG emissions from automobiles, and would also expressly require the Administrator to consider fuel economy standards in assessing the maximum feasible reduction of GHG emissions.[31] Other versions of the proposals would have required EPA to ensure that GHG emission standards were fully consistent with fuel economy standards.[32]

Congress ultimately rejected those proposals, which further evidences that it did not intend that EISA would preempt EPA or California from promulgating GHG emission standards for motor vehicles.[33]

d. EPA, NHTSA and CARB's collaborative efforts resulted in national GHG vehicle standards.

In 2010, President Barack Obama directed EPA and NHTSA to work with California to develop GHG fleet standards for MY 2017 through 2025 light duty vehicles. EPA, NHTSA, and CARB developed a Joint Technical Assessment Report (Joint TAR) which was released in September 2010. The report concluded "electric drive vehicles including hybrid(s)…battery electric vehicles…plug-in hybrid(s)…and hydrogen fuel cell vehicles…can dramatically reduce petroleum consumption and GHG emissions compared to conventional technologies.... The future rate of penetration of these technologies into the vehicle fleet is not only related to future GHG and CAFE standards, but also to future reductions in HEV/PHEV/EV [electric vehicle] battery costs, [and] the overall performance and consumer demand for the advanced technologies…."

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[31] Draft Amendment to Chapter 329, title 49, United States Code (Nov. 20,2007); §32920(a), (b), (c), pp.3-5, Committee on Environment and Public Works Democratic Staff CAFE documents3.pdf.
[32] Michael Freedhoff, recipient. "Language – GHG Rulemaking" email to Michal Freedhoff, Nov. 28, 2007; Author unknown. Michael Freedhoff, recipient, "GHG Rulemaking" email, Nov. 29, 2007, pp. 6-7, Committee on Environment and Public Works Democratic Staff CAFE documents3.pdf.
[33] Jessica Schafer, "MARKEY: President Threatens to Undo Fuel Economy Deal", email Michael Freedhoff, et al., Dec. 7, 2007. pp. 14-15, Committee on Environment and Public Works Democratic Staff CAFE documents3.pdf ; O'Donnell, Frank "Car industry makes its move! – Sen. Levin floats energy language to kneecap EPA, California and other states", email to Frank O'Donnell, Dec. 12, 2007. p. 17. Committee on Environment and Public Works Democratic Staff CAFE documents3.pdf.

In July 2011, automakers, California, and the federal government committed to a series of actions that would allow for the development of national greenhouse gas standards (and complementary CAFE standards) for model years 2017 through 2025. As part of that agreement, California committed to a continuation of the "deemed to comply" option, accepting federal program compliance for model years 2017 through 2025 with the understanding that it would provide equivalent or better overall greenhouse gas reductions in the state compared to California's program. California also understood that any changes to the national program would be based on extensive technical review jointly conducted by all three agencies.

Consistent with the national program commitment, CARB adopted the Advanced Clean Cars regulations in 2012, which is comprised of three components. The first two components created the LEV III regulation, which combines the control of criteria pollutants (to create LEV III Criteria, as discussed above) and GHG emissions (LEV III GHG) into a single coordinated package of requirements. The LEV III Criteria program applies to 2015 through 2025 model year vehicles, and the LEV III GHG program applies to 2017 through 2025 model year vehicles. The third component consisted of amendments to California's Zero Emission Vehicle (ZEV) regulation that establishes requirements for zero- and near-zero-emission vehicles.

The adopted LEV III GHG regulation includes elements that: (1) reduce CO_2 emissions from new light-duty regulatory MY 2016 levels by approximately 34 percent by MY 2025, and from about 251 grams of CO_2 per mile to 166 grams, based on the projected mix of vehicles sold in California; (2) set emission standards for CO_2, methane (CH_4), and nitrous oxide (N_2O); (3) establish footprint-based CO_2 emission standards instead of GHG fleet average emission standards;(4) provide credits toward the ZEV regulation if a manufacturer over complied with its national GHG requirement, and (5) unlike the federal GHG program, require upstream emissions from ZEVs to be counted towards a manufacturer's light-duty vehicle GHG emissions.

EPA and NHTSA adopted federal passenger vehicle GHG standards and fuel economy standards in 2012 that were consistent with the California standards. The 2012 Final Rule is referred to as the "2017 through 2025 model year National Program" (or National Program). Because the federal program was expected to achieve GHG emission reductions that are equivalent to the California program, CARB modified its LEV III GHG regulation to continue to allow the "deemed to comply" option beyond model year 2016, by accepting federal compliance with the EPA standards as sufficient to demonstrate compliance with California's standards for the 2017 through 2025 model years.

As part of the National Program, EPA included a requirement that NHTSA and it conduct a midterm evaluation (MTE) to assess the appropriateness of the greenhouse standards for the 2022 through 2025 model years, because of the long timeframe for the standards. The regulation codifying this commitment required that, "[b]y no later than April 1, 2018, the Administrator shall determine whether the standards … for the

2022 through 2025 model years are appropriate under section 202(a) of the Clean Air Act …"[34] (the "MTE Regulation"). When CARB adopted the "deemed to comply" option for model year 2017 through 2025, CARB also agreed to participate in the federal mid-term evaluation.[35]

The first milestone in the federal MTE was an extensive multi-year study that updated the technical and cost data used in the original 2012 analysis. The results of this joint agency study were presented in a July 2016 report titled Draft Technical Assessment Report: Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-202517 (2016 Draft TAR). The 2016 Draft TAR provided the technical basis for determining the feasibility and cost of compliance with the federal passenger vehicle greenhouse gas and fuel economy standards in the 2022 through 2025 model years. The 2016 Draft TAR itself was not a determination of the appropriateness of the standards; rather it provided a core input to future policy decisions on the 2022 through 2025 model year greenhouse gas and CAFE standards.

On November 30, 2016, EPA provided for public comment its "proposed adjudicatory determination (Proposed Determination) that the [National Program] greenhouse gas standards currently in place for model years 2022 through 2025 remain appropriate under the Clean Air Act and therefore should not be amended to be either more or less stringent."[36]

On January 13, 2017, EPA released its final determination (Final Determination) to maintain the existing federal greenhouse gas emission standards for 2022 through 2025 model year vehicles, finding that automakers are well positioned to meet the standards at lower costs than previously estimated. EPA concluded that "there has been no information presented in the public comments on the Proposed Determination that materially changes the Agency's analysis documented in the Proposed Determination."[37]

3. The Zero Emission Vehicle regulation.

As stated above, in 1990, CARB adopted an ambitious program designed to significantly reduce the environmental impact of light-duty vehicles through the commercial introduction of ZEVs into the California fleet, as part of the LEV I regulation. The ZEV regulation has subsequently been amended in 1996, 1999, 2001, 2003, 2008, and 2012 and obtained waivers for each of those amendments.

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[34] 40 C.F.R. § 86.1818-12(h).
[35] CARB Reso. 12-11 (Jan. 26, 2012).
[36] EPA, Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation: Technical Support Document, 81 Fed.Reg. 87,927 (Dec. 16, 2016), EPA-420-R-16-021.
[37] EPA-420-R-17-001.

The ZEV regulation existed as a footnote to the original LEV I standards, which asserted manufacturers would need to make a certain percent of ZEV in order to comply with the LEV standards. However, manufacturers failed to develop ZEV technology quick enough to meet requirements, and the Board withdrew all but the 2003 10 percent ZEV production requirement in 1996. In 1998, as other technologies like hybrid electric vehicles (HEV) and partial zero emission vehicles (PZEV) came to market, the Board adopted changes to allow manufacturers to earn credit for those new technologies and use those credits to meeting their ZEV requirements. HEV and PZEV technology proliferated through the early 2000s as ZEV technology progressed more slowly.

In 2009, CARB staff analyzed pathways to meeting California's long-term 2050 GHG reduction goals in the light duty vehicle subsector and determined that ZEVs would need to comprise nearly 100 percent of new vehicle sales between 2040 and 2050, and commercial markets for ZEVs would need to launch in the 2015 to 2020 timeframe. Staff's analysis concluded that even widespread adoption of advanced conventional technologies, like (HEV, would be inadequate to meet the 2050 GHG targets.[38] CARB heard staff's findings at its December 2009 hearing and adopted Resolution 09-66,[39] reaffirming its commitment to meeting California's long-term air quality and climate change reduction goals through commercialization of ZEV technologies. CARB further directed staff to propose future amendments to the ZEV program, and specified that future proposals should consider shifting the ZEV regulation's focus to both GHG and criteria pollutant emission reductions, and pathways for commercializing ZEVs and PHEVs in order to meet the 2050 goals. The Board also recommended in the same Resolution that hybrid and PZEV technology should become foundational in setting LEV III GHG and criteria standards, previously discussed.

In 2012, CARB adopted amendments to its ZEV regulation when it adopted the California Advanced Clean Car Program. The amendments affecting ZEVs through the MY 2017 primarily enacted minor changes to enable manufacturers to successfully meet 2018 and subsequent MY requirements, and amendments affecting 2018 and later MY ZEVs were intended to achieve increased commercialization of ZEVs and PHEVs, and disallowed conventional technologies like HEV and PZEVs to count toward meeting a manufacturer's ZEV obligation, since those technologies help set the LEV III Criteria and GHG standards.

As stated previously, EPA granted California a waiver for the 2016 Draft TAR program in 2013, which included the LEV III Criteria, LEV III GHG, and ZEV regulation.

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[38] "White Paper: Summary of Staff's Preliminary Assessment of the Need for Revisions to the Zero Emission Vehicle Regulation". *CARB*. Accessed on October 24, 2018. https://www.arb.ca.gov/msprog/zevprog/2009zevreview/zevwhitepaper.pdf.

[39] Resolution 09-66. *CARB*. Accessed on October 24, 2018. https://www.arb.ca.gov/msprog/zevprog/2009zevreview/res09_66.pdf.

G. California's separate Motor Vehicle Emissions Control Program has delivered great benefit to the nation.

1. Increasingly stringent emission controls on new motor vehicles benefit the nation.

As demonstrated above, California's motor vehicle emissions control program has significantly reduced emissions of air pollutants from motor vehicles, not only in California, but also throughout the nation, because EPA has consistently modeled its federal emission standards upon requirements first adopted by CARB. Indeed, California's State Implementation Plan (SIP), its program for complying with the federal ambient air quality standards, depends in substantial part upon its vehicle emissions standards, as do the SIPs of many other states. Were the vehicle programs to be disrupted, California would struggle to maintain compliance with these key ambient air quality standards.

The extent to which vehicle emissions standards have evolved is readily apparent when comparing the average exhaust emissions from an uncontrolled light-duty motor vehicle and the certification emission standards for criteria pollutants for SULEVs in CARB's current LEV III Criteria regulation.

Table III-3 Comparison of Exhaust Emissions from an Uncontrolled Vehicle and MY 2025 LEV III SULEV20 Certification Standards
(all units in grams/mile)

	HC	CO	NOx	PM
Uncontrolled Vehicle[40]	8.7	87	3.5	-
SULEV20 Certification Standard[41]	a	1.0	a	.003/.001[b]

a. combined non-methane organic gas and oxides of nitrogen standard (NMOG+NOX): 0.020 g/mi
b. 75 percent of MY 2025 vehicles must certify to a .003 g/mi standard; 25 percent of vehicles must certify to a .001 g/mi standard.

The California LEV III regulation additionally requires each manufacturer to demonstrate compliance with the following composite phase-in requirements applicable to its entire fleet:[42]

2025 Fleet Average NMOG + NOx Standards: 0.030 g/mi

This comparison demonstrates that the 2025 LEV III certification standards represent over a 99 percent reduction in NOx and hydrocarbon emissions from an uncontrolled

[40] Frank P. Grad et al., *The Automobile and the Regulation of Its Impact on the Environment*, University of Oklahoma Press, 1975. p. 119.
[41] 13 Cal. Code Regs. § 1961.2(a)(1), (2) (2015).
[42] 13 Cal. Code Regs. § 1961.2 (2015).

vehicle, and over a 98 percent reduction in carbon monoxide from an uncontrolled vehicle.

CARB also requires manufacturers to demonstrate that their vehicle emission control systems are sufficiently durable to control vehicle emissions for increasing periods of time. When manufacturers requested that the EPA Administrator suspend the statutory emission standards for HC and CO for 1975 model year vehicles in 1972, only one of the 500 test vehicles demonstrated compliance with the applicable emissions standard and none of the vehicles had actually accumulated the requisite 50,000 miles. In contrast, CARB's LEV III regulation requires 2015 and subsequent model light-duty vehicles to comply with certification emission standards for 15 years or 150,000 miles, whichever occurs first. In addition, CARB's OBD II regulation requires manufactures to actively monitor virtually every component and system on a vehicle that can cause increases in emissions over their actual operational lives.

2. California's Motor Vehicle Emissions Control Program has significantly improved California's air quality.

a. California's Motor Vehicle Emissions Control Program is critical to attain national ambient air quality standards.

Section 109 of the Clean Air Act authorizes and directs EPA to establish national ambient air quality standards (NAAQS) for air pollutants, and EPA has promulgated NAAQS for a number of air pollutants, including ozone, particulate matter, and nitrogen dioxide. For regions in California that have not attained a NAAQS for a specified pollutant, CARB is required by 110(a)(1) of the Clean Air Act to adopt State Implementation Plans (SIPs) that describe how it will attain the NAAQS in those regions by certain deadlines and to submit SIPs to EPA for its review and approval. An EPA approved SIP has the "force and effect of federal law".[43]

Prior to 2015, California relied upon emission reductions attributable to on-road and off-road vehicle regulations for which EPA had granted waivers of preemption under Clean Air Act sections 209(b) and 209(e) in its SIP; although California did not expressly include such waived regulations in its SIP, EPA had historically approved California's SIP submittals. In 2015, the U.S. Court of Appeals for the Ninth Circuit ruled in *Committee For A Better Arvin v. U.S. EPA*,[44] that EPA had impermissibly approved revisions to California's 2007 SIP that relied on reductions from waived vehicle regulations, because the SIP revisions did not expressly include the waived regulations. CARB consequently submitted a SIP revision to EPA on August 14, 2015, to include a number of waived on- and off-road vehicle regulations into its SIP. CARB's submittal specifically included some of the elements of the California 2016 Draft TAR program

[43] *Safe Air for Everyone v. EPA*, 488 F.3d 1088, 1097 (9th Cir. 2007) quoting *Trustees for Alaska v. Fink*, 17 F.3d 1209, 1210 n. 3. (9th Cir. 1994).
[44] 786 F.3d 1169 (9th Cir. 2015).

that established emission standards and other emission-related requirements for criteria pollutants in its submittal; other aspects of the program (as we discuss below) also produce benefits. EPA approved CARB's SIP revision on June 1, 2016.[45]

California has historically experienced severe air pollution problems. Although it has adopted the most stringent motor vehicle emissions program in the world, on-road mobile sources such as passenger cars and trucks, and the fossil fuels powering such sources still comprise a significant source of air pollutants and precursors to air pollutants that contribute to the formation of ozone, PM2.5, toxic diesel particulate matter, and greenhouse gas emissions in California. For example, approximately 45 percent of the current 2018 NOx emissions in California originate from on-road mobile sources, and although existing CARB regulatory programs will continue to reduce these emissions in the future, on-road mobile sources will continue to comprise a substantial source of emissions, including precursors of ozone, into the foreseeable future.

The significant contribution of mobile sources to emissions of air pollutants in California, has led CARB to develop a strategic approach for future regulatory measures (Mobile Source Strategy). This strategy utilizes interconnected regulatory strategies for mobile sources that are designed to meet various California's goals, including attaining the NAAQS, achieving GHG emission reduction targets, and minimizing emissions associated with the production and usage of petroleum in mobile sources.[46] A central component of the Mobile Source Strategy includes proposed regulatory measures designed to achieve additional reductions of emissions from light-duty motor vehicles and to accelerate the deployment of ZEVs. Consequently, California's continued ability to develop its motor vehicle emissions control program is critical to its ability to meet its future emission reduction objectives.

b. California's Motor Vehicle Emissions Control Program is working to clean the air.

Although it is clear that California faces additional challenges in reducing motor vehicle emissions in the future, it is also undisputable that California's motor vehicle emissions control program has directly resulted in significant improvements in California's air quality, even as California's population, number of motor vehicles, and the vehicle miles traveled have increased.[47]

For example, although California once had 19 areas that exceeded the 1-hour or 8-hour ozone NAAQS, only five regions in the state still exceed those standards today. Even the California's South Coast Air Basin has achieved progress in reducing ozone levels – although it once exceeded the 1-hour ozone NAAQS over 200 days per year, it has

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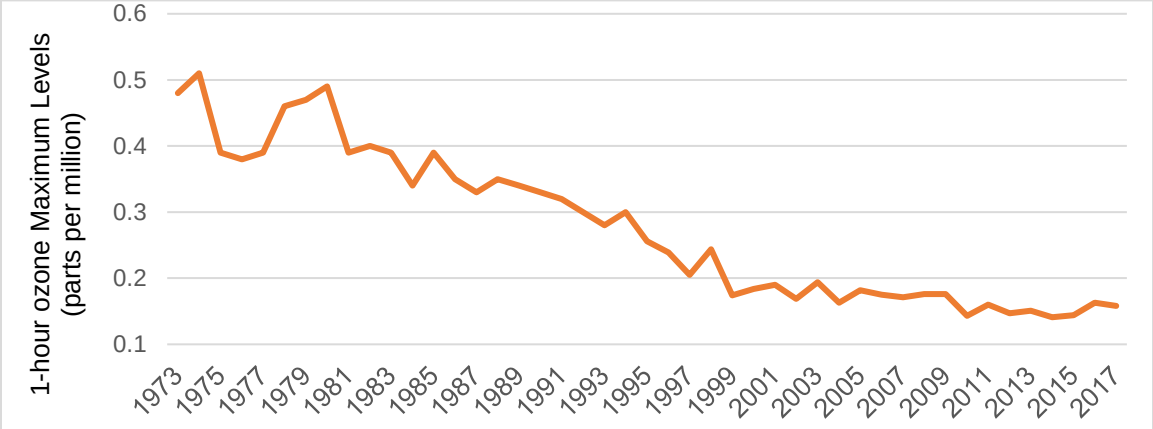
[45] 81 Fed.Reg. 39,424 (June 16, 2016).
[46] Mobile Source Strategy. *CARB*. Accessed on October 24, 2018. https://www.arb.ca.gov/planning/sip/2016sip/2016mobsrc.htm.
[47] Fifty Year Air Quality Trends and Health Benefits, 50th Anniversary of the California Air Resources Board. *CARB*. Accessed on October 24, 2018.https://www.arb.ca.gov/board/books/2018/020818/18-1-2pres.pdf?_ga=2.45440740.1976365608.1539293850-952965368.1510767707.

recently only exceeded the 1-hour ozone NAAQS only 17 days per year. The South Coast Air Basin has also reduced the number of days it has exceeded the 8-hour ozone NAAQS in half since 1990, and 40 percent of the population in that basin now lives in communities that meet the 75 parts per billion (ppb) 8-hour ozone standard.

As indicated below in *Figure III-1*, the annual maximum 1-hour average for ozone in the South Coast has significantly continued to decline over the last four decades.[48]

Figure III-1 South Coast Air Basin 1-hour ozone maximum levels[49]

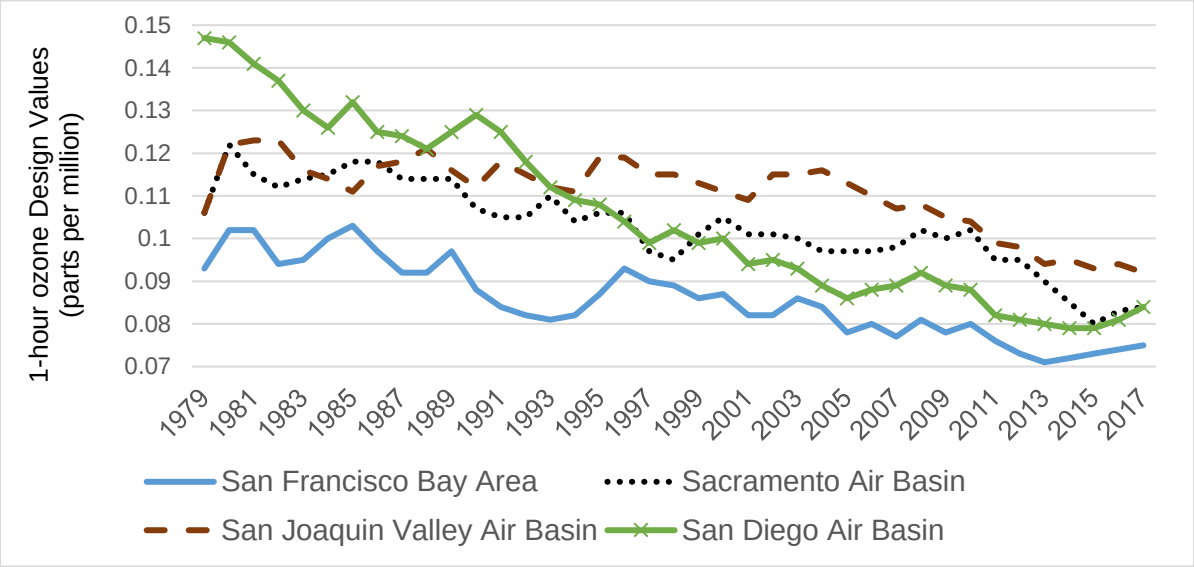


Other regions across California have also seen dramatic improvements in ozone levels. The San Joaquin Valley now meets the 1-hour ozone standard[50], is on track for meeting the 80 ppb 8-hour ozone standard by 2023, and recently adopted a plan to meet the 75 ppb 8-hour standard.[51]

Figure III-2 illustrates that the San Francisco Bay Area, the Sacramento region, the San Joaquin Valley, and the San Diego area, have also experienced reductions in 1-hour ozone levels since the 1970s.

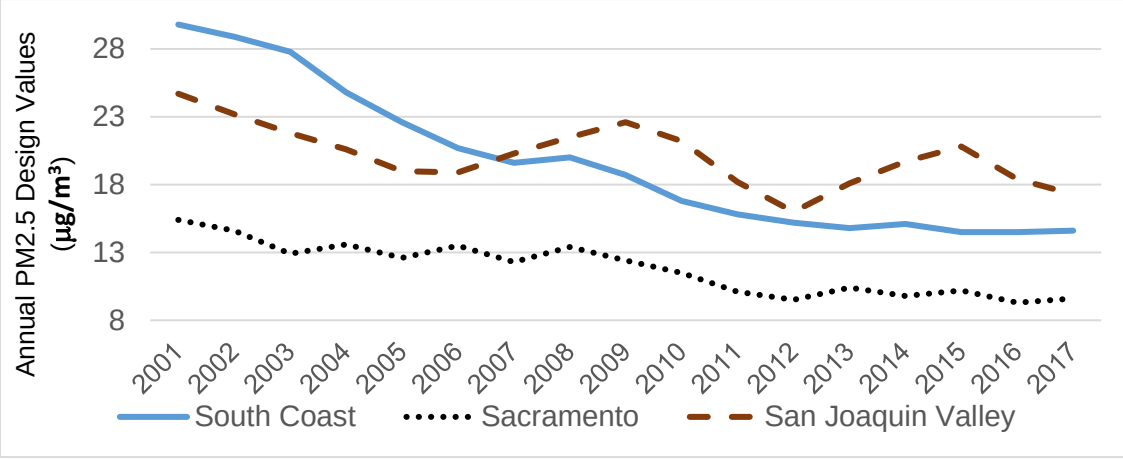
[48] Air Quality Data Statistics (iADAM) database. *CARB*. Accessed on October 24, 2018. https://www.arb.ca.gov/adam/trends/trends1.php.
[49] *Ibid*.
[50] 81 Fed.Reg. 46608 (July 18, 2016).
[51] 2016 Plan for the 2008 8-Hour Ozone Standard (June 16, 2016). *SJVUAPCD*. Accessed on October 24, 2018. http://www.valleyair.org/Air_quality_Plans/Ozone-Plan-2016.htm.

Figure III-2 1-hour ozone design values across California[52]



In addition to reductions of ozone levels, emissions of other criteria pollutants have also been reduced to the point that California meets the NAAQS for lead, carbon monoxide, and nitrogen dioxide. California's air pollution control programs have also lowered fine particulate matter (PM2.5) pollution significantly. *Figure III-3* demonstrates reductions in annual PM2.5 levels in the three PM2.5 nonattainment areas in California.

Figure III-3 Annual PM 2.5 design values in California[53]



[52] SJVUAPCD, 2016 Plan for the 2008 8-Hour Ozone Standard (2016). http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2016/June/final/13.pdf.
[53] SJVUAPCD, 2016 Plan for the 2008 8-Hour Ozone Standard (2016). http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2016/June/final/13.pdf.

c. California air has recovered along with a growing population and economy.

California has achieved these significant reductions of emissions even as its population increased by over 25 percent, and its gross domestic product more than doubled. Last year, California grew to be the world's sixth largest economy, and job growth in the State over the 12 months prior to December 2016 was 2.3 percent, outpacing the national rate of 1.6 percent. All this has been achieved while pursuing the nation's most aggressive air quality and climate policies. Today, the air pollution control industry in California generates more than $6 billion a year and employs over 30,000 people. The clean energy sector in California generates an additional $27 billion a year and employs approximately 125,000 people.

d. California has reduced emissions despite more vehicles and miles traveled.

It is also notable that CARB has managed to achieve significant reductions in emissions from motor vehicles even in the presence of a significant increase in the number of motor vehicles and the number of miles they are driven on California's highways throughout the years.

In 1950, approximately 2 million motor vehicles were operated in the metropolitan area of Los Angeles, California, approximately 5 million vehicles were registered in California, and approximately 49 million vehicles were registered in the United States by June of 1968, California's population of motor vehicles had increased to 10.7 million, and as of December 2017, over 35 million vehicles were registered for use in California. Over 25 million of the registered vehicles are automobiles.

Not only has the number of California's motor vehicles increased, the number of miles travelled (VMT) by such vehicles has also significantly increased over the years.

In 1972, California's highways experienced approximately 67 billion VMT. Statewide VMT increased to approximately 93 billion VMT in 1982, 142 billion VMT in 1992, 176 billion in 2002, and 195 billion in 2016. This rate of increase has far outpaced the increase of California's population during this same time period. In 2016, approximately 269 million vehicles were registered for use in the United States, and nationwide VMT increased from 1260 billion VMT in 1972 to 3174 billion VMT in 2016.

e. California has reduced emissions without holding back fuel economy.

It is also notable that CARB's motor vehicle emissions control program has achieved the above-mentioned reductions in vehicle emissions without adversely affecting vehicle fuel economy. Since 1975, EPA has collected data related to vehicle tailpipe carbon dioxide (CO_2) emissions and fuel economy, and has published that data in a report entitled the "Trends" report. The current version of the Trends report incorporates final

data from 2016 model year vehicles and preliminary data from 2017 model year vehicles.[54]

The 2017 Trends Report indicates that the fleet-wide average real world CO_2 emissions rate for new 2016 model year vehicles is 359 grams per mile (g/mi), and the fuel economy value is 24.7 miles per gallon (mpg), which represents "a new record low for CO_2 emissions and a record high for fuel economy." Preliminary 2017 model year data indicate an even lower fleet-wide CO_2 emissions rate and a fleet-wide fuel economy value of 25.2 miles per gallon.

Historical data indicates that light-duty vehicles exhibited significant improvements in reductions of CO_2 emissions and increases of fuel economy from 1975 to 1981, a slower pace of improvements from 1982 through 2004, and beginning in 2005, "annual CO_2 emissions and fuel economy improvements in ten of the twelve individual years, and with CO_2 emissions decreasing by 22 percent and fuel economy increasing by 28 percent since MY 2004."[55] This pattern of fuel economy improvements and corresponding reductions of CO_2 emission occurred even as additional data indicates that since 2005, developments in technology have enabled vehicles to enjoy higher levels of acceleration performance. Between 1975 and 2015, average vehicle weight remained consistent, vehicle horsepower increased approximately 68 percent, and fuel economy increased approximately 88 percent.[56] In fact, since the 1981 model year, vehicle horsepower has increased almost every year, and current levels of horsepower are greater than twice the levels of horsepower of vehicles in the early 1980s.[57]

The improvements in vehicle fuel economy have directly benefitted consumers by reducing their fuel costs. An owner of a 2016 model year vehicle would save approximately $1,300 in avoided fuel costs over five years, compared to the owner of a 2008 vehicle, and would save approximately $2,050 in avoided fuel costs over five years compared to the owner of a 2004 model year vehicle.[58]

Finally, the advancements in technology have expanded the availability of vehicles that appear to be capable of complying with the existing federal CO_2 emission requirements for the 2025 model year. Specifically, nearly 5 percent of production model year 2017 vehicles (exclusively hybrids (HEV), plug-in hybrids (PHEV), electric (BEV), and fuel cell (FCEV) vehicles) appear to meet the model year 2025 CO_2 emission targets.[59]

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[54] Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2017. U.S. EPA. Accessed on October 24, 2018. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100TGLC.pdf.
[55] *Id*. at 7.
[56] *Id*.
[57] *Id*. at 25-27.
[58] *Id*. at 9.
[59] *Id*. at 119.

3. California's continued compliance with state and federal mandates requires its robust vehicle program.

Despite all this progress, California continues to urgently need its vehicle programs. Mobile sources continue to dominate emissions in California, and its population continues to live predominantly in basins bounded by mountains, in which air quality is poor because of continued emissions. Climate change, which is being driven substantially by mobile source emissions, compounds these problems by worsening the conditions that lead to local air pollution, and by making populations more vulnerable. Climate change also, of course, profoundly threatens health and welfare throughout California.

4. Mobile source emissions are a big part of the problem.

Mobile sources – cars, trucks, and myriad off-road equipment – and the fossil fuels that power them, are a big source, if not the biggest source, of the emissions that are hurting public health and changing the climate.

In 2016, greenhouse gas emissions from the transportation sector accounted for about 28 percent of total U.S. greenhouse gas emissions, making it the largest contributor of U.S. greenhouse gas emissions. In terms of the overall trend, from 1990 to 2016 total transportation emissions increased due, in large part, to increased demand for travel. The number of vehicle miles traveled (VMT) by light-duty motor vehicles (passenger cars and light-duty trucks) increased by approximately 45 percent from 1990 to 2016 as a result of a confluence of factors including population growth, economic growth, urban sprawl, and periods of low fuel prices.

Mobile sources are also the largest contributors to the formation of ozone, PM2.5, toxic diesel particulate matter, and greenhouse gas (GHG) emissions in California. Because of this, vehicular emissions must be significantly cut to achieve the NAAQS for ozone in 2023 and 2031, and to reduce GHG emissions by over 40 percent below 1990 levels by 2030. The interconnected strategies necessary to meet these goals has led California to develop an integrated planning approach to control vehicular emissions over the next 15 years that includes a comprehensive transformation to cleaner vehicle technologies, fuels, and energy sources.[60]

There are three fundamental issues with NHTSA's handling of the Clean Air Act's general conformity requirements. First, NHTSA uses inappropriate modeling to reach its conclusion. As noted above in Section III.A., NHTSA has – without explanation – chosen not to utilize California's EMissions FACtor (EMFAC) model for 2014, the EPA-approved model that California uses to meet its requirements under the Clean Air Act, to generate the numbers relevant to a conformity determination under the Clean Air Act. Second, NHTSA, in its Draft Environmental Impact Statement (DEIS) associated with the rollback proposal, argues that any emissions flowing from its actions are neither

[60] CARB Mobile Source Strategy.

direct nor indirect for general conformity purposes under 40 CFR section 93.152, stating that it cannot control the technologies that auto manufacturers would use, or consumer behavior (including purchasing).[61] Yet this assertion flies in the face of the primary reason NHTSA is undertaking this rulemaking, which is that the existing standards' costs purportedly are causing new vehicles to become more costly and thereby negatively impacting consumer purchasing behavior. NHTSA then attempts to justify this course of action by predicting, using new modelling inputs of its own design, the emissions levels that would flow from its action. In other words, the rulemaking is premised on understanding consumer purchasing and the emissions implications of such purchasing, while NHTSA claims on the other hand that it cannot make assumptions about these very things when it comes to satisfying general conformity obligations. NHTSA cannot have it both ways. Indeed, the Ninth Circuit Court of Appeals has previously recognized that "[b]y allowing particular fuel economy levels, which NHTSA argues translate directly into particular tailpipe emissions, NHTSA's regulations are the proximate cause of those emissions just as EPA Clean Air Act rules permitting particular smokestack emissions are the proximate cause of those air pollutants…."[62] Finally, in the context of this joint rulemaking between NHTSA and EPA, it is inappropriate that NHTSA's determination regarding its own conformity obligations, regardless of its independent merit or lack thereof, does not address any conformity-related obligations EPA may have that flow from the joint rulemaking.

CARB intended to rely on its existing programs, such as the ZEV regulation, and its new efforts such as California Assembly Bill 617,[63] to attempt to minimize emissions that otherwise would be expected to grow with increasing populations and vehicles operated in California. To remove the ZEV regulation causes substantial harm to this effort and will directly result in increases in near-roadway exposures for Californians during this time of population growth.

In addition to its directional shift in 2012 based on the 2009 Vision modeling mentioned above, CARB has reconfirmed it needs to obtain significant reductions in GHG emissions from the transportation sector (which includes mobile sources) in order to comply with the above mentioned statutory mandates, especially since the transportation sector is largest source of GHG emissions in California.[64] CARB has identified strategies to obtain GHG emissions from mobile sources that include policies to move toward a goal of achieving 100 percent ZEV sales in the light-duty vehicle sector and reductions in VMT, and accelerating the use of clean vehicle and equipment technologies and fuels through the targeted introduction of zero emission and near-zero emission technologies in other sectors.[65]

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[61] DEIS at 4-14 and 4-15.
[62] *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin*., 538 F.3d 1172, 1217 (9th Cir. 2008).
[63] Cal. Assem. Bill No. 617, stats. 2017, ch. 136.
[64] *The 2017 Climate Change Scoping Plan Update*, CARB. 2017. p. 98.
[65] *Id.* at 97-102.

There is an urgent need to help the transportation system take the next step in innovation to reduced- and zero-emission technologies. The ZEV regulation is designed to accelerate technology development through steadily increasing minimum sales. These technologies are necessary to reverse the increasing emissions from the transportation sector. And it is working. Total ZEV and PHEV sales and the number of available vehicle models are steadily climbing. Manufacturers have over-complied with the requirements, and costs are falling faster than predicted.[66]

As detailed in Section VII.A.1 of these comments, the rollback scenario creates an additional increase of about 1.24 tons per day (tpd) increase in NOx emissions in the South Coast air basin, 90 percent of which is from upstream fuel activity increases. Because of the SIP commitments for federal ozone standards, these increased refinery emissions would have to be offset elsewhere. This means that even more vehicles would need to be removed to compensate, and because the dirtiest vehicles would already have been removed, more newer and cleaner vehicles would need to be removed - either an additional 1.3 million clean conventional vehicles, or 1 million additional ZEVs. This will almost double the number of vehicles that must be replaced to meet the region's air quality commitments. As discussed above, without the ZEV regulation, the State Implementation Plan in California will to obtain reduce emissions significantly from other sources and through other means. But there are no obvious solutions. To put it plainly, California's ZEV regulation is a practical necessity to meeting the NAAQS for ozone.

We later discuss the many negative impacts the federal proposal would have on California's strategies to protect the public, and those employed by jurisdictions opting into California programs. Suffice to say here that the federal proposal essentially guts these efforts, at great cost to the public, and undermining California's ability to comply with federal Clean Air Act mandates. We turn next, however, to the federal proposal itself and its many flaws.

IV. NHTSA and EPA must improve fuel economy and reduce GHG emissions, and thus must maintain or strengthen the existing standards.

Having surveyed California's long history as a vehicle regulator, within the structure established by Congress, we can now turn to the federal proposal, which contrasts in sharp relief. For half a century, California, EPA, and (since its more recent creation) NHTSA, have worked together to regulate vehicle emissions and fuel economy. That program has included greenhouse gases for nearly a decade. The necessity of this program has never been clearer, as pressing climate threats and continued air quality challenges underline the need for CARB's programs, and for continued federal

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[66] *See* Final Determination, pp. [15-16, 21]; *California's Advanced Clean Cars Midterm Review*, CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/board/books/2017/032317/17-3-8pres.pdf. pp 21-29.

leadership. This proposal, unfortunately, ignores all of this history and the pressing needs to come. In this section of the comments, we discuss the Agencies' core obligations, and the procedurally improper way they have begun their effort to shirk their duties while attacking California.

From the inception, the actions of EPA and NHTSA to break the national program for greenhouse gas emissions and fuel economy standards have been unwarranted and contrary to the federal Agencies' legal obligations.

A. The existing harmonized national program is a success.

Since California proposed the very first motor vehicle emission control requirements, the automobile manufacturing industry has sought not more than one standard across the nation. As discussed above, California's authority has been maintained as a proper balancing of the various interests. Since the 2016 model year, the industry has reaped the benefit of one program across all the states. It avoided the costly litigation that had been filed to challenge California's initial greenhouse gas emissions standards.[67] Since 2009, the industry has enjoyed consistently increasing sales, as discussed in detail below. In response to this proposal the industry expressly voiced support for continuing one national program that includes California.[68] The existing harmonized national program has been an unquestionable success, improving vehicle performance and fuel efficiency, and reducing emissions.

B. The current federal administration broke the existing national program illegally and without valid basis.

The Administration has, from its inception, taken action to disrupt the unified program, at great cost to public health and to the certainty industry requires. Because the facts do not support the Administration's policy preferences, it has been forced to take a series of procedurally irregular steps to force a change. The patent arbitrariness of each phase of the process underlines the arbitrariness of the final proposal.

Following EPA's Final Determination in early 2017 that the existing GHG emission standards remain appropriate, the incoming President announced he was "cancelling" it, despite the extensive analyses and robust record supporting it. He characterized the regulations as "job-killing,"[69] despite 2016 as the "best year on record" for U.S. light-vehicle sales, following previous years of similarly strong sales.[70]

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[67] Freeman, J. *The Obama Administration's National Auto Policy: Lessons from the "Car Deal,"* 35 Harvard Env. L. Rev. (July 11, 2015). p. 343.
[68] *See*, e.g., testimony of Bob Holycross, Ford Motor Company, Sept. 25, 2018, Dearborn, Michigan.
[69] Remarks by President Trump at American Center for Mobility. Detroit, Michigan, March 15, 2017. https://www.whitehouse.gov/the-press-office/2017/03/15/remarks-president-trump-american-center-mobility-detroitmi
[70] Stoddard, Haig, and Wards. Auto December Surge Lifts 2016 Sales to Record 17.5 Million Units. Jan. 4, 2017.

Following this impulsive direction, EPA published a notice in the Federal Register announcing its intent to reconsider the Final Determination, again despite the robust record on which it is based.[71] CARB (and many others) opposed this action, filing extensive comments.

Associated with these actions, NHTSA solicited comments on the scope of the environmental impact statement for the rollback proposal.[72] CARB (along with many others) also commented on the proper scope of this analysis.[73]

EPA solicited comment on its reconsideration of the Final Determination, and expanded the model years at issue to include 2021, which had not been subject to the midterm evaluation.[74] EPA then issued a new, untimely "revised" Final Determination that concluded the existing standards "are not appropriate."[75] This decision was contrary to EPA's regulatory mandate to base its decision on the joint technical assessment report by EPA, NHTSA, and CARB, and instead on vague and uncertain concerns and unidentified "new information." Rather than explain its basis as required[76] EPA presented about 11 pages of assertions and vague references to unidentified new assumptions, concerns, and information. EPA failed to premise its revised Final Determination on a comprehensive and collaborative technical assessment report, as it did not meaningfully reflect the content of the 2016 TAR. Thus, the Revised Determination made critical decisions on the fate of the program improperly. Accordingly, the Revised Determination was promptly challenged by California and several other parties.[77]

EPA and NHTSA then issued this proposal, containing nothing that would maintain the national program. It is not based on the draft Technical Assessment Report (TAR) jointly prepared in 2016 by EPA, NHTSA, and CARB,[78] the Technical Support Document (TSD) supporting the initial proposed determination,[79] or anything comparable. Indeed, EPA said the TAR was not being reopened for comment.[80] Unlike the process used to develop the TAR, there was no transparency and CARB was not invited to participate in any substantive technical discussions regarding the program or the rollback proposal. The federal Agencies did not produce a comparable assessment updating the prior analysis or explaining why it was no longer representative. In reconsidering its Final

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[71] 82 Fed.Reg. 14,671 (Mar. 22, 2017).
[72] 82 Fed.Reg. 34,740 (July 26, 2017).
[73] *See* Docket No. NHTSA-2017-0069, esp. Air Resources Board – Comment, with attachments, document nos. NHTSA-2017-0069-0140-0140.
[74] 82 Fed.Reg. 39551, 39553, Request for Comment on Reconsideration of the Final Determination of the Mid-Term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022–2025 Light-Duty Vehicles; Request for Comment on Model Year 2021 Greenhouse Gas Emissions Standards, Aug. 21, 2017.
[75] 83 Fed.Reg. 16,077 (Apr. 13, 2018) (the "Revised Determination").
[76] 40 C.F.R. § 86.1818-12(h)(1), (2), (4).
[77] *California v. U.S*. EPA, U.S. Court of Appeals, Dist. of Columbia Circuit, Case Nos. 18-1114, -1118, -1139.
[78] *See* EPA-HQ-OAR-2015-0827-0926.
[79] *See* EPA-HQ-OAR-2015-0827-5941.
[80] 82 Fed.Reg. 39551, 39553.

Determination that led to the rollback proposal, EPA did not follow its own regulations. It did not present in a new technical report or in the rollback proposal and supporting Preliminary Regulatory Impact Assessment the "new information" it asserted was the basis for its actions.

Any information provided by manufacturers and other proponents of relaxing the existing standards was not identified, evaluated by the Agencies, and made available for public comment. The federal Agencies merely accepted it as a basis to reach a different conclusion, but without explaining why. CARB has requested this information from the federal Agencies and the automobile manufacturers.[81] To date, the Agencies have not provided the requested information. The manufacturers, for the most part, have provided updated outlooks for meeting the existing standards and repeated their assertions that it will be difficult to fully meet the existing standards without additional flexibilities or some relaxing of the stringency, but have not provided information warranting a full rollback of the standards like those being proposed. In fact, both Ford Motor Company and Fiat Chrysler Automobiles (FCA) testified at the public hearing stating that they support year-over-year increases in the stringency of the standards. Likewise, the trade association, Global Automakers, representing 19 manufacturers including Toyota, Honda, and Nissan, testified that "[t]he regulations should require fuel economy and GHG improvements each year…"[82]

This proposal is not the product of reasoned decision-making based on an objective review of the evidence regarding the development of technology, condition of the industry, need to protect public health and the environment, and potential to conserve energy. It is a contrived solution to justify a predetermined outcome.

C. NHTSA and EPA's proposed approach improperly abdicates statutory directives.

Executive agencies must act within the bounds provided for them by Congress. As the Supreme Court has explained, "[u]nder our system of government, Congress makes laws and the President, acting at times through agencies like EPA, "faithfully execute[s]" them."[83] "The power of executing the laws necessarily includes both authority and responsibility to resolve some questions left open by Congress that arise during the law's administration. But it does not include a power to revise clear statutory terms that turn out not to work in practice" in an agency's view.[84] Here, the Agencies announce

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[81] *See* CARB, Request for Documents in Support of: Request for Extension of Comment Period and Additional Public Hearings Regarding Joint Proposed Rule to Roll Back Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards for Model Years 2021-2026 Light-Duty Vehicles, September 11, 2018. Docket Nos. 2018-0067-4166, EPA-HQ-OAR-2018-0283-0883

[82] *See* EPA-HQ-OAR-2018-0283*, e.g.,* Testimony on the SAFE proposal of Julia Rege, Director, Environment and Energy, Association of Global Automakers, Inc., Fresno, California, September 24, 2018; Testimony on the SAFE proposal of Ford Motor Company and Fiat Chrysler America, Dearborn, Michigan, September 25, 2018.

[83] *Utility Air Regulatory Group v. EPA*, 134 S.Ct. 2427, 2446 (2014).

[84] *Id*.

new policy preferences – to *not* act to reduce vehicle air pollution or to improve vehicle fuel economy. The factual bases for these preferences are wrong, as we discuss below. But even if the Agencies were *right*, they are not empowered to rewrite statutes as they prefer. Such actions by administrative agencies violate the Constitutional separation of powers, as well as administrative procedure and substantive statutes. But “”EPA [and NHTSA] may act only as authorized by Congress.”[85] We thus are compelled to remind the Agencies that they may not exceed their powers in our system of ordered liberty.

The Agencies’ proposed rollback violates Congressional direction to conserve energy, set the maximum feasible fuel economy standards, and reduce emissions that endanger public health or welfare. It assumes that the world will forever remain fixed in its current trajectory for controlling vehicular fuel economy and emissions of air pollutants from motor vehicles. This impermissibly abdicates the Agencies’ statutory directives to promulgate increasingly stringent requirements to ensure continued reductions of air pollutants and continued increases in fuel economy from motor vehicles. The effects of climate change can and, under the law, must be addressed by promulgating more protective measures.

The Agencies’ rollback proposal is inconsistent with their respective statutory directives under the federal Clean Air Act (Clean Air Act) and the Energy Policy and Conservation Act of 1975 (EPCA), as amended by the Energy Independence and Security Act of 2007 (EISA). As discussed in greater detail below, those statutes require EPA and NHTSA to promulgate increasingly stringent requirements to ensure continued reductions of air pollutants and continued increases in fuel economy from motor vehicles, yet the Agencies proposed rollback would preclude any improvements in air quality or fuel economy.

The Agencies attempt to justify their proposed alternative actions by dismissing the acknowledged increases in vehicular fuel consumption and emissions of CO_2 that would result from their proposed actions. The Agencies estimate that their proposed actions would increase aggregate fuel consumption and emissions of CO_2 by 4 percent over the time period beginning 2016 and ending 2035, which they assert would not meaningfully impact the climate. They fail to acknowledge that if this holds true, by century’s end global ambient CO_2 concentrations will be at levels not present for millions of years. This policy performance is illegal. It has been called a “bedrock principle” of separation of powers with regard to climate change-related decisions, policy objectives with respect to climate change do not on their own authorize the agency to regulate. The agency must have statutory authority for the regulations it wants to issue.”[86] The Agencies attempt to

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[85] *Mexichem Fluor, Inc. v. EPA*, 866 F.3d 451, 460 (D.C. Cir.2017) (Kavanaugh, J.).

[86] *Id.* at 460. The same theme is sounded in a recent dissent from denial of a writ of certiorari by Justice Gorsuch (joined by Chief Justice Roberts and Justice Alito. *See Scenic America, Inc. v. DOT*, 138 S. Ct. 2 (Oct. 2, 2017). The Justices explain that they are skeptical of deference to administrative agencies, and the theory that Congress may implicitly delegate unbounded authority to agencies to solve problems Congress has not solved. That skepticism must convert to disapproval in instances like these, where agencies are explicitly *declining* to follow Congressional direction with regard to critical tasks set forth in statute.

justify their proposed alternative actions by dismissing the acknowledged increases in vehicular fuel consumption and emissions of CO_2 that would result from their proposed actions. The Agencies estimate that their proposed actions would increase aggregate fuel consumption and emissions of CO_2 by 4 percent over the time period beginning 2016 and ending 2035, which they assert would not meaningfully impact the climate, and that by century's end global ambient CO_2 concentrations will be at levels not present for millions of years. This is a nihilistic and fatalistic view.

1. EPA's proposal is entirely inconsistent with its statutory mandate.

EPA's proposed action would establish a light-duty vehicle GHG emissions program that is entirely inconsistent with its statutory obligation to promulgate emission standards at a level needed to protect the public health and welfare from the harms associated with GHGs emitted from light-duty motor vehicles.[87] Moreover, by electing to flatline the proposed standards for six years, EPA will disincentivize vehicle manufacturers from developing new technologies that could produce further reductions of GHGs from vehicles, as contemplated by Congress when it enacted the technology forcing structure of Title II of the Clean Air Act.

a. EPA's overriding mandate under Section 202(a)(1) of the Clean Air Act is to establish emission standards for new motor vehicles to protect the public health and welfare.

Section 202(a)(1) of the federal Clean Air Act[88] authorizes the Administrator of the EPA to prescribe and to occasionally revise "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." Section 302(g) of the Clean Air Act[89] defines "air pollutant" as including "any air pollution agent or combination of such agents, including any physical, chemical, biological, radioactive ... substance or matter which is emitted into or otherwise enters the ambient air."

In 2003, EPA denied a rulemaking petition to regulate greenhouse gas emissions from new motor vehicles under section 202 of the Clean Air Act. That denial ultimately proceeded to the U.S. Supreme Court, which held that EPA had acted improperly.[90] The Supreme Court first held that the Clean Air Act's definition of "air pollutant" in section 302(g) unambiguously encompasses compounds that contribute to climate change, including carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons, and that section 202(a)(1) of the Act authorizes EPA to regulate greenhouse gases emitted from motor vehicles if EPA "forms a 'judgment' that such emissions contribute to climate change."[91] The Supreme Court then held that EPA also improperly denied the petition

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[87] *Massachusetts*, 549 U.S. 497, 532.
[88] 42 U.S.C. § 7521(a)(1).
[89] 42 USC 7602(g).
[90] *Massachusetts v. EPA*, 549 U.S. 497 (2007).
[91] *Massachusetts v. EPA*, 549 U.S. 497, 528 (2007).

under the alternative basis (that even if EPA had the statutory authority to regulate greenhouse gases, it would be unwise to do so at this time). The Supreme Court noted that Clean Air Act section 202(a)(1) conditions EPA's discretion to regulate air pollutants upon a judgment that "must relate to whether an air pollutant "cause[s], or contribute[s] to, air pollution which may reasonably be anticipated to endanger public health or welfare,"[92] and then determined that EPA's "laundry list of reasons not to regulate" in this case did not meet the Clean Air Act's clear statutory directive requiring EPA to justify not taking further action "only if it determines that greenhouse gases do not contribute to climate change or if it provides some reasonable explanation as to why it cannot or will not exercise its discretion to determine whether they do."[93]

In response to the *Massachusetts* decision, EPA subsequently determined that six greenhouse gases in the atmosphere may reasonably be anticipated to endanger both public health and public welfare, and further determined that "the emissions of such greenhouse gases from new motor vehicles and new motor vehicle engines contribute to the greenhouse gas air pollution that endangers public health and welfare under Clean Air Act section 202(a)."[94] These EPA determinations were upheld by the U.S. Court of Appeals for the District of Columbia Circuit in *Coalition for Responsible Regulation v. EPA*,[95] (affirmed in part, and reversed in part on unrelated grounds by *Utility Air Regulatory Group v. EPA*,[96]).

EPA has since reaffirmed that finding, and does not propose to change it. Nor could it. Yet, the Clean Air Act requires EPA to act to set vehicle standards commensurate with the endangerment they are to address. EPA has simply ignored Congress's direction in this regard.

b. EPA cannot make the required findings under section 202 to roll back the emissions standards.

EPA has not properly weighed the relevant factors for changing the existing emissions standards, in contravention of the Clean Air Act's text and purpose. Specifically, EPA gave essentially no weight to the factors Congress required it to consider—namely, the volume of dangerous air pollution and the need to continue to drive innovation in pollution control technology—abdicating its statutory duty to protect the American people from the devastating impacts of climate change. This duty is independent of, but consistent with, NHTSA's obligations to conserve energy, as discussed below. Similarly, EPA has not properly established that costs compel rolling back the standards.

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[92] *Massachusetts*, 549 U.S. 497, 532-533.
[93] *Id*. at 533.
[94] 74 Fed.Reg. 66,496 (Dec. 15, 2009).
[95] 684 F.3d 102 (D.C. Cir. 2012).
[96] 134 S.Ct. 2427 (2014).

c. The technology forcing mandate of the Clean Air Act is clear.

It is abundantly clear that Congress intended Section 202(a) of the Clean Air Act to be a "technology forcing" statute, and intended that manufacturers continually develop technology in order to meet emission standards that cannot be achieved using only existing technology.

> *The legislative history of both the 1970 and the 1977 amendments [to the Clean Air Act] demonstrates that Congress intended the agency to project future advances in pollution control capability. It was "expected to press for the development and application of improved technology rather than be limited by that which exists today.*[97]

This core purpose should drive EPA's assessment of available technologies, and those which may become available. As it turns out, little technology-forcing is even required: As the EPA itself concluded just over a year ago in its first final mid-term determination, and as we dilate on at length below, technology is readily available for industry to meet the current vehicle emissions standards.

EPA does not dispute that the purpose of establishing the proposed CO_2 emission standards is to "reduce GHG emissions, which contribute to climate change," and also acknowledges that the technology needed to comply with more stringent emission standards associated with the baseline "no action" alternative currently exists.

EPA thus has not proposed to make, and cannot support, the requisite finding under section 202(a)(2) of the Clean Air Act—that rolling back the existing standards is "necessary to permit the development and application of the requisite technology." The majority of these technologies have already been developed, have been commercialized, and are in-use on vehicles today. These technologies include, but are not limited to, engine and transmission technologies, vehicle mass reduction technologies, technologies to reduce the vehicles' aerodynamic drag, and a range of electrification technologies. The electrification technologies include 12- Volt stop-start systems, 48-Volt mild hybrids, strong hybrid systems, PHEV, and ZEVs.

> *For example, the existing CO_2 standards are projected to require a combined passenger car and truck fleet penetration of mild hybrids plus strong hybrids of 58 percent of new vehicle sales in MY 2030 …. These technologies are available and in production today, and MY 2020 through MY 2025 standards are still a number of years away.*[98]

According to both EPA's and California's 2017 Advanced Clean Cars Midterm Review, manufacturers have successfully employed a variety of technologies that reduce GHG

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[97] *NRDC v. EPA*, 655 F.2d 318, 328 (D.C. Cir, 1981) (citing S. Rep. No. 1196, 91st Cong., 2d Sess. 24 (1970), and H.R.Rep.No.294, 95th Cong., 1st Sess. 273 (1977)).
[98] 83 Fed.Reg. at 42,986, 43,229.

emissions and increase fuel efficiency, many at a faster rate of deployment than was originally projected, as evidenced by large penetration rates of advanced engine and transmission technologies across the industry in the last five years. Based on 2017 EPA compliance data, manufacturers are over-complying with the GHG requirements and are offering various vehicles today that are currently able to comply with the GHG standards for later model years. For example, of the more than 1,300 conventional vehicle model configurations available in 2016, 23 truck configurations, 23 sport utility vehicle (SUV) configurations, and 26 passenger car configurations meet 2020 or later GHG standards with a conventional gasoline powertrain. An additional 78 model variants comprised of HEVs, PHEVs, and BEVs currently meet the 2020 or later standards. According to the 2017 EPA Light Duty Vehicle Trends Report, 26 percent of projected MY 2017 vehicle production already meets or exceeds the 2020 MY CO_2 emissions targets, showing that the number of vehicles meeting or exceeding the MY 2020 standards has steadily increased over time.

However, despite this evidence of widely available technology, EPA has intentionally proposed to promulgate emission standards that are less stringent than existing standards and that would lead to increased emissions of GHGs.

> *As shown in Table VIII–34, the analysis projects that, compared to the baseline standards, the proposed CO_2 standards for MYs 2021–2026 would increase vehicle CO_2 emissions by 713 million metric tons (MMT) over the lifetime of the vehicles produced from MY 1979 through MY 2029, with an additional 159 MMT in CO_2 reduction from upstream sources* ***for a total increase of 872 MMT.***
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> 83 Fed.Reg. 42986, 43240 (Aug. 24, 2018) (***Emphasis added***).

d. EPA has not established that costs compel a rollback.

EPA attempts to justify the proposed rollback on its "particular consideration" for "high projected costs" and "the impact of the standards on vehicle safety."[99] But as shown throughout these comments, the asserted costs are inflated, the actual costs are outweighed by the benefits, and the proposed rollback will harm public safety.

Even if that were so, EPA has not proposed to find, or offered a basis to find, that any of the proposed alternatives (other than the no-action alternative) are "necessary" "giving appropriate consideration to the cost of compliance within such period" and considering available lead times to further refine the necessary technology.[100]

The Clean Air Act contemplates a doubling or tripling of cost to justify such a showing.[101] Assuming EPA's estimates of the cost of compliance were accurate, which they are not, they do not rise to this level. They reflect an increase of a few hundred

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[99] 83 Fed.Reg. at 43,231.
[100] *Motor & Equip. Mfrs. Ass'n, Inc. v. EPA ("MEMA I")*, 627 F.2d 1095, 1118 (D.C. Cir. 1979).
[101] *Ibid.*

dollars over the previous estimates, and a couple percentages of the total price of the average new passenger vehicle.

At root, EPA attempts to act contrary to Congressional intent to internalize the cost of pollution and ensure public health is protected. Section 202(a)(2) reflects Congress' intent to impose some burdens on auto manufacturers, and even on consumers, to reduce harmful air pollution. [102] EPA may not frustrate that legislative determination.

Greenhouse gases endanger public health. EPA has recognized it. Changing existing law to allowing emissions to increase violates the command in Section 202(a) of the Clean Air Act to regulate these emissions.

EPA may now take a different policy view – wrongly. But this is immaterial; it is for the people's elected representatives to change the statute's policy if they so choose, not the agency. As Justice Scalia, writing for the Court, reminds us,

> *[w]e reaffirm the core administrative-law principle that an agency may not rewrite clear statutory terms to suit its own sense of how the statute should operate. … Instead, the need to rewrite clear provisions of the statute should have alerted EPA that it had taken a wrong interpretive turn. Agencies are not free to 'adopt ... unreasonable interpretations of statutory provisions and then edit other statutory provisions to mitigate the unreasonableness.*[103]

2. NHTSA's proposal is inconsistent with the overriding mandate of EPCA to maximize the fuel efficiency of new motor vehicles.

NHTSA falls into the same error as EPA, unlawfully arrogating to itself the ability to change clear policy set forth in statute.

Section 32902(a) of EPCA mandates that the Secretary of Transportation establish average fuel economy (CAFE) standards for automobiles that represent the maximum feasible average fuel economy level that NHTSA believes manufacturers can achieve in each model year. In promulgating such CAFÉ standards, the Secretary shall consider "technological feasibility, economic practicability, the effect of other motor vehicle standards of the Government on fuel economy, and the need of the United States to conserve energy."

Although EPCA provides NHTSA some discretion with respect to balancing the four aforementioned statutory factors, that discretion is nevertheless constrained by EPCA's overriding mandate of conserving energy. *Center for Biological Diversity v. NHTSA.*[104]

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[102] *Ibid*.
[103] *Utility Air Regulatory Group v. E.P.A.* 573 U.S. 302, 134 S.Ct. 2427, 2447, 189 L.Ed.2d 372 (2014), *quoting Coalition for Responsible Regulation v. E.P.A.* (D.C. Cir., Dec. 20, 2012, No. 09-1322) 2012 WL 6621785, at *16, Kavanaugh, J., *dissenting from the den. of rehearing en banc*.
[104] 538 F.3d 1172, 1195 (9th Cir. 2008).

"Whatever method it uses, NHTSA cannot set fuel economy standards that are contrary to Congress's purpose in enacting the EPCA—energy conservation."[105]

It is undisputable that NHTSA's proposal is inconsistent with EPCA's overriding statutory objective of conserving energy – NHTSA's own estimate of the impact of its proposal on the nation's consumption of petroleum is an increase of approximately 500,000 barrels per day, an amount that NHTSA itself admits is "significant". As discussed below, this is an underestimate, based on a false, unsupported assumption that manufacturers will voluntarily over-comply with the standards. Compared to the "No action alternative," NHTSA's proposed alternative would increase total light-duty vehicle fuel consumption between 2020 to 2050 by 206 billion gasoline gallon equivalents.

As explained below in Section VII, NHTSA's justification is premised in part on the success of its own program. Fuel economy has increased, and not impacted consumer choice or demand, putting the nation on a path to net exports of petroleum.[106] Yet the supporting analysis fails to account for the reversal of that trend if this proposal were finalized, and irrationally concludes that because the program is working, it should be halted.

NHTSA justifies its proposal in part on its discretion to consider consumer demand – it argues that because gasoline prices have decreased since 2012, and are anticipated to remain low through 2050, consumers are demanding larger and heavier vehicles that present challenges to establishing more stringent fuel economy standards. Although NHTSA may consider consumer demand for vehicles in proposing fuel economy standards, its discretion is ultimately constrained by EPCA's overall objective of conserving energy.

> *Congress intended energy conservation to be a long term effort that would continue through temporary improvements in energy availability. Thus, it would clearly be impermissible for NHTSA to rely on consumer demand to such an extent that it ignored the overarching goal of fuel conservation.*
>
> *Center for Auto Safety v. NHTSA*, 793 F.2d 1322, 1340 (D.C. Cir. 1986).

NHTSA further justifies its proposal on its assessment of the availability, effectiveness, and compliance costs of fuel economy related technologies that are anticipated to be available within the 2021 to 2026 model years. However, as explained in greater detail in Section V, NHTSA's assessment is arbitrary and capricious because it is entirely inconsistent with EPA's previous findings and evidence, and CARB's findings and evidence, that such technologies are readily available, and are capable of effectively

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[105] *Id*. at 1197.
[106] *See* 83 Fed.Reg. at 43,214 [oil intensity of U.S. GDP has declined since EPCA's enactment]; 43,215 [wide array of fuel-efficient vehicles with range of features]; 43,216 [decreased demand for fuel].

reducing GHG emissions and improving fuel economy, at lower costs than anticipated by NHTSA.

In conclusion, the Agencies proposed alternatives are inconsistent with the statutory directives of the Clean Air Act and EPCA, respectively, which envision the promulgation of increasingly stringent requirements to ensure the continued reductions of both emissions and fuel consumption from motor vehicles. The proposed alternatives also effectively disincentivize motor vehicle manufacturers from seeking to research, develop, refine, and gain experience with advancements in technologies that will enable manufacturers to comply with existing and future standards at reduced costs. Consequently, the proposal adversely impacts the nation by indisputably increasing emissions of GHGs, and consumption of fuel, and by also disincentivizing the automotive industry from continuing to develop and refine technology that will allow the industry to achieve greater emissions reductions at lower costs.

3. There is no demonstrated basis to adjust compliance flexibilities that are working to reduce emissions, provide manufacturers with incentives to innovate, and create jobs.

The federal Agencies requested comments on whether to change or add regulatory compliance credits, or flexibilities, in the national greenhouse gas vehicle regulations.[107] The existing compliance flexibilities should not be changed. This will further consistency in compliance planning by automakers for model years in the existing program. For example, the ZEV multiplier is important for automakers as a regulatory incentive to bring more electric vehicles to market for compliance nationally. Although California has a ZEV requirement, the ZEV multiplier in the national program helps ensure automakers are marketing ZEVs and PHEVs in other states. ZEV and PHEV sales are expected to continue increasing as more diverse models (including in vehicle size and category, with cross-overs, all-wheel drive, and performance vehicles) entering the market. Further, the impact of the ZEV multiplier on the national program is diminishing as it will phase out under the existing standards.

Based on the available information, compliance flexibilities in other technology categories should remain unchanged. HEVs are widely available at varying levels of power and performance across vehicle sizes, and CARB does not believe it deserves special treatment in the greenhouse gas vehicle regulations. The incentive for large hybrid pick-up trucks should remain limited in scope to ensure program emission benefits are not eroded. New compliance flexibilities for natural gas vehicles or high-octane blend fuel vehicles are not appropriate at this time. Critically, new compliance flexibilities (or off-cycle credit categories) for autonomous vehicles are not appropriate at this time. Although the technology is widely expected to provide safety and mobility benefits, automakers are expected to bring the technology to market regardless so

[107] 83 Fed. Reg. at 43,446-43,447.

incentives are unnecessary, and it is not established that these technologies will reduce emissions given their potential for high annual mileage.

4. The Agencies have not justified departing from their prior determinations or met their obligations for a reasoned analysis, and are not entitled to deference.

The federal Agencies have advanced a novel analysis in support of the rollback. They have acknowledged it departs from prior analyses. But the Agencies have not explained why the extensive analyses developing the existing standards, and concluding they remain appropriate, are now invalid. This is fatal for the proposal.

Reasoned decision-making requires that the Agencies "weighed competing views, selected a [solution] with adequate support in the record, and intelligibly explained the reasons for making that choice."[108] The Agencies must fully explain their departure from the "facts and circumstances that underlay" the prior determinations.[109]

a. The Agencies have not established why their prior decisions must be changed.

A court may "hold unlawful and set aside" an agency's action if it is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law."[110] To avoid this, an administrative agency must adequately explain its decisions, and "must examine the relevant data and articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made." *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mutual Automobile Ins. Co..*[111] An agency action is arbitrary and capricious under the Administrative Procedure Act (APA) where the agency (i) has relied on factors which Congress has not intended it to consider; (ii) entirely failed to consider an important aspect of the problem; (iii) offered an explanation for its decision that runs counter to the evidence before the agency; or (iv) is so implausible that it could not be ascribed to a difference of view or the product of agency expertise.[112]

If an agency reverses course on a prior policy, it is "obligated to supply a reasoned analysis for the change."[113] Further, an agency must "display awareness that it is changing position," show that "there are good reasons" for the reversal, and demonstrate that its new policy is "permissible under the statute."[114] An agency must

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[108] *FERC v. Elec. Power Supply Ass'n*, 136 S. Ct. 760, 784 (2016).
[109] Fox, 556 U.S. at 516; Pub. Citizen, 733 F.2d at 98 (agency must "'cogently explain'" basis for suspending rule) (quoting State Farm, 463 U.S. at 48); *Organized Village of Kake v. U.S. Dep't of Agric*., 795 F.3d 956, 968-969 (9th Cir. 2015); *AMB Onsite Services-West v. NLRB*, 849 F.3d 1137, 1146 (D.C. Cir. 2017).
[110] 5 U.S.C. § 706.
[111] 463 U.S. 29, 43 (1983) ("*State Farm*").
[112] *Id.*
[113] *State Farm*, 463 U.S. at 42.
[114] *F.C.C. v. Fox Television Stations, Inc.*, 556 U.S. 502, 515 (2009).

"provide a more detailed justification than what would suffice for a new policy created on a blank slate" when "its new policy rests upon factual findings that contradict those which underlay its prior policy."[115]

The Agencies have fallen short in several respects. The Agencies have improperly relied on factors Congress did not intend them to consider, as discussed throughout these comments. Prominent examples are how NHTSA has improperly constrained the meaning of its obligation to "conserve energy" to avoiding waste.[116] The denotation and connotation from the overall statute and legislative history are broader, to require energy efficiency and the effective use of scarce resources – by conserving them.[117] The Agencies, in their analysis, have then placed determinative weight on their flawed premise of safety impact, despite the absence of this factor from the statute, and improperly elevated a cramped view of consumer preference to overshadow the statutory directives to conserve energy and protect consumers from rising fuel costs.

The Agencies have not explained why the prior analysis and evidence supporting the initial Final Determination of January 2017 are no longer valid. The proposed rollback is not based on the 2016 Draft TAR, and does not explain why its analyses are wrong – it asserts they are wrong, and relies on different analyses it contends are better.

As explained in detail below, the asserted analysis for increasing fatalities due to improving fuel economy is unfounded. But even if rolling back the standards did decrease fatality projections, there are several direct ways to accomplish the same effects without sacrificing fuel savings. These are described further below.

Moreover, the Agencies have improperly asserted that because the nation had been forecasted to become a net exporter of energy, the fuel economy standards do not need to improve. Not only is this forecast obsolete, as discussed below, if the Agencies finalize the proposal, it contravenes the statutory direction to conserve energy. EPCA does not empower NHTSA to decide that the nation no longer needs to conserve energy.

The Agencies have entirely failed to consider important aspects of the problem. For example, they do not assess the public health, environmental, and human costs of the increased criteria, toxic, and GHG emissions as they acknowledge will come from the proposal.

The Agencies have improperly excluded technologies. The proposal asserts it considered a "wide range" but failed to explain what technologies were excluded and why (besides improperly assessing how technologies are deployed and at what cost, as discussed below).

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[115] *Id*.
[116] 83 Fed.Reg. at 43,213.
[117] 49 U.S.C. § 32902(f); H.R. Rep. No. 94-700, at 116-117.

The proposal does not address the impact on consumers if oil and gasoline prices rise, whether that rise is sudden or gradual, for machines that will be in use for decades, or the rippling effects on the economy of increasing the burden on those with the lowest household incomes.

The Agencies have not acknowledged the effect on states, citizens, and the various sectors of the industry from disrupting the consistent national program that provided regulatory certainty for many years. California has designed its motor vehicle emissions control program to align with the harmonized national program and has been granted a waiver for those standards. As discussed in greater detail below, California, and the section 177 states that have elected to adopt those standards as their own have incurred reliance interests ultimately flowing from those standards. For instance, California has incurred reliance interests because it is mandated to achieve an aggressive GHG emissions reduction target for 2030. California law requires a multi-pronged approach demanding GHG emissions reductions from various sectors, including the transportation sector, which is the largest contributor to California's GHG emissions.[118] California's Advanced Clean Cars program, including the State's GHG and ZEV standards, is a crucial part of this multi-pronged approach, and California has made, and is continuing to make, decisions about other regulatory actions in reliance on the emissions reductions the Advanced Clean Cars program will produce. Consequently, the Agencies' proposal to reduce the stringency of their respective standards would, in the absence of affirmative CARB action, undermine the basis of California's planning for its emission reduction goals, infringing on the State's core police power and ability to protect its citizens. The agency proposal therefore contravenes Congress' intent in enacting the Clean Air Act that expressly preserves *States'* reliance interests. "Where coordinate state and federal efforts exist within a complementary administrative framework, and in the pursuit of common purposes, the case for federal pre-emption becomes a less persuasive one."[119]

The Agencies have offered explanations for their proposal that run counter to the evidence. The Agencies assert that fuel efficiency and emissions controls have sacrificed other attributes that are in greater demand, despite the evidence of increasing sales over the same model years that standards have been increasing, with growing options and features in the market.

As explained by the California Attorney General is his accompanying comment, the proposed rollback also departs from NHTSA's practice in past rulemakings, where the agency considered "all types of technologies that improve real-world fuel economy."[120] This scope of consideration was consistent with the agency's long-held definition of the technological feasibility factor as "whether particular methods of improving fuel economy

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[118] Cal. Health & Saf. Code § 38566.
[119] *New York State Dep't of Soc. Servs. v. Dublino*, 413 U.S. 405, 421 (1973).
[120] See, e.g., 77 Fed.Reg. 62,624, 62,668 (Nov. 15, 2012); 75 Fed.Reg. 25,324, 25,555 (May 7, 2010).

will be available for commercial application in the model year for which a standard is being established."[121] Now, NHTSA proposes to narrow the scope of its consideration to an unspecified "wide range" of technologies. [122] NHTSA expressly admits it "has not attempted to account for every technology that might conceivably be applied to improve fuel economy," and the only explanation provided is that NHTSA "considers it unnecessary to do so given that many technologies address fuel economy in similar ways."[123]

With respect to zero-emission technologies, the Agencies assert that sales are declining and consumers are rejecting these vehicles. This is false: while sales as a percentage have fallen, total sales have risen. The apparent decline is only a function of an expanding overall national market.

The Agencies acknowledge that oil prices may rise in the future,[124] but base the proposal in part on the current state of relatively low prices.

The explanation advanced by the Agencies is implausible. It is contorted, illogical, and unsupported by the evidence. It is not one that can be ascribed to a difference of view or the product of agency expertise.

The Agencies irrationally and inconsistently assert that the market appropriately responds to consumer preferences for fuel efficiency, yet simultaneously asserts that the market will over-respond. This is illogical, and contrary to any evidence it has occurred before. If anything, with respect to fuel economy standards, several manufacturers typically pay fines rather than comply – despite the existence of credits under the harmonized national emissions standards that allow manufacturers to fit their compliance obligations to their production cycles.

b. The Agencies have not fulfilled their statutory requirements.

As explained above, NHTSA's proposal does not "provide for improved efficiency of motor vehicles" over the long term. Stagnating the standards violates Congressional direction to ratably increase fuel economy when the technology for doing so has been demonstrated to exist (which it does, as explained below) or could be developed in the necessary time. Since market inefficiencies may preclude sufficient improvement without regulatory incentives, EPCA requires standards that advance technology.[125] NHTSA's failure is summed it by its expectation that manufacturers will voluntarily exceed the standards, effectively conceding the standards are not the required "maximum feasible."

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[121] See 42 Fed.Reg. at 63,188; 83 Fed.Reg. at 43,208 (emphasis added).
[122] 83 Fed.Reg. at 43,208.
[123] *Ibid*.
[124] *See, e.g.,* 83 Fed.Reg. at 43,214, n. 444 [acknowledging potential for gasoline prices to rise in the future].
[125] *Center for Auto Safety v. National Highway Traffic Safety Administration, et al.*, 793 F.2d 1322, 1339, citing S. Rep. No. 179, 94th Cong., 1st Sess. 2 (1975), U.S.C.C.A.N. 1975 at 9.

EPA and NHTSA wholly fail to analyze the economic effects of the climate change and public health implications of the rollback. The Agencies assert these are insignificant, but that is only because the Agencies' projections of climate change are so extreme. An appropriate analysis of a proposal that speeds progress toward such a calamitous condition must acknowledge and analyze the expected effects.

c. The Agencies are not entitled to deference.

The rollback proposal relies to a great degree on modeling and analyses developed by NHTSA's Volpe center, [126] including the CAFE Model. The proposal is premised in large part on addressing predicted traffic fatalities. However, Congress provided the Department of Transportation distinct authority, separate from its direction to improve fuel economy, to accomplish this goal.[127] The over-arching purpose of the latest Congressional directive to set the "maximum feasible" fuel economy standards in the underlying statute is "To move the United States toward greater energy independence and security, to increase the production of clean renewable fuels, to protect consumers, [and] to increase the efficiency vehicles."[128] While the Secretary of Transportation may have delegated to NHTSA the authority to determine fuel economy standards, NHTSA's purpose is highway safety. As discussed below, NHTSA has many means available to directly reduce fatalities, including by reducing vehicle miles traveled, which it (wrongly) emphasizes will increase because of the existing standards. NHTSA is not charged with assessing and developing programs to reduce the public health and environmental effects of air pollutants. It has no direction to do so, and no special expertise.

It is "EPA [that] has been charged with protecting the public's 'health' and 'welfare,' a statutory obligation wholly independent of [the Department of Transportation's] mandate to promote energy efficiency."[129] But EPA's analysis of these issues appears to have been rejected. EPA was essentially shut out of the drafting process at the staff level; indeed, staff provided extensive comments on the analysis and conclusions in the draft proposal, many of which do not appear to have been incorporated into the analysis.[130] As EPA staff wrote with regard to the regulatory impact analysis, which contains the core analysis supporting the rule:

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[126] The Department of Transportation established the John A. Volpe National Transportation Systems Center (Volpe Center) to advance transportation innovation for the public good. *See* https://www.volpe.dot.gov/about-us.

[127] 49 U.S.C., Subt. VI, Pt. A., Ch. 301, § 30101, et seq.
[128] Energy Independence and Security Act of 2007 (EISA), PL 110–140, December 19, 2007, 121 Stat 1492.
[129] *Mass. v. EPA*, 549 U.S. at 532. *See also Coal. for Responsible Regulation v. EPA, 684 F.3d 104, 127 (D.C. Cir. 2012), rev'd on other grounds Utility Air Regulatory Group v. EPA, 134 S. Ct. 2427* (2014) (recognizing that "just as EPA lacks authority to refuse to regulate on the grounds of NHTSA's regulatory authority, EPA cannot defer regulation on that basis"; "[EPA is not] required to treat NHTSA's . . . regulations as establishing the baseline for the [§ 202(a) standards]"; and further that "the [§ 202(a) standards] provid[e] benefits above and beyond those resulting from NHTSA's fuel economy standards").
[130] These are noted throughout this comment letter; *see*, e.g.., EO 12866 Review, EPA Comments on GHG/CAFE NPRM Preamble, June 29, 2018.

> *This Preliminary RIA is a work product of DOT and NHTSA, and was not authored by EPA. The Preliminary RIA is based on the independent technical assessment from DOT-NHTSA, and the document should reflect appropriately who has authored the Preliminary RIA. EPA's name and logo should be removed from the DOT-NHTSA Preliminary Regulatory Impact Analysis document. EPA is relying upon the technical analysis performed by DOT-NHTSA for the Notice of Proposed Rulemaking.*

That EPA's *political* appointees, who are generally not policy experts, rejected the views of their expert staff and instead followed the bad analyses offered by NHTSA does not repair this flaw; it, instead, demonstrates the degree to which EPA has arbitrarily delegated its authority to others, while declining to exercise its own expertise.

NHTSA is statutorily obligated to consider EPA's emissions standards in determining the fuel economy standards,[131] but EPA is not obligated to do the same.[132] EPA, for its part, may not simply accept NHTSA's analysis without doing its own. To have done so is arbitrary.[133]

The rollback proposal is not a product of agency expertise. It is inconsistent with prior analyses, legal positions, and judicial determinations, and fails to meaningfully establish that the prior fundamental technical information and analyses are no longer reliable. It is not persuasive because it is inconsistent with logic, accepted economic theory, and empirical information. It is not entitled to deference.

d. CARB is entitled to significant deference as a congressionally-recognized regulator of motor vehicle emissions, with more experience than EPA.

CARB and its analyses remain entitled to great deference. As discussed at length above, California conducted ground-breaking research in the effects of motor vehicle pollution, and the means to address it. CARB's technical analyses continue to be solidly founded on extensive research, including original research and collaboration with academic institutions, EPA, and industry. It has a proven track record of success.

CARB has a deep bench of expertise, developed over decades of its Congressionally-authorized work to regulate vehicle emissions. Its staffers have broad experience, advanced degrees, and specialized training in relevant fields, including air pollution modeling, atmospheric chemistry, mechanical engineering, public health, and economics. Examples of the expertise reflected here include analyses by:

Michael McCarthy is CARB's Chief Technology Officer of the Emission Compliance, Automotive Regulations, and Science (ECARS) Division. He has B.S.E. in Mechanical

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[131] 49 U.S.C. § 32902(f).
[132] *Coal. for Responsible Regulation*, 684 F. 3d at 127.
[133] *City of Tacoma v. FERC*, 460 F. 3d 53, 75 (D.C. Cir. 2006).

Engineering from the University of California – Los Angeles. He has worked at CARB since 1992. He has been a member of several Society of Automotive Engineers (SAE) International Standards and International Standards Organization Committees, and received the 2006 Henry Souther Standards Award from SAE International. He led CARB's participation in its own Midterm Review, and in the joint Midterm Evaluation of the MY 2022-2025 standards that culminated with a final determination in January 2017 that the standards remain both technologically and financially feasible and otherwise appropriate.

Belinda Chen has worked at CARB since 2006, lead the economic and fiscal impact section for the 2012 Advanced Clean Cars regulations, and the consumer acceptance component for the 2017 Advanced Clean Cars Midterm Review. She holds a B.A. from Brown University in Environmental Studies and Biology, and a M.S from the University of California, Davis, in Transportation Technology and Policy. She was also the recipient of EPA's Science to Achieve Results (STAR) graduate fellowship and U.S. DOT Eisenhower Transportation fellowship, and is a contributing author to the Handbook of Transport Modeling, Second Edition (Handbooks in Transport Volume 1), D.A. Hensher and K.J. Button (eds).

Anna Wong has worked at CARB since 2006, and is a Staff Air Pollution Specialist and leads in the review, development and modifications for California's ZEV regulation, including the 2008 and 2012 regulatory amendments, as well as the Midterm Review. She holds a B.S. from the University of California, Davis in Community and Regional Development.

Sherrie Sala-Moore currently works in CARB's On-Road Model Development Section using engineering concepts to develop and improve methodologies, emissions estimates, and documentation for use in regulations, attainment plans, and other ARB programs. In prior CARB positions, she developed calculators and conducted technical analysis for the Goods Movement Emission Reduction Program, and provided technical analysis for the development of the Diesel Truck and Bus regulation.

Dr. Sara Forestieri has a Ph.D. in Civil & Environmental Engineering from UC Davis. Her work in CARB's mobile source analysis branch focuses on data collection and analysis for the agency's mobile source inventory EMFAC.

Dr. Marko Jeftic is an Air Resources Engineer at the ARB. He holds a Ph.D. degree in mechanical engineering from the University of Windsor in Ontario, Canada. He has authored journal and conference papers related to reductions of vehicle exhaust emissions. He currently works at CARB in the Advanced Clean Cars Branch of the Emissions Compliance, Automotive Regulations and Science Division. His focus is on light duty vehicle regulations.

Dr. Emily Wimberger is the chief economist at the California Air Resources Board where she leads the economic analysis of California's climate change and criteria pollution regulations and policies. Previously, Emily served as a researcher at the University of

California Center for Energy and Environmental Economics at UC Santa Barbara and as Economics Fellow at the California Air Resources Board. Dr. Wimberger received her Ph.D. in Agriculture and Resource Economics from the University of California Davis and her bachelor's degree in Energy, Environmental, and Mineral Economics from Penn State.

Dr. William Leung is an economist in CARB's Office of Economic Policy & Analysis and is responsible for performing regulatory impact assessments for CARB's proposed regulations. He holds a Ph.D. in Economics from UC San Diego and has performed research on consumer responses to gasoline prices.

Ryan Hart, P.E., has been an Air Resources Engineer at the California Air Resources Board since 2014 where he specializes in light-duty vehicle electrification technology. Prior to joining ARB, Ryan worked at a battery test facility where he designed and instrumented life-cycle tests for various electric vehicle batteries. He has a B.S in mechanical engineering and is completing his M.S. from California State University, Sacramento.

Dr. Melanie Zauscher has a Ph.D. in Engineering Sciences from the University of California, San Diego. Her primary responsibility at CARB includes managing research related to the zero emission vehicle market, real-world usage of zero emission vehicles, vehicle choice, vehicle incentives, and autonomous vehicles. In addition, she is leading a team to write a comprehensive report to review CARB's ZEV programs.

Dr. Nehzat Motallebi has a Ph.D. in Atmospheric Science from University of California, Davis. Her primary responsibility at CARB includes managing research projects in the field of Particulate matter monitoring, data analysis, and regional air quality modeling. She is also managing several Climate Change research projects on global radiative effect of particulate black carbon, improving the carbon dioxide emission estimates from the combustion of fossil fuels in California, characterization of black carbon and organic carbon air pollution emissions and evaluation of measurement methods, and impact of climate change on meteorology and regional air quality in California.

Firas Abu-Sneneh is an economist in CARB's Industrial Strategies Division since 2016, and is responsible for conducting economic analyses on California's transportation fuel markets and producing projections of California's transportation fuel matrix. He holds a B.Comm from McGill University in Finance and Economics, and an M.S. from the University of California, Davis in Agricultural and Resource Economics, where he also is working on finishing his PhD in Agricultural and Resource Economics.

CARB's expertise is not limited to its own resources. To ensure it was objectively considering the potential merits of the SAFE NPRM, CARB contracted with several experts in the various fields relevant to the proposal to provide their independent views. These include:

Dr. Frank Ackerman is a Principal Economist at Synapse Energy Economics. He is an environmental economist who has written widely on energy, climate change, and related issues. He has studied the employment benefits of clean energy scenarios, critiqued a number of flawed economic studies related to clean energy and the environment, and been published widely on these topics.

Dr. Maximillian Auffhammer is the George Pardee Jr. Family Professor of International Sustainable Development at the University of California Berkeley. Among his posts are a research associate at the Energy Institute at Haas, a Fellow of the CESifo network and a research associate at the National Bureau of Economic Research as well as a Humboldt Fellow. He teaches Ph.D. level econometrics, microeconomic theory to MBA students at the Haas School of Business and microeconomic theory, macroeconomic theory, economics of climate change and research methods to graduate and undergraduate students across the university. He has won many research awards, including grants from the National Science Foundation, the Environmental Protection Agency, and private foundations. He has been appointed by the American Statistical Association to serve as a member of the Statistical Advisory Board to the Energy Information Administration in the Department of Energy, and was the chair for two years. He has served on a National Academies of Sciences Panel to assess the social cost of carbon (SCC) and was a lead author on the fifth assessment report of the Intergovernmental Panel on Climate Change. The National Academies of Sciences provide nonpartisan, objective guidance for decision makers on pressing issues. They bring together experts from across disciplines to look at the evidence. The study committees “survey the landscape of relevant research, hold public meetings to gather information, and deliberate to reach consensus, which results in a shared understanding of what the evidence reveals and the best path forward”. The SCC panel issued an interim and final report recommending specific short term and long term updates to the Social Cost of Carbon (NAS, 2016). His research has won the Cozzarelli Prize for best paper in the prestigious Proceedings of the National Academies of Sciences, and he has published extensively in these areas.

Dr. David S. Bunch is Professor of Management at the University of California, Davis, and faculty associate of the Institute of Transportation Studies since its inception. He is an internationally recognized expert on discrete choice modeling methods, which are used to understand and predict consumer choices when they select one product from a competing set. His research interests include new product development and introduction, travel behavior, and vehicle choice, including market potential for alternative fuel vehicles. He has consulted on transportation policy issues for state and federal agencies, public utilities, and the airline industry. Professor Bunch has specific expertise in developing simulation models of vehicle market behavior for the purpose of evaluating alternative policy scenarios, including new vehicle greenhouse gas regulations, and feebates. He is the designer and creator of three versions of the CARBITS model for the CARB, and has been the chair of an expert panel advising the California Energy

Commission on their ongoing enhancement of DynaSim (their market simulation model for producing transportation fuel forecasts, and evaluating alternative transportation and clean energy policies in California).

Mr. Gopalakrishnan Duleep is President of H-D Systems. His extensive work on cost and performance of fuels and engine technology has been widely cited around the world. Through his work, he meets periodically with the technical staff of most of the world's largest automobile manufacturers to discuss new technology and has obtained key insights on vehicle development through this process. In 2008-2009, he directed analyses as a support contractor to the National Academy of Sciences Committee on Fuel Economy Standards. He has also worked extensively on vehicle criteria pollutant emissions and supported the development of EPA vehicle emissions models in the 1985 to 1995 time-frame, and on heavy-duty diesel emissions in the 1990 to 2005 time-frame.

Dr. Kenneth Gillingham is an Associate Professor of Economics at Yale University. He is also a faculty research fellow at the National Bureau of Economic Research. He served as the Senior Economist for Energy & the Environment at the White House Council of Economic Advisers in 2015-2016, and in 2005 he served as a Fellow for Energy & the Environment at the White House Council of Economic Advisers. He is an energy and environmental economist, with research in transportation, energy efficiency, and the adoption of new technologies. He has over 40 publications, including in top journals in economics, science, and business, many focusing on the economics of fuel economy standards and related issues.

Dr. David Greene is a Senior Fellow of the Howard H. Baker, Jr. Center for Public Policy and a Research Professor of Civil and Environmental Engineering at The University of Tennessee. In 2013 he retired from Oak Ridge National Laboratory with the rank of Corporate Fellow after a 36 year career researching transportation and energy policy issues for the U.S. Government, especially the Departments of Energy and Transportation. Dr. Greene has authored or co-authored three hundred professional publications including over one hundred articles published in peer-reviewed journals, and served on more than a dozen special committees of the National Academies and is currently a member of the Committee for the Assessment of Technologies for Improving Fuel Economy of Light-Duty Vehicles. He is the only person to have served on all five National Academy committees on the Corporate Average Fuel Economy Standards and the fuel economy of light-duty vehicles convened since 1990. His research has received awards from multiple organizations and he was recognized for contributing to the award of the 2007 Noble Peace Prize to the Intergovernmental Panel on Climate Change. He holds a Ph.D. in Geography and Environmental Engineering from The Johns Hopkins University and degrees in Geography from the University of Oregon (MA) and Columbia University (BA).

Dr. Susan Handy is a Professor in the Department of Environmental Science and Policy at the University of California, Davis. She is internationally known for her research on the relationships between transportation and land use. She currently focuses in part on strategies for reducing automobile dependence. She holds a B.S.E. in Civil Engineering from Princeton University, an M.S. in Civil Engineering from Stanford University, and a Ph.D. in City and Regional Planning from the University of California at Berkeley.

Dr. David Ragland founded the UC Berkeley Traffic Safety Center, now called the Safe Transportation Research and Education Center (SafeTREC), which conducts research on transportation practices, evaluates new technologies for road safety, and analyzes transportation policy (https://safetrec.berkeley.edu/). He has authored or co-authored more than 100 technical reports and peer-reviewed publications in the traffic safety arena, and advised state and federal transportation agencies on issues of transportation safety, including collision analysis, data collection, and safety for vulnerable populations such as pedestrians and bicyclists.

Gary Rogers, Vice President of Roush Industries, has over 30 years experience in senior corporate management of an engineering design and development company specialized in ground vehicles, engines and transmissions, hybrid and electric systems, vehicle controls and new technology development, and has been the principle investigator in over $200 million in U.S. government sponsored research and development tasks.

Dr. Elizabeth A. Stanton is the founder and Director of the Applied Economics Clinic. She has worked for more than 17 years as an environmental economist, and has authored more than 140 reports, policy studies, white papers, journal articles, and book chapters on topics related to energy, the economy, and the environment. Dr. Stanton’s articles have been published in Ecological Economics, Renewable Climatic Change, Environmental and Resource Economics, Environmental Science & Technology, and other journals.

Mr. R. Michael Van Auken is a Senior Principal Engineer with Dynamic Research, Inc. He has conducted and directed numerous technical analyses in the areas of vehicle dynamics and control, crashworthiness and crash avoidance; including ride characteristics, handling, occupant injury assessments and technology effectiveness estimates for automobiles, motor cycles, and ATVs. This involved mathematical modeling and computer simulation of driver and vehicle systems, data analysis, and interpretation of results, as well as full scale and component testing and model validation. Other activities have included development of tire-road math models; Fourier analysis, sound signal and other types of signal analysis; large scale computer simulations of multi-body dynamics; finite element analysis; and various types of statistical analyses and experimental design. He is widely published in his field.

In preparing these comments, CARB has considered the opinions of these experts, as discussed throughout, and provided the federal Agencies with the reports describing their opinions.

Overall, the essential point is that the collaborative and comprehensive analyses that led to the Technical Assessment Report, Proposed Determination, Initial Final Determination, and CARB's Mid-Term Review Report remain the most complete and consistent analyses of the existing standards. CARB's assessments in matters of reducing harmful pollution from motor vehicles, unlike NHTSA's, are founded on expertise and a statutory mandate. It is entitled to significant deference. NHTSA is not.

5. The federal Agencies have not made the case for change.

As will be explained in detail below, the Agencies do not demonstrate the existing standards need to change. Given the cooperative relationship between states and the federal government, the underlying statutes recognize the states' continued role regulating for the health and welfare of their citizens and do not preempt California's role and expertise regulating motor vehicle emissions along with the federal government.[134] This is all the more so where California has significant expertise the federal agency does not, and where states otherwise rely on federal actions and on federal decisions to endorse or approve state actions.

Having reviewed the obligations of the Agencies, we now turn to the suspect technical analysis offered in the proposed rollback as a justification for acting directly contrary to these Congressional directives. Consistent with the rushed and unreasonable development process for the proposal, the evidence is entirely unpersuasive.[135]

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[134] *See Pharmaceutical Research and Mfrs. of America v. Walsh* (2003) 538 U.S. 644, 666, 123 S.Ct. 1855, 155 L.Ed.2d 889, *citing Hillsborough County v. Automated Medical Laboratories, Inc.*, 471 U.S. 707, 715–718, 105 S.Ct. 2371, 85 L.Ed.2d 714 (1985), *and New York State Dept. of Social Servs. v. Dublino*, 413 U.S. 405, 421, 93 S.Ct. 2507, 37 L.Ed.2d 688 (1973).

[135] Indeed, the analysis is so poor, misleading, and incomplete as plainly to violate the Information Quality Act (§ 515 of Public Law 106-554), and the relevant implementing guidelines of both EPA and the Department of Transportation. Both entities set an especially high standard for information the agencies disseminate that is "influential"; rulemaking information is, clearly, influential. As EPA writes, influential information includes:

> Information disseminated in support of top Agency actions (i.e., rules, substantive notices, policy documents, studies, guidance) that demand the ongoing involvement of the Administrator's Office and extensive cross-Agency involvement; issues that have the potential to result in major cross-Agency or cross-media policies, are highly controversial, or provide a significant opportunity to advance the Administrator's priorities. Top Agency actions usually have potentially great or widespread impacts on the private sector, the public or state, local or tribal governments. This category may also include precedent-setting or controversial scientific or economic issues.

Guidelines for Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by the Environmental Protection Agency(2002). U.S. EPA. Accessed on October 24, 2018. https://www.epa.gov/sites/production/files/2017-03/documents/epa-info-quality-guidelines.pdf. p. 20. DOT (including NHTSA) also defines rulemaking data as "influential." DOT, *The Department of Transportation's Information Dissemination Quality Guidelines*(2002), at p. 27-29. Influential data, per both sets of guidelines, is supposed to be subject to especially rigorous quality checks on both sets of guidelines, generally should be peer-reviewed, and

V. The technology analysis is unfounded.

We have reviewed the many ways the Agencies' newfound policy preferences have led them to wander away from Congress's clear direction. We now turn to the analyses that allegedly support those preferences. It is severely wanting, such that even if the Agencies had discretion to adopt views contrary to Congress, it could not possibly support the views they have adopted.

The Agencies' flawed proposal proceeds in two related steps. First, it dramatically overinflates the costs of compliance with the existing standards. Then, it makes a series of unsupportable assumptions to insist that these inflated costs will lead to fatalities – a point that, even if true, would be for Congress to consider, but which the Agencies find dispositive enough to overturn their statutory mandates as they stand.

We begin with an extensive discussion of the technology analysis, demonstrating how, at every step, the Agencies have improperly inflated costs. Note, though, that the plural "Agencies" is a misnomer: The analysis appears to have been driven almost entirely by NHTSA, even though EPA ultimately added its name to the proposal, so we frame our comments accordingly. As we discuss below, EPA's own technical staff rejected many of the conclusions the Agencies now offer, as do independent experts.

In the technology assessment, the Agencies have taken several steps backwards from previous analyses most notably relative to the 2016 Draft TAR, of which CARB, EPA, and NHTSA co-authored, and to EPA's 2016 Proposed Determination. In areas of engines, transmissions, and vehicle technologies, the Agencies' analysis reflects changes to generally assign less benefits, higher costs, or newly imposed constraints that prevent deployment on significant portions of the fleet. In the area of electrification, the Agencies inexplicably revert back to reliance on outdated components to develop unrealistically oversized technology packages and excessive costs beyond what current vehicles are already achieving. And in the model and its inputs, several key assumptions and methodologies combine to generate artificially high technology costs through excessive over-compliance, utilization of technology to improve vehicle performance rather than GHG emission performance, and an erroneous methodology that fails to apply cost-effective technologies in a logical fashion.

The proposal by NHTSA and EPA overestimates implementation costs for the existing greenhouse gas and fuel economy standards. The federal proposal provides no compelling or substantive evidence to support its assumptions, and is contrary to current, publically available information.

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should be immediately corrected if inaccurate; it certainly should not be the basis for a rulemaking if inaccurate. Yet, that is what has happened here: There is no evidence that EPA or DOT, for instance, followed these Guidelines, or their related Peer Review Policies, to conduct a proper analysis; on the contrary, there appears to be no peer review of most of the relevant models and analyses discussed below, and most are wildly inaccurate. This inadequate work and violation of internal guidelines is strong evidence that the conclusions are illegally arbitrary and not grounded in substantial evidence.

A. The Agencies made incorrect engine assumptions contrary to publically available information.

The Agencies' analysis of conventional vehicle technology suffers multiple fatal deficiencies. It unreasonably constrained and significantly differed from recent analyses without adequate explanation. EPA and NHTSA inappropriately modeled advanced gasoline engine technology costs that are contrary to publically available and current information. For example, known technologies, such as high compression ratio engines (referred to in the CAFE model as HCR1 and HCR2), were overly limited or ignored, while other technologies (for example, cooled exhaust recirculation engines, CEGR, and downsized turbo charged engines) were modeled incorrectly.

The Agencies did not present sufficient new evidence to change the previous technical findings. Thus, instead of relying on new information as had been asserted as justification for the proposal, the analysis was based on older data that does not reflect current technology. It limited the manner, timing, and coordination of emission control technologies in unreasonable ways that artificially increased its cost and diminished its effectiveness.

This was done using NHTSA's CAFE model, despite the significant lack of expertise within that agency, and in contravention of the analyses by EPA and CARB, with their deeper expertise in vehicle pollution control technology. NHTSA failed to incorporate EPA's expertise on engine technologies in this analysis. In EPA's own words,

> *EPA has not been consulted by NHTSA regarding a list of engine technologies which NHTSA should consider for the purposes of this Notice of Proposed Rulemaking.*[136]

In general, the previous analyses by the Agencies have projected far less need for electrification than what the Agencies now project in this proposal. While it is not completely clear everything that the Agencies have changed, the underlying cause is a reduction in the assumed cumulative improvements for what advanced gasoline technology is able to achieve. As summarized in a report reviewing this proposal by Gopalakrishnan Duleep of H-D Systems,[137] *Table V-6* in these comments highlights substantial differences in the assumed levels of mild and strong hybrids that would be needed to comply with the existing standards in 2025MY. Compared to previous estimates by EPA, the use of mild hybrids is now projected to be over double what it previously was while strong hybrids are expected to be needed on ten times the amount of vehicles. Together, these would represent nearly 60 percent of all vehicles in the 2025MY fleet. For NHTSA, the new projections call for nearly 2.5 times the amount of

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[136] EPA Comments on the Preliminary RIA (July 12, 2018). U.S. EPA. Accessed on October 24, 2018. https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0283-0453. p. 229.
[137] Duleep, G. "Review of the Technology Costs and Benefits Utilized in the Proposed SAFE Rule." H-D Systems, September 2018 (Duleep Report). Table 22-6, p 18.

mild hybrids and approximately 1.7 times the number of strong hybrids bringing its combined fleet projection to over 55 percent.

Table V-1 (Table 2-6, From Duleep's Report) Comparison of Technology Penetration to Meet MY 2025 standards from Agency Studies

	2016 DRAFT TAR CAFE	2016 DRAFT TAR GHG	2016 FINAL TAR GHG	2018 PRIA GHG	2018 PRIA CAFE
WEIGHT REDUCTION	15	6.6	9	7.3	6.4
VVT	96	96	95	TBD	TBD
VVLT	62	8	31	TBD	TBD
CYL. DEAC.	27	54	49	TBD	TBD
DYNAMIC DEAC.	NA	NA	NA	4	6
TURBO 18 BAR	13	22	27	62	64
TURBO 24 BAR	14	11	7		
HIGH CR	0	44	27	26	26
TURBO MILLER	0	4	2	NA	NA
8+ SPEED AUTO.	51	90	93	76	72
ADVANCED CVT	18				
IDLE STOP-START	38	20	15	15	14
MILD HYBRID	13	18	18	38	32
STRONG HYBRID	14	2.6	2	20	24
PLUG-IN HYBRID	0.5	1.7	2	1	1
BATTERY ELEC.	1	2.6	3	1	1

In Duleep's report,[138] the changes in assumed efficiencies for key gasoline technologies were examined to see what could have caused such a shift in the need for more electrification. The report provided a summary table of its findings where the biggest changes had occurred and what a more appropriate estimate of technology effectiveness would be.

[138] Duleep Report, pp. 5 & 29.

Table V-2 (Table from Duleep's Report) Summary of Corrected Estimates

Technology Identifier		PRIA Benefit Estimate*	Correct Estimate*	Justification for correct estimate
Stop-start Systems		1.8%	2.8 - 3.3%	From vehicle test data
48V Mild Hybrid		5.35%	9.0%	From vehicle test data
Advanced 8/9 spd. Trans.		7.6 to 8%	10 to 11%	Data from FCA models
Aero Drag 20% reduction		3.0%	4.3%	No Gear/Axle ratio adjustment in PRIA analysis
Tire RRC 20% reduction		3.1%	4.4%	No Gear/Axle ratio adjustment in PRIA analysis
Mass Reduction 5		6.9%	10.4%	Glider weight assumption error
Tire RRC 30% reduction		Not used	1.8%	Tires w/RRC <0.065 already available
HCR2		Not used	~19%	From 2018 Camry data
Miller Cycle		Not used	4 to 5% over Turbo	From VW/Honda data
ADEAC + 48V Hybrid		Not used	~20%	Tula Technologies/ Delphi data

*Benefits relative to average 2016 vehicle with 4-valve PFI engine with VVT and 6-speed automatic, tire RRC-0.09

The summary noted underestimations (or unsupported exclusions) in several engine technologies (HCR1), transmission technology, and vehicle technology (mass reduction, aerodynamic assumptions, A/C crediting). Further review found significant deficiencies and exclusions in the engine modeling.

1. **The Agencies inappropriately limit known engine technologies, such as high compression ratio engines (HCR1).**

The most notable exclusions include naturally-aspirated engines utilizing a high compression ratio and an Atkinson-like cycle referred to as HCR1 (and a more advanced version, HCR2) in the CAFE Model. With the advent of advanced electronic controls for variable valve timing (VVT) (and sometimes variable valve lift (VVL) combined with more precise fueling, these engines are able to take advantage of the higher efficiencies of the Atkinson cycle and effectively achieve substantially higher compression ratios than older technology allowed. HCR engines first appeared in strong hybrids, and through continuous improvements, have allowed manufacturers such as Mazda to deploy the technology essentially across all of its engines and vehicles. Toyota has also begun to deploy the technology starting with the 2018MY Toyota Camry 2.5L engine and has stated its intent to deploy the technology across the vast majority of its engines. In prior analysis by the Agencies, modeling and benchmarking has found the HCR technology to be very cost competitive with downsized turbocharging and even more cost-effective in some cases.

For the HCR1 technology package, the NPRM and PRIA only provide vague reference that the technology is limited in the CAFE Model and that the technology is "not suitable for MY 2016 baseline vehicle models that have 8-cylinder engines and in many cases 6-cylinder engines."[139] However, looking at the "market input" files for the CAFE Model, the HCR1 technology is declared not suitable on 207 of the 288 engines cumulatively used by all of industry including over 50 percent of the 4 cylinder engines and nearly 90 percent of the 6 cylinder engines instead of only being restricted from 8 cylinder and "in many cases 6 cylinder engines." This is an inappropriate constraint imposed by the CAFE Model and does not reflect reality.

An unspoken but implied rationale for the stated constraint of not allowing it on 8-cylinder and some 6-cylinder engines is that trucks or larger vehicles could not utilize an HCR1 engine. This is not a reasonable constraint, since the Toyota Tacoma has utilized a 3.5L V6 HCR Atkinson-like engine since the 2016MY. The Agencies acknowledge this by labeling it in the baseline file as an HCR1 engine in the Tacoma, yet they similarly disallow this technology from other Toyota V6 engines utilized in vehicles like the Sienna minivan and 4Runner SUV. If the intended rationale is that HCR engines will have insufficient low end torque to satisfy truck-like towing demands, it would be inappropriate to restrict the engine from minivan and SUV applications which have a lower tow rating and lower expected towing demands. However, the Agencies have failed to supply any detailed rationale as to why HCR applications are so constrained in the CAFE Model.

Further, the 2019MY Ram 1500 5.7L V8 is noted as using a higher compression ratio than earlier versions and using its VVT system to reduce pumping losses via delayed, or late, intake valve closing[140]—resulting in an HCR-like engine with an over-expanded or Atkinson cycle. While several naturally aspirated engines using late (or early) intake valve closing to achieve some of the over-expanded Atkinson-like cycle improvements may not fully be as efficient as the modeled HCR1 package, the Agencies provide no other mechanism to represent these benefits.

As a simple approximation to see how sensitive the compliance costs were to the constraints imposed on HCR1 technology, a run was done where the CAFE Model restrictions on HCR1 were removed, thus allowing the technology to be available for all engines, regardless of the number of cylinders. As shown in the first column of *Table V-3* below, the average vehicle costs to comply with the existing standards (for model years 2017–2032) are over $200 per year *lower*. This confirms that such artificial and incorrect restrictions imposed on technologies such as HCR1 have a significant impact on the overall cost of compliance.

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[139] 83 Fed.Reg. 43,038.

[140] "2019 Ram drops weight, gains 48V eTorque mild hybrid system", *Green Car Congress*. Accessed on October 24, 2018. http://www.greencarcongress.com/2018/01/20180115-ram.html.

Table V-3 Comparison of Average Incremental Tech Costs ($) for Existing Standards and Proposed Rollback when changing HCR1 restrictions[141]

MY	Existing Standards Ave. Tech Cost (HCR1 restricted) - Ave. Tech Cost (HCR1 not restricted), $	Rollback Standards Ave. Tech Cost (HCR1 restricted) - Ave. Tech Cost (HCR1 not restricted), $
2016	0	0
2017	33	11
2018	111	19
2019	143	26
2020	136	2
2021	225	1
2022	245	-2
2023	271	2
2024	251	2
2025	251	0
2026	253	-4
2027	186	-1
2028	224	-1
2029	245	0
2030	236	0
2031	227	-1
2032	229	0

Moreover, improvements on the original HCR1 engine, reflective of a 2012MY vintage Mazda engine, have already been made on engines in production. The Agencies have not only excluded HCR1 from most vehicles but have also failed to capture improvements in the technology that have already occurred. This would presume the Agencies believe the earliest implementations of HCR technology, like the engines in the 2012MY Mazda vehicles, fully reflect the best this technology can deliver through the 2030MY. On the other hand, the Agencies acknowledge on page 243 of the PRIA that Toyota's new 2018MY 2.5L Camry HCR engine has already achieved further improvement with an industry leading 40 percent thermal efficiency utilizing an improved Atkinson cycle engine with CEGR. Yet rather than acknowledging this confirmed there was actual improvement available over the original HCR1 engine, the Agencies discounted this on page 43,038 of the NPRM with a footnote. Footnote 144 identifies the inclusion of an improved oil pump on the Camry as an excuse that the existing HCR1 assumptions were still appropriate and just needed to be coupled with other

[141] See submitted DVD, folder "Add HCR1 Table V-3" for input and output files associated with this table.

available technologies in the model to represent the overall improvements that Toyota achieved.

Specifically, the Agencies suggest combining HCR1 with the 2.36 percent improvement assumed for more efficient engine accessories (which the Agencies' refer to as IACC) was an appropriate way to represent the new Toyota engine. With the Agencies noting in the PRIA that this analysis included full simulation modeling runs 'for more than one million' simulations,[142] the suggestion to intermix technologies to represent an improved HCR engine is disingenuous for several reasons. First, the engine also includes CEGR while the NPRM analysis precludes CEGR from being added to an HCR engine (however, the tech package that the Agencies previously modeled as an advanced version of HCR known as HCR2 did include CEGR). Secondly, the "market input" file to the CAFE Model indicates nearly half of the Toyota models were already considered to have implemented this level of IACC improvements in the 2016 baseline. In other words, the Agencies believe that Toyota has already significantly incorporated such improvements in its current vehicles so that technology is unavailable to be added a second time to reflect the improved HCR engine.

The assumption of current IACC implementation also conflicts with the suggestion that Toyota's new engine can be represented by adding these benefits to an HCR1. For instance, the 2016 Toyota Tacoma with the 3.5L V6 is already identified in the baseline as using HCR1 and IACC technologies—the very same combination that the Agencies believe should be used to represent Toyota's new engine that gets substantially better efficiency than what the Tacoma engine actually does. Further, Toyota has indicated that it plans to roll out the Camry engine technology across the majority of its engines by 2021MY and the vast majority of its vehicle sales by 2023MY.[143] Given the Agencies assumption that nearly half of Toyota's current models already incorporate the IACC improvements, the suggested method will be unable to represent implementation of this new higher efficiency engine across much of Toyota's product line.

2. The Agencies place unnecessary limitations on emerging engine technology.

The same flawed approach of discounting viable technologies was used in assessing emerging technologies.[144] For several technologies, no effort was made to recognize even the most conservative estimate of the potential of the technologies.

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[142] PRIA, p. 189.
[143] "Toyota revs engine development", *Automotive News*, Accessed on October 18, 2018. http://www.autonews.com/article/20180305/OEM03/180309685/.
[144] Even the Agencies recognize this failing, for example in the context of advanced cylinder deactivation. Despite advanced cylinder deactivation not being in production before the NPRM was issued, vehicle manufacturers have announced their intent to introduce it and indeed, it has already been certified as of this time. In this case, the Agencies, despite their absolute minimal effort to attempt to quantify the benefits, still estimated some benefit and cost for the advanced cylinder deactivation system in an attempt to represent its potential capability in the analysis.

a. The Agencies wrongly do not consider second generation high compression ratio engines (HCR2).

For example, contrary to the previous analysis for the 2016 Draft TAR and EPA's Proposed and original Final Determination, the Agencies have elected to disallow a second generation of the Atkinson HCR engine combined with CEGR and cylinder deactivation (HCR2). The stated reasons include that the engine map for this configuration was too speculative, that it had been designed with the software tool GT-POWER, and that no engine had yet been produced in this configuration. The Agencies note:

> *This engine remains entirely speculative, as no production engine as outlined in the EPA SAE paper has ever been commercially produced or even produced as a prototype in a lab setting. Furthermore, the engine map has not been validated with hardware and bench data, even on a prototype level (as no such engine exists to test to validate the engine map).*[145]

The fact that the Agencies, especially EPA, make such a statement is genuinely impossible to credit. EPA's Technical Support Document for the Proposed Determination[146] that was released in November 2016, described the progression of prototype benchmark testing that was done to validate the GT-POWER derived engine map. Specifically, it notes that a Mazda engine was modified to increase the compression ratio, add CEGR, and add cylinder deactivation and noted:

> *In summary, the CO_2 effectiveness used within the Proposed Determination for the application of cEGR to non-HEV Atkinson Cycle engines has been confirmed with laboratory testing and is expected to be conservative relative to the effectiveness that was achieved during engine dynamometer testing.*[147]

Additionally, it is not like the Agencies relegated acknowledgement of this prototype testing to only four pages of discussion buried in a technical support document never to be mentioned again. In one of its many public speaking engagements, EPA representatives have presented on the development of the HCR2 map and note that they have concluded a demonstration at their lab of CEGR added to a high compression ratio Mazda engine. Indeed, a slide from a presentation[148] at the March 16, 2017 Center for Automotive Research's Fuel Economy Detroit 2017 event by William Charmley, Director, Assessment and Standards Division of EPA's Office of

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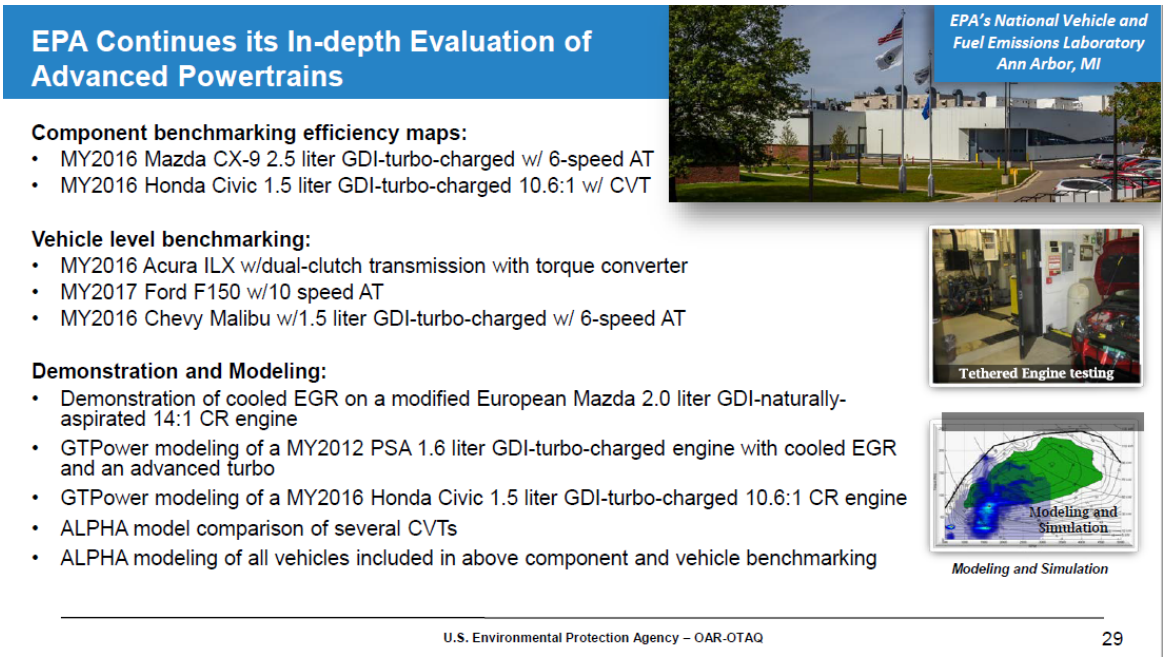
[145] 83 Fed.Reg. at 43,038.
[146] Proposed Determination, § 2.3.4.1.8, Pages 2-295 through 2-299, November 2016.
[147] *Ibid*.
[148] Charmley, B. EPA GHG UPDATE FOR 2017 FUEL ECONOMY DETROIT. U.S. EPA. Accessed on October 24, 2018. https://www.epa.gov/sites/production/files/2017-03/documents/fuel-economy-detroit-2017-03-16.pdf.

Transportation and Air Quality confirmed that such demonstration had been done on a modified European Mazda 2.0L engine:

Figure V-1 Charmley Center for Automotive Research Fuel Economy Detroit 2017 Presentation (Slide 29)



Further, indicating the Agencies are no longer considering the HCR2 because it was originally developed using GT-POWER is a particularly odd rationale considering the majority of the engine maps used by Autonomie rely on engine maps that were originally developed by IAV using GT-POWER. As noted in the PRIA:

> *The impact of engine technologies on fuel consumption, torque and other metrics was characterized using GT-POWER© simulation modeling conducted by IAV Automotive Engineering, Inc. (IAV).*[149]

As EPA's own staff wrote in comments on the "interagency" proposal now before us:

> *There are Atkinson engine vehicles on the road today (2018 Camry and Corolla with cooled EGR and the 2019 Mazda CX5 and Mazda6 with cylinder deac) that use high geometric compression ratio Atkinson-cycle technology that is improved from the first generation, MY2012 vintage "HCR1" technology. While it is true that no production vehicle has both cooled EGR and cylinder deac, as the EPA "HCR2" engine did, nonetheless, these existing engines demonstrate better efficiency than estimated by EPA. Therefore, it would be appropriate to continue to use*

[149] PRIA, p. 189.

EPA's cooled EGR + deac engine map to represent "HCR2" engines and strike this text [to the contrary] and revise accordingly.[150]

EPA goes on, in a later review after NHTSA did not correct the error, to say that:

It would be appropriate to include HCR2 engine technology in the primary analysis case as representative of Atkinson engine vehicles on the road today (2018 Camry and Corolla with cooled EGR and the 2019 Mazda CX5 and Mazda6 with cylinder deac) that are improved from the first generation, MY2012 vintage "HCR1" technology. While it is true that no current production vehicle has both cooled EGR and cylinder deac, as the EPA "HCR2" engine did, nonetheless, these existing engines demonstrate similar efficiency.[151]

Based on EPA's findings, the Toyota and Mazda engines are not only exceeding the efficiencies assumed for HCR1 engines but they are already achieving similar efficiency as the modeled HCR2 package even though they don't have the full complement of technologies (i.e., CEGR and DEAC) used in the HCR2 package. Given they are advanced HCR engines and do include CEGR on the Toyota engines and DEAC on the Mazda engines, it seems much more appropriate to represent them in the full simulation modeling as HCR2. And their existence as production engines today certainly speaks to the feasibility of this technology for modeling that goes out to 2030MY.

In his review of the NPRM, Gary Rogers similarly noted that he found the exclusion of HCR2 technology to be erroneous:

Our review identified several incremental technologies which were either identified, but not utilized in technology pathways, such as second generation, high compression ratio engines with cooled EGR for knock mitigation. In another example, the use of Miller-cycle features in high compression ratio, turbocharged engines was excluded completely, even though VW introduced in a turbocharged engine with Miller-cycle valve being in production by VW (1.5L) since 2017.[152]

Further, Rogers conducted his own modeling exercise to see what the HCR2 technology package would yield when allowed to be used and modeled in a manner to optimize the benefits in combination with the transmission, mild hybridization, and other road load reductions. Using GT-POWER combined with Roger's engineering expertise, an HCR2 mild hybrid (BISG) technology combination was modeled for a Toyota RAV-4 to compare it to the ultimate HCR1 strong hybrid (SHEVP2) package modeled by the

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[150] EPA Comments on the NPRM Sent to OMB (June 29, 2018). U.S. EPA. Accessed on October 24, 2018. https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0283-0453. p.83.
[151] EPA Comments on the Preliminary RIA (July 12, 2018). U.S. EPA. Accessed on October 24, 2018. https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0283-0453. p. 281.
[152] Rogers, G. *Technical Review of: The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks, Final Report*. Roush Industries. October 25, 2018. (Rogers Report) p. 4.

Agencies as necessary to meet the existing standards. As show in the table below, the Agencies modeled that the RAV-4 would need to evolve to using an HCR1 engine, a P2 strong hybrid, and significant tire, mass, and aerodynamic reductions to achieve a 58.0 mpg at a cost of over $4,400. Setting aside realities such as Toyota already offers a RAV-4 hybrid in a power-split "PS" configuration instead of the modeled P2 configuration and, as noted earlier, how Toyota has already advanced the HCR engine well beyond the levels of HCR1, Rogers explored alternative technology combinations. Specifically, Rogers, found that an HCR2 engine coupled with a BISG mild hybrid when optimized in concert with each other and the transmission, would yield 57.9 mpg at a cost of just over $1,750—less than 40 percent of the costs assumed by the Agencies. And this finding is without any modification to the individual technology costs estimated by the Agencies (including BISG costs which are noted later as being excessive).

Table V-4 Comparison of example pathways in NPRM and modeling done by G. Rogers

MY	Source	Vehicle	Class	Engine	MPG	Technologies	Costs
2016		Toyota Rav4 AWD	Small SUV	2.5L I4 (NA)	32.85	DOHC; VVT; AT6; CONV; ROLL0; MR1; AERO0	$0.00
2025	NPRM	Toyota Rav4 AWD	Small SUV	2.5L I4 (NA)	58.00	HCR1; AT8; SHEVP2; ROLL20; MR4; AERO20	$4,422
2025	Rogers	Toyota Rav4 AWD	Small SUV	1.8L I4 (NA)	57.92	HCR2; AT8; ROLL20, MR4; AERO10, 48V-BISG	$1,767

Key:

DOHC—dual overhead camshaft engine
VVT—variable valve timing; AT6—6-speed transmission
AT8—8-speed transmission
CONV—conventional powertrain (non-electric)
ROLLO—baseline tires
ROLL20—low rolling resistance tires, level 2 (20% reduction)
MR1—mas reduction, level 1 (5% reduction in glider weight)
MR4—mass reduction, level 4 (15% reduction in glider weight)
AERO0—baseline aero
AERO10—aero drag reduction, level 2 (10% reduction)
AERO20—aero drag reduction level 4 (20% reduction)
HCR1—high compression ratio engine, level 1
HCR2—high compression ratio engine 2
SHEVP2—P2 strong hybrid/electric vehicle
48V—BISG—48-volt belt mounted integrated starter/generator

b. The Agencies wrongly restricted cooled exhaust gas recirculation for use on turbocharged engines.

Additionally, the Agencies' analysis restricted cooled exhaust gas recirculation (CEGR) for use only on turbocharged engines. This is despite the existence of engines like the

new 2018MY Camry 2.5L engine that combines naturally aspirated HCR technology with CEGR or the 2019MY Ram 1500 naturally aspirated 3.6L V6 Pentastar that utilizes CEGR in combination with an increased compression ratio from 10.2 to 11.3.[153] As EPA noted in its prior analysis, properly applied CEGR is useful in improving efficiency at part-load conditions on HCR engines. As detailed in Section 2.3.4.1.8 of EPA's Proposed Determination Technical Support Document,[154] EPA provided compelling evidence to validate its HCR2 package including the use of CEGR which was even tested on an engine modified to include a CEGR system. Nothing in the NPRM refutes any of this evidence or provides any new data or theory on which to base an exclusion of CEGR from naturally aspirated or HCR engines. By doing so, the Agencies are providing an insufficient assessment of the currently available technology.

Further, even on turbocharged applications where CEGR was allowed, the Agencies project an extremely small benefit, at significant cost, that is inconsistent with past analyses and other sources. CEGR was originally included in the Agencies' higher turbocharged engine (e.g.,TURBO2 or TDS24) as part of the required suite of technologies needed to be used to enable the more highly boosted engines. In particular, CEGR and variable valve lift (VVL) were utilized to enable higher efficiencies at lighter load operating conditions. In EPA's Proposed Determination TSD, they noted the advanced turbocharged engine "…shows improved brake thermal efficiency (BTE) at lower speeds and lighter loads due to the use of technologies that are either just now entering production (such as CEGR) or that have been in production for some vehicle applications for over a two decades (VVL)." However, this seems inconsistent with how the Agencies are now utilizing CEGR on the turbocharged engines.

As noted by Roger in his review of the Agencies' analysis, the Agencies have applied CEGR in a very narrow window of high engine speed and engine load operating conditions. Rogers notes:

> *The 2018 PRIA modeling erroneously excludes the application of cooled EGR in engine operating modes that highly influence overall vehicle fuel economy. This exclusion of the benefits associated with knock mitigation and reduced enrichment significantly understates incremental improvement.*[155]

The 2018 PRIA analysis applies cooled EGR to turbocharged engines in an extremely narrow window at high engine speed and high load. The 2018 PRIA modeling erroneously excludes the application of cooled EGR in engine operating modes that highly influence overall vehicle fuel economy. This exclusion of the benefits associated with knock mitigation and reduced enrichment significantly understates incremental

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[153] "2019 New Ram specifications." Ram. Accessed on October 24, 2018. https://iimediaevents.com/2019ram1500/Files_Only_Content/Press-Releases/PDFs/2019_Ram_1500_SP.pdf
[154] Proposed Determination, pp. 2-293 - 2-307.
[155] Rogers Report, pp. 12-13.

improvement the Mazda 2.5L turbocharged skyactiv engine exemplifies a wider-range cooled EGR strategy.

From page 313 of the PRIA, *Figure V-2* below confirms that the Agencies have now modeled CEGR1 as having essentially no incremental benefit to TURBO2 and in some cases, even a disbenefit. Yet, the technology utilization report output file from the Agencies' central analysis run shows the CAFE Model still applies the CEGR1 technology to 35 percent of the fleet in the existing standards run.

Figure V-2 Reproduction of PRIA Figure 6-1119 on effectiveness of advanced engine technologies across different other technologies

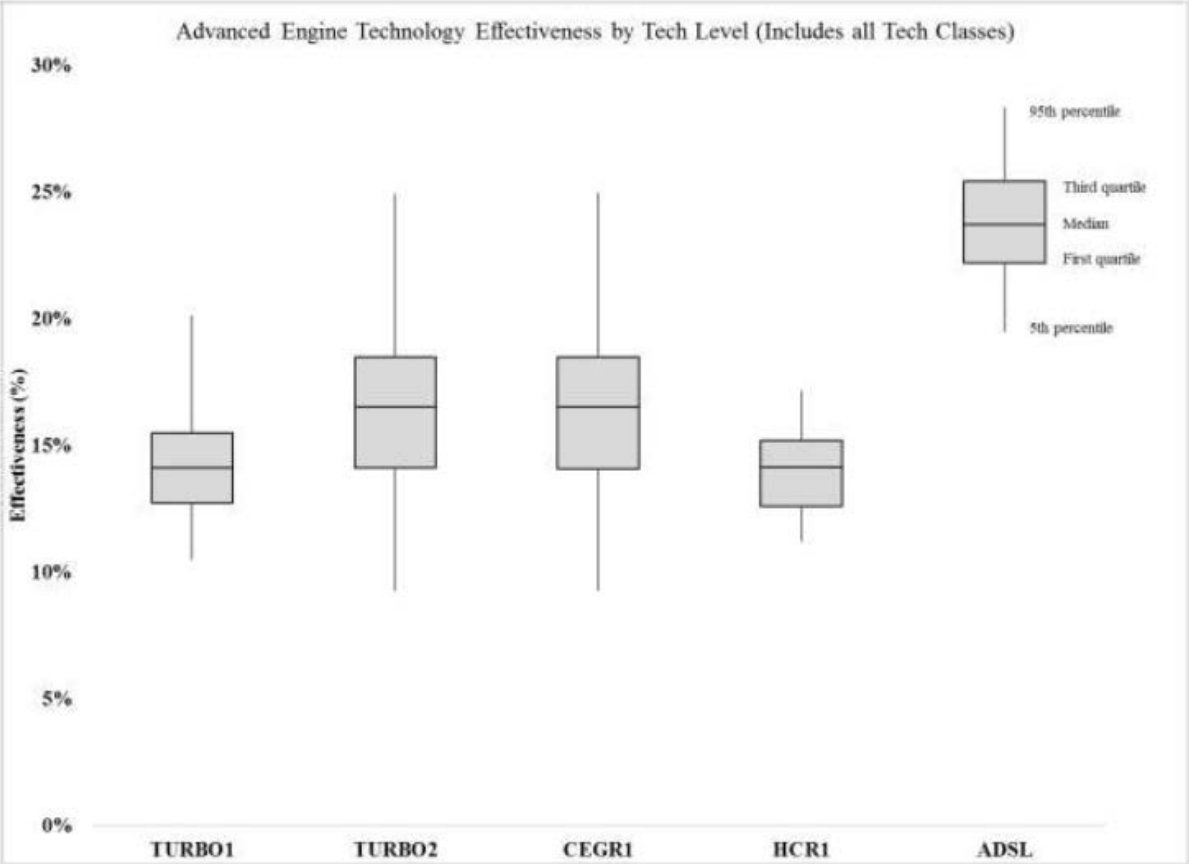

Figure 6-119 shows the effectiveness of advanced engine technologies across different other technologies

In a review of the Agencies' analysis by Duleep,[156] it was similarly noted the CEGR1 assumptions in the analysis show no incremental benefit of the TURBO2 (also known as TURBO-24 bar or TDS24). Table 3-6 of Duleep's report (shown as *Table V-5* in these comments) highlighted that the Lumped Parameter Model (LPM) used by EPA in

[156] Duleep Report, p. 28.

its prior analyses, projected an incremental GHG reduction of approximately 3.5 percent over the TURBO-24 bar engine.

Table V-5 (Table 3-6 from Duleep's Report) Engine Technology Benefits (percent GHG Reduction)*

Technology		LPM Benefit	PRIA Benefit	Technology for LPM
VVL -Continuous		3.2	3.73	LPM includes LUB
DEAC		2.5	2.49	LPM includes LUB
SGDI		2.0	1.92	LPM includes LUB
SGDI +DEAC		3.8	3.97	LPM includes LUB
TURBO – 18 bar		12.8	13.3	Includes SGDI, VVL, FRIC2, LUB and TURBO18
TURBO- 24bar		14.6	15.3	Includes SGDI, VVL, FRIC2, LUB and TURBO24
TURBO – 24 bar +CEGR		18.1	15.3	Above + CEGR
HCR1		12.5	13.4	Included SGDI, VVL, FRIC2, LUB and ATK1
HCR2		19.8	18.6	Above + ATK2 w/EGR instead of ATK1
ADEAC		NA	11.4	Not modeled in 2016

*Relative to baseline midsize car, DOHC 4V VVT PFI engine, 6AT

Further, EPA previously validated that its modeled improvements were appropriate. Specifically, in EPA's Proposed Determination TSD (pages 2-311 through 2-320), the agency identified three turbocharged engines that were already effectively achieving the benefits of EPA's TURBO-24 bar + CEGR combination. These include the Honda 1.5L engine used in the 2017 Honda Civic, the VW 1.5L engine used in the 2017 Golf, and the Audi 2.0L engine used in the 2017 A3. The TSD also included comparisons of the brake thermal efficiency (BTE) engine maps for the modeled TURBO + CEGR combination to the three production engines and found that all three engines, despite being configured with slightly less technology than the modeled TURBO-24 bar + CEGR combination, achieved similar efficiencies. EPA summarized the findings on page 2-317 as:

> *On the whole, contemporary turbocharged engines can achieve higher peak BTE and high BTE over a broader range of engine operating conditions than TDS24 modeling results. TDS24 shows improved BTE at lower speeds and lighter loads due to the use of technologies that are either just now entering production (cEGR) or that have been in production for some vehicle applications for over a two decades (VVL). Further development of contemporary turbocharged engines from 2017 to 2025,*

including use of more advanced boosting systems (e.g., VNT or series sequential turbochargers), engine downsizing to 22-bar BMEP or greater, use of external cooled EGR, combustion system improvements and use of variable valve lift systems would further improve low-speed, light load pumping losses. These improvements would allow current turbocharged/downsized engines to meet or exceed the BTE modeled for TDS24 through incremental developmental improvements (e.g., VVL, cEGR) with sufficient lead time to meet the 2025 light-duty GHG standards.

The Agencies have not provided sufficient evidence in their analysis to refute these previous findings or otherwise support the elimination of the previously determined benefit for a TURBO2 engine coupled with CEGR.

c. The Agencies ignored the Miller cycle.

Additionally, the Agencies' analysis acknowledges that the Miller cycle is already being utilized on turbocharged engines, with and without additional features like electric boost.[157] In Agency terminology, the Miller cycle has been used to identify an over-expanded cycle (e.g., Atkinson cycle) in a boosted engine (through supercharging or turbocharging). Such a configuration allows the combination of some of the expanded high efficiency operating benefits with the benefits of a turbocharged or otherwise boosted engine. While the boosting has traditionally been achieved with a mechanical feature like a turbocharger driven by exhaust gas flow or a belt or gear driven mechanical supercharger, manufacturers and suppliers are now implementing systems with electrically powered superchargers. This set-up increases the efficiency of the system as the electrically powered setup is more efficient than a mechanical system especially when paired with a mild hybrid or other system that can recapture energy during braking events to power the supercharger.

The Agencies, however, declare that they were unable to consider such technologies at the time of the analysis despite acknowledgement that Argonne National Laboratory (ANL) has already benchmarked a Mazda CX-9 using such a cycle under contract to NHTSA. The Agencies predicated the need to reconsider the EPA's original Final Determination on the fact that new data should be included in the analysis. Yet, the Agencies did not consider new data that was not only available, but also that they themselves specifically contracted to have done. Even worse, EPA acknowledged, back in March of 2017 in the same conference presentation noted earlier, that it had already completed benchmarking testing of the 2016MY Mazda CX-9 engine at its own lab.[158] Failure to consider such data is evidence of a clear intent of the Agencies to avoid inclusion of any new data that provides support for the existing standards.

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[157] 83 Fed.Reg. at 43.051.
[158] Charmley, B. *EPA GHG Update for 2017 Fuel Economy Detroit. U.S. EPA*. Accessed on October 24, 2018. https://www.epa.gov/sites/production/files/2017-03/documents/fuel-economy-detroit-2017-03-16.pdf.

d. The Agencies did not appropriately consider advanced cylinder deactivation.

Advanced cylinder deactivation (ADEAC) such as the TULA/Delphi dynamic skip-fire system has also not been appropriately considered by the Agencies. The Agencies describe the system in the NPRM as:

> *Advanced cylinder deactivation systems (or rolling or dynamic cylinder deactivation systems) allows a further degree of cylinder deactivation than DEAC. The technology allows the engine to vary the percentage of cylinders deactivated and the sequence in which cylinders are deactivated, essentially providing "displacement on demand" for low load operations, so long as the calibration avoids certain frequencies.*[159]

This newly developed system, developed in a partnership with Tula Technologies, Delphi, and GM, has been implemented on the just being released 2019 GM full size pick-ups with V8 engines under the name of Dynamic Fuel Management.[160] While the Agencies did provide some token recognition of the benefits with an assumption of 3 percent improvement for 4-cylinder engines and 6 percent for 6-cylinder and larger, CARB understands that EPA has already tested a prototype vehicle configured with the TULA system and such data should have been used to more appropriately estimate the benefits. Further, the PRIA notes that the ADEAC technology is its own engine technology path making it mutually exclusive from the other primary advanced engine technology paths of turbocharging or HCR. As stated in the PRIA, "…once one path is taken, it locks out the others."[161] Given both TULA and Delphi claim benefits are in the 7 percent to 15 percent range for CO_2 emissions and 10 percent to 20 percent for fuel economy[162] and GM has already moved to roll this technology out on its larger engines, this technology needs to be more accurately represented in the analysis for costs and benefits. Further, Delphi, has also already paired the system with a 48V mild hybrid and found even further gains are possible and it is incumbent upon the Agencies to consider such data when modeling expected technologies and their capabilities all the way out to 2030MY.

e. The CAFE Model disallows manufacturers to pursue multiple emerging engine pathways, which does not reflect reality.

The CAFE Model utilizes engine pathways that effectively prevent manufacturers from pursing multiple engine technologies at the same time. As noted above, ADEAC

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[159] 83. Fed.Reg. at 43,038.
[160] 2019 Silverado Leads Industry With Dynamic Fuel Management. Chevrolet. Accessed on October 24, 2018. https://media.chevrolet.com/media/us/en/chevrolet/home.detail.html/content/Pages/news/us/en/2018/may/0518--silverado-dfm.html
[161] PRIA, p. 492.
[162] Demand better cylinder deactivation with Dynamic Skip Fire. Delphi Technologies. Accessed on October 24, 2018. https://www.delphi.com/dynamic-skip-fire-1. Smarter fuel efficiency. Tula Technology. Accessed on October 24, 2018. https://www.tulatech.com/.

represents one exclusive pathway while HCR, turbocharging, variable compression ratio engines, and advanced diesel represent the others. However, the HCR1 path is extremely constrained, the variable compression ratio path is turned off, and the advanced diesel path is effectively turned off with extensive costs assigned to it. This leaves the turbocharged path as the only viable path for most vehicles. And, if a manufacturer has implemented turbocharging on an engine, that powertrain can never switch at a future redesign to an HCR engine (or vice-versa). Contrary to the assumptions used in the NPRM analysis, if a given engine technology represents a cheaper path to comply, manufacturers will utilize that technology regardless of what prior technology they may have deployed.

The pathway restrictions in the CAFE Model, however, prevent a manufacturer from switching between a turbocharged and HCR pathway under the premise that manufacturers either would not develop both or would be committed irreversibly to one path or the other. This assumption is not based in reality and is not reflective of actual industry practice—manufacturers who have pursued turbocharging have also already pursued HCR engines for other vehicles in their line-up. For example, General Motors (GM) utilizes downsized turbocharging in some vehicles, such as the newly designed 2019MY Silverado pick-up and the Malibu sedan which has two different turbocharged engine options. GM also has a third offering in the Malibu sedan which is an HCR naturally aspirated 1.8L equipped with cooled exhaust gas recirculation (CEGR) mated to a hybrid electric system, and the Chevrolet Volt has a similarly equipped 1.5L engine.[163] Ford Motor Company (Ford) similarly has mated HCR engines with its hybrid powertrains while simultaneously adding significant volumes of downsized turbocharged engines. Fiat Chrysler Automobiles' (FCA) 3.6L Pentastar engine has incorporated some degree of late intake valve closing and increased compression ratio nearing that used by Toyota on the 3.5L Tacoma engine, which is labeled as an HCR engine by the Agencies. This would suggest that FCA's 3.6L Pentastar engine would never be eligible for turbocharging by the CAFE Model; however, according to FCA, that engine is capable of transitioning to direct fuel injection and turbocharging as both technologies were engineered into the engine design and remain "on the shelf" should future regulations require them.[164]

Further, given global markets and competitive pressures, manufacturers traditionally have, and are continuing to effectively pursue multiple technology paths simultaneously. Whether it has been pursuit of both gasoline and diesel technologies to satisfy different market customers or pursuit of technologies optimized for smaller or larger vehicle types, manufacturers have developed a broad suite of technologies so they are positioned well to respond to different market demands as well as take advantage of technology improvements that tip the scales in the favor of a different path.

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[163] https://www.sae.org/news/2014/10/gm-unveils-more-efficient-2016-volt-powertrain.
[164] 2016 Pentastar V6 adds new VVT, cooled EGR. SAE. Accessed on October 24, 2018. https://www.sae.org/news/2015/08/2016-pentastar-v6-adds-new-vvt-cooled-egr

As one example, GM's small block EcoTec engine family represents a common modular engine, built from a 3 cylinder and a 4 cylinder block, which spans displacements from 1.0L to 1.5L. Notably this engine incorporates naturally aspirated variants, turbocharged variants, and even a 1.5L HCR variant equipped with cooled EGR and late intake valve closing to achieve an over-expanded Atkinson-like cycle used in the current Chevrolet Volt.[165],[166] In other words, GM's current production single shared engine has variants on both the turbocharged and HCR engine pathways that the Agencies have declared are so mutually exclusive that even when the engine gets redesigned, it cannot switch from one pathway to the other. With both engine technologies in the current line-up for several manufacturers or as the case with GM, in variants of the same modular engine family, a restriction on future engine choices in the CAFE Model has no technical basis or evidence of past practice to support it.

B. The Agencies did not adequately consider other GHG-reducing vehicle technologies.

At the vehicle level, various technologies are available to reduce GHG emissions. Aerodynamic improvements, tire rolling resistance improvements, and mass reduction are all technologies that essentially reduce the energy (and thus the fuel whether gasoline or electricity) needed to move the vehicle. However, not all improvements come from reduced fuel usage. Another available technology to reduce GHG emissions, already deployed aggressively by a few manufacturers, involves a change to the refrigerant used in the air conditioning system on vehicles. These new refrigerants have much lower global warming potential than past refrigerants and, when coupled with systems designed with less potential for leaks to the atmosphere, represent a significant contribution to lower GHG emissions from vehicles.

1. The Agencies made incorrect and inconsistent assumptions on vehicle transmissions.

For transmissions, there also appears to be a significantly changed assumption regarding the effectiveness improvements. Duleep found a 2 percent-3 percent lower efficiency assumed for advanced 8- and 9-speed transmissions relative to the data EPA itself previously developed with back to back testing on FCA vehicles. The testing of the 8-speed transmission in the 2014 Dodge Ram was described in EPA's Proposed Determination TSD (page 2-330) and an SAE International paper.[167] Rogers found that the modeling did not consider 'skip-shifting' where a transmission can upshift or

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[165] GM provides technical details of the Gen 2 Voltec propulsion system used in the 2016 Volt. Green Car Congress. Accessed on October 24, 2018. http://www.greencarcongress.com/2015/04/20150423-voltec.html.

[166] Jocsak, J., White, D., Armand, C., and Davis, R., "Development of the Combustion System for General Motors' High-Efficiency Range Extender Ecotec Small Gas Engine," SAE Int. J. Engines 8(4):1587-1601. 2015. https://doi.org/10.4271/2015-01-1272.

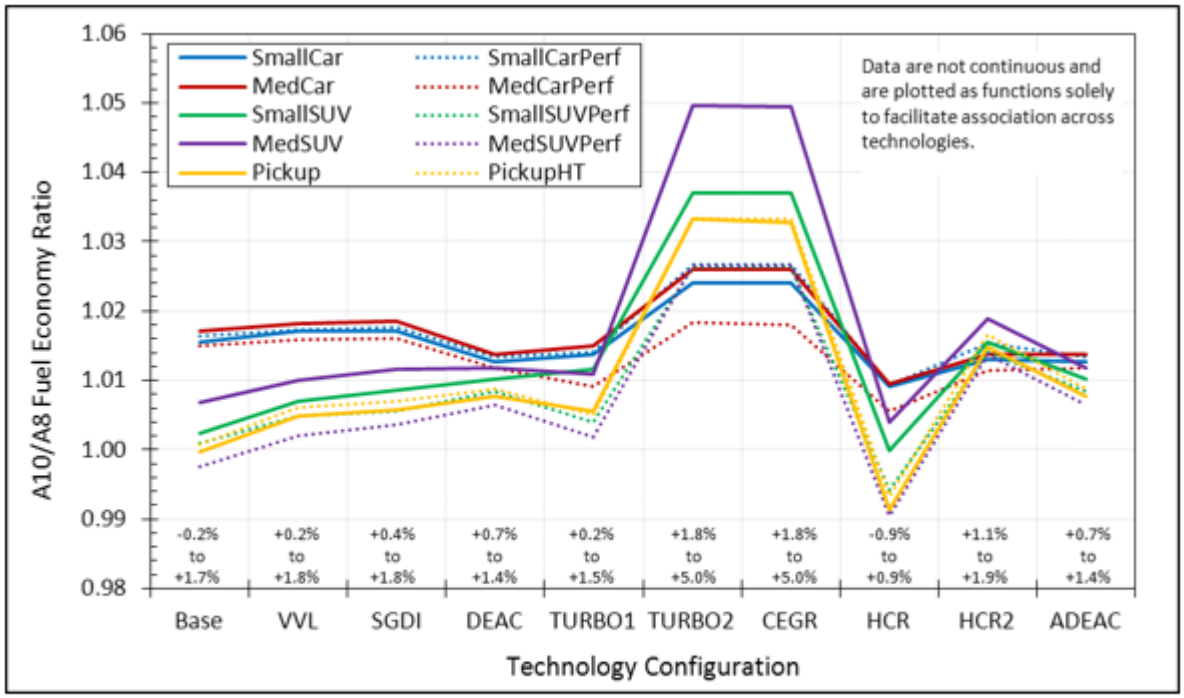
[167] Moskalik, A., Hula, A., Barba, D., and Kargul, J., "Investigating the Effect of Advanced Automatic Transmissions on Fuel Consumption Using Vehicle Testing and Modeling," SAE Int. J. Engines 9(3):1916-1928, 2016, doi:10.4271/2016-01-1142.

downshift in a non-sequential manner (e.g., shifting from 5th to 7th without first shifting to 6th gear). Rogers further identified that the final drive ratio was kept constant as powertrains were changed and that transmission gear ratios were not optimized.[168] Directionally, all of these result in less optimal implementations that do not fully realize the improvements associated with the engine and transmission technologies applied. Meszler Engineering Services technical memo on the NPRM[169] had additional observations suggesting transmission improvements had been incorrectly modeled. *Figure V-3*, reproduced from Figure 1 of the memo, shows tha the incremental efficiency improvements modeled for a 10-speed transmission (AT10) relative to an 8-speed transmission (AT8) are inconsistent for different powertrains and do not follow logical expectations. Meszler notes:

> *Transmission benefits accrue largely from an increased ability to allow engines to operate in zones of maximum efficiency. As a result, one expects transmission impacts to be similar (on a percentage change basis) across engine technologies, and even more similar across vehicle classes using the same technology. Yet the data presented in Figure 1 show substantial inconsistency.*

[168] Rogers, G. Technical Review of: The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks, Final Report. Roush Industries. October 19, 2018. p. 18.
[169] Technical Memorandum on The NPRM CAFE Model's Treatment of Technology Benefits and Costs. Meszler Engineering Services. October 2018. p. 5-6.

Figure V-3 (Figure 1 from Meszler memo) Comparative Example of Technology Impacts as Extracted from the ANL Database Underlying the NPRM CAFE Model (AT10 vs AT8)



Technology configurations are cumulative so that all technologies from VVL through CEGR also include all the technology that precedes it (moving from left to right). Because the turbocharging, HCR, and ADEAC advanced engine technology paths are independent, the cumulative technology packages for HCR1, HCR2, and ADEAC include all baseline technology, VVL, SGDI, and DEAC. The HCR2 package also includes HCR1 technology. All packages include VVT technology.

The figure above also shows implausibly drastic differences in efficiency modeled for the same transmission when coupled with a more advanced TURBO2 engine versus the initial TURBO1 package. If that transmission is coupled with a high compression ratio (HCR) engine, it suddenly results in a fuel disbenefit—causing fuel consumption to get worse rather than better—for several of the vehicle classes. And yet, when it is coupled with a more advanced version of that engine technology, HCR2, the projected improvement drastically changes for some classes and has only minor changes for others. Meszler notes that, while there was insufficient time during the comment period to isolate the cause of these illogical results, "…a detailed review of transmission shift schedules and how they are tailored to changes in engine technology is appropriate."[170] This comment echoes that of Rogers noted above where he found several steps in the modeling process prevent the optimization of the transmission with the selected powertrain technology, leading to an underestimation of the benefits.

As mentioned earlier, in the presence of increasingly stringent standards which require deployment of additional technologies at rising costs, manufacturers will be increasingly vigilant in ensuring they get every bit of reduction they can out of added technologies. A

[170] *Id.,* p. 6.

modeling approach suggesting that they would forgo such improvements from simple gear ratio or final drive ratio specification changes or shift schedule calibration changes is unrealistic and results in an underestimation of the benefits from advanced transmissions in combination with the powertrain.

Additional technologies have also been announced or introduced including the variable compression ratio engine from Nissan now available in the 2019MY Infiniti QX50[171] and the Mazda spark controlled compression ignition system for a 2020 launch known as SkyActiv-X.[172] While CARB appreciates the difficulty in assessing the capability, costs, and applicability of these various technologies, the responsibility to set the maximum feasible standards demands that the Agencies fully evaluate and consider the role of such near-term production technologies to assist individual manufacturers or the industry as a whole to meet the standards.

3. The Agencies underestimated aerodynamic improvements.

As vehicles become more aerodynamic, less energy is required to move the vehicle resulting in lower GHG emissions. A deeper look found some systematic reductions in presumed efficiencies relative to what EPA's Lumped Parameter Model (LPM) calculates, underestimating the benefits of aerodynamic improvements. Specifically as summarized in Table 3-8 of Duleep's report,[173] in the tire rolling resistance and aerodynamic improvements, the Agencies now project less benefit across all of the categories. However, the Agencies' analysis provides no description or cite any new data or evidence as to why they have reduced their projected assumptions.

Table V-6 (Table 3-8 from the Duleep's report)

Body technology benefits

(percent reduction in fuel consumption)

Technology		LPM Benefit	PRIA Benefit
Rolling Resistance -10%		2.2	1.54
Rolling Resistance -20%		4.4	3.06
Aero Drag -10%		2.1	1.51
Aero Drag -20%		4.3	3.03

Additionally, the Agencies have now restricted the highest level of aerodynamic drag, AERO20, from pick-ups as well as cars and SUVs with over 405 horsepower.[174] A review of the market inputs file for the CAFE Model shows that AERO20, however, has actually been excluded from 40 percent of all vehicles including convertibles and

[171] Infiniti. Accessed on October 24, 2018. https://www.infinitiusa.com/crossover/qx50/performance/.
[172] Next-Generation Skyactiv-X Gasoline Engine. Mazda. Accessed on October 24, 2018. http://www2.mazda.com/en/next-generation/technology/.
[173] Duleep Report, p. 18.
[174] 83 Fed. Reg. at 43,047.

minivans in addition to pick-ups and high horsepower vehicles. While some of these exclusions may be valid, the Agencies have used a broad rule, implemented inconsistently, to inappropriately exclude the technology from too many vehicles. Foremost, the assumption results in some variants of the majority of luxury sedans and SUVs being excluded from AERO20 because they often have a high horsepower engine. Alone, these vehicles make up approximately one-fourth of the excluded vehicles. Yet the input files also identify the Tesla Model S sedans and Model X SUVs, which have horsepower in excess of 405, as having already implemented AER020 improvements. While electrification provides a higher motivation to minimize road load through technologies such as aerodynamic reductions, implementing AERO20 reductions on high horsepower sedans and SUVs is clearly feasible and should not be artificially restricted in the CAFE Model.

4. The Agencies incorrectly and overly limited mass reduction.

A key technology expected to be used by manufacturers to meet the GHG standards is mass reduction. Very simply, when vehicles are made lighter, they require less energy and less fuel to power them. In this and past analyses, the Agencies have included mass reduction by defining discrete ranges of mass reduction such as mass reduction levels 1 through 5 (MR1, MR2, etc.) and defining costs for each of those discrete levels. The basis for the technical feasibility of mass reduction and the associated costs are past mass reduction focused studies primarily commissioned by CARB, EPA, and NHTSA.

The Agencies' analysis relies on a portion of the same studies used in the 2016 Draft TAR; however, key assumptions have changed without any supporting rationale. For instance, EPA previously primarily relied on four studies[175] (two contracted or by EPA and two contracted for by NHTSA) and applied mass reduction on the total vehicle, utilizing the full potential of the technology to not only lightweight the body and structure but appropriately, to lightweight and downsize powertrain components to match the needs of the lighter vehicle. NHTSA previously limited mass reduction to the 'glider' or non-powertrain portion of the vehicle and had determined that the glider represented 75 percent of the total vehicle weight. However, for the their analysis, the Agencies now cite only two of the four previously cited studies, utilize an approach that provides only for lightweighting of the glider (rather than the total vehicle), and rely on a new assumption that the glider now represents only 50 percent of the total vehicle weight. The Agencies provide no rationale to support the change in application of mass reduction to eliminate secondary mass reduction (or mass 'compounding') or ignore some of their own studies as a source of information nor does it provide any supporting evidence or rationale for the new 50 percent assumption. The combination of these changes, however, substantially reduces the availability of mass reduction technology in the model to reduce tailpipe CO_2 emissions, forcing other, more expensive technologies

[175] EPA-420-R-12-019, EPA-420-R-12-026, SAE Paper 2013-01-0656, EPA-420-D-16-900 p. 383.

to be selected by the model to achieve the target standards. This is further exacerbated by the use of technically unsupported costs for the levels of mass reduction allowed that are calculated erroneously by not considering the EPA studies which had lower costs, not considering secondary mass reduction which provides further cost savings, and falsely inflating the costs from the cited NHTSA Honda Accord study for the MR4 and MR5 levels of mass reduction.

a. The Agencies erroneously modified the glider assumptions.

The two studies used are the MY 2011 Honda Accord lightweighting study to develop passenger cost curves and a MY 2014 Chevrolet Silverado 1500 full-size pickup truck study to develop light-duty truck curves. For these studies, the glider represents 79 percent of curb weight for the passenger car, and 74 percent for the light-duty truck. And in previous analysis, NHTSA utilized an assumption of 75 percent for the glider share. However, the NPRM uses an assumption that the glider represents 50 percent of curb weight and notes only that this is a different assumption and was used to align with an assumption in ANL's Autonomie model. The Agencies also note that ANL's assumption of the glider is comprised of different subsystems than those used by the Agencies in their definition of a glider yet they maintain this erroneous assumption and make no attempt to correct for it. Further, even ANL appears to acknowledge this is an improper assumption as it's recently published report for the Department of Energy (DOE)[176] uses the assumptions shown in the table below for its Autonomie modeling runs. Notably, the assumptions range mostly from 65 percent to 70 percent for the glider share of the total vehicle weight rather than the erroneous 50 percent utilized by the Agencies for their analysis.

Table V-7 percent Glider Mass Share by Year and Vehicle Classification

Tech Type	Vehicle Class	Model Year (Lab Year + 5)			
		2015	2020	2025	2030
Spark Ignited Conventional Engine	Compact	68.3	63.6	66.3	65.8
	Midsize	67.7	65.8	68.8	68.4
	Small SUV	68.8	67.0	70.2	69.8
	Midsize SUV	68.0	66.1	69.1	68.6
	Pickup	68.6	68.6	71.5	71.1

[176] "An Extensive Study on Sizing, Energy Consumption, and Cost of Advanced Vehicle Technologies." Argonne National Laboratory. Accessed on October 24, 2018. https://www.autonomie.net/pdfs/ANL_BaSce_FY17_Report_10042018.pdf.

This assumption severely limits the effectiveness of mass reduction as the most aggressive mass reduction category of 15 percent to 20 percent mass reduction can only reduce the vehicle curb weight by 10 percent. This is an inappropriate maximum for mass reduction as the studies cited (and the studies excluded) all show cost-effective reductions are available beyond 10 percent of curb weight reduction. Additionally, actual vehicles in production like the aluminum body Ford F150, have already been lightweighted by more than 10 percent of the curb weight confirming this restriction is inappropriate and not reflective of what is currently happening in the industry. Table 2.14 (page 2-151) of EPA's Proposed Determination TSD (shown as Table V-8 below) summarizes some of the more significant vehicles with mass reductions with five identified as having mass reduction in excess of 10 percent of curb weight. The Agencies' newly imposed 10 percent restriction means vehicle improvements like these that have already happened on production vehicles are not considered feasible in the NPRM analysis.

Table V-8 (Table 2.14 from 2017 Proposed Determination TSD) Examples of Mass Reduction in Selected Recent Redesigns (Compared to MY2008 Design)

Table 2.14 Examples of Mass Reduction in Selected Recent Redesigns (Compared to MY2008 Design)[RR]

Vehicle Make	2008 Model Year curb Weight (kg)	Model Year	Change in Vehicle Curb Weight (kg)	% Change	% Footprint Change
Acura MDX	2070	2014	238	11.5%	+0.5%
Audi Q7	2320	2014	325	14%	0
Land Rover Range Rover	2400	2014	336	14%	+5.2%
Silverado 1500 Crew Cab 4x4	2422	2014	86	3.6%	n/a
Ford F150 2.7L EcoBoost, 4x2 Supercrew	2446	2015	318	13%	n/a
Nissan Murano	1500	2015	30	2%	n/a
Cadillac CTS	1833	2015	110	6%	+1.6%
Honda Pilot	4367	2016	131	3%	+6.1%
Chevy Cruze[442]	1425	2016	114	8%	n/a
Chevy Malibu[443]	1552	2016	136	9.2%	+0.3%
GMC Acadia	2120	2017	318	15%	-7.8%
Chrysler Pacifica	2110	2017	114	5.4%	+8.2%
Cadillac XT5[444]	1893	2017	82	4.5%	+2.7%

b. The Agencies inexplicably do not consider secondary mass reductions.

The analysis also does not apply secondary mass reduction which is a departure from the analysis done by EPA for the Draft TAR. Secondary mass reduction includes the ability to downsize or lightweight other key components that are inexplicably excluded from consideration by the Agencies in their analysis, including but not limited to drive axles, suspension, and braking components (as a result of the overall vehicle being lighter); fuel tank (and corresponding weight of fuel during certification testing);

powertrain (lighter engine and transmission needed to power the lighter vehicle); and thermal systems. A simple example of secondary mass reduction includes using composites to reduce weight in thermal or powertrain components such as the water pump.[177] Most studies, including those contracted by or relied upon by EPA in the TAR and Proposed Determination and original Final Determination[178] by EPA show there are significant opportunities for secondary mass reduction that lead to additional cost savings associate with mass reduction. Notably, even the Accord and Silverado studies contracted for by NHTSA and relied upon by the Agencies in their proposal acknowledges and quantifies secondary mass reduction opportunities yet the Agencies chose to exclude it from consideration this time. By failing to account for this part of the technology in a manner similar to what was done before, EPA has inflated the costs for mass reduction as well as the amount of mass reduction that is feasible and cost-effective leading to an overestimate in the technology costs needed to meet the existing standards.

c. The Agencies improperly excluded other studies and technology.

The mass reduction costs in the current rulemaking are only based on the 2011 Honda Accord study and the 2014 Silverado study that were sponsored by NHTSA. However, previous reports and mass reduction analysis by EPA and NHTSA relied upon additional studies that are improperly excluded in the current rulemaking analysis. A summary of the studies is given in Table V-9 below. In addition to the 2011 Honda Accord and 2014 Silverado studies, the table shows the excluded studies, the corresponding mass reduction levels and the associated mass reduction costs found in each study. The mass reduction level and cost values include secondary mass reductions in studies where it was applied. For the excluded studies cited in the table, all of the mass reduction cost values are substantially lower than the values used in the Agencies' analysis. Furthermore, the 2011 Honda Accord and the 2014 Silverado studies also have markedly lower costs than this proposals' values when secondary mass reduction is included. The Agencies improperly exclude secondary mass reduction and exclude the lower mass reduction costs from studies used in their earlier analyses, leading to inflated mass reduction costs in their current analysis.

Table V-9 Summary of Agencies Sponsored Mass Reduction Studies

Vehicle Class	Agency	Year of Completion	Report	Mass Reduction [percent Curb Weight]	Cost [$/kg]

[177] Lightweighting summit: Targeting composites auto powertrain opportunities. Composites World. Accessed on October 24, 2018. https://www.compositesworld.com/articles/lightweighting-summit-targeting-composites-auto-powertrain-opportunities-.
[178] EPA-420-R-12-019, EPA-420-R-12-026, SAE Paper 2013-01-0656, EPA-420-D-16-900 p. 383.

Passenger Car	U.S. EPA	2012	Light-Duty Vehicle Mass Reduction and Cost Analysis — Midsize Crossover Utility Vehicle[179]	18.3 percent	-$0.43
	CARB	2012	Evaluating the Structure and Crashworthiness of a 2020 Model-Year, Mass-Reduced Crossover Vehicle Using FEA Modeling[180]	30.8 percent	$0.65
	NHTSA	2012	2011 Honda Accord Lightweighting Study[181]	22.43 percent	$0.96
	NHTSA	2106	Update to 2011 Honda Accord Study with Small-Overlap Testing[182]	20.47 percent	$1.20
Light Duty Truck	U.S. EPA	2015	2011 Silverado 1500 Lightweighting Study[183]	20.8 percent	$4.35
	NHTSA	2016	2014 Silverado 1500 Lightweighting Study[184]	16.7 percent	$3.57
	Transport Canada	2015	Light-Duty Truck Weight Reduction Study with Crash Model, Feasibility and Cost Analysis[185]	18.5 percent	$4.65

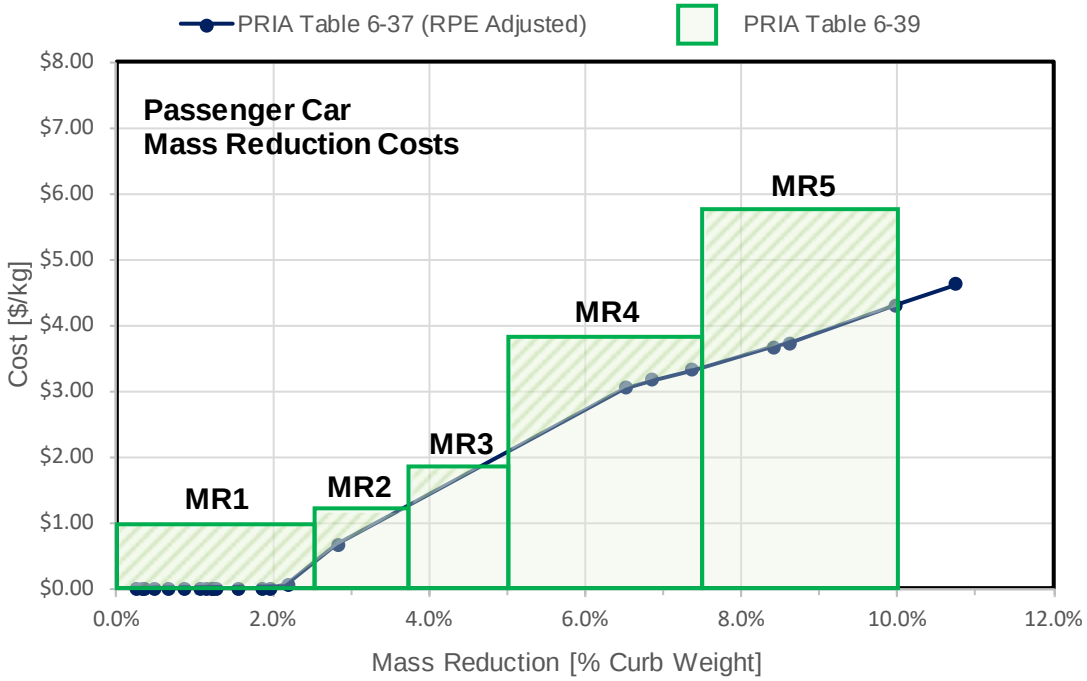
d. The Agencies inflated cost study results.

Tables 6-37 and 6-39 of the PRIA purport to show the costs from the cited NHTSA Honda Accord study, and how those cost numbers were rescaled for the NPRM to reflect both the new 50 percent glider mass assumption, and to convert from direct manufacturing costs (DMC) to retail price equivalent (RPE). However, a comparison of the mass reductions in those two tables when scaled by percent of total curb weight reduction, shown in the Figure V-4, illustrates how the costs were erroneously inflated by the Agencies with no supporting rationale. The bars in the graph below represent the costs associated with discrete levels of mass reduction for a passenger car as applied in the CAFE Model and shown in PRIA Table 6-39, and the line in the graph represents actual cost points from the Honda Accord study as given in PRIA Table 6-37

[179] EPA-420-R-12-026 (2012). "Light-Duty Vehicle Mass Reduction and Cost Analysis - Midsize Crossover Utility Vehicle."
[180] Lotus Engineering Inc. (2012). "Evaluating the Structure and Crashworthiness of a 2020 Model-Year, Mass-Reduced Crossover Vehicle Using FEA Modeling". Prepared for the California Air Resources Board (ARB).
[181] Singh, H., Kan, C-D., Marzougui, D., Quong, S., et al. "Mass Reduction for Light-Duty Vehicles for Model Years 2017-2025". Report No. DOT HS 811 666. 2012.
[182] Singh, H., Kan, C-D., Marzougui, D., & Quong, S. "Update to future midsize lightweight vehicle findings in response to manufacturer review and IIHS small-overlap testing". Report No. DOT HS 812 237. 2016.
[183] EPA-420-R-15-006 "Mass Reduction and Cost Analysis - Light-Duty Pickup Truck Model Years 2020-2025." 2015.
[184] Singh, H., et al. "Mass Reduction for Light-Duty Vehicles for Model Years 2017-2025". DOT Contract DTNH22-13-C-00329. 2016.
[185] "Light-Duty Truck Weight Reduction Study with Crash Model, Feasibility and Cost Analysis." Transport Canada. 2015.

and adjusted for RPE, converted to 2016 dollars. The striped area within the bars in the figure below illustrates that the discrete mass reduction costs applied in the CAFE Model are inflated and exceed the costs derived from the Honda Accord study. In all instances, the discrete costs used in the CAFE Model are chosen from the upper end of the respective mass reduction range, leading to cost overestimation. For example, MR2 represents a mass reduction range of 2.5 percent to 3.75 percent by curb weight percentage, and instead of representing MR2 by the cost at the midpoint of this range, which is at 3.13 percent and which would represent the average cost for the aforementioned range of mass reduction, the actual cost value in the CAFE Model assigned to MR2 is the cost at 3.8 percent, which would represent an upper end cost estimate for the MR2 mass reduction range. Furthermore, the costs in the CAFE Model that are assigned to MR1, MR4, and MR5 mass reduction levels substantially exceed the costs from the Honda Accord study given in PRIA Table 6-37, as shown in the Figure V-4 yet no explanation was provided or evidence cited to justify the increases.

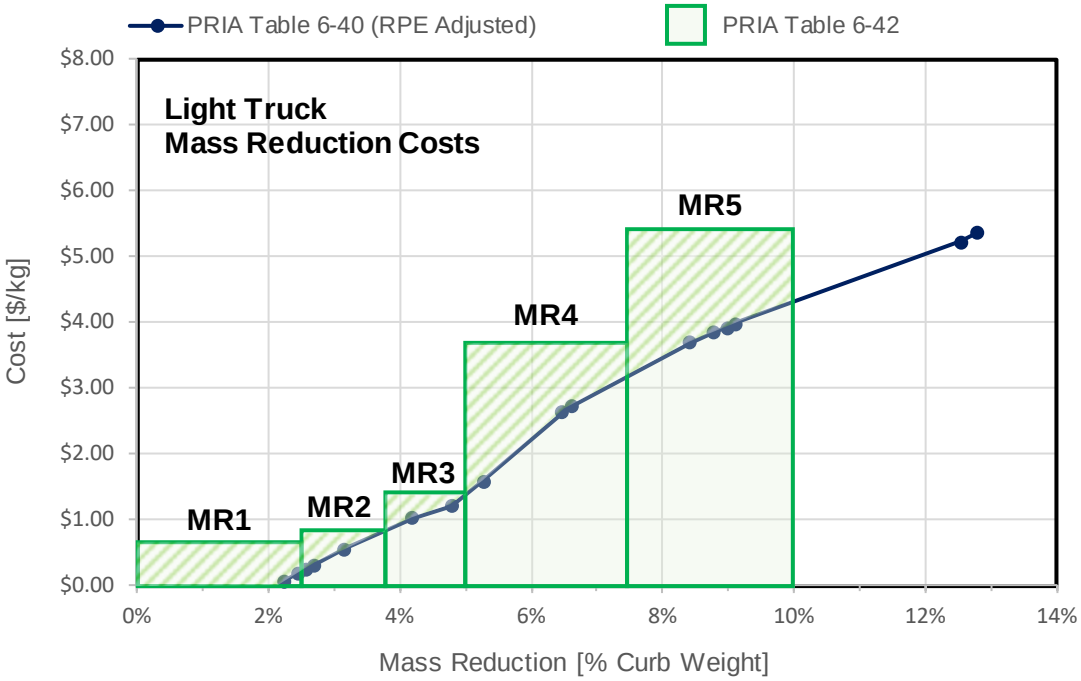
Figure V-4 Passenger Car Mass Reduction Costs



A similar figure was generated for the light truck mass reduction costs. The Figure V-5 below compares the discrete mass reduction costs used in the CAFE Model for light trucks, as given in PRIA Table 6-42, to the actual mass reduction costs from the Chevrolet Silverado study cited by NHTSA, as given in PRIA Table 6-40 and adjusted for RPE, converted to 2016 dollars. Generally, the same trends were observed as with passenger cars; namely, MR2 and MR3 were assigned costs at the upper end of their mass reduction range while the MR1, MR4, and MR5 costs significantly exceeded the costs from the Silverado study for the corresponding levels of mass reduction. Consequently, the mass reduction costs assigned to both passenger cars and light

trucks in the CAFE Model are inappropriately inflated and not justified by the studies the Agencies relied upon. Further, no other evidence or rationale to justify the use of these arbitrarily higher costs is provided in the proposal.

Figure V-5 Light Truck Mass Reduction Costs



5. The Agencies should keep air conditioning efficiency and leakage credits.

The Agencies propose to eliminate the air conditioning (A/C) leakage credit and reduce the stringency of the GHG emission standards by the expected average credit amount, starting with model year 2021. The Agencies suggest that if the final rulemaking did eliminate the leakage credit, EPA would consider whether it is appropriate to initiate a new rulemaking to regulate A/C leakage independently. CARB opposes this proposal and strongly recommends EPA to retain the A/C leakage credit provisions. First, as quoted in the preamble of the EPA model year 2017-2025 rule, Clean Air Act Title II section 202(a)(1) 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."*[186]

[186] *See* 77 Fed.Reg. 62,623, 62,672 (October 15, 2012).

EPA's Endangerment and Cause or Contribute Findings for Greenhouse Gases under section 202(a) of the Clean Air Act establish that the combined emissions of six GHGs including HFCs from new motor vehicles and new motor vehicle engines contribute to the GHG air pollution that endangers public health and welfare.[187] Also, vehicular HFC emissions are significant in quantities, estimated by EPA to be equivalent to CO_2 emissions of 13.8 g/mi for cars and 17.2 g/mi for trucks.[188] Thus, it is appropriate to include vehicle HFC emissions in the standards. Second, the NPRM states the desire for better harmony between the EPA GHG standards with the NHTSA CAFE standards, but it has not demonstrated why eliminating non-CO_2 GHGs such as HFCs would be necessary under Clean Air Act Title II section 202(a)(1). In essence, eliminating HFC credits makes EPA's standards less effective, for no reason at all. Therefore, elimination of the A/C leakage credit would be an arbitrary decision.

This is especially so because the D.C. Circuit's recent *Mexichem* decision[189] has, in important regards, limited EPA's ability to limit the use of these powerful pollutants under Title VI of the Clean Air Act. EPA then issued a Guidance Document stating it would not be implementing any provision of "Rule 20"[190] that was at issue in the Mexichem case, which includes motor vehicle air conditioning.[191] In addition, EPA recently issued a proposed rule to rescind extension of certain refrigerant management requirements to substitute refrigerants, specifically HFCs, and is taking comment on whether it should eliminate the full set of the extension of refrigerant management requirements to substitute refrigerants including a self-sealing valve requirement for small containers of HFC-134a used in non-professional automotive service.[192] Accordingly, maintaining the program under Title II of the Clean Air Act is of particular importance to pollution prevention and to ensuring that significant investments in less polluting refrigerants are maintained in the motor vehicle context.[193]

Furthermore, leakage credit has been a key compliance option that many manufacturers have chosen; and due to its cost-effectiveness, leakage credit has been effective in fostering an industry-wide transition to low-leak A/C system components and

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[187] *See* 74 Fed.Reg. 66,495, 66,496 (December 15, 2009).
[188] *See* 77 Fed.Reg. 62,623, 62,805 (October 15, 2012).
[189] *Mexichem Fluor, Inc. v. EPA*, 866 F.3d 451 (D.C. Cir.2017). In Mexichem, the court reviewed Rule 20, which added HFCs to the list of prohibited substances under the Significant New Alternatives Policy (SNAP) Program pursuant to § 612 of the Clean Air Act. On October 9, 2018, the Supreme Court of the United States denied certiorari.
[190] Protection of Stratospheric Ozone: Change of Listing Status for Certain Substitutes Under the Significant New Alternatives Policy Program, 80 Fed.Reg. 42,870 (July 20, 2015) (Rule 20).
[191] Protection of Stratospheric Ozone: Notification of Guidance and a Stakeholder Meeting Concerning the Significant New Alternatives Policy (SNAP) Program, 82 Fed.Reg. 18,431 (Apr. 27, 2018).
[192] Protection of Stratospheric Ozone: Revisions to the Refrigerant Management Program's Extension of Substitutes, 83 Fed.Reg. 49332 (Oct. 1, 2018). Extension of the appliance maintenance and leak repair provisions to HFCs was included in the 2016 Rule (Protection of Stratospheric Ozone: Update to the Refrigerant Management Requirements Under the Clean Air Act, 81 Fed.Reg. 82,272 (Nov. 18, 2016).
[193] The Agencies must, of course, fully analyze these major economic impacts in the RIA, and in their consideration of this rule generally.

climate-friendly refrigerants. Eliminating the leakage credit provisions without committing to an equally effective alternative program, as in the Agencies' proposal, would result in substantial regulatory uncertainty and hence, highly likely stagnant or dwindling industry investment in these fields, jeopardizing a decade's worth of progress in reducing HFC emissions from vehicle A/C systems. Therefore, such a proposal would be an unnecessary and unjustified change to a proven mechanism that effectively and efficiently reduces vehicle HFC emissions to fulfill EPA's statutory obligation, and hence is inappropriate.

This relaxation harms states and the public in general. It also harms states that have legal mandates to reduce HFCs. For example, California has a legal mandate to reduce HFC emissions by 40 percent below 2013 levels by 2030.[194] Motor vehicle air conditioners make up 23 percent of HFC emissions in California - not an insignificant amount.

EPA staff, in interagency review, repeatedly commented opposing removal of these critical tools. As EPA wrote: "EPA does not agree that the HFC credit program should be removed from the GHG standards."[195] EPA should take its own advice.

The proposed rollback also proposes to gradually reduce the maximum cap of the A/C efficiency credit, starting with model year 2021. CARB opposes this proposal and strongly recommends EPA to maintain the maximum credit caps in the existing regulation. The efficiency credit provisions have been effective in incentivizing the industry to gradually adopt A/C efficiency-improvement technologies, which reduce vehicles' real-world energy consumption and CO_2 emissions beyond what certification test cycles reflect. Reducing the maximum available efficiency credit would very likely slow or halt this movement, leading to an increase of real-world energy consumption and CO_2 emissions.

C. The Agencies inflated electrification costs to be excessive and unrealistic.

In addition to improperly modeling the costs and efficiencies of technologies to reduce emissions from internal combustion engines, the Agencies overestimate the costs of mild hybrid electric vehicles (MHEV), conventional hybrid electric vehicles (HEV), plug-in hybrid electric vehicles (PHEV), and zero-emission technologies (such as hydrogen fuel cell electric vehicles or battery electric vehicles, or BEVs). This is caused by the Agencies relying on outdated component specifications to determine component costs and efficiencies, failing to properly account for improvements in components and costs or consider newer data, incorrectly identifying and assessing existing technologies, improperly oversizing components and batteries for the modeled vehicle classes, and underestimating efficiencies of the technologies by improper modeling. These improper

[194] Cal. Health & Saf. Code § 39730.5.
[195] Response from EPA to OMB regarding interagency comments, June 29, 2018. Docket ID EPA-HQ-OAR-2018-0283-0453. p.7, p.293, p.295, p.296, p.297, p.299, p.300, p.301, p.304, p.305, p.306, p.307, p.308, p.309, p.310.

assumptions result in systematic overestimation of the costs needed to comply with the existing standards as well as unrealistic component and system designs. These mistakes are compounded by the incorrect assumptions on advanced gasoline technologies which leads to exaggerated projections of the amount of electrification needed to comply with the existing standards. Overall, these errors result in unnecessarily high levels of electrification, exacerbated by improper modeling at inflated costs, which causes the projected technology costs to be excessive and unrealistic.

While the Agencies may try to dismiss criticism of their modeling of PHEVs or BEVs as virtually none of these vehicles were projected as needed to meet the existing standards, the electrification assumption mistakes also apply to mild HEV systems and strong HEV systems. For these systems, the Agencies (mistakenly) model them as needed in high levels to meet the existing standards. Accordingly, the incorrect assumptions that artificially inflate the costs of the individual systems result in the Agencies' analysis also falsely exaggerating the overall costs for compliance with the existing standards.

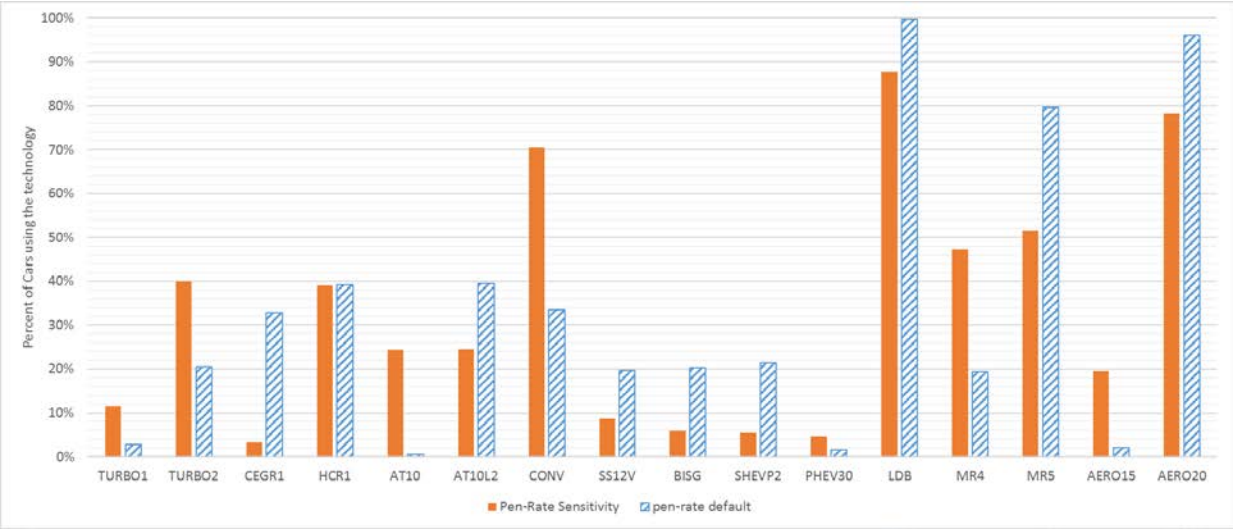
Further, the mistakes described later in the ranking algorithm used by the CAFE Model demonstrate that the electrification costs have a significant impact. For example, the sensitivity run done by the Agencies and noted as 'high oil prices with 60 month payback' also revealed some significant differences relative to electrification. Specifically, this scenario, which resulted in the ranking algorithm finding much more cost effective technologies to apply, lowered the average passenger car cost to comply with existing standards by approximately $700 per car (over 25 percent of the estimated total car compliance costs).[196] An examination of the technology utilization report in the output files of that sensitivity run, relative to the default central run for the Agencies' analysis finds an interesting result.

Figure V-6 below shows a comparison of the fleet-wide passenger car technology penetration rates between the sensitivity case and the default case under the existing standards. The solid bars show the percentage of the passenger car fleet projected to be equipped with each of the advanced technologies to meet the existing standards in the sensitivity case that chooses a more cost-effective path to comply. The default central analysis for meeting the existing standards in the NPRM is shown in the hatched bars. The sensitivity run results in an additional 4 percent of vehicles with the PHEV30 technology but also results in more than 10 percent to 15 percent less of the fleet in *each* of the other electrification categories including strong HEVs, mild HEVs, and stop-start systems (SHEVP2, BISG, and SS12V). This allows over 35 percent more of the fleet to not utilize any electrification and remain with conventional engine technology (CONV). This run also shows that less of nearly every upper end engine, vehicle, and transmission technology is utilized including CEGR1, AERO20, MR5, and AT10L2

[196] Further details are discussed in Table V-17.

allowing more vehicles to deploy less technology by remaining in the less advanced relevant category (e.g., TURBO2, TURBO1, AERO15, MR4, AT10).

Figure V-6 Comparison of fleet wide passenger car technology penetration rates between sensitivity case and default case



This sensitivity case clearly demonstrates that the results of the Agencies' analysis can be highly sensitive to the assumed cost and effectiveness values of the electrification technologies. And, it shows that the model finds it is more cost-effective to deploy a small portion of advanced electrification in the form of 4 percent of the vehicles as PHEVs by 2029MY in lieu of massive use of virtually every other advanced technology - including over 35 percent less of the fleet using HEV, MHEV, and stop-start systems. Thus, in some cases, a targeted deployment of very advanced technology like a PHEV can be more cost effective than wide-scale deployment of a moderate technology.

Additionally, EPA's analysis fails to follow its own "Guidelines for Preparing Economic Analyses"[197] which warns (page 5-1) that establishing an appropriate baseline is critical:

> *Because an economic analysis considers the impact of a policy or regulation in relation to this baseline, its specification can have a profound influence on the outcome of the economic analysis.*

Of note, the guidelines (page 5-1) state that:

> *A proper baseline should incorporate assumptions about exogenous changes in the economy that may affect relevant benefits and costs (e.g., changes in demographics, economic activity, consumer preferences, and technology), industry compliance rates,* ***other regulations***

[197] Guidelines for Preparing Economic Analyses, December 17, 2010 (updated May 2014). National Center for Environmental Economics, Office of Policy, U.S. Environmental Protection Agency. Accessed on October 24, 2018. https://www.epa.gov/sites/production/files/2017-08/documents/ee-0568-50.pdf.

> ***promulgated by EPA or other government entities**, and behavioral responses to the proposed rule by firms and the public. (**emphasis added**)*

The same guidance (page 5-13) also explicitly states:

> *…any state regulation that has been finalized should be included in the baseline.*

CARB currently has a ZEV regulation that is finalized and has been issued a waiver by EPA (see above discussion).[198] This regulation, also voluntarily adopted by nine other states and the District of Columbia under Section 177 of the Clean Air Act, mandates an increasing portion of each vehicle manufacturer's annual new vehicle sales to be ZEVs through model year2025. In the 2016 Draft TAR and subsequent Proposed and original Final Determination, EPA properly followed its guidelines by including compliance with these state regulations by including an estimate of the minimum number of required ZEVs in the baseline. For these past analyses, EPA then properly assessed the incremental impact of the GHG regulations relative to the baseline. However, without providing any explanation for the change from past approaches or for why it is violating its own guidelines, EPA has now omitted compliance with the ZEV regulation in the baseline. This leads to a projection of ZEVs lower than required by the regulation in all of the scenarios modeled and consequently, an increased burden to add technology to the internal combustion engine vehicles to over-comply in order to meet both fleet average standards.

The relevance of this glaring omission is highlighted when considering the announcements made by all manufacturers regarding future plans for electrification. Indeed, sales of PHEVs, BEVs, and FCEV have been accelerating despite the currently few model offerings in the largest, and still growing, market segments (crossovers and SUVs). Market forecasts and research also show continued increasing interest in the future. Based on current policies in place, the International Energy Agency is forecasting global plug-in electric vehicle sales (BEVs and PHEVs) will increase from approximately 4 million in 2020 to 21.5 million by 2030, which translates to a 24 percent average year-on-year sales growth during this time period[199]. Similarly, Bloomberg New Energy Finance is estimating that global plug-in electric vehicles sales will increase quickly reaching 11 million in 2025 and 30 million in 2030, reaching 55 percent of light-duty vehicle sales in 2040[200]. Wards Intelligence[201] is projecting that U.S. luxury BEVs,

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[198] 78 Fed.Reg. 2,112 (Jan. 9, 2013).
[199] https://webstore.iea.org/download/direct/1045?filename=global_ev_outlook_2018.pdf.
[200] E-Buses to Surge Even Faster Than EVs as Conventional Vehicles Fade. BloombergNEF. Accessed on October 24, 2018. https://about.bnef.com/blog/e-buses-surge-even-faster-evs-conventional-vehicles-fade/.
[201] Luxury EV Sales to Triple Over Next Seven Years. Wards Intelligence. Accessed on October 24, 2018. http://subscribers.wardsintelligence.com/market-analysis/luxury-ev-sales-triple-over-next-seven-years-0?NL=WAW-06&Issue=WAW-06_20180905_WAW-06_289&sfvc4enews=42&cl=article_2.

FCEVs, and PHEVs will triple in the next seven years from about 42,000 in 2018 to 139,000 in 2025.

The aforementioned sales projections are supported by several manufacturers' recent announcements of longer term, broad reaching electrification plans that will affect model years 2022 to 2025, and beyond. Audi, at the 2015 Los Angeles International Auto Show, announced that it is committed to achieving 25 percent of U.S. sales from electric vehicles by 2025.[202] Audi will likely need to develop several more electrified models across its product line to reach such sales goals. In March of 2018, Ford announced that it would be investing $11 billion into electrified vehicles,[203] which is nearly triple the investment announced in 2015.[204] Part of that plan involves adding 13 new global electrified vehicles by 2020, even with projections of U.S. sales to shift to over 85 percent trucks and SUVs. Volvo is aiming for 50 percent of sales to be fully electrified by 2025.[205]

Similar announcements have also come from Daimler, Honda, Volkswagen (VW), the Hyundai Motor Group, and Nissan. In June of 2016, Daimler announced that it would be investing seven billion euros in 'green' technology over the following two years.[206] Daimler subsequently announced the creation of an all new Mercedes-Benz sub-brand "EQ", which will be dedicated to bringing all-electric vehicles to market,[207] the first of which is coming in 2020 to the United States.[208] Honda's Chief Executive Officer (CEO) announced in February of 2016 that the company will strive to have two-thirds of the overall sales come from electrified vehicles by 2030.[209] VW announced a new group strategy name "TOGETHER – Strategy 2025" that includes a major electrification initiative with more than 30 new electric vehicles (including its brand Audi) by 2025 and annual sales between two and three million units.[210] The Hyundai Motor Group in April

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[202] "Audi declares at least 25 percent of U.S. sales will come from electric vehicles by 2025." Audi of America. Accessed on October 24, 2018. https://www.audiusa.com/newsroom/news/press-releases/2015/11/audi-at-least-25-percent-u-s-sales-to-come-from-electric-2025.
[203] Ford ups its electrified vehicle ante to $11B; 86 percent trucks and SUVs in the product mix by 2020. Green Car Congress. Accessed on October 24, 2018. http://www.greencarcongress.com/2018/03/20180316-ford.html.
[204] "Ford investing $4.5 billion in electrified vehicle solutions, reimagining how to create future vehicle user experiences." Ford Motor Company. Accessed on October 24, 2018. https://media.ford.com/content/fordmedia/fna/us/en/news/2015/12/10/ford-investing-4-5-billion-in-electrified-vehicle-solutions.html.
[205] Volvo clarifies electrification plan, aims for 50 percent of sales to be 'fully electric' by 2025. Electrek. Accessed on October 24, 2018. https://electrek.co/2018/04/25/volvo-electrification-plan-fully-electric/.
[206] "Daimler invests massively in green powertrain technologies: All Mercedes-Benz model series will be electrified," Daimler. Accessed on October 24, 2018. http://media.daimler.com/marsMediaSite/ko/en/11108480.
[207] "Next step in electric offensive: Mercedes-Benz to build first electric car of the new EQ product brand in its Bremen plant," Daimler. Accessed on October 24, 2018. http://media.daimler.com/marsMediaSite/ko/en/14353750.
[208] The new Mercedes-Benz EQC. Mercedes Benz. Accessed on October 24, 2018. https://www.media.mbusa.com/releases/release-5c7ee2d5215f25dab29798d2d90ba9b6-the-new-mercedes-benz-eqc.
[209] "Summary of Honda CEO Speech on February 24, 2016," Honda Motor Co., Ltd. Accessed on October 24, 2018. http://world.honda.com/news/2016/c160224aeng.html.
[210] "New Group strategy adopted: Volkswagen Group to become a world-leading provider of sustainable mobility," The Volkswagen Group. Accessed on October 24, 2018. https://www.volkswagen-newsroom.com/en/press-releases/new-group-strategy-adopted-volkswagen-group-to-become-a-world-leading-provider-of-sustainable-mobility-1852 .

of 2016 announced a new electrification plan that includes 26 new models by 2020. In reference to the announcement, the senior vice president of Hyundai Motor Group's Eco Technology Center said "This is the basement that we will build upon."[211] Earlier this year, Kia announced at the Consumer Electronics Show that it plans to have 16 electrified platforms globally by 2025 as part of its "Boundless for All" campaign.[212] Nissan announced earlier this year that it will produce 1 million electrified vehicles annually by fiscal year 2022, worldwide, and expects 20 to 30 percent of U.S. production to be electrified by 2025.[213] In October, Wards Automotive reported Mazda will deploy some amount of electrification on all vehicle products by 2030.[214] With nearly all manufacturers showing electrification within the next few generations of vehicles, it is unacceptable for the Agencies to treat this technology pathway as improbable.

1. The Agencies' assumptions for non-battery components for electrified vehicles were non-descriptive and incorrect.

a. The Agencies relied on outdated data.

The Agencies' analysis is inappropriately relying on older data on electric machines and inverter efficiencies across all electrification applications. The Agencies, for this rulemaking, stated they utilized the following sources for developing non-battery component efficiencies:

- Oak Ridge National Laboratory (ORNL) (2008). Evaluation of the 2007 Toyota Camry Hybrid Synergy Drive System. Submitted to the U.S. DOE
- ORNL. (2011). Annual Progress Report for the Power Electronics and Electric Machinery Program[215]
- ORNL/SPR-2014/532 Annual Progress Report for the Power Electronics and Electric Motors Program

The consistent failures of the Agencies to meet their core transparency and clarity obligations under the Administrative Procedure Act are further underlined by the exceptional difficulty of checking these core points. The first two reports listed above were not easily found due to the citations lacking the proper ORNL document numbers, like what is found in the third reference. As discussed previously, the comment period

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[211] Hans Greimel, "Hyundai-Kia's grand electrification plan," Autonews. Accessed on October 24, 2018. http://www.autonews.com/article/20160404/OEM05/304049949/hyundai-kias-grand-electrification-plan.
[212] 'Boundless for All': Kia presents vision for future mobility at CES 2018. Kia. Accessed on October 24, 2018. https://www.kiamedia.com/us/en/media/pressreleases/13440/boundless-for-all-kia-presents-vision-for-future-mobility-at-ces-2018.
[213] Nissan aims to sell 1 million electrified vehicles a year by FY2022. Nissan. Accessed on October 24, 2018. https://newsroom.nissan-global.com/releases/release-487297034c80023008bd9722aa05f858-180323-01-e.
[214] Mazda Aims for 100 percent Electrification By 2030. Mazda. Accessed on October 10, 2018. http://subscribers.wardsintelligence.com/electrification/mazda-aims-100-electrification-2030.
[215] This is assumed to be: ORNL/TM-201/263, Oak Ridge National Laboratory Annual Progress Report for Power Electronics and Electric Machinery Program, October 2011.

provided for a proposal of this magnitude and technical complexity was unreasonably short, and made further unreasonable because the necessary information to fully review the proposal was not provided.

The Agencies applied data for the efficiencies as follows from the PRIA:[216]

Table V-10 Summary of Electric System Data Sources

Powertrain Type	**Source of Efficiency Map for Motor1 (Traction Motor) + Inverter**	**Source of Efficiency Map for Motor2 (Motor/Generator) + Inverter**
Micro 12-V HEV, BISG	Camry EM1 data from ORNL	
CISG and Parallel HEV	Sonata HEV data from ORNL	
Split HEV and Blended PHEV	Camry EM1 data from ORNL	Camry EM2 Data from ORNL
EREV PHEV	Camry EM1 data from ORNL	Sonata HEV data from ORNL
BEV and FCEV	Nissan Leaf data from ORNL	

However, the vehicle model years from which those data were developed, as identified in the ORNL reports, are as follows:

Table V-11 Summary of Data Source Vehicle Model Year

Data Source	**Model Year Vehicle**
Camry EM1 data	MY2007 Toyota Camry Hybrid
Camry EM2 data	MY2007 Toyota Camry Hybrid
Sonata HEV data	MY2011 Hyundai Sonata Hybrid
Nissan Leaf data	MY2012 Nissan Leaf

Given rapid development over the last 10 years in automotive electrification, reliance on specifications from vehicles that are 6 to 11 model years old, and likely had their components designed in the two to three years prior, is completely inappropriate to assess the costs and efficiencies of these components for model years 2020 to 2030 vehicles. Vehicle manufacturers have gone through one or two generations of design since then with substantial gains in virtually all components. There are several examples of these gains that have occurred over the past few years, two of which come

[216] Docket ID: NHTSA-2018-0067-1972, Page 373-374, Table 6-28 Electric machine efficiency map sources for different powertrain configurations.

from General Motors (Chevrolet Volt and Bolt) and another from Toyota with the 3rd to 4th generation Prius improvements.

The 2nd generation Volt, released for the 2016MY, saw several improvements that resulted in increases in charge sustaining fuel economy of 13.5 percent, overall vehicle efficiency of 8.2 percent and all electric range by 39 percent over the 1st generation model which included the following:[217,218,219]

- Electric motor volume reduced by 20 percent
- Electric motor mass reduced 40 percent
- Peak electric motor efficiencies increased by 2 percent
- Power inverter volume reduced from 13.1 liter (L) to 10.4L
- Total Voltec (electrification drive unit) mass reduced from 164 kilogram (kg) to 119kg
- The drive unit is up to 12 percent more efficient in operation
- 20 percent higher battery volumetric energy density

The Chevrolet Bolt EV [Electric Vehicle] (introduced for the 2017MY) saw improvements over the Chevrolet Spark EV (introduced for the 2013MY) that included:[220]

- A reduction in on-board charger volume from 13.0L to 12.3L while the maximum power increased from 3.3 kilowatts (kW) to 7.2kW – a 130 percent increase in volumetric energy density
- Increase of electric motor peak power density (kiloWatt/Liter) of 55 percent
- Volumetric power density (kilovolt-Amp/Liter) of the single power motor inverter module increased 83 percent
- Gravimetric power density (kilovolt-Amp /kilogram) of the single power motor inverter module increased by 55 percent

The 4th generation Prius (introduced for the 2016MY) included some of the following improvements over the 3rd generation Prius (introduced for the 2010MY):[221,222]

- 20 percent reduction in mechanical losses through friction in the transaxle and electric motors
- Electrical losses in the power control unit (PCU) reduced by 20 percent
- The volume of the PCU reduced by 33 percent and mass reduced by 11 percent which allowed for the PCU to be packaged directly above the transaxle
- Internal combustion engine maximum thermal efficiency increased to 40 percent

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[217] GM provides technical details of the Gen 2 Voltec propulsion system used in the 2016 Volt. Green Car Congress. Accessed on October 24, 2018. http://www.greencarcongress.com/2015/04/20150423-voltec.html.
[218] First look at all-new Voltec propulsion system for 2G Volt; “the only thing in common is a shipping cap” Green Car Congress. Accessed on October 24, 2018. http://www.greencarcongress.com/2014/10/20141029-voltec.html.
[219] Compare Side by Side. Fueleconomy.gov. Accessed on October 24, 2018. https://www.fueleconomy.gov/feg/Find.do?action=sbs&id=35246&id=36863
[220] Design of the Chevrolet Bolt EV Propulsion System, SAE 2016-01-1153. April 5, 2018. doi: 10.4271/2016-01-1153.
[221] Toyota Unveils Advanced Technologies in All-New Prius. Toyota. Accessed on October 24, 2018. https://pressroom.toyota.com/releases/2016+toyota+prius+technology.htm.
[222] Toyota details powertrain advances in Gen4 Prius; available E-Four system for all-wheel drive (not for US). Green Car Congress. Accessed on October 24, 2018. http://www.greencarcongress.com/2015/10/20151013-prius.html.

The Agencies, however, appeared to ignore all of this improvement for the rollback proposal and relied on already outdated data as representative of technology over the next 10 or more years. This failure to consider new data let alone existing data renders the analysis unrepresentative of actual technology costs.

b. The Agencies fail to account for component efficiency improvements and cost reductions.

In addition to starting with inappropriately old component efficiency assumptions, the Agencies did not project any efficiency gains over time despite a demonstrated history of these components getting more powerful or smaller (or both), more efficient, and cheaper to manufacture. There are several other examples of significant improvements in electrification components beyond the aforementioned Chevrolet Volt and Bolt EV, and Toyota Prius. Some of those even come from the same sources that the Agencies used for this analysis. As shown above in Table V-11, the Agencies relied on Oak Ridge National Laboratory (ORNL) data for electric machine performance data. As mentioned in the previous sections, one of the main reasons for opening this rulemaking was to update the Agencies' analysis with more recent data. However, the Agencies' asserted "recent data" that were used for electrified vehicles came from ORNL's 2014 Annual Progress Report and Electric Motors program, which supplied the 2012 Nissan Leaf electric machine data for the Autonomie modeling of the BEV and FCEV powertrains.[223] However, ORNL has since released newer data that the Agencies did not use. In fact, a presentation on some of that newer data from ORNL (which was available at the time of the Agencies' analysis) is even referenced in a U.S. Department of Energy (DOE) presentation titled "Overview of the DOE VTO Electric Drive Technologies R&D Program' which has been included in the Agencies' dockets for the NPRM[224].

ORNL published another annual progress report for its electric drive technologies program in October 2015.[225] That report contains several important updates to the extensive ongoing teardown and benchmarking work of electrification technologies by ORNL that was available to be used by the Agencies in the NPRM analysis. One useful part of those updates was the benchmarking of the 2014MY Honda Accord Hybrid inverter and traction motor to develop an efficiency map for the system. That efficiency map should have been analyzed and compared against the older Toyota Camry Hybrid and Hyundai Sonata Hybrid maps that are being used and update the modeling. The lack of consideration of the newer data (which was available after the 2014 ORNL annual report, and in subsequent ORNL annual reports) is another example of the biased selection of data by the Agencies to only utilize data that attempts to support a weakening of the standards.

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[223] Oak Ridge National Laboratory Annual Progress Report for the Power Electronics and Electric Motors Program, ORNL/SPR-2014/532, Docket IDs: NHTSA-2018-0067-0031 and EPA-HQ-OAR-2018-0283-0030.
[224] Presentation - Overview of the DOE VTO Electric Drive Technologies R&D Program, Docket IDs: NHTSA-2018-0067-0032 and EPA-HQ-OAR-2018-0283-0032.
[225] Oak Ridge National Laboratory Annual Progress Report for the Electric Drive Technologies Program. Oak Ridge national Laboratory. Accessed on October 24, 2018. https://info.ornl.gov/sites/publications/files/Pub59624.pdf.

Additional information available to the Agencies to update their analysis comes from Argonne National Laboratory's (ANL) Autonomie group for the U.S. DOE Vehicle Technologies Office (VTO) & Fuel Cell Technologies Office (FCTO). Every few years, the U.S. DOE VTO and FCTO publish a report that "evaluates the impact of numerous technology improvements on component sizes (i.e., power, energy, weight), fuel and electrical consumption, and manufacturing cost."[226] The 2017 report projects several improvements to electrification technologies that were not considered in the Agencies' analysis.[227] Some of those include:

- Increase in high voltage system peak efficiency from 91 percent in 2015 (2010 lab year) to between 93 percent and 96 percent in 2030 (2025 lab year)
- High voltage specific system power from 1,125 Watt per kilogram (W/kg) in 2015 to between 1,500 and 1,600 in 2030
- High voltage system cost from $22/kW in 2015 to between $6.2 and $10/kW in 2030 (representing a reduction in system cost of up to 71.8 percent)
- On-board charger costs reduced from $175/kW to between $35 and $65/kW in 2030.

Had the Agencies followed through on their stated rationale of reconsidering the previous EPA final determination so that it could consider new data, the Agencies would have at least considered, discussed, and utilized or dismissed newer data from the same sources from which their prior data and models came. The newer data also demonstrates that ANL is projecting improvements in efficiency from various electrification technologies. Such information would have not supported the Agencies' current proposal to rollback the standards. The failure by the Agencies to use representative data results in unsupported and inflated technology costs.

c. The proposal lacks information on non-battery component performance sizing and costs.

In a substantial departure from past practice,[228] the Agencies do not provide any substantive discussion or documentation of how the costs were developed for the non-battery components of the electrification technologies in their analysis. One example is shown here:

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[226] U.S. DOE Benefits & Scenario Analysis. Autonomie. Accessed on October 24, 2018. https://www.autonomie.net/publications/fuel_economy_report.html.
[227] ANL/ESD-17/17, An Extensive Study on Sizing, Energy Consumption, and Cost of Advanced Vehicle Technologies, August 2017.
[228] Joint Technical Support Document: Final Rulemaking for 2017-2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, EPA and NHTSA, EPA-420-R-12-901, August 2012. Table 3-116 "FEV Teardown Results."

> "*For today's analysis, the costs assumed a higher voltage system would be needed for BISG and CISG on larger vehicles (MedSUV, MedSUVPerf, Pickup, PickupHT), but the agencies are evaluating the functionality of lower voltage systems on larger vehicles. The agencies seek comment on whether lower voltage systems should be considered on these larger vehicles for the final rule analysis, and why."*[229]

The Agencies provide no further explanation of the design or specifications of the "higher voltage" systems for bigger vehicles. The specifications of those belt-integrated starter generator (BISG) and crank-shift mounted starter generator (CISG) systems (including battery sizes and battery costs) in the ANL Autonomie files are identical regardless of vehicle class or technology combination. Table 6-29 of the PRIA also shows the exact same performance specifications for the BISG and CISG systems.[230] And, contrary to the PRIA quote cited above, the input 'technologies' files for the CAFE Model show that the Agencies actually assigned higher costs to the BISG systems (oddly by a factor of 2.17 times) on the *smaller* vehicles and did not make any change in the performance specifications for those systems. For the CISG systems, the Agencies assigned higher costs to the non-battery costs for the larger vehicles (by a factor of exactly 2.0 times) but again, did not make any change in the component specifications for the system. Information regarding how these costs and cost differences were derived or any actual component changes that were assumed are nowhere to be found in any of the Agencies' analysis for the rollback proposal (BISG and CISGs are discussed further below).

The lack of disclosure of the non-battery cost development information is also an issue for the other electrification technologies. For example, the parallel (commonly called P2) and power-split strong hybrid systems have inexplicably high costs assigned to them relative to costs used in past Agency analyses, as well as compared to other sources. There is no discussion on why or what changed from the Agencies' previous analysis. Previous analysis in the Agencies' 2012 FRM,[231] draft 2016 TAR,[232] and 2016 Proposed Determination[233] show much lower costs on some non-battery electrification technologies. Based on contracted teardown work with FEV from 2010, these analyses provide the logic and decision making for assuming those costs. The International Council on Clean Transportation (ICCT) noted that FEV's work overstated strong hybrid costs,[234] which the Agencies ignored entirely. Additional studies (like the Ricardo teardown work that was done for CARB,[235] and for which EPA helped review) point to

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[229] PRIA, p. 368.
[230] PRIA, Table 6-29 – BatPaC Results for Reference vehicle classes with MR0, Aero0 and Roll10, pp. 376-377.
[231] Final Rule Making Joint Technical Support Document. U.S. EPA. Accessed on October 24, 2018. https://nepis.epa.gov/Exe/ZyPDF.cgi/P100F1E5.PDF?Dockey=P100F1E5.PDF. Sections 3.2 and 3.4.3.4 to 3.4.3.6.
[232] 2016 Draft TAR, Section 5.3.4.3
[233] Section 2.3.4.3.6
[234] German, J. *Hybrid Vehicles Technology Development and Cost Reduction*, Technical Brief No. 1, July 2015, ICCT.
[235] Advanced Strong Hybrid and Plug-In Hybrid Engineering Evaluation and Cost Analysis. CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/msprog/acc/mtr/hybrid_phev_report_full.pdf.

the same general point made by ICCT that the FEV teardown costs are likely to be lower now and even more so in the future. As the Agencies provide no justification or rationale for the increases in strong hybrid modeled costs for the rollback proposal, there is no meaningful way to comment on the exact components or cost changes that they now rely upon.

The same issues around strong hybrid non-battery costs in the proposal are also true for modeling of BEVs and PHEVs. Comments on the TAR's non-battery costs, which were significantly lower than for the rollback proposal, indicated that those costs were actually conservative and not overly optimistic. This is highlighted in the 2016 Proposed Determination with the following input from outside stakeholders:

> *Regarding general plug-in vehicle costs, Ford Motor Company stated, "In general, the cost associated with plug-in electric technologies appears to be conservative."*[236]
>
> *Comments from Tesla Motors were more direct on this topic. Tesla commented that "Tesla's non-battery component costs for Model 3 are lower by double-digit percentages in every category versus the 2020 U.S. DRIVE figures considered in the TAR.*[237]
>
> *Tesla stated, "Tesla's non-battery powertrain component costs for Model 3 are dramatically lower than the costs the Agencies are considering for 2025 BEV production … From the 2008 Roadster to the Model 3, we have realized cost reductions of more than 60 percent on non-battery components. These savings are due in part to improvements in the volumetric and gravimetric profile of the components, which have led to substantial reductions in direct manufacturing costs per unit. We see significant room for further cost reductions between Model 3 launch in 2017 and the regulatory timeline covered in the TAR (2022 – 2025)."*[238]

Comments from ICCT also described the projected BEV costs as too high. ICCT commented:

> *Overall the agencies appear to have overestimated electric vehicle costs in the TAR. The agencies have utilized state-of-the-art tools including the DOE BatPaC model on battery costs. However, somehow costs elsewhere in the agencies' calculations appear to have pushed up electric vehicles' incremental costs to still remain above $10,000 in the 2025 time frame. Based on our examination of detailed engineering cost files for the TAR, we see agency incremental technology costs for 100- and 200-mile BEVs of $11,000 to $14,000 in 2025. We believe the*

[236] Proposed Determination, p. 2-345.
[237] *Id.*, p. 2-345.
[238] *Id.*, p. 2-346.

agencies have overestimated these incremental technology costs, as the ICCT's recent analysis for a similar C-class compact car are approximately $3,100 to $7,300, respectively, for the same BEV ranges.[239]

The Agencies have also been aware of newer data that they make no mention of in their analysis. UBS Group AG, a Swiss multinational financial services and investment bank, contracted a teardown study of the Chevrolet Bolt EV which was published May 18, 2017.[240] UBS contracted the teardown work to Munro & Associates – a globally recognized company that provides "reverse engineering, and material and technology cross pollination providing superior data and business case metrics for new product design innovation."[241] UBS analysts, with the assistance from Munro & Associates' expertise, determined the costs of all the components that comprise the Bolt EV. The Agencies are aware of that study and have used the UBS teardown data, along with a CARB contracted teardown study of several electrification components (explained in further detail below), to consider modifications to modeling of non-battery costs for rulemaking actions. At the 31st International Electric Vehicles Symposium, the Agencies gave a presentation summarizing the consideration of those two teardown studies for updating non-battery costs for modeled BEVs.[242] The Agencies' presentation showed that directionally, non-battery costs assigned to BEVs should move lower for all vehicle classes. The Agencies never discuss why this newer data, which they have examined in detail, are not used in their analysis.

The Agencies have provided no detailed information on how non-battery technology costs were developed, which is a significant departure from the detailed analysis the Agencies previously conducted for the 2016 Draft TAR and EPA's Proposed Determination. The significant upward adjustment in non-battery costs is not supported by industry input, analysis conducted by other outside sources, or by the Agencies' previous analysis.

d. The Agencies incorrectly identified and assessed existing technologies.

The Agencies describe currently available electric motor technology and what may be coming in the future by stating:

Lower-cost magnets for Brushless Direct Current (BLDC) motors – BLDC motor technology, common in hybrid and battery electric vehicles, uses rare earth magnets. By substituting and eliminating rare earths from the

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[239] Proposed Determinaton p. 2-346.
[240] UBS Evidence Lab Electric Car Teardown – Disruption Ahead?. UBS. Accessed on October 24, 2018. https://neo.ubs.com/shared/d1wkuDlEbYPjF/.
[241] Evolving How You Manufacture. Munro & Associates, Inc. Accessed on October 24, 2018. https://leandesign.com/
[242] EPA-HQ-OAR-2018-0283-1790.pdf, "Predicting Powertrain Costs for Battery Electric Vehicles Based on Industry Trends and Component Teardowns", Presentation by Michael J. Safoutin, U.S. Environmental Protection Agency, EVS31, October 3, 2018 https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0283-1790.

> *magnets, motor cost can be significantly reduced. This technology is announced, but not yet in production. The capability and material configuration of these systems remains a closely guarded trade secret.*[243]

Several currently manufactured vehicles, manufacturers' publically announced intent, and previous EPA analysis prove that statement incorrect. The Tesla Model S and Model X use alternating current (AC) induction electric machines for both their front and rear electric motors for every available version since both vehicles went into production in 2012 and 2015, respectively.[244,245] Those AC induction machines do not utilize any rear-earth magnets. The all-wheel drive versions of the Tesla Model 3 also utilize a rare-earth free magnet AC induction machine for their front motor.[246] Honda has also announced that they have developed a new electric motor without any heavy rare-earth metals.[247] Additionally, according to a report by General Motors' employees, the Chevrolet Volt has a motor with a magnet without rare-earth metals in its Motor A position, which has been used since the vehicle went into production in 2015.[248] EPA was clearly previously aware that this technology was already in production as it noted in its Proposed Determination from 2016:

> *The 2016 second-generation Chevy Volt reduced the use of rare-earths in its drive unit by more than 80 percent by using lower-cost ferrite magnets in place of rare-earths in one of its motors…*[249]

Ricardo Inc., under contract by CARB, tore down and costed several strong hybrid and PHEV technologies, including the rare earth magnet free ferrite Motor A from the MY2016 Chevrolet Volt.[250] Description of the motor, along with images, and cost analysis are readily available in the report and were available to the Agencies when they were conducting the Agencies' analysis. Furthermore, EPA staff were consulted on some of the process for the Ricardo tear-down report as it was intended to update the non-battery component costs and specifications that were used for the Draft TAR. Additionally, Chevy Volt technical information is cited in several areas of the PRIA, because it was used to develop operational parameters for modeling PHEV technology in Autonomie. The assertion by the Agencies that rare-earth free magnets for use in

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[243] 83 Fed.Reg. at 43,051.
[244] Tesla Model S Owner's Manual. Tesla. Accessed on October 24, 2018. https://www.tesla.com/sites/default/files/model_s_owners_manual_north_america_en_us.pdf.
[245] Tesla Model X Owner's Manual. Tesla. Accessed on October 24, 2018. https://www.tesla.com/sites/default/files/model_x_owners_manual_north_america_en.pdf.
[246] Musk, E. Twitter. Accessed on October 24, 2018. https://twitter.com/elonmusk/status/998015873167208448.
[247] Shiraki, M. & Tajitsu, N. Honda co-develops first hybrid car motor free of heavy rare earth metals. Reuters. Accessed on October 24, 2018. https://www.reuters.com/article/us-honda-rareearths/honda-co-develops-first-hybrid-car-motor-free-of-heavy-rare-earth-metals-idUSKCN0ZS06C.
[248] The Next Generation "Voltec" Extended Range EV Propulsion System. SAE International. Accessed on October 24, 2018. https://doi.org/10.4271/2015-01-1152.
[249] EPA-420-R-16-021, Page 2-67.
[250] Advanced Strong Hybrid and Plug-In Hybrid Engineering Evaluation and Cost Analysis. CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/msprog/acc/mtr/hybrid_phev_report_full.pdf.

BLDC motors are only an announced technology, but not in production, is clearly false and represents another failure to utilize the best available information to inform the development of their regulations.

Due to the lack of information and transparency provided by the Agencies, it is unclear how much of an effect this particular oversight in available technology relative to all of the other outdated and incorrect assumptions has had on their costing methodologies for electric motors in their modeling of electrification technologies. This is a change in methodology, as previous analysis done by the Agencies for the Draft TAR, and by EPA for its 2016 Proposed Determination clearly provided the process and logic by which electrification components were costed. Because the costing methodology for the non-battery components has also not been properly disclosed, there is no way to properly scrutinize how the costs were developed and determine if they are appropriate and reflective of reality.

Lack of understanding of vehicle electrification by the Agencies is also illustrated by the Agencies' misclassification of the 2016 Chevrolet Malibu Hybrid as having a P2 hybrid drivetrain in both the PRIA and in the market input file for the CAFE Model.

> *The P2 HEV system has an added clutch to engage or disengage the motor from the engine. Disengaging the engine clutch allows all-electric operation and more efficient brake-energy recovery. Examples of this include the MY 2016 Hyundai Sonata Hybrid and MY 2016 Chevrolet Malibu Hybrid, among others*[251]

This is, in fact, not true. The Malibu Hybrid shares much of its drivetrain with the Chevrolet Volt, which is not a P2 system. The Agencies should refer back to Chapter 6 of the 2015 National Academy of Sciences 2015 report, *Cost, Effectiveness, and Deployment of Fuel Economy Technologies for Light-Duty Vehicles*[252] as it has a very clear explanation of the different types of electrified powertrains. By the NAS Report definitions, the Volt is classified as a power-split hybrid style system and not a P2. The Volt and Malibu Hybrid drivetrains are so similar that GM also refers to the Malibu Hybrid's drivetrain by the Voltec name, making the Malibu Hybrid drivetrain also a power-split hybrid, not a P2. This information is easily accessible to the public and GM has also made many presentations at industry events, including one at the 2016 SAE Hybrid and Electric Vehicle Technologies Symposium where the Agencies' staff were in attendance.

Classifying a vehicle's powertrain correctly is extremely important for correct cost allocation and modeled fuel effectiveness improvements of components. This misclassification, along with the misunderstanding of the state of the industry in regards to technology are significant oversights in the analysis. This points to the Agencies' lack

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[251] PRIA, p. 369, § 6.3.9.4 SHEVP2.
[252] Electrified Powertrains. National Academic Press. Accessed on October 24, 2018. https://www.nap.edu/read/21744/chapter/6.

of understanding about how electrification systems work and casts doubt that the technologies are appropriately considered in this analysis.

2. The Agencies' battery assumptions were inadequate.

The Agencies' analysis and modeling of battery technology is inadequate to support an informed rulemaking. Previous analysis and modeling efforts were much more rigorous and transparent than what has been done for this NPRM. The NPRM provides insufficient analysis, detail, and data to support any assumptions regarding battery sizing and costs let alone the inflated assumptions used by the Agencies.

a. The Agencies did not appropriately use the BatPaC model.

i. Insufficient data precludes meaningful comment.

ANL's Battery Pack and Costing Tool (BatPaC) is a bottom up costing model that projects the manufacturing cost of vehicle battery packs based on an extensive set of input parameters. The model is used for the proposed rollback, and has been used in the Agencies' prior rulemaking efforts to model battery costs.[253] However, the Agencies' analysisNPRM analysis is missing information about the BatPaC model that is vital to properly assess how the battery technology was modeled and costed. Previously, the Agencies' released the ANL BatPaC model files that were used to develop the battery specifications and costs.[254] This time around, however, the BatPaC model version and files used for the NPRM have not been posted to either of the Agencies' docket or otherwise been made available for review.

For the NPRM, the Agencies claim to use the "most up-to-date" version of BatPaC, but the version of the model that was actually used is never disclosed. The Agencies' previous analysis have always fully described and disclosed the BatPaC version used. BatPaC has been updated several times since its original public release in 2012. Without disclosure of the BatPaC modeling files that were used, clear statements about what version of the model was used, or thorough descriptions of the inputs to those modeling runs, there is no way to know what assumptions were made for raw material pricing, battery cell yields, pack electrical connection topology, battery production volume assumptions, or if any additional parameters were modeled, like rapid charging capability. All of those pieces are critical to understand if the BatPaC model has been run correctly and is producing proper cost values for battery packs, particularly when the new modeled battery pack costs are higher than the Agencies' previous analysis.

The Agencies make claims about using the most up to date version of BatPaC in several areas of their analysis.

The NPRM states:[255]

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[253] 83 Fed.Reg. at 43,002-43,003.
[254] Example of one file set can be found in Docket # EPA-HQ-OAR-2015-0827-0678.
[255] 83 Fed.Reg. at 43,047.

> *In addition, the most recent ANL BatPaC model is used to estimate battery costs.*

The PRIA states:

> *In addition, this analysis rely [sic] on the most recent ANL BatPaC model to estimate battery costs.*[256]

> *In addition, the agency relied on the most recent Battery Performance and Cost model (BatPaC) to estimate battery costs*[257]

Additionally, the model referenced in the PRIA only points to the ANL website for BatPaC, and not what version was used for the analysis. The PRIA then states this:

> *The BatPac's assumptions can be adjusted to specific battery type, and for today's analysis the agencies relied on DOE ANL's battery experts to provide cost and battery size data for full vehicle simulation.*[258]

The Agencies reference a footnote to the above statement. Based on the Agencies' wording, that footnote is expected to give the reader critical information about the BatPaC assumptions that were developed by DOE ANL's battery experts. However, the footnote states "ANL vehicle component input file [Docket ID]". By not correctly identifying the file, the Agencies' are not disclosing information that is critical to understand how the battery costs were developed.

Without properly disclosing the version of BatPaC and the input assumptions that were used, insufficient information is available about what battery chemistries were used in the Agencies' analysis. Disclosure of what specific battery chemistry is being used, for each electrification application, is important to understand how costs are being developed, particularly since costs have been adjusted upward for the NPRM from the Agencies' previous analysis. As EPA wrote in its own review of this proposal:

> *Overall, battery costs included in this analysis are higher than what EPA has obtained from the most recent version of the BatPaC model. There is not enough detail provided for EPA to determine what is contributing to these higher costs, but two potential factors are notable. First, the text refers to both ANL/ESD-15/28 and the BatPac model, so there are potentially inconsistencies in the application of assumptions from one of these sources to the other. Second, the text frequently refers to the BatPaC model to lend authority to the battery cost estimates, without providing sufficient information on the much more significant issue of how*

[256] Docket ID: NHTSA-2018-0067-1972, p. 361.
[257] *Ibid.*, p. 362.
[258] *Ibid.*, p. 362.

> *battery sizing or other model inputs were determined, much less the battery sizings or cost estimates that resulted.*[259]

The lack of disclosure of information about the Agencies' use of the BatPaC model leads to other issues in understanding the changes made for the NPRM analysis compared to the Agencies' older analysis. When referring to battery cathode chemistries in lithium-ion batteries, in the case of nickel-manganese-cobalt, it is often shortened to NMC followed by three numbers. Each one of those numbers represents the relative ratio of those constituent materials. For example, NMC622 is a cathode with 60 percent nickel, 20 percent manganese, and 20 percent cobalt. Those ratios are important, because different compositions imply different production costs. Additionally, those materials have different commodity prices, and the total cost of a battery can vary significantly based on those commodity prices. There is an ongoing effort by battery manufacturers to remove as much cobalt from cathodes as possible, because commodity pricing for cobalt has increased significantly over the past few years.

The Agencies' analysis is unclear and inconsistent regarding battery chemistries. Table 6-27 of the PRIA states that LFP-Gr chemistries are being modeled for micro HEVs, BISG HEVs, CISG HEVs, and Full HEVs. For PHEVs and BEVs, the table shows NMC441-Gr being modeled for both PHEVs and BEVs. The choice is affirmed again with this statement in the PRIA:

> *We selected NMC441 as choice [sic] of chemistry for PHEVs and BEVs. NMC441 [sic] more suitable for high energy batteries capable of discharge rates [sic].*[260]

However, there is a Microsoft Excel file in EPA's docket (ID: EPA-HQ-OAR-2018-0283-0054) and NHTSA's docket (ID: NHTSA-2018-0067-0003) titled "ANL-Summary of Main Component Performance Assumptions NPRM." There is a tab in that document which is labeled 'Description – BatPaC' with the same table listed as what is in the PRIA, except the chemistry listed for PHEVs and BEVs is NMC333-G instead of NMC441-Gr. This file is not referenced directly in the PRIA or NPRM. NMC441-Gr chemistry is not an available option in the most up to date version of BatPaC, but NMC333-G is. NMC441-G was replaced with NMC622-G in BatPaC. Without knowing what cell chemistry or version of BatPaC were used, it is impossible to replicate the Agencies' analysis and properly analyze what was done to make sure that the analysis was appropriate and reflective of reality. EPA repeatedly requested NHTSA to send documentation and files pertaining to battery size and cost development as illustrated by this statement:

> *Overall, battery costs included in this analysis are higher than what EPA has obtained from the most recent version of the BatPaC model. There is not enough detail provided for EPA to determine what is contributing to these higher costs, but two potential factors are notable. First, the text*

[259] EPA Comments on the Preliminary RIA (July 12, 2018). U.S. EPA. Accessed on October 24, 2018. https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0283-0453. p. 347.
[260] Docket ID: NHTSA-2018-0067-1972, p. 383.

> *refers to both ANL/ESD-15/28 and the BatPac model, so there are potentially inconsistencies in the application of assumptions from one of these sources to the other. Second, the text frequently refers to the BatPaC model to lend authority to the battery cost estimates, without providing sufficient information on the much more significant issue of how battery sizing or other model inputs were determined, much less the battery sizings or cost estimates that resulted.*[261]

Even though that comment was raised in interagency discussions before the NPRM was released, it was never properly addressed in the publicly released PRIA or NPRM preventing meaningful comment from stakeholders as to the validity of the new assumptions.

Per a Freedom of Information Act (FOIA) Request ES18-003395 that was fulfilled on October 23, 2018 – three days before the close of the comment period for the SAFE Vehicles Proposal - NHTSA disclosed that BatPaC version 3.0 was used for the analysis. This is a contradiction with their assertion that:

> …the most recent ANL BatPaC model is used to estimate battery costs.[262]

It is also a contradiction with the assertion by the Agencies that they are using NMC441-Gr (discussed below in section ii), as it was removed as an available option in BatPaC v3.0.

ANL released version 3.1 of their BatPaC model in October, 2017 which contained a number of updates. Version 3.0 has been available since December of 2015, making it almost two years older than the actual most recent version. Additionally, NHTSA is choosing to withhold information about battery pack configurations.

ii. The Agencies made inappropriate battery chemistry selection.

Based on the limited disclosure of data sources, it appears the Agencies' selected battery chemistries represent a step backward from previous analysis done for the 2016 Draft TAR even taking into account the confusion as to whether NMC441 or NMC333 was chosen for PHEVs and BEVs. The Agencies' 2016 Draft TAR stated the following:

> *Version 3 of BatPaC replaces NMC441 with NMC622, a more commonly cited formulation of NMC with a long cycle life.*[263]

Based on industry input, ANL added a nickel rich option cathode chemistry, NMC622, to the BatPaC model, though it is unclear why this decision regarding cathode chemistry was made. The PRIA states ANL was relied heavily upon for this NPRM analysis:

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[261] Docket ID: EPA-HQ-OAR-2018-0283-0453, Document entitled: EO 12866 Review: NHTSA responses to interagency comments sent to OMB.
[262] 83 Fed.Reg. at 43,047.
[263] Draft TAR. (2016). EPA-420-D-16-900. p. 5-344.

The BatPac's assumptions can be adjusted to specific battery type, and for today's analysis the agencies relied on DOE ANL's battery experts to provide cost and battery size data for full vehicle simulation.[264]

Table V-12 provides a comparison of the chemistries used by the Agencies in the Draft TAR and EPA's Proposed Determination versus those now presumed to be used in the NPRM:

Table V-12 Comparison of chemistries: Draft TAR, Proposed Determination, NPRM

Technology Application	Battery Chemistry	
	TAR / PD	NPRM
Micro HEV (12V SS)	Advanced Pb-Acid	LFP-Gr
BISG / CISG	75 percent LMO/25 percent NMC - Gr	LFP-Gr
Strong Hybrid (P2HEV and PSHEV)	NMC/LMO-Gr	LFP-Gr
PHEV30 (PHEV20 in TAR/PD)	NMC/LMO-Gr	NMC441-Gr or NMC333-Gr?
PHEV50 (PHEV40 in TAR/PD)	NMC622-G	NMC441-Gr or NMC333-Gr?
BEV200	NMC622-Gr	NMC441-Gr or NMC333-Gr?

Several of the world's largest lithium-ion battery production companies for light duty vehicles, including LG Chem[265], SK Innovation[266], and CATL[267] have indicated that they are moving beyond NMC111, NMC532, and NMC622, to NMC811 for production batteries for BEVs. While there have been a few delays at getting NMC811 into the market in 2018 from both LG Chem and SK Innovation, the technology is expected to come to market in 2019[268], far sooner than was anticipated, even in the Agencies' previous analysis for the 2016 TAR and EPA's Proposed Determination. Regardless of whether the Agencies chose NMC441 or NMC333 for BatPaC modeling runs, this cathode chemistry is not representative of the technology going into current BEVs, nor

[264] Docket ID: NHTSA-2018-0067-1972, p. 362.
[265] LG Chem to produce new powerful EV battery. The Investor. Accessed on October 24, 2018. http://www.theinvestor.co.kr/view.php?ud=20170908000616.
[266] Woo-hyun, S. SK Innovation to produce EV batteries with 100 km extension of driving range. The Korea Herald. Accessed on October 24, 2018. http://www.koreaherald.com/view.php?ud=20170831000976.
[267] CATL rushing to launch NCM 811 battery cells first. Electrive. Accessed on October 24, 2018. https://www.electrive.com/2018/08/15/catl-rushing-to-launch-ncm-811-battery-cells-first/.
[268] SK Innovation Postpones NCM 811 Batteries. Insideevs. Accessed on October 24, 2018. https://insideevs.com/sk-innovation-postpones-ncm-811-batteries/.

does it represent near-future BEV battery technologies. Additionally, the battery chemistry selection for the NPRM does not represent many of the PHEV batteries nor strong hybrid batteries that are being deployed in the market, nor have been for several years now. This results in a misappropriation of higher costs for electrification technologies in the Agencies' analysis, and further highlights the Agencies' sudden lack of knowledge about electrification, despite the far more directionally correct projections in previous analysis for the 2016 Draft TAR and EPA's Proposed Determination.

b. Battery learning curves are inappropriately applied.

The Agencies developed battery cost learning curves to adjust costs downward over time for batteries based on estimated learning by manufacturers. Figure 6-154 in the PRIA shows a battery learning factor for all batteries used in the analysis for all electrification levels except for start-stop 12V technology. The Agencies' have consistently revised costs and adjusted them downwards as new information becomes available. This is evident in Table 5.115 of the 2016 Draft TAR (shown as *Table V-13* in these comments):

Table V-13 (Table 5.115 from Draft TAR) Average Change in Projected Battery Pack DMC from 2012 FRM to 2016 Draft TAR

Electrified Vehicle Type	Average change	
	Change in pack cost	Change in cost per kWh
EV75	-24.9%	-13.4%
EV100	-27.1%	-15.0%
EV150/200	-24.0%	-18.7%
PHEV40	-12.2%	-1.5%
PHEV20	-8.7%	-3.2%
HEV	29.6%	27.7%

[269]

Plenty of publicly available data supports lower costs in the near term than what the applied learning curve rates would do to the battery costs developed by the Agencies. Costs in the 2016 Draft TAR and EPA's Proposed Determination were lower than what the Agencies are now stating. EPA's Proposed Determination Technical Support Document stated the following:

> *Several updates were motivated in part by public comments suggesting that projected battery costs were too conservative in light of recent industry estimates. In the Draft TAR, EPA compared the projected cost per kWh for BEV200 battery packs to other sources such as the Nykvist & Nilsson study and the GM/LG cost announcement. In so doing, EPA*

[269] 2016 Draft TAR, p. 5-347, Table 5.115.

recognized that the Draft TAR cost projections may be somewhat conservative, as would befit projections made in the face of future uncertainty. EPA also recognized that projections of battery capacity for a given vehicle weight and range target were in many cases somewhat larger (i.e. conservative) than seen in some production vehicles. At the time, it was felt that a somewhat conservative estimate for both would be appropriate given the uncertainties associated with future cost estimation.

Several commenters argued that battery costs have fallen at a faster rate than anticipated, and would continue to fall to perhaps below the levels projected in the Draft TAR. Tesla Motors also referred to current and future vehicles that are anticipated to have lower cost per kWh and/or smaller packs for a given range target. Although the comments did not provide detailed data such as evidence of actual pack costs for specific vehicles or types of vehicles, these comments suggested that the conservative nature of the existing projections should be re-examined, as the effect might be magnified by the projection of larger pack capacities than necessary.[270]

Several examples of BEV battery cost disclosures and well supported projections can be seen in Table V-14 below. The Agencies' have previously considered some of that information, particularly the GM Announcement. If the Agencies were consistent with their previous thorough analysis, they would look to the other cost information that has become available. However, in the Agencies' analysis there is no consideration of any new information or data to adjust battery costs.

Table V-14 – BEV Battery Costs

Source	Year for Cost	Cost ($/kWh)	Cell or Pack?
GM Announcement[271]	2016	$145	Cell
	2020	$100	Cell
Tesla[272]	2016	$190	Pack
Audi[273]	2018	$114	Cell
	2017	$209	Pack

[270] Proposed Determination TSD, 2016, p. 2-370.
[271] GM: Chevrolet Bolt Arrives In 2016, $145/kWh Cell Cost, Volt Margin Improves $3,500. Insideevs. Accessed on October 24, 2018. https://insideevs.com/gm-chevrolet-bolt-for-2016-145kwh-cell-cost-volt-margin-improves-3500/.
[272] Quintaro, P. Tesla Q1'16 Earnings Conference Call: Full Transcript. Benzinga. Accessed on October 24, 2018. https://www.benzinga.com/news/earnings/16/05/7936960/tesla-q116-earnings-conference-call-full-transcript
[273] Neuer Audi Entwicklungs-Vorstand Peter Mertens "Wir glauben an den Diesel." Auto Motor Sport. Accessed on October 24, 2018. https://www.auto-motor-und-sport.de/news/interview-audi-entwicklungs-vorstand-peter-mertens/.

Bloomberg New Energy Finance Report[274]	2030	$100	Pack
UBS Bolt EV Teardown Report[275]	2017	$200	Pack
	2025	$130	Pack
2016 Total Battery Consulting Report[276]	2025	$160	Pack
2017 Total Battery Consulting Report[277]	2025	$140	Pack
2018 Total Battery Consulting Report[278]	2025	$85 - $112	Cell

Considering the substantial volume of publicly available information, and public input to the Agencies' previous analysis, projected battery costs should have been adjusted even further downward for the NPRM. Instead, the Agencies have moved costs upward without sufficient justification. The analysis for the Proposed Determination and 2016 Draft TAR provided far more justification for the battery costs that were modeled.

c. Batteries are wrongly sized.

Reductions in a vehicle's weight (mass), aerodynamic drag, or tire rolling resistance will make a vehicle more efficient with all other things being equal. As a vehicle becomes more efficient, there is opportunity to resize the battery pack to better optimize the package and make the vehicle even more efficient than it would have been without that optimization. However, as evidenced by the output Autonomie files (ANL MidsizeNonPerfo 07202017, etc.)[279] provided for this proposal to represent all possible combinations of technology available for the CAFE Model to apply, battery packs are only resized from the base road load vehicle configuration in a few cases. That base configuration for a vehicle is identified in the Autonomie simulation output files as MR0, Aero0, and Tire0 which represents a vehicle with no reductions in mass (MR0), no improvements in aerodynamic drag (Aero0), and no improvements in tire rolling resistance (Tire0) from a nominal vehicle representing pre-2012MY levels of technology. All other combinations of road load reductions like lower levels of mass reduction (MR1 or MR2), aerodynamic drag reductions (Aero1-4), or tire rolling resistance reductions (Tire10 and Tire20) do not result in any battery resizing. This results in significant increases in all-electric vehicle ranges for combinations of road load reduction technology other than Aero0 and Tire0 at mass reduction levels MR0, MR3, MR4, and MR5 as the battery ends up oversized for its intended use. The vehicle

[274] Long Term Electric Vehicle Outlook 2018, Published 21 May 2018, https://www.bnef.com/core/insights/18621
[275] Q-Series UBS Evidence Lab Electric Car Teardown – Disruption Ahead? UBS. Accessed on October 24, 2018. https://neo.ubs.com/shared/d1wkuDlEbYPjF/.
[276] An insider's view of the future xEV market and the battery technology that will power it. Total Battery Consulting. Accessed on October 24, 2018. https://totalbatteryconsulting.com/industry-reports/xEV-report/overview.html.
[277] An insider's view of the future xEV market and the battery technology that will power it. Total Battery Consulting. Accessed on October 24, 2018. https://totalbatteryconsulting.com/industry-reports/xEV-report/overview.html.
[278] The xEV Industry Insider Report. Total Battery Consulting. Accessed on October 24, 2018. https://totalbatteryconsulting.com/industry-reports/xEV-report/Extract-from-the-2018-xEV-Industry-Report.pdf
[279] NHTSA Docket IDs: NHTSA-2018-0067-1663, NHTSA-2018-0067-1661, NHTSA-2018-0067-1492, NHTSA-2018-0067-1487, NHTSA-2018-0067-1662, NHTSA-2018-0067-1494, NHTSA-2018-0067-1856, NHTSA-2018-0067-1486, and NHTSA-2018-0067-1855, and all files referenced in EPA Docket ID: EPA-HQ-OAR-2018-0283-0770.

ends up with a higher cost battery pack than needed causing the package to be even less cost effective.

This resizing restriction, a clear carryover from the Agencies' assumptions on when a conventional engine should be resized, is illogical to apply to battery packs and is inconsistent with manufacturers' standards practice. Given the expense of the battery pack, especially when falsely exaggerated as done in the Agencies' analysis, vehicle manufacturers are highly financially motivated to minimize battery pack size. Further, resizing a battery pack, by reducing the total number of cells, is not even close to comparable to the expenses a vehicle manufacturer faces when redesigning an entirely new engine with a smaller displacement. Battery pack designs are much more scalable than engines and, given the expense, are optimized for any redesign of a vehicle, regardless of the mass or road load reduction amount. Further, this is a departure from the previous battery sizing work conducted by the Agencies for the 2016 Draft TAR, and by EPA for its 2016 Proposed Determination with no rationale or evidence to support the change.

3. The Agencies made erroneous electric vehicle assumptions.

a. BEV configurations do not match on road vehicles.

In every Autonomie modeled technology combination in the Agencies' analysis, battery packs for BEVs are grossly oversized for a target 200 mile label range causing projected battery pack costs to also be exaggerated. This is shown by using the input vehicle configurations (which are a result of Autonomie modeling runs) in the CAFE Model for BEVs to determine the size and cost of which battery is used when applying that technology to a vehicle. *Figure V-7* was created by taking all the possible 200 mile range BEV technology combinations assigned to all individual modeled vehicle classes from the Autonomie output data in the Agencies' dockets[280] and plotting each specific vehicle's curb weight in kilograms on the Y-axis versus that vehicle's calculated label efficiency in Watt-hours/mile.

The Calculated Label Efficiency in the chart used the following calculation:

((UDDS Cycle Efficiency * 0.55) + (HWFET Cycle Efficiency * 0.45)) * 0.7

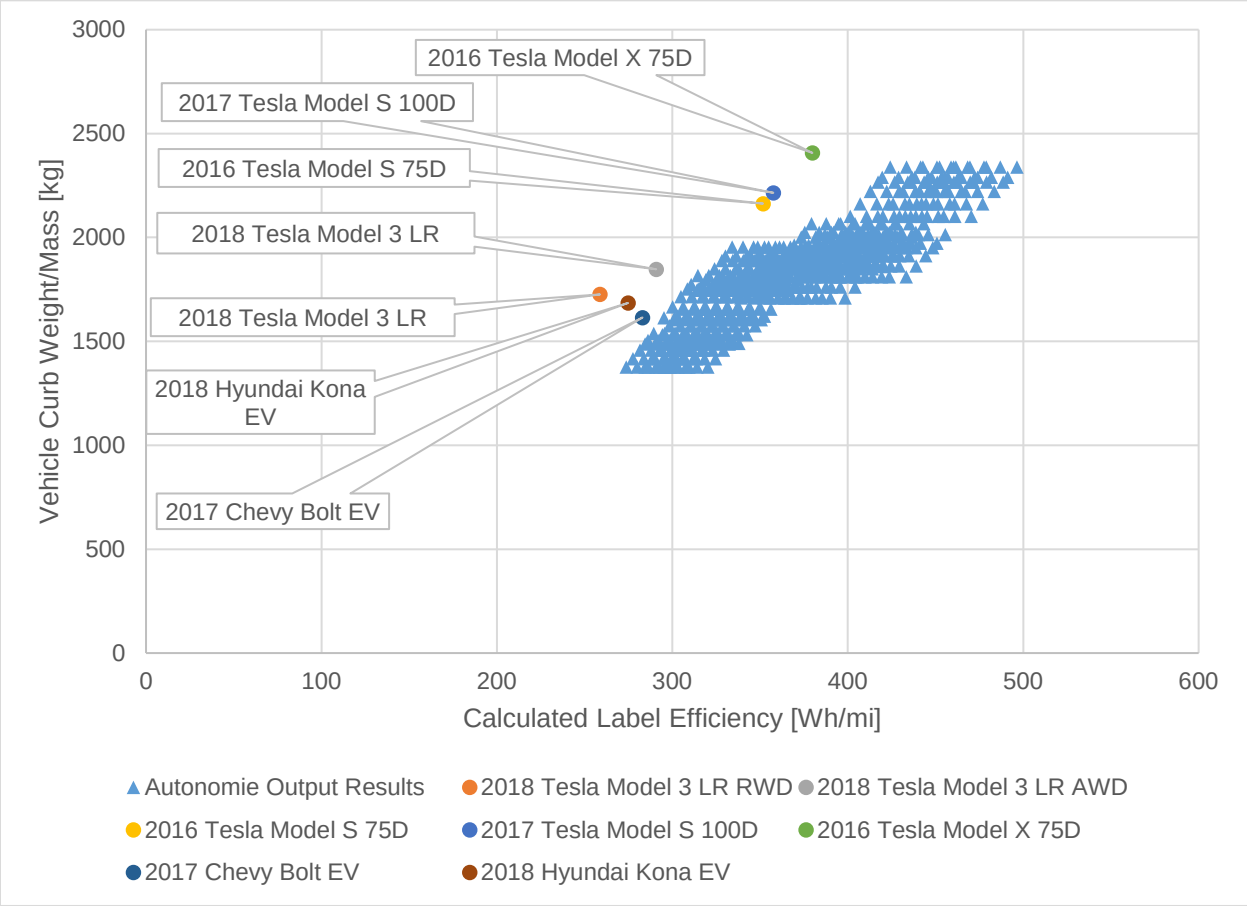
The urban dynamometer drive schedule (UDDS) and highway fuel economy test (HWFET) cycle efficiencies for all the Autonomie output results were sourced from the posted Excel binary files in the dockets.[281] The masses of the Autonomie output result

[280] All ANL Autonomie output files - NHTSA Docket IDs: NHTSA-2018-0067-1663, NHTSA-2018-0067-1661, NHTSA-2018-0067-1492, NHTSA-2018-0067-1487, NHTSA-2018-0067-1662, NHTSA-2018-0067-1494, NHTSA-2018-0067-1856, NHTSA-2018-0067-1486, and NHTSA-2018-0067-1855, and all files referenced in EPA Docket ID: EPA-HQ-OAR-2018-0283-0770.

[281] NHTSA Docket IDs: NHTSA-2018-0067-1663, NHTSA-2018-0067-1661, NHTSA-2018-0067-1492, NHTSA-2018-0067-1487, NHTSA-2018-0067-1662, NHTSA-2018-0067-1494, NHTSA-2018-0067-1856, NHTSA-2018-0067-1486, and NHTSA-2018-0067-1855, and all files referenced in EPA Docket ID: EPA-HQ-OAR-2018-0283-0770. However The PRIA did not directly reference these files as being the actual outputs from Autonomie that were used in the CAFE Model runs, and the CAFE Model does not directly source information from them.

vehicles were pulled from the same set of spreadsheets using the curb weight column. Efficiency data for the other currently available vehicles identified in the chart were sourced from FuelEconomy.gov data.[282] The available 2-cycle data was converted into the Calculated Label Efficiency using the same formula identified above. Curb weights of the vehicles were sourced from manufacturer published data[283, 284, 285]

Figure V-7 BEV 200 Efficiency vs. Mass



The figure shows that the modeled battery energy capacities and efficiencies for the NPRM do not match the capability of currently available vehicle designs, much less are they representative of future offerings. As *Figure V-7* shows, of all the available Autonomie Model results for 200 mile range BEVs in the Agencies' analysis (for all

[282] Download Fuel Economy Data. Fuel Economy. Accessed on October 24, 2018. https://www.fueleconomy.gov/feg/download.shtml.
[283] Tesla Model 3 Owner's Manual. Tesla. Accessed on October 24, 2018 https://www.tesla.com/content/dam/tesla/Ownership/Own/Model percent203 percent20Owners percent20Manual.pdf
[284] Chevrolet Bolt EV. Chevrolet. Accessed on October 24, 2018. https://media.chevrolet.com/media/us/en/chevrolet/vehicles/bolt-ev/2018.tab1.html.
[285] Hyundai Kona Electric 64 kWh. Electric Vehicle Database. Accessed on October 24, 2018. https://ev-database.uk/car/1126/Hyundai-Kona-Electric-64-kWh.

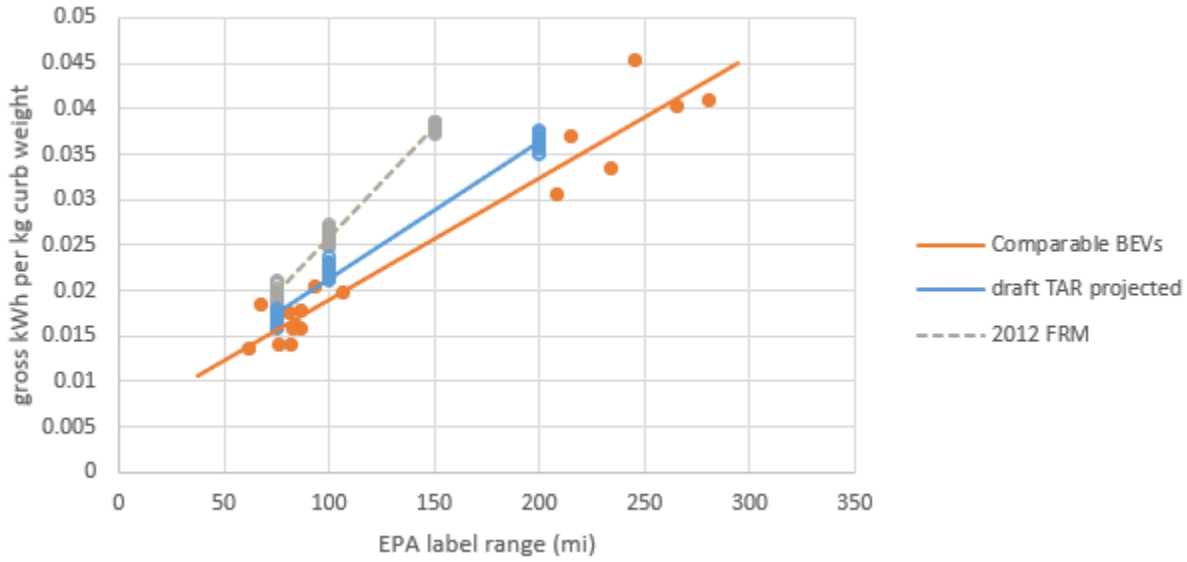
vehicle classes), there is not a single combination that is as efficient, at a given mass, as currently manufactured BEVs with over 200 miles of range – which can only be expected to further improve. The triangles on the chart designate the modeled efficiency (Wh/mi) for a given curb weight and all points are to the right of actual vehicles. This indicates the model is projecting 200 mile BEVs in the future will be less efficient (using more energy to travel each mile) and requiring larger battery packs than today's BEVs.

Further, all of the currently manufactured BEVs identified in the charts have ranges well over 200 miles of range which makes the modeled projections that much more out of touch with reality. To achieve ranges even higher than 200 miles based on the modeled results, it would require even larger battery packs, which increases vehicle curb weight (y-axis) and would move the simulated BEV to triangles even further to the right of actual vehicles. It is clear that the Autonomie model results for BEVs do not represent current product offering efficiencies for a given vehicle mass and class, and that battery pack energy capacity is considerably oversized for each vehicle in the results. Given that the Agencies did not model any efficiency increases for electrified powertrains, and that battery electric vehicles on average continue to get more efficient every year while adding significant range, the disparity between the Autonomie model results and vehicles actually produced will grow significantly.

These inappropriate Autonomie simulation results are not representative of previous analysis completed by the Agencies' for their 2016 Draft TAR and EPA's Proposed Determination. The 2016 Draft TAR included a thorough analysis of production vehicle battery energy capacities as a unit function of curb weight compared to the vehicles' EPA certified ranges. Figure 5.113 (shown as *Figure V-8* below) from the Agencies' TAR illustrates some of that analysis:[286]

[286] 2016 Draft TAR, p. 5-340.

Figure V-8 (Figure 5.34, 2016 Draft TAR): BEV label range and gross curb weight



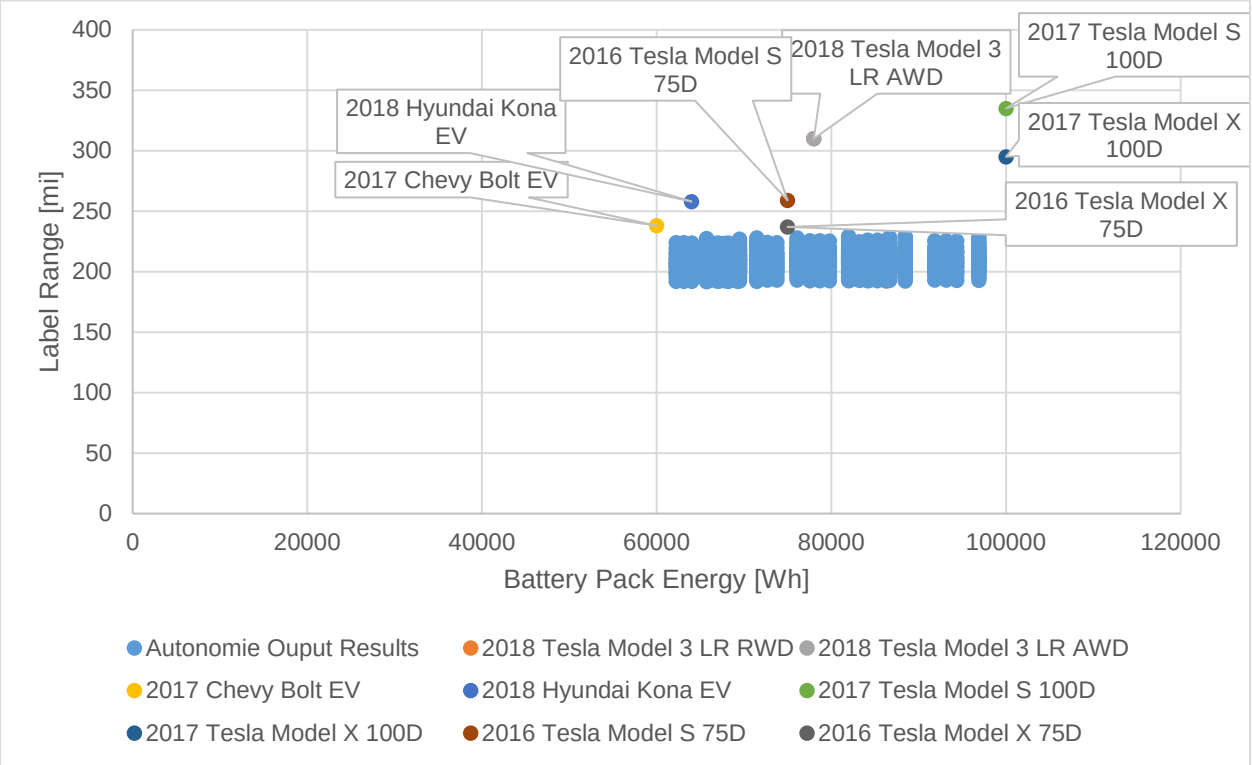
The Agencies explain the above figure with the following:

> *Seen another way, the plot suggests that at least **some current production vehicles** have been able to deliver a given range with slightly less battery capacity than this Draft TAR analysis predicts **for a future time frame**. While this supports a conservative estimate, this trend deserves further examination because the goal of the Draft TAR is to represent a future state of technology in 2022-2025.[287] (**emphasis added**)*

This is in stark contrast to what was done for the NPRM. It appears that there was no analysis done to compare the modeled vehicle battery pack energy capacities to production vehicles to understand if the modeled values were reflective of reality. *Figure V-9*, below, shows that the NPRM modeled battery energy capacities, intended to represent vehicles out to 2030MY, have been oversized relative to what today's production vehicles are already utilizing, thus artificially inflating costs used in the Agencies' analysis. The figure shows, for a given battery capacity (x-axis), all of the modeled results achieve a lower range (nominally 200 miles) while the actual BEVs of today are able to achieve even more range out of the same battery capacity. There is no justification given for why the Agencies have chosen to omit the available information that they have used in the previous modeling efforts for the 2016 Draft TAR and EPA's Proposed Determination and rely on a less rigorous analysis.

[287] 2016 Draft TAR, p. 5-340.

Figure V-9 BEV Battery Pack Size vs. Range



b. PHEV configurations do not match on road vehicles.

The Agencies' also model PHEVs inappropriately when compared to current production vehicles and, as a result, the costs assigned to the technology are inappropriately high for the following reasons:

- Electric motors are grossly oversized
- All-electric vehicle efficiencies (kilowatt-hour per mile) are low
- Like BEVs, batteries are only resized in the modeling at certain mass reduction events, but not for any other road load reduction. This results in modeled battery energy capacities much higher than what is on current production vehicles.
- Non-battery system costs for both 30-mile range PHEV and 50-mile PHEV (PHEV30 and PHEV50) technologies are inappropriately high compared to previous analysis. The source of the costs are not disclosed, so there is no way to analyze how the costs were developed and what specifically contributes to the inappropriately high modeled costs. Previously, NHTSA had disclosed that information[288]

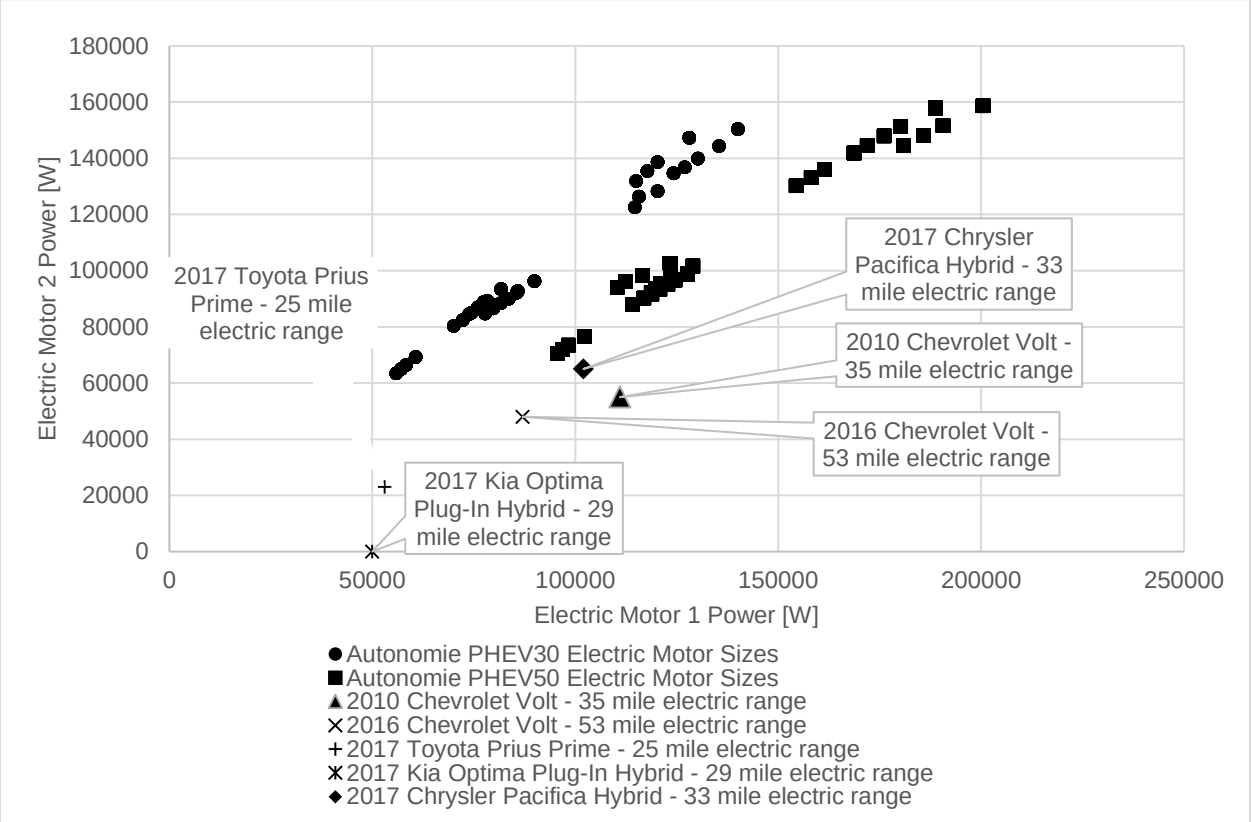
[288] Documents associated with the MYs 2012-2016 rulemaking. NHTSA. Accessed on October 24, 2018. https://www.nhtsa.gov/es/corporate-average-fuel-economy/documents-associated-mys-2012-2016-rulemaking.

- Current production PHEV models, which have a strong HEV drivetrain option, do not have the additional complexity implied by the large incremental costs applied to the PHEV technologies over the strong HEV technologies.

i. PHEV electric motors have been oversized.

In almost all cases, the electric motors for the 30 mile all electric range plug-in hybrids (PHEV30) and 50 mile all electric range PHEVs (PHEV50) are grossly oversized, and the combustion engines also have too much power assigned to them relative to current production vehicles. *Figure V-10* shows the maximum rated motor power in Watts for each electric motor for the Autonomie results for PHEV30s and PHEV50s (all classes of vehicles) and for some production PHEVs.

Figure V-10 Autonomie Modeled PHEV 30 and PHEV 50 and Example Current Production PHEVs Electric Motor Power in Watts



In the case of the 2016 Chevrolet Volt, which is the only current representative example of a PHEV50, its first electric motor is rated at 87kW (x-axis of the chart) and its second is rated at 47kW (y-axis of the chart). Both motors are far smaller than any motor combination in the Autonomie results, regardless of vehicle classification. The Agencies have disclosed virtually no information about how both the PHEV30 and PHEV50 non-battery components were cost modeled, and very little about how the motors were sized. However, the grossly oversized electric motors could be a dominant factor in

driving the high system costs that are inappropriately assigned to these technologies in the modeling, particularly if the Agencies are still using the outdated motor teardown information.

ii. The Agencies incorrectly assumed overpowered engines on PHEVs.

Figure V-11 Autonomie Modeled PHEV30 and PHEV 50 and Production Vehicle Examples
(ICE Power vs. Electric Motor 2 (Starter/Generator) Power in Watt)

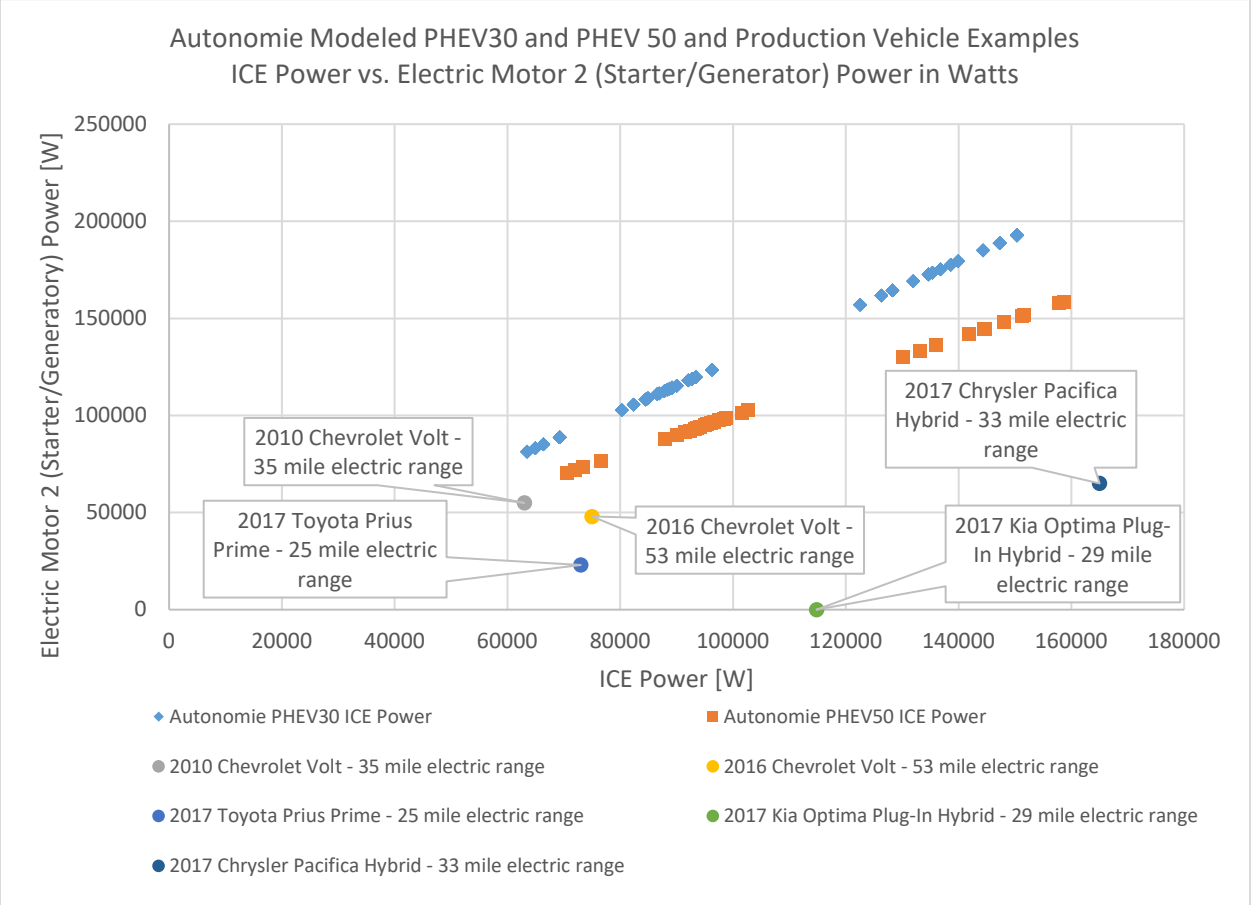


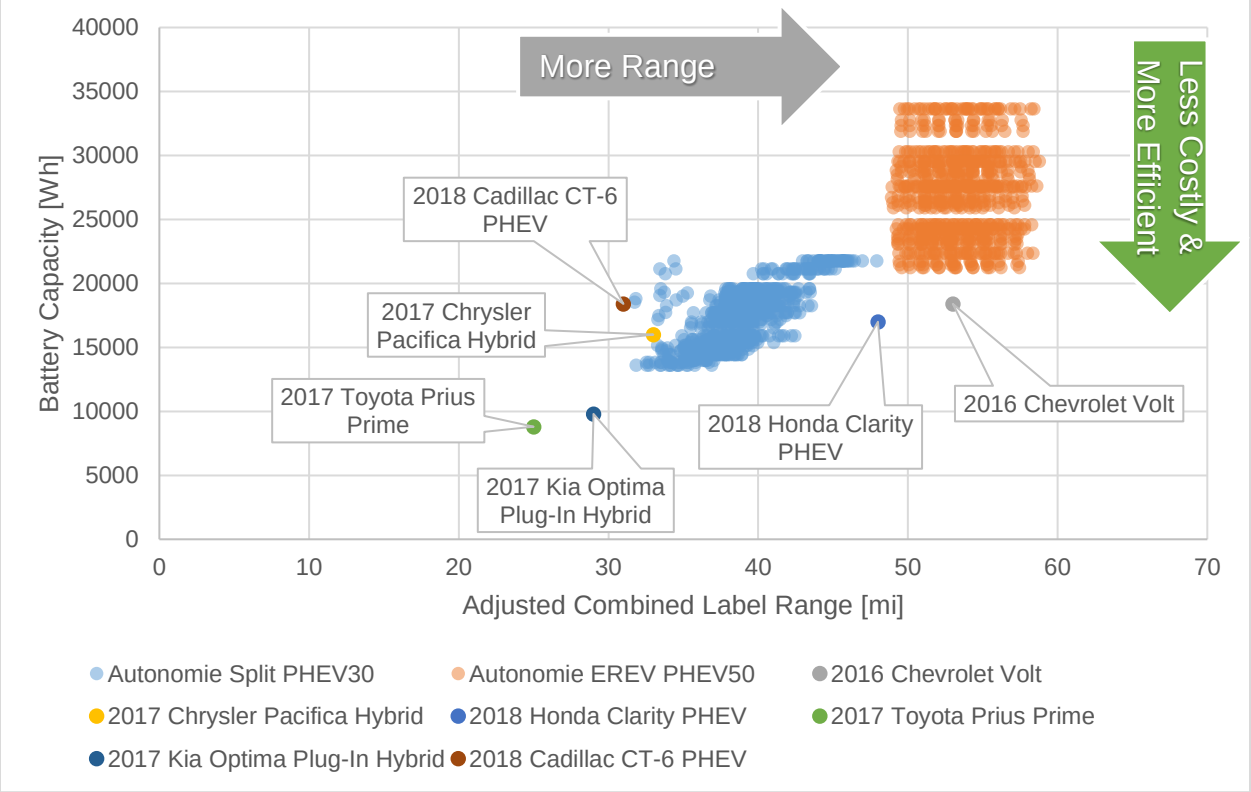
Figure V-11 shows the relationship between the Autonomie modeled (all vehicle classes) PHEV30 and PHEV50 vehicle assumed gasoline combustion engine peak power in Watts (x-axis) and the Electric Motor 2 power in Watts (y-axis). The Electric Motor 2 in the Autonomie modeling is considered to be the starter/generator motor for the purposes of charging the battery pack when the vehicle is operating in pure electric mode. It is evident that the Electric Motor 2 is vastly oversized in every application relative to current, and previous, production PHEVs. Again, while there is little to no information on how these system were cost modeled by the Agencies, oversizing of components is likely a big contributor to the vastly inflated costs of these systems.

Previous analysis completed by the Agencies for the TAR compared the modeled motor sizing to actual production vehicles to ensure the Agencies modeling was realistic.

> *Based on this analysis and a new power-to-weight study described in Section 5.3, EPA has revised the PHEV motor power ratings assumed for its GHG assessment. The assessment will therefore adopt power ratings closer to those suggested by the power-to-weight ratios that PHEV manufacturers appear to be following, while maintaining an estimated acceleration performance equivalent to conventional vehicles. Assigning a more accurate power rating to the PHEV motor will allow greater fidelity in the projected cost of both the battery and non-battery components of PHEVs. Specific adjustments to PHEV motor power sizing are discussed in Section 5.3.*[289]

Again, no justification has been provided for what the Agencies did in the NPRM but it is apparent that the Agencies did not compare and validate their modeled PHEV electric motor sizes against production vehicles and adjust if necessary, as they have done in previous analysis.

Figure V-12 Label Range vs. Battery Capacity



[289] Draft TAR, p. 5-90.

Figure V-12 shows that in several cases, the modeled battery capacity (y-axis) to achieve a certain range (x-axis) in the Autonomie simulation results, is much bigger than what exists on several representative current production vehicles. The most evident example is the 2016MY Chevrolet Volt. It has 53 miles of all-electric range and is an EREV configuration virtually identical to what Autonomie attempted to model as 50 mile extended range electric vehicle (EREV) (i.e., the square marker) in the upper right. However, the Volt's battery capacity is already far smaller than any available combination of technologies that Autonomie modeled. The modeled sizes, intended to be representative of ~2020MY through 2030MY PHEVs, already underestimate the state of technology introduced over two years ago with the 2016MY Volt. When considering even modest rates of likely improvement into the future, the Autonomie results become even more unrealistic. Even relative to today's Volt, Autonomie oversizes the battery (and thus the costs) by over 25-40 percent.

Figure V-12 also shows that many of the modeled combinations of technology have ranges that far exceed their targeted value. This is particularly true for the PHEV30s, shown as the cluster of triangle markers on the graph, that were intended to nominally all have a range of 30 miles. As noted earlier where resizing of the battery pack is not done for the vast majority of actual technology combinations, one of the consequences is clearly noticeable as some of the intended 30 mile range vehicles reach nearly 50 miles in range. Further, not one of the modeled PHEVs actually hits the 30 mile target – all vehicles have greater than 30 miles extended range. This oversizing in the battery packs results in vehicles that are not representative of 30 mile PHEVs, and, in turn, greatly exaggerate the projected costs for that technology. In addition to directly causing increased cost with a larger battery, the impact snowballs as the larger than necessary battery pack causes the vehicle's curb weight to be higher than necessary which leads to the vehicle being less efficient which leads back to a need to have an even larger battery pack.

In prior analyses, EPA recognized the need to recalibrate battery sizing as the battery, motor, and vehicle technology continued to advance. For example in the 2016 Draft TAR, EPA revisited the original rulemaking assumptions by comparing predicted results to actual vehicles, and made changes to improve its sizing estimations.

> *For the FRM analysis, EPA determined battery energy capacities and power capabilities for modeled PEVs using a spreadsheet-based sizing methodology that was described in Section 3.4.3.8.1 of the 2012 TSD. Because battery capacity and power requirements are strongly influenced by vehicle weight, and battery weight is a function of capacity and power while also being a large component of vehicle weight, sizing the battery for a BEV or PHEV requires an iterative solution. This problem is well suited to the iteration function available in common spreadsheet software. A spreadsheet-based methodology was therefore selected as being sufficiently powerful while remaining accessible to public inspection using standard commercially available software. EPA used Microsoft Excel for this purpose, with the Iteration setting enabled and set to 100 iterations.*

> *This Draft TAR analysis is based on the same methodology, with significant refinements to reflect developments in the industry since the FRM and to improve the fidelity of the sizing estimates. The general methodology is reviewed below, followed by a review of the refinements.*[290]

For the NPRM, however, it appears the Agencies have reverted to outdated sizing assumptions as the projected PHEV battery sizes are clearly oversized relative to current production vehicles. By not even considering the currently available data, the Agencies have generated a false representation of the costs to comply with the existing standards.

The information presented by the Agencies in the 2016 Draft TAR and by the EPA in its Proposed Determination had far more supporting information and better documentation that points to a much more rigorous analysis of the components used in the PHEV systems.[291]

There are several examples of vehicles in the market that support much lower non-battery incremental costs for PHEVs than what the Agencies have put forth in this rulemaking. Those include the Toyota Prius Prime,[292, 293, 294] the Chevrolet Volt, and the Hyundai Sonata and Kia Optima PHEVs.

According to publicly available information published by Toyota, the plug-in hybrid Prius Prime utilizes virtually all of the same components as the non-plug-in Prius. The electrification components that are shared between the two models essentially encompass the entire drivetrain, including the ICE. The electrification components that are the same are:

- Electric Motor (MG1)
- Electric Generator (MG2)
- Power Split Device
- Reduction Gear
- Power Control Unit – Includes DC/DC Converter, Boost Converter, and Inverter

The Prius Prime has a few additional powertrain parts over the normal Prius which include: an on-board charger (which converts alternating current electricity to direct current electricity to charge the Prime's battery pack); a one-way clutch on the generator electric motor to provide drive power when needed; and a higher energy

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[290] 2016 Draft TAR, p. 5-315.
[291] 2016 Draft TAR, Sections 5.2.4.
[292] Hybrid Vehicle. Toyota. Accessed on October 24, 2018. https://www.toyota-global.com/innovation/environmental_technology/technology_file/hybrid.html#comm01.
[293] Toyota Prius Technical Specifications. Toyota. Accessed on October 24, 2018. http://media.toyota.co.uk/wp-content/files_mf/1329489972120216MTOYOTAPRIUSTECHNICALSPECIFICATIONS.pdf.
[294] Prime Mover: Toyota Maxes Out Tech and Style in the World's Best-Selling Hybrid to Create the 2017 Prius Prime. Toyota. Accessed on October 24, 2018. https://toyotanews.pressroom.toyota.com/releases/prime-mover-toyota-creates-2017-prius-prime.htm.

capacity high voltage traction battery to enable the Prius Prime to be a plug-in hybrid vehicle.

General Motors has stated publically that they were able to significantly reduce the cost of their second generation Chevrolet Volt relative to its first generation.[295] During a presentation at the 2015 Global Business Conference, GM's CEO[296], The second generation Volt went from 38 miles of all electric range to 53 miles. The electric drivetrain unit, which GM refers to as the generation two Voltec Drive Unit, lost 45kg of mass as well.[297] Charge sustaining fuel economy improved from 37 mpg to 42 mpg, combined.

The Hyundai Sonata and Kia Optima PHEVs share most of their components with their non-plug-in, hybrid counterparts. They use the same electric motor in the P2 position, but for the PHEV version of the vehicles, the electric motor operates at a higher voltage and is able to produce more peak power.[298] The other component differences and additions for the PHEVs over the non-plug-in hybrids include the addition of the on-board charger, and the higher voltage, larger energy capacity battery pack.

These three examples illustrate that what the Agencies are asserting for the incremental costs of a PHEV over strong HEV technologies are not supported in the market. Because the Agencies disclose very little about how their costs were developed for these technologies, particularly on the non-battery component side, it is virtually impossible to understand what the drivers are for the increases in costs relative to the Agencies' previous analysis for the 2016 Draft TAR and EPA's Proposed Determination. The available PHEV market offerings do not support the Agencies' upward adjustment in costs relative to its previous analysis in the 2016 Draft TAR and EPA's Proposed Determination, and significant incremental and total system costs, and no justification is provided for the change.

c. The Agencies make incorrect assumptions regarding strong hybrids.

Regarding strong hybrids, the analysis has several errors, incorrect assumptions, and methodology flaws. These combine to result in inappropriate combinations of technologies with strong hybrids that are excessively costly and, in some cases, result in a disbenefit in fuel efficiency.

For example, in the existing standards scenario, the model projects over 600 of the approximately 1600 total vehicle models will be strong hybrids in 2029MY with the vast majority of those 600 being P2 HEVs with an 8-speed automatic transmission and

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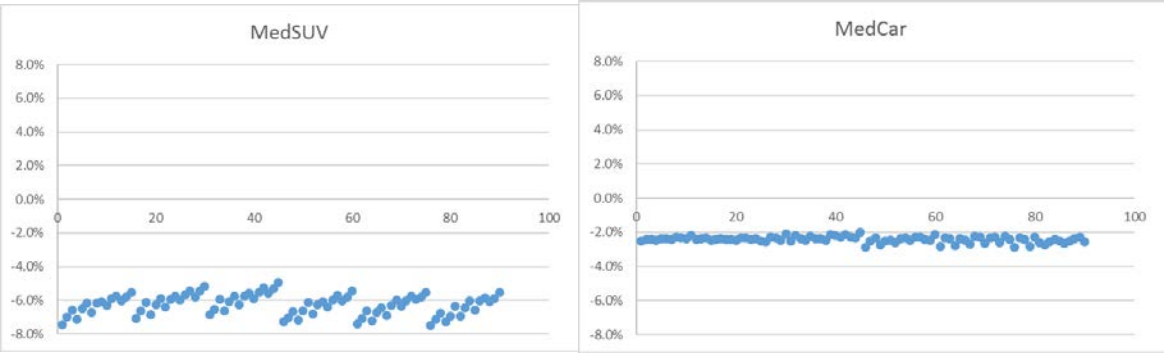
[295] Vehicles with more efficiency at better margins. Insideevs. Accessed on October 24, 2018. https://insideevs.com/wp-content/uploads/2015/10/volt-profit-maring-increase.jpg.
[296] GM: Chevrolet Bolt Arrives In 2016, $145/kWh Cell Cost, Volt Margin Improves $3,500. Insideevs. Accessed on October 24, 2018. https://insideevs.com/gm-chevrolet-bolt-for-2016-145kwh-cell-cost-volt-margin-improves-3500/.
[297] SAE Paper# 2015-01-1152, as presented at 2015 SAE Hybrid and Electric Vehicles Technologies Symposium.
[298] First Drive: 2016 Hyundai Sonata PHEV and HEV. Green Car Congress. Accessed on October 24, 2018. http://www.greencarcongress.com/2015/05/20150526-sonata.html.

coupled with an advanced gasoline engine with TURBO2 or CEGR1 technology. However, such a combination of advanced gasoline with a strong hybrid is an illogical combination because some of the efficiency improvements of the advanced gasoline engine are unnecessary and no longer have a worthwhile benefit when paired with a strong HEV. Indeed ANL's own modeling shows that in many cases, a TURBO2 or CEGR1 engine technology coupled with a P2 HEV results in worse fuel economy/higher GHG emissions than when coupled with a TURBO1 engine. Each dot in the charts below represent the modeled fuel consumption improvement of a CEGR1 P2HEV incremental to a TURBO1 P2HEV. The charts show that, for both the medium SUV and medium car vehicle classes, the improvement is negative meaning GHG emissions are actually higher than they would have been if the less advanced technology (and less costly) TURBO1 gasoline engine had been used.

Figure V-13 Incremental fuel consumption improvement (or loss) for CEGR1 P2HEV relative to a Turbo1 P2HEV

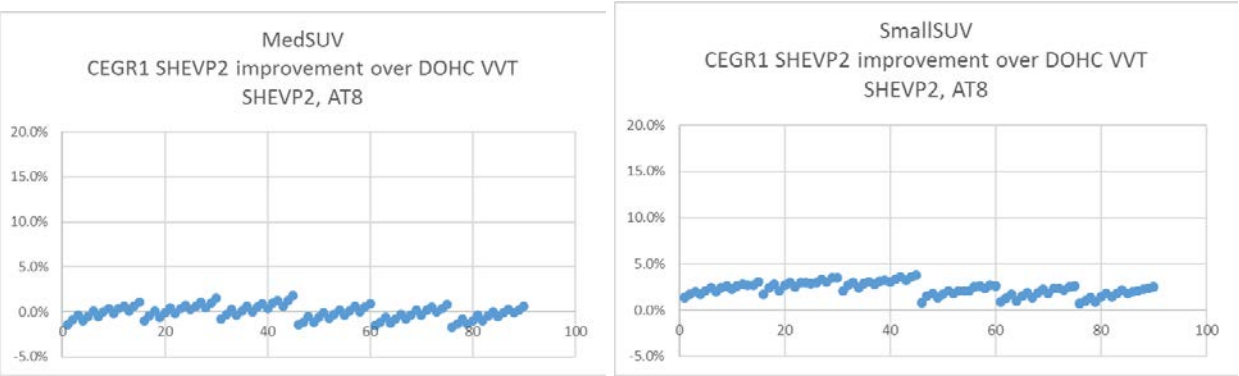


As another clear indication of the failure of the CAFE Model to carry out is primary purpose of finding the lowest cost path for compliance, the CAFE Model still selects these technology combinations in the final results. This causes inflated costs (by including unnecessary advanced engine technology with the strong HEV system) and then of course, the model must also add even more technology to these or other cars because these combinations actually cause GHG emissions to be higher than they should. While not all vehicle classes show similar negative results, 6 of the 10 vehicle classes show consistently negative results and 2 of the remaining classes show efficiency gains of less than 1 percent. Such a small improvement could readily be had by cheaper combinations of technology than the advanced CEGR1 engine represents.

Further, in several cases, the selected combinations of CEGR1 or TURBO2 with a P2HEV are worse or only negligibly better than if the P2HEV had been paired with a conventional gasoline engine with VVT. In Figure V-14 and Figure V-15 below, the incremental efficiency improvements of CEGR1 P2HEV are plotted relative to a conventional DOHC VVT P2HEV for the medium and small SUV vehicle classes. Clearly the combination of technologies is illogical as the selection of such an advanced gasoline engine (in the case of CEGR1) increases cost substantially yet it only marginally decreases or, in some cases, actually increases GHG emissions-- yet the CAFE Model still selects that combination for some vehicles. In addition to making the

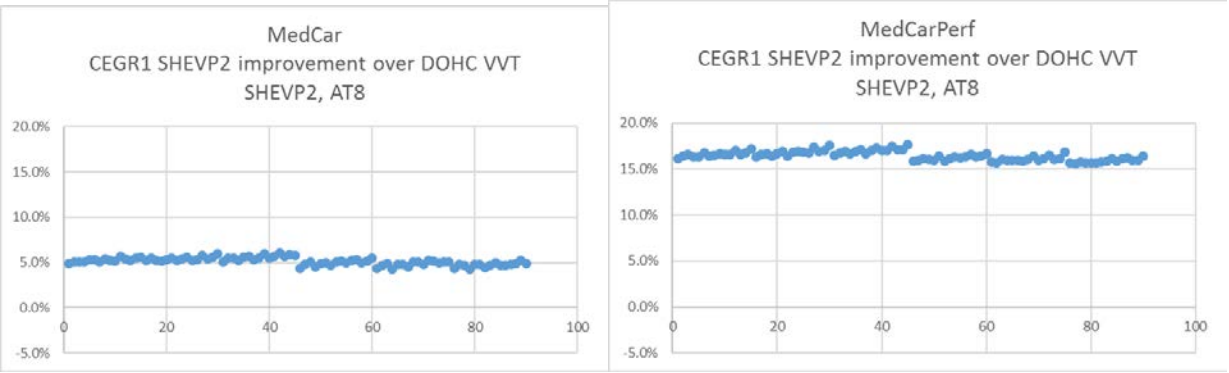
analysis falsely indicate higher costs and more technology than what is actually needed, this again confirms that that CAFE Model is using inappropriate logic or algorithms. A cost optimization model would not be designed to allow selection of combinations that are cost ineffective and conflict with the types of choices that vehicle manufacturers will make in product planning and final design.

Figure V-14 Incremental improvement in fuel consumption for a medium and small SUV SHEVP2 paired with a CEGR1 engine over the same SHEVP2 paired with a conventional engine



The model results also show unexpectedly and irrationally high differences in vehicle classes for the same technology combinations. For instance, when comparing the same technologies as used in the previous examples (i.e., the relative improvement of a CEGR1 P2HEV versus a conventional DOHC VVT P2HEV) for a medium size car, the model predicts fuel consumption improvements of ~5 percent while the same combinations of technology on a medium size performance-designated car shows improvements in excess of 15 percent.

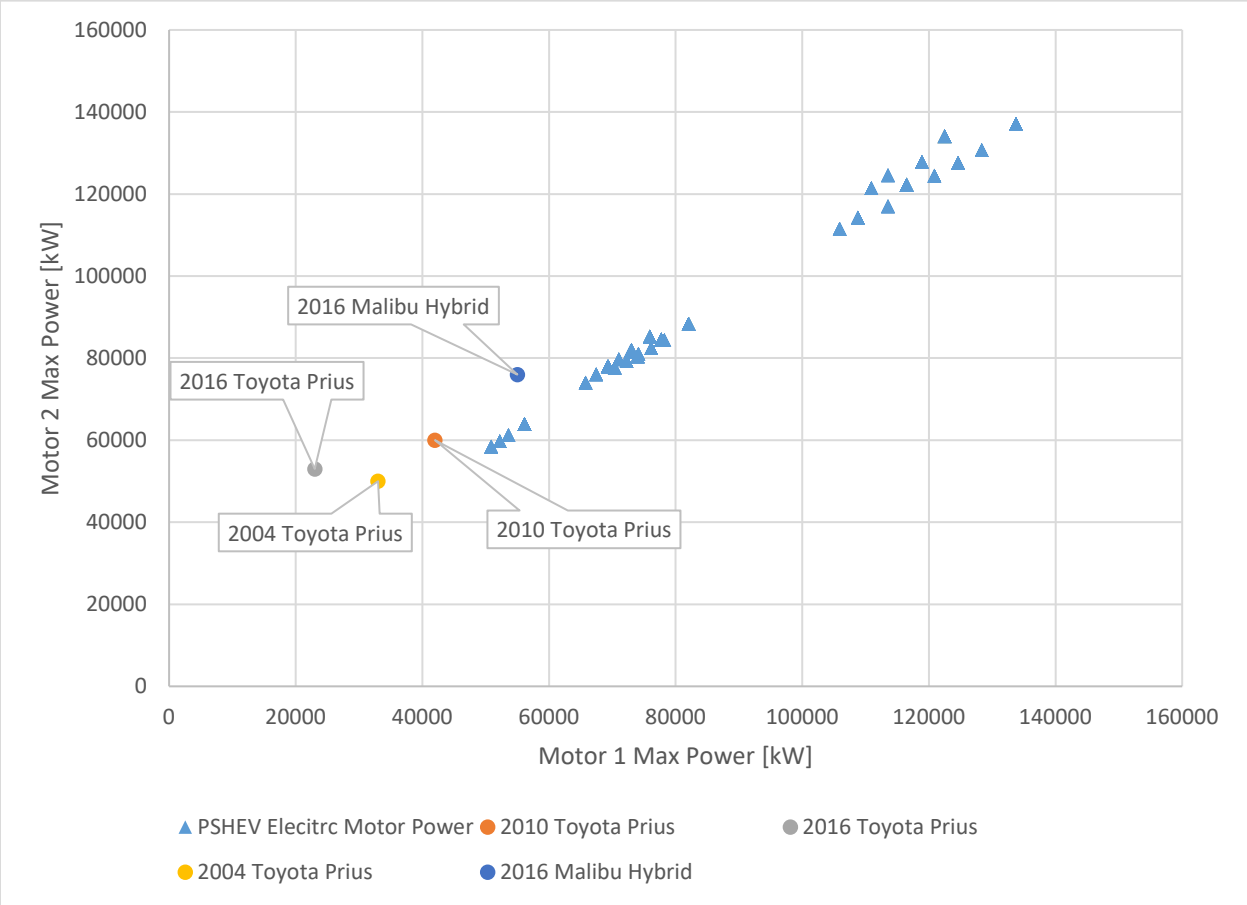
Figure V-15 Incremental improvement in fuel consumption for a medium non-performance and performance car SHEVP2 paired with a CEGR1 engine over the same SHEVP2 paired with a conventional engine



Such discrepancies likely reflect fundamental mistakes in the inputs or Autonomie model logic and cast considerable doubt on the validity and robustness of the data relied upon for the NPRM analysis.

As noted above, utilizing the same rule to resize electric motors and batteries as was used to resize ICEs is improper, particularly for strong hybrids. Manufacturers have shown that they will optimize designs of both batteries and electric motors for each particular vehicle model, and resizing is not done based on some arbitrary mass reduction amount. The 3rd generation Toyota Prius introduced for the 2010MY has a listed curb weight of 3,042 pounds.[299] The 4th generation Prius has a base curb weight of 3,050 pounds.[300] Accordingly, the vehicle has undergone essentially no effective mass reduction from the 3rd generation to 4th generation as a whole vehicle, yet almost every aspect of the 4th generation powertrain has been redesigned and optimized. This resulted in significant improvements in fuel efficiency and cost for the 4th generation model. The Agencies would not allow this optimization to occur and, as a result, mistakenly oversizes batteries and electric motors.

Figure V-16 - Autonomie Modeled Power-Split Hybrid vs. Production Power-Split Hybrid Vehicle Electric Motor 1 & 2 Max Power



[299] 2010 Toyota Prius Spec & Performance. Nada Guides. Accessed on October 24, 2018. https://www.nadaguides.com/Cars/2010/Toyota/Prius-4-Cyl/Liftback-5D/Specs.
[300] 2016 Toyota Prius Spec & Performance. Naga Guides. Accessed on October 24, 2018. https://www.nadaguides.com/Cars/2016/Toyota/Prius/Liftback-5D-Three-I4-Hybrid/Specs.

As noted earlier, the Agencies provide little to no information of how costs were developed for non-battery components. Without that information, stakeholders can only guess as to why the costs have increased by such large amounts for strong hybrid systems relative to the Agencies' previous analysis for the 2016 Draft TAR and EPA's Proposed Determination. Without such details, it is unclear how much the improper rule on resizing of batteries, the incorrectly modeled batteries, or the much larger than necessary electric motors (that also have inappropriately high $/kW costs assigned to them) may be contributing to the overestimation of costs for the strong hybrid systems.

d. The Agencies undervalue potential improvements for mild hybrids.

For mild hybrids, the Autonomie modeling incorrectly assigns a smaller improvement for BISG and CISG systems than those systems can achieve. Utilizing the fuel consumption incremental value (FCIV) output file from the CAFE model, the modeled improvements of BISG and CISG systems, relative to conventional engines, turbo-charged engines, and high compression ratio engines without stop-start across the vehicle classes show a range of improvements from 4 percent to 6 percent. And, when looking at the configurations actually selected by the model in the existing standards run, nearly 500 of the 1600 vehicle models in 2029MY are mild HEVs with 496 of those 500 selected as BISG systems. The vast majority of these are vehicles equipped with a PO speed (with level 2 improvements) automatic AT10L2 transmission and mated with a TURBO2 or CEGR1 engine. A closer look at those combinations in the FCIV files show estimated improvements in the 5-6 percent for most vehicle classes and 4-5 percent for pick-ups, the most common class that gets a BISG system.

Figure V-17 BISG Efficiency for Medium-sized SUV (Incremental to Turbo2 or CEGR1)

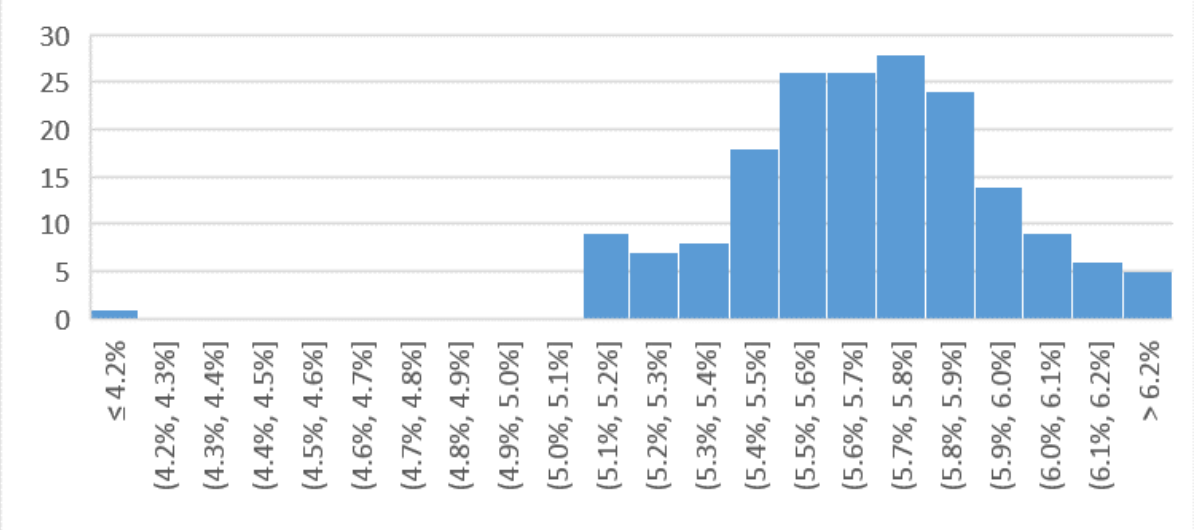
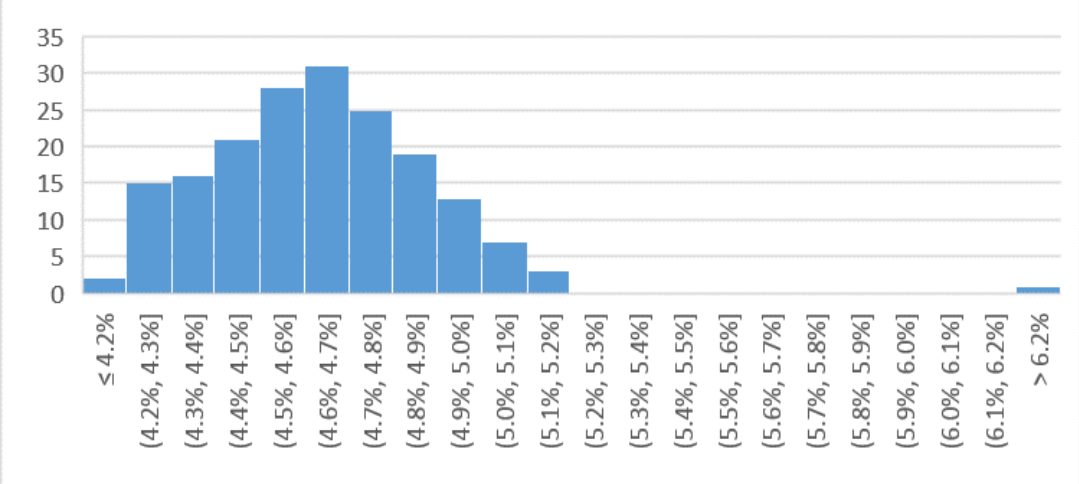


Figure V-18 BISG Efficiency Pickup Truck (Incremental to Turbo2 or CEGR1)



However, these improvements are substantially below all other estimates as to the benefits of a BISG system. For example, Table 5.85 of the 2016 Draft TAR noted that EPA was estimating 8 percent-9.5 percent improvement from 48V mild hybrids while NHTSA's modeling files from the Draft TAR indicated it was assuming 7.5 percent to 10 percent across various vehicle classes. The 2015 National Academy of Sciences report[301] estimated a 10 percent reduction in fuel consumption for mild hybrid technology. ANL's recent report for DOE,[302] using Autonomie and done by the same ANL staff that provided modeling results for the NPRM, indicated a modeled incremental fuel consumption improvement of 8.5 percent to 12.7 percent across vehicle classes from the 2015 to 2025 model years relative to turbocharged and non-turbocharged gasoline spark ignited engines in the same model years. The newly certified 2019 Ram 5.7L V8 2wd full size pickup is equipped with an optional 48V BISG system and certification data[303] shows the option increases unadjusted fuel economy from 17.90/31.35/22.18 to 20.80/31.95/24.68 respectively for city/highway/combined, which represents an approximate 11 percent improvement in combined fuel economy. Ward's Auto reported on a Delphi 48V prototype system that was installed on a Honda Civic and achieved a 10 percent reduction in CO_2 emission levels back in July of 2016.[304] Continental reports its BISG system has a 13 percent fuel savings.[305] Even

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[301] Electrified Vehicles, National Research Council. "Cost, Effectiveness, and Deployment of Fuel Economy Technologies for Light-Duty Vehicles". Washington, DC: The National Academies Press, 2015. https://doi.org/10.17226/21744. p. 155, § 4.
[302] "An Extensive Study on Sizing, Energy Consumption, and Cost of Advanced Vehicle Technologies. Argonne National Laboratory. Accessed on October 24, 2018. https://www.anl.gov/argonne-scientific-publications/pub/145412.
[303] Data for 2019 model year vehicles. Fuel Economy. Accessed on October 24, 2018. https://www.fueleconomy.gov/feg/epadata/19data.zip.
[304] "Delphi's 48V Bet Feels Like Sure Thing", Wards Auto. Accessed on October 24, 2018. http://wardsauto.com/technology/delphi-s-48v-bet-feels-sure-thing.
[305] 48 Volt belt-driven Starter Generator with integrated Inverter. Continental Automotive. Accessed on October 24, 2018. https://www.continental-automotive.com/en-gl/Passenger-Cars/Powertrain/Electrification/48-Volt-Mild-Hybrid/48-Volt-belt-driven-starter-generator.

EPA's prior analysis for the Proposed Determination estimated a higher technology effectiveness of 7 percent to 9.5 percent.[306] The Agencies provide no explanation or cite any evidence to support why their estimations not only differ from previous estimates and other sources but also contradict modeling results by the same ANL staff for the recent DOE report.

As noted earlier regarding costs for the BISG system, the rollback proposal irrationally increases non-battery costs by a factor of 2.17 for small cars and small SUVs relative to medium size SUVs and trucks. Additionally, battery costs for the BISG systems are substantially higher than previous analyses with no substantive evidence or rationale to support the change. For the proposal, the Agencies assumed a 0.806 kWh battery would be necessary regardless of the vehicle class yet previous analysis by the Agencies relied on substantially small batteries of 0.25 to 0.5 kWh. [307,308] No explanation of the need to upsize the battery was identified.

Further, the battery costs are now assumed to be ~$1,100 (2017MY) to ~$800 (2025MY) while previous analysis such as EPA's Proposed Determination used values from ~$500 to ~$300 in the same time period.[309] The 2019 Ram eTorque system, noted earlier, only utilizes a 0.430 kWh battery for a full size pick-up.[310] Hyundai and Kia use a 48V system in Europe on its Tucson and Sportage SUV models that utilizes a 0.46 kWh battery.[311] Resizing of the battery to a more representative size, which would be about 53 percent of the size utilized for the proposed rollback, would dramatically reduce costs to a level similar to those utilized in previous analyses.

To assess how much the erroneous assumptions for mild hybrids could be influencing the results, CARB ran a sensitivity case with partially modified costs and efficiencies only for the BISG system. Specifically, the fuel consumption improvements modeled by ANL in the most recent report for DOE[312] were utilized in place of the assumptions used for the Agencies' analysis. As noted above, ANL, via Autonomie modeling, identified efficiencies between 8.5 percent to 12.7 percent for mild hybrids, relative to both gasoline spark ignited and relative to turbocharged gasoline spark ignited across five different vehicle classes. Using approximately the smallest modeled improvement

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[306] Table 2.90 GHG Technology Effectiveness of Mild Hybrids, page 2-339, Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation: Technical Support Document, EPA-420-R-16-021, November 2016.
[307] Table 6-29 – BatPac Results for Reference vehicle classes with MR0, Aero0 and Roll0, PRIA, p. 376-377.
[308] 2016 Draft TAR, Section 5.3.4.3.2, p. 5-301.
[309] Table 2.125 Costs for MHEV48V Battery, page 2-399, Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation: Technical Support Document, EPA-420-R-16-021, November 2016.
[310] New 2019 Ram 1500 Specifications. Iimediaevents. Accessed on October 24, 2018. https://iimediaevents.com/2019ram1500/Files_Only_Content/Press-Releases/PDFs/2019_Ram_1500_SP.pdf.
[311] Hyundai. Accessed on October 24, 2018. https://www.hyundaimotorgroup.com/MediaCenter/News/Press-Releases/kmc-powertrain-180515.hub#.W8rJQ42ouUk.
[312] "An Extensive Study on Sizing, Energy Consumption, and Cost of Advanced Vehicle Technologies. Argonne National Laboratory. Accessed on October 24, 2018. https://www.autonomie.net/pdfs/ANL_BaSce_FY17_Report_10042018.pdf.

across the 2015 to 2025 model years for each of the five classes, improvements of 8.5 percent-11 percent were utilized for a modified CAFE Model run. Further, non-battery costs for the cars and small SUVs were reduced to match the non-battery costs for the medium SUVs and trucks—which still reflects higher costs than those previously used by EPA in the Proposed Determination. The battery costs, which were noted above to be excessive by approximately 50 percent due to erroneous oversizing of the battery, were not adjusted. The results of this run are summarized in the table below. The changes in BISG assumptions were significant as the first column shows average vehicle technology costs to meet the existing standards dropped by $300 to $500 per year, reflecting an approximate 25 percent drop in 2029 model year incremental technology costs to meet the existing standards relative to the rollback standards.

Table V-15 Change in Average Vehicle Technology Costs with Corrected BISG assumptions[313]

MY	Existing Standards Ave. Tech Cost (NPRM BISG assumptions) - Ave. Tech Cost (New BISG assumptions)	Rollback Standards Ave. Tech Cost (NPRM BISG assumptions) - Ave. Tech Cost (New BISG assumptions)
2016	0	0
2017	41	0
2018	120	9
2019	166	16
2020	147	12
2021	211	22
2022	248	18
2023	342	15
2024	337	15
2025	321	14
2026	369	13
2027	380	14
2028	427	15
2029	470	16
2030	462	14
2031	454	14
2032	450	13

For CISG systems, the proposed rollback analysis indicates similarly low, and typically, even lower, efficiency improvements than the BISG systems. Relative to BISG, CISG systems are generally considered more capable and more efficient as they do not have

[313] See submitted DVD, folder “BISG Changes Table V-15” for input and output files associated with this table.

the same belt-related constraints including maximum torque limitations, load restrictions on the front crank to avoid uneven crankshaft bearing wear, and mechanical energy transfer losses. Further, the decision to implement a CISG system is typically made early in the design process because doing so often requires an engine block casting change. The assumption that manufacturers would not optimize the engine and transmission when installing a CISG is not realistic and results in improper pairing of advanced gasoline engines and transmissions in the modeling and leads to underestimation of the efficiency benefits.

The Agencies fail to disclose the necessary details to conclude why the mHEV systems are projected to have so much lower efficiency than past estimates. However, they acknowledge it did not adjust final drive ratios, customize shift patterns, or resize engines when the model adds a BISG or CISG to a vehicle. Directionally, all of these likely result in less than full optimization to take advantage of the capability of the system. For instance, the ability of the CISG system to provide low end torque makes it an ideal technology to pair with an engine technology that may have poor low end torque but improved efficiency under other conditions. Examples could include an HCR engine sized with minimal low end torque to maximize efficiency improvements in other operating conditions or a turbocharged downsized engine equipped with a larger turbine to reduce backpressure but provide improved efficiency over a larger portion of the engine map.

It is also undisclosed whether the ANL modeling took full advantage of the system like vehicle manufacturers likely would to use the system not just at or near idle but to also provide temporary boosts for acceleration and to enable engine shut-off during coasting events such as Daimler's EQ Boost system.[314] Further, the technology package modeling results in the ANL files provided in the docket indicate that over 80 percent of the modeled systems with mild hybrids resulted in performance improvements over the baseline vehicle indicating some portion of the system capability was improperly modeled to improve performance rather than reduce CO_2 emissions. The assumption that CISG systems are typically worse efficiency than BISG system reflects a lack of understanding as to how the systems work and the underlying physics involved. Regardless the reason, the Agencies knew better and should have used a more appropriate estimate for the effectiveness of the system. By not doing so, the analysis has underestimated the benefits of mHEV 48V systems and overinflated the costs for compliance by forcing more costly technologies to be added to make up for the shortfall.

Systematically, the Agencies have changed from previous analyses and utilized several key assumptions and methodologies that combine to generate artificially high technology costs. The modeling of excessive over-compliance with the rollback standards to underestimate the impacts of increased fuel usage to consumers and the

[314] Mercedes Benz press release. Mercedes Benz. Accessed on October 24, 2018. https://www.mbusa.com/vcm/MB/DigitalAssets/AboutUs/PressReleases/PR-2019_Mercedes-BenzCLS.pdf.

environment not to mention undermining the Agencies' position that the rollback standards are maximum feasible. The model itself uses a flawed ranking algorithm that results in application of cost-ineffective technologies and correspondingly finds a more expensive estimate of technology costs. Additionally, the Agencies' methodology of full simulation modeling failed to maintain baseline vehicle performance resulting in significant portions of the technologies being applied to improve vehicle performance rather than reduce vehicle GHG emissions causing even more technology (and cost) to be added. Combined, these errors have a particularly exaggerated effect on the electrification packages that estimate exaggerated costs due to oversizing of components and batteries and significant vehicle performance gains.

4. The CAFE Model shows over-compliance without any reasonable basis.

For the NPRM analysis, the Agencies have inappropriately modeled substantial over-compliance with the proposed rollback without any reasonable basis, thereby violating their own guidelines and statutory direction. This approach also results in an incorrect calculation of the benefits and costs for the rollback as it underestimates significant costs to consumers, GHG emission impacts, and air quality impacts.

In Table VII-22 of the NPRM,[315] the Agencies show that the modeling run for the existing standards has the industry, as a whole, just meeting the required standard. The table indicates the required standard in 2029MY is projected to be 175 grams per mile (g/mi) and the achieved fleet average is 174 g/mi. However, when it comes to modeling the proposed rollback, Table VII-23[316] shows a required standard of 240 g/mi but the achieved fleet average is 230 g/mi, resulting in substantial over-compliance of 10 g/mi. Given the total difference in the rollback and existing standards is 65 g/mi, this over-compliance represents over 15 percent of the gap between the two.

In the CAFE modeling, the over-compliance is even more excessive where Tables VII-1[317] and VII-2[318] show that nearly 3 mpg of over-compliance is modeled in the proposed rollback representing over 28 percent of the entire gap between the required standard in the existing standards (46.6 mpg) and in the proposed rollback (37.0 mpg). Over the course of the CAFE regulation, for which there is a lengthy record, manufacturers have not historically over complied with the required standards in any similar type of fashion as what has been modeled by the Agencies. Based on data from EPA's annual trends report and Oak Ridge National Lab's (ORNL) Transportation Energy Data Book, *Figure V-19* below shows that industry has not systematically over complied with the required standards. Accordingly, it is inappropriate to be modeling such dramatic over-compliance in the NPRM analysis.

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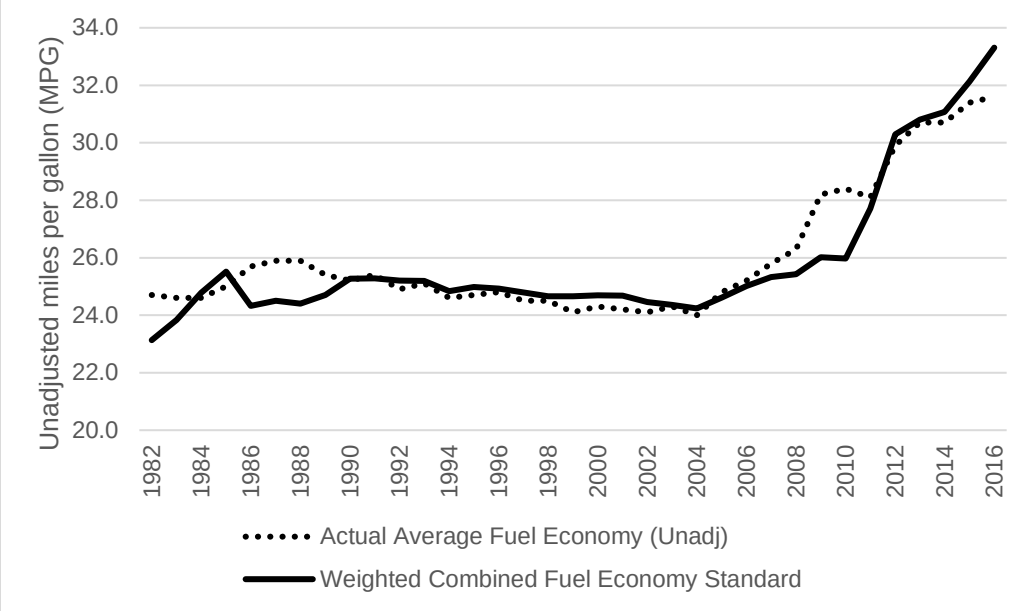
[315] 83 Fed.Reg. at 43,283.
[316] 83 Fed.Reg. at 43,285.
[317] 83 Fed.Reg. at 43,257.
[318] 83 Fed.Reg. at 43,259.

Figure V-19 Fuel economy standards and actual unadjusted fuel economy[319]



Modeling such over-compliance in the proposed rollback skews the results of the analysis and misleads the stakeholders as to the impacts on consumers and the environment. It does so by falsely under-estimating the increase in fuel consumption that consumers will face in operating costs, the increase in criteria pollutant emissions from increased refining and handling of the additional fuel, and the increase in GHG emissions emitted by vehicles. For example, the inappropriate modeling of the rollback scenario underestimates 18 billion gallons of gasoline being consumed, between calendar year 2016 through 2032.

Lastly, the modeled over-compliance in the proposed rollback (which is used to define the benefits and costs of the rollback) shows that the industry as a whole, would actually comply with the existing 2021MY standards instead of the proposed rollback at 2020MY standards. A full 13 of the 16 manufacturers would also individually meet the 2021MY CAFE standards even though the Agencies have proposed to flatline the standards at 2020MY and claimed to model compliance only with the 2020MY standards. Further, the remaining three (Ford, Fiat Chrysler, and Volkswagen) only fall short of the 2022MY standards because the Agencies presume a significant shift in fleet mix to more cars in the proposed rollback which effectively makes each of these three manufacturers' standard over 2 mpg higher in the rollback scenario in 2021MY compared to the current standards scenario in 2021MY. The presumption that this proposed rulemaking, which is yet to be finalized, would result in this dramatic shift in sales mix for a model year that

[319] See CARB created "FuelEconomy" Excel Spreadsheet, which uses data from the following sources: https://cta.ornl.gov/data/chapter4.shtml (Table 4.11) and EPA 2016 Trends Report: https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100TGIA.pdf.

is effectively only two years from now, is even more unrealistic considering both Ford[320] and Fiat Chrysler[321] have publicly announced that they will be ending sales of virtually all car based models. And, in addition to the rollback scenario modeled by the Agencies having sufficient over-compliance to meet the 2021MY current standards instead of the proposed 2020MY maximum feasible standards, it has so much over-compliance that nearly 40 percent of the manufacturers would also meet the existing 2022MY standards.

Given the entire analysis and its net benefits and costs are predicated on this modeled over-compliance, the Agencies have actually modeled compliance with more stringent standards than proposed. According to EPA's Guidelines for Preparing Economic Analyses[322], the agency "…should develop baseline and policy scenarios that assume full compliance with existing and newly enacted (but not yet implemented) regulations." Modeling substantial over-compliance in the rollback scenario is contrary to this guideline. For NHTSA, this violates its requirement to adopt maximum feasible standards. It cannot credibly define the 2020MY standards as maximum feasible (and flatline 2021 through 2026 standards from there) while basing its analysis on compliance at levels comparable to the more stringent existing 2021MY standards.

In regards to assessing manufacturer compliance with the existing standards and proposed rollback, one of the fundamental principles of the Agencies' analysis is that, within the defined constraints, manufacturers will seek the lowest cost to comply. The PRIA states:

> *The CAFE model applies a given technology to a given vehicle and estimates the incremental improvement in fuel consumption from the new combination of technologies on that vehicle – with the ultimate goal of applying the lowest cost technology combination that allows the vehicle to meet the CAFE or CO_2 standard.*[323]

Within the defined constraints, this is usually done by adding the most effective technology (in terms of percent CO_2 reduction) at the lowest achievable cost. The CAFE Model, however, fails to accurately do that and results in an overestimation of the actual costs to comply with the existing standards.

5. The Agencies failed to choose appropriate technology packages.

In an attempt to decide which technologies to add to a vehicle, the CAFE Model uses an algorithm to calculate a metric that would be expected to represent the most cost-effective technology to deploy. This is intended to represent how each manufacturer

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[320] "Ford Details Plans to Improve Fitness, Refocus Model Lineup and Accelerate Introduction of Smart Vehicles and Services" Ford Motor Company. Accessed on October 24, 2018. https://s22.q4cdn.com/857684434/files/doc_news/archive/1-16-2018-deutsche-bank-press-release.pdf

[321] Wayland, M. FCA to stop making Dart, 200; focus shifts to RAM, Jeep. The Detroit News. Accessed on October 24, 2018. https://www.detroitnews.com/story/business/autos/chrysler/2016/01/27/fca-plan/79400188/.

[322] § 5.4.1, p. 5-9, Guidelines for Preparing Economic Analyses, December 17, 2010 (updated May 2014), National Center for Environmental Economics, Office of Policy, U.S. Environmental Protection Agency.

[323] PRIA, p. 357.

would quantitatively evaluate (i.e., rank) the available technologies to apply to a given vehicle to decide on which technologies to deploy. In general, this metric would typically be defined as some ratio of costs versus benefits. However, in the CAFE Model, this algorithm metric is largely defined as the difference between technology costs and fuel savings (only for the first 30 months of the vehicle's life) divided by the total affected sales for that vehicle. While this metric biases the model to select more technologies on high volume vehicles, it also results in an illogical decision making process for how a manufacturer would achieve compliance and results in a more costly compliance path.

Specifically, this algorithm does not consider the full benefits associated with the technology being applied for individual vehicles. Rather than look more simply at costs divided by the full benefits of the technology like that used by EPA in its OMEGA model, the formula in the CAFE Model primarily looks at costs minus the partial benefits of the technology—namely, the benefits in the form of fuel savings in the defined 30 month payback period. While the algorithm does attempt to further consider a larger portion of the benefits of the technology, it does so in an inappropriate manner and still fails to capture the full benefits.

The model emulates a CAFE compliance like approach where manufacturers can choose to pay fines rather than comply. When modeling CAFE scenarios, the model compares the costs of adding further technology necessary to comply versus the costs of paying fines in lieu of complying. When it is cheaper to pay fines, the model would stop applying technology. However, no such option exists in the EPA GHG standards. Yet the CAFE Model still tries to monetize a theoretical fine that manufacturers would be able to pay for failing to comply and includes a valuation of how much would be saved in fines by adding the next technology. In fact, the scenarios input file for the CAFE Model shows that it is directly using the CAFE fines amount (e.g., $5.50 per 0.1 mpg of shortfall) to calculate the theoretical value of a CO_2 credit for use in the CO_2 CAFE Model. This approach is not only invalid for modeling of the GHG standards, it results in the partial benefits of the technology being scaled to a very small monetized value that has virtually no impact on the cost calculation in the algorithm. EPA brought up the same concerns during its preliminary review:

> *In reality, the value of a CO_2 compliance credit to any manufacturer is a function of complex and interrelated factors, making it difficult to incorporate a realistic estimate into any model. The dollar value of a credit for a particular manufacturer would depend on their compliance status, their fleet composition and applied technologies, the cost of the available technologies for further reducing CO_2 emissions, the availability*

of banked credits, the level of future stringency increases, and many other factors.[324]

To make matters worse, this term of the algorithm does not even consider the full benefit of the technology. When evaluating a technology that would reduce the theoretical fines, the algorithm eliminates consideration or valuation of any benefits that occur from the technology causing the vehicle to over-comply with its standard. As an example, if a vehicle is currently 30 g/mi above its standard and the addition of a specific technology would cause it to drop 40 g/mi to be at a net level of 10 g/mi below its standard, the algorithm will only value the benefit from the first 30 g/mi of reduction that would take the vehicle from 30 g/mi over to being in compliance at the standard. The additional 10 g/mi of benefit, while real, is assigned zero dollars of valuation. This results in technologies being ranked based on a less than full recognition of their benefits and causes less cost effective technologies to be applied first. Said another way, it results in the same technology being ranked lower if it is being considered for a car that is already at or near its standard versus how it would be ranked for a vehicle that is far dirtier than its standard. EPA noted this same finding in their preliminary review of the model, stating:

The problem is that in truncating credit values at zero as shown in Equation 4, the CAFE Model gives less consideration to technologies that reduce a vehicle's CO_2 below its target, regardless of how cost effective that technology might be.[325] Even with both of the algorithm's two terms for partial valuation of the benefits of the technology, the end result is that it causes the model to pick technologies with lower upfront *cost* rather than technologies with better overall *cost effectiveness*. For example, on a vehicle that is below, at, or barely exceeding its standard, the model might evaluate two theoretical technologies. The first could be a $1000 technology that saves $900 in fuel costs in the first 30 months (pays back 90 percent of its cost in that timeframe) which would make it a very cost effective technology. However, that technology would not be applied by the model before a very cost ineffective technology that costs $100 and only saves $1 in fuel costs in the first 30 months (pays back 1 percent of its cost in that timeframe). In the algorithm used by the CAFE Model, the second technology would look more attractive as the net cost minus fuel savings is $99 while the second one is a net cost of $100. For a model that is intended to minimize costs, this makes absolutely no sense. Of course, it is also easy to see that you would need to put the second technology on 900 cars (at a cumulative cost of $90,000) to save $900 in fuel (or improve the fleet emissions by the equivalent of saving $900 in fuel). On the other hand, you could put the first technology on just one car (at a cumulative cost of $1,000 or just 1.1 percent of the other technology's cumulative cost), and save the same $900 in fuel (or improve the fleet emissions by the equivalent of saving $900 in fuel).

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[324] William Charmley, email message to Chandana Achanta, June 18, 2018. Regulations. Accessed on October 24, 2018. https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0283-0453, Attachment 5, p. 22.
[325] *Ibid.*

In addition to the algorithm considering technology cost and early fuel savings, it also considers total vehicle sales and ranks the same technology as more favorable if it is being applied to a higher sales volume vehicle. When combined with the partial valuation of the technology benefits that only considers full value for reductions on vehicles significantly dirtier than their standard, this causes the model to not just prioritize but inappropriately favor technology deployment on high volume vehicles that are the highest emitters relative to their standard. In other words, for a given manufacturer, the model will prioritize application of technology packages that are the lowest up front technology cost to vehicles that are the dirtiest relative to their standard. If a particular vehicle is already close to its GHG standard, the same technology package that gets selected by a dirtier vehicle because it is the most cost-effective, will be ranked lower by the algorithm and not applied to the cleaner vehicle, even though it is equally cost-effective.

Worse yet, the model will continue to apply additional technologies that are less cost-effective to other more-polluting vehicle models, instead of applying the more cost-effective package on a vehicle that is already meeting its foot-print based GHG standard. This causes the model to pile on technologies that are actually less cost-effective on the highest volume and dirtiest vehicles in lieu of adding more cost-effective technologies on lower volume or cleaner vehicles. Given the standards are a fleet average standard and not standards that each individual vehicle model must meet, this approach is completely illogical and creates an artificial compliance scenario that is much more costly to the manufacturers. Vehicle manufacturers can generally be expected to make prudent financial choices. If they are faced with the option of lowering their fleet average by the same amount either by spending fewer cumulative dollars to put a more cost effective technology on their cleanest vehicles or by spending more dollars to put a less cost effective technology on their dirtier cars, they will chose the lower cost alternative. The overall impact of this mistake in the ranking algorithm is to substantially inflate the costs associated with compliance, particularly in the early years of the existing standards. EPA also noted this in their preliminary review of the model:

> *The As-Received CAFE model will only consider technology packages where the value of CO_2 credits to the manufacturer exceeds the net package cost, ignoring the potential for any cross-subsidization within a manufacturer's vehicle lineup. This net cost could be thought of as the amount a manufacturer would need to adjust the vehicle price, higher or lower, in order to offset any changes in consumers' willingness to pay for the vehicle due to the added technologies.*[326]

[326] William Charmley, email message to Chandana Achanta, June 18, 2018. Regulations. Accessed on October 24, 2018. https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0283-0453, Attachment 5, p. 21 (footnote 11).

As a simple demonstration of this fundamental flaw, a change to the ranking algorithm was made in the source code of the CAFE Model without changing any other part of the model.[327] The only change made was to which technologies would be applied first by the model. The ranking algorithm was changed to a simpler ratio of technology costs (incremental technology cost minus the same fuel savings during the defined payback period as the original algorithm) divided by the full benefits of that technology, without regard to sales volume or theoretical CAFE-based fines or how far above the vehicle standards the car currently was. This change resulted in reduced costs for both the existing standards and the proposed rollback that are summarized in *Table V-16* below.

As shown in the first column of the table, the average vehicle costs to comply with the existing standards are reduced by up to $700 per year in the early years of the regulation and result in substantially lower cumulative costs to industry, lower purchase price for consumers (and any associated impact on vehicle sales or scrappage), and shorter consumer payback from fuel savings. The second column shows an expected much smaller impact on the rollback standards where less technology is applied. Combined, this results in the incremental costs for the average vehicle to comply with the existing standards relative to complying with the rollback to be reduced by as much as $600 per year in early model years and approximately $200 per year in the latter years of the program. The fact that this simple change found a cheaper path to achieve compliance than the original algorithm confirms that the Agencies' analysis is incorrectly calculating costs of compliance.

Table V-16 Comparison of average incremental technology costs for existing standards and proposed rollback when using simple technology cost ratio[328]

MY	Existing Standards Ave. Tech Cost (Old formula) - Ave. Tech Cost (New Formula)	Rollback Standards Ave. Tech Cost (Old formula) - Ave. Tech Cost (New Formula)
2016	$0	$0
2017	$113	$43
2018	$328	$50
2019	$518	$86
2020	$671	$88
2021	$671	$40
2022	$611	$38
2023	$566	$37

[327] No changes to the efficiencies of any technologies or costs of any technologies or any of the other pathway constraints (proper or improper) imposed in the model for this analysis.
[328] See folder "Efficiency Algorithm Change TableV-16" for input and output files used to making this table.

2024	$306	$33
2025	$172	$33
2026	$34	$33
2027	$71	$39
2028	$174	$41
2029	$242	$41
2030	$227	$42
2031	$232	$41
2032	$251	$41

The failure of the CAFE Model algorithm to find a cost-effective compliance path is also apparent in an examination of the sensitivity cases disclosed in the NPRM. Specifically, Table VII-93 in the NPRM notes sensitivity runs for payback periods of 12, 24, and 36 months relative to the default analysis using 30 months.[329] As noted above, the ranking algorithm's primary valuation of the benefits of a technology is reflected in the subtraction of fuel savings during the defined payback period from the technology costs. The three payback sensitivity runs show that, without changing anything in the model related to costs or benefits of the technology or platform/engine/technology availability or sharing constraints imposed by the CAFE Model, a change regarding the length of payback in the ranking algorithm results in the CAFE Model finding a cheaper path for manufacturers to comply, in every case. When lengthening the payback period used in the algorithm, the average 2029MY manufacturer's suggested retail price for vehicles estimated to meet the existing standards drops from $35,161, to $35,078, and then to $34,996 for 12, 24, and 36 month payback periods, respectively. Again, this change does not alter how the technologies perform and only alters which technologies are applied first by the model and yet it finds a cheaper path that would save manufacturers and consumers money. This is not a rational or logical outcome for the model to pick more or less cost effective routes to comply without making any changes to technology costs or benefits.

The inappropriate use of fuel savings during the defined payback period in the ranking algorithm as the primary measure of the benefit of the technology is also highlighted in another of the sensitivity runs in Table VII-93 of the NPRM. Specifically, the 'high oil price with 60 month payback' scenario shows a dramatic reduction in compliance costs

[329] 83 Fed.Reg. at 43,360.

for 2029MY in the existing standards, even after adjusting for a different fleet mix.[330] The CAFE Model finds a much cheaper path to comply simply when it assumes customers will be faced with higher fuel prices and when the ranking algorithm considers fuel savings over 60 months instead of 30 months. In the CO_2 run output file 'compliance report' for the sensitivity runs posted by NHTSA on its FTP site, this scenario resulted in lower average costs for both cars and trucks to comply. As shown in *Table V-1717* below, average car costs to comply were nearly $700 less and average truck costs nearly $50 less. By utilizing the same car/truck fleet share ratio from the default run, the combined fleet average cost from the sensitivity run indicates the CAFE Model found a path that was nearly $400 per vehicle cheaper to comply. A comparison of the achieved GHG levels shows that the sensitivity case also results in a fleet that over-complies by an additional 2 g/mi.

Table V-17 Average vehicle costs in "High oil price and 60 month payback" sensitivity case compared to default central NPRM case

	MY2029 Existing GHG Standards, Default run	MY2029 Existing GHG Standards, High oil and 60 month payback run	Savings relative to default run
Average Car cost	$2,542	$1,858	$684
Average Truck cost	$3,114	$3,068	$46
Combined*	$2,815	$2,437	$379
Combined* fleet average performance	174 g/mi	172 g/mi	2 g/mi additional over-compliance

* Car/truck sales fractions from default run (52 percent car/48 percent truck) were utilized with the average car and truck costs in the sensitivity run to calculate a comparable combined fleet average cost and fleet performance level.

This further demonstrates that the ranking algorithm utilized by the CAFE Model fails at its primary purpose—to find the most cost effective path to compliance given all the technology options and pathway constraints. It is completely nonsensical that changes solely in the ranking algorithm, which make no change to the actual benefits or costs of the available technologies, results in dramatically different compliance costs. By failing to consider the actual full CO_2 benefit of the technology in the ranking algorithm, the model chooses to apply technologies in an illogical fashion that exaggerates costs. EPA recommended modifications to the "efficiency" metric, which would have resulted

[330] In the presence higher fuel prices, the model presumes consumers will *see*k out vehicles with higher fuel economy and simulates this by reducing the fraction of new vehicle sales that are trucks/SUVs and increasing the fraction that are cars. The sensitivity case referenced caused such a shift so the individual car and truck average prices were used and reweighted back to the same car/truck fraction of new vehicle sales that is used in the default central NPRM analysis.

in lower costs and better utilization of efficient technologies.[331] However, it appears this input was ignored in the model released with the NPRM.

In addition to incorrect assumptions in the cost efficiency ranking algorithm, technology costs are further inflated when the CAFE Model applies technologies that have been modeled erroneously such that they provide little or no benefits (or even disbenefits). In such cases, the manufacturer gains little in terms of achieving compliance but nonetheless must absorb the costs of applying those technologies because the ranking algorithm is not smart enough to avoid selecting them. By examining the effectiveness and cost input files to the CAFE Model, CARB identified several advanced gasoline engine technologies and transmission technologies that appeared to provide little benefit in terms of CO_2 reduction but were being applied in significant volumes to meet the existing standards in the Agencies' analysis. Setting aside the point that, in most of these cases, the Agencies have erroneously underestimated the benefits of these technologies as described above, the CAFE Model should still make valid decisions about which technologies are advantageous to deploy given their assumed costs and efficiencies. However, this is not the case. CARB examined one technology to illustrate this point, namely cooled exhaust gas recirculation (known in the Agencies' analysis as CEGR1).

CARB performed a sensitivity run in the CAFE Model to assess how removing CEGR1, a technology that is utilized substantially in the Agencies' central analysis, from the pool of available technologies would affect the cost of compliance for both the existing standards and the proposed rollback. This was done by entering "SKIP" flags for these technologies in the market input file of the CAFE Model, thereby preventing these technologies from ever being added to a vehicle during the model run. Given the model is designed to pick the lowest cost compliance path for manufacturers and only apply the most effective technologies, it is expected that removing a technology that is utilized would increase costs for compliance. However, the results, which are summarized in *Table V-18* below, show reduced costs to comply with the existing standards, which is the opposite of the expected and rational result. The first column of the table shows the difference in average vehicle costs to comply with the existing standards between the default scenario (CEGR1 included) and the modified scenario where that technology was blocked from application by the model (CEGR1 removed). This column shows removing CEGR1 reduces costs to comply with the existing standards by approximately $50 per year in the earlier years and over $100 in the later years. This again confirms that the CAFE Model is flawed as it does not identify, within the constraints imposed and with unchanged costs and efficiencies of the remaining available technologies, the lowest cost path for manufacturers to comply.

[331] William Charmley, email message to Chandana Achanta, June 18, 2018. Regulations. Accessed on October 24, 2018. https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0283-0453, Attachment 5, p. 6, 21-25.

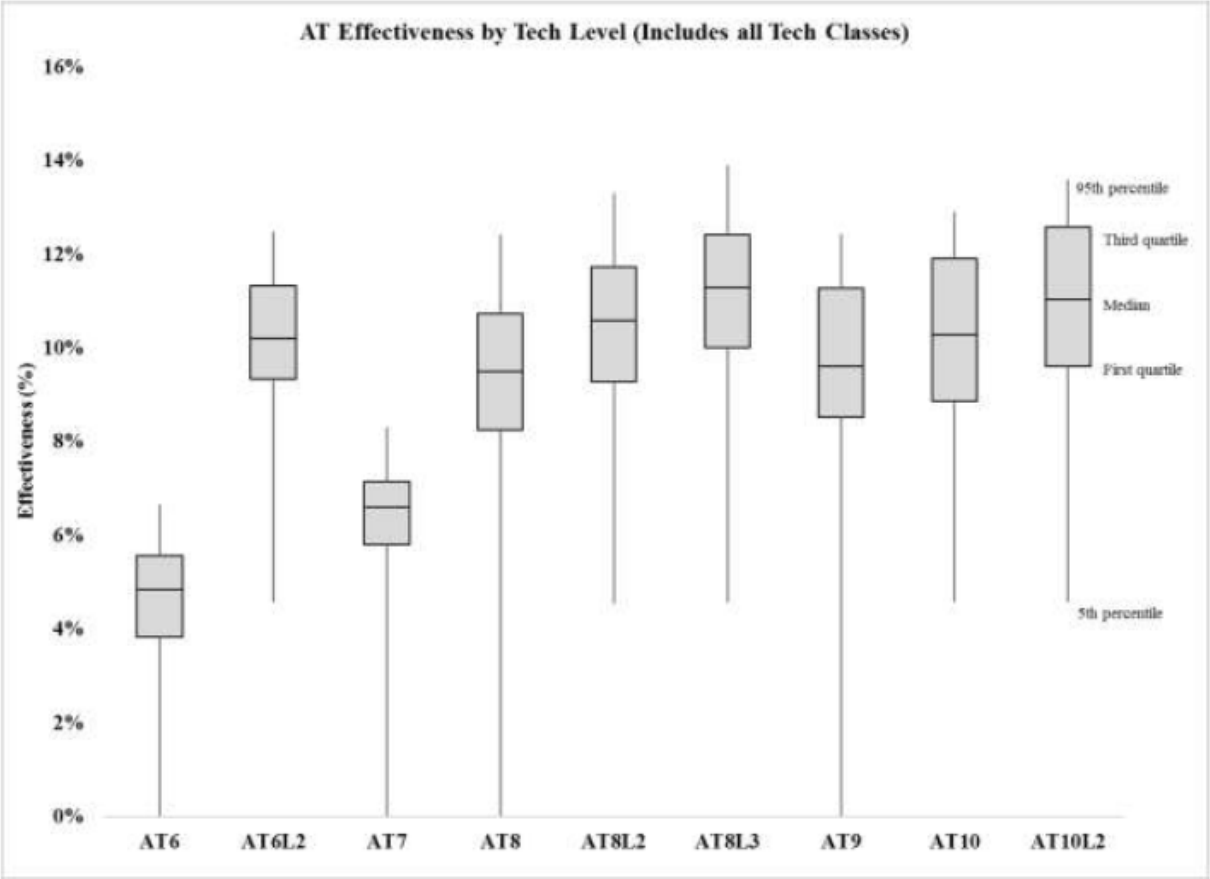
Table V-18 Comparison of compliance costs when CEGR1 technology is eliminated[332]

	Existing Standards Ave. Tech Cost (CEGR1 incl) - Ave. Tech Cost (CEGR1 removed)	**Rollback Standards Ave. Tech Cost (CEGR1 incl) - Tech Cost (CEGR1 removed))**
2016	$-	$-
2017	$5	$0
2018	$25	$-
2019	$18	$0
2020	$39	$0
2021	$53	$0
2022	$61	$0
2023	$70	$0
2024	$75	$0
2025	$83	$0
2026	$86	$0
2027	$101	$0
2028	$106	$0
2029	$109	$0
2030	$111	$0
2031	$110	$0
2032	$110	$0

As a second example, CARB looked at excluding different transmission technologies. Transmissions were selected because the CAFE Model uses advanced transmissions on the vast majority of the fleet and, as noted earlier, there were some inconsistencies in the modeled improvements when advanced transmissions were coupled with different engine technologies. Additionally, Figure 6-151 on page 356 of the PRIA (shown as *Figure V-20* in this comment letter) showed a wide spread of modeled incremental benefits spanning a possible increase, decrease, or no change when looking at any advanced transmission above a 6-speed (with level 2 improvements) automatic transmission.

[332] See submitted DVD, folder “No CEGR Table V-18” for input and output files associated with this table.

Figure V-20 (Figure 6-151 from the PRIA) Range of effectiveness for automatic transmissions across all different technologies and vehicle classes



By disabling all transmissions above a 6-speed (with level 2 improvements) automatic transmission in the input files for the CAFE Model, a run was done that was prevented from adding any of the advanced transmissions. The column on the right reflects the change to the average vehicle technology costs to meet the proposed rollback when the advanced transmissions are no longer available and shows an expected result. That is, when a technology that is picked frequently by the model is removed from the list of available technologies, other more expensive technologies must be selected and average vehicle costs go up by approximately $60 per year.

Table V-19 Comparison of compliance costs when advanced transmissions are restricted[333]

MY	Existing Standards Ave. Tech Cost (Default: Advanced Transmissions Available) - Ave. Tech Cost (Advanced Transmissions restricted)	Rollback Standards Ave. Tech Cost (Default: Advanced Transmissions Available) - Ave. Tech Cost (Advanced Transmissions restricted)
2016	$0	$0
2017	$18	$4
2018	$32	$15
2019	$59	$8
2020	$94	-$19
2021	$77	-$58
2022	$70	-$58
2023	$100	-$57
2024	$142	-$57
2025	$181	-$56
2026	$241	-$60
2027	$292	-$60
2028	$310	-$68
2029	$325	-$68
2030	$318	-$63
2031	$315	-$63
2032	$317	-$62

The first column in the table shows what happens to average vehicle costs to meet the existing standards. As the existing standards are more stringent, there is an increased use of advanced transmissions coupled with advanced engines and the expected result would be that average vehicle costs would increase by eliminating the advanced transmissions. However, the actual result is the opposite. That is, average vehicle costs go down by $100 to $300 per year.

The conclusion from these two model runs is counterintuitive to what a rational model would be expected to do: by eliminating available technologies for manufacturers to utilize, the CAFE Model finds a **cheaper** path for manufacturers to comply with the

[333] See submitted DVD, folder “No Advanced Transmissions Table V-19” for input and output tables associated with this table.

existing standards. This is not just a quirk or anomaly but demonstrates that the logic utilized by the model to choose which technologies to apply is wrong.

6. The Agencies did not conduct a performance-neutral analysis.

Despite claims to the contrary, the Agencies did not conduct a performance neutral analysis to appropriately assess the isolated impacts of the existing and proposed rollback standards. By failing to maintain performance neutrality, the analysis gives an inaccurate accounting of the benefits and costs attributable solely to the existing standards and proposed rollback, most notably by exaggerating the costs and types of technology that will be required to meet the existing standards.

In several areas of the NPRM, the Agencies allude to an approach that was used in modeling to assure the performance of the baseline vehicles was maintained as various technologies were added. For instance, the NPRM notes[334]:

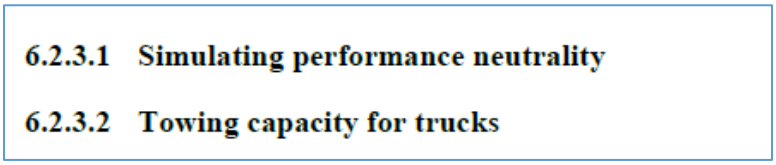
> *In the simulation modeling, resizing was applied to achieve the same performance level as the baseline for the least capable performance criteria but only with significant design changes.*

And:

> *In addition, simulation modeling was conducted to determine the appropriate amount of engine downsizing needed to maintain baseline performance across all modeled vehicle performance metrics when advanced mass reduction technology or advanced engine technology was applied, so these simulations take into account performance neutrality…*

The PRIA apparently intended to also address the topic of performance neutrality by dedicating an entire section to describe the approach and rationale used. However, other than designating a section title in the document, "6.2.3.1 Simulating performance neutrality,"[335] nothing was provided as the entire section was left blank before moving on to the next section in the document. See below – headings with no words.

Figure V-21 Subsection Titles from PRIA, Page 223



Contrary to the stated intent (or unstated in the case of section 6.2.3.1) to maintain performance neutrality, the modeling and analysis did not actually carry this out.

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[334] 83 Fed.Reg. at 43,208, 43,026.
[335] PRIA, p. 223-224.

a. The Agencies inappropriately restricted engine resizing.

When efficiency improvements are made to a vehicle, the engine no longer needs to deliver the same horsepower or torque to maintain the existing performance levels. For instance, if a vehicle is made lighter, more aerodynamic, or utilizes a more efficient transmission, a less powerful engine can be utilized and still achieve the same acceleration and speed-related performance. Accordingly, as additional improvements in efficiency are incorporated, the engine must be resized (generally done by changing to a smaller displacement or using fewer cylinders) to maintain the original performance. However, the CAFE Model inappropriately restricts resizing of an engine to only occur when the Agencies have arbitrarily decided that a particular vehicle model collectively has had 'enough' of a change in mass reduction to warrant a smaller engine. This is a departure from past practice by EPA and is an artificial constraint that limits the optimization of the technologies being applied. The Agencies defend this decision by saying vehicle manufacturers will not incur the expense of resizing the engine if only small reductions to mass or road load are made and uses a whimsical example of a manufacturer that would certainly not resize its engine upon opting to remove the floor mats from a vehicle. While this may sound logical, it is not reflective of how manufacturers will approach the decision. In the presence of the existing standards where technologies are being increasingly applied at added cost, manufacturers cannot afford to leave efficiency gains on the table by not maximizing the reductions of the added technologies to minimize added total costs and remain competitive. Further, manufacturers plan ahead to consider not only the impacts on this particular vehicle but on other vehicles that may ultimately also use a variant of the same engine. These decisions reflect a complicated set of factors manufacturers must balance and the Agencies' attempt to reflect this in a simplistic rule about which technology combinations would warrant a resizing of the engine is flawed.

b. The Agencies erroneously resized engines.

Secondly, even in the overly limited cases where the Agencies decided 'enough' technology had been applied to warrant resizing of the engine, the modeling did not actually carry it out appropriately. As noted above, the Agencies represented that the analysis was "…conducted to determine the appropriate amount of engine downsizing needed to maintain baseline performance …when advanced mass reduction technology or advanced engine technology was applied." However, a review of the ANL Autonomie modeling result files in the docket developed by ANL staff for the CAFE Model to use as effectiveness values for each of the technology combinations indicate this was not actually done. The files reveal that while resizing was limited, as indicated, to cases where significant mass reduction (which in the Agencies' analysis would be at mass reduction level 3, called 'MR3', or above) was applied, the engine was not actually resized to match the baseline performance of the vehicle to which it was being applied. Instead, the resizing was only simulated for cases where those levels of mass reduction were applied, *in the absence of virtually all other technology or efficiency improvements*.

For example, in the midsize nonperformance vehicle class, of the nearly 106,000 modeled technology combinations of engine technologies, transmissions, electrification technologies, mass reduction improvements, tire rolling resistance improvements, and aerodynamic improvements, only 164 combinations were resized. Of the 164 that were resized, every single one assumed the vehicle for which the engine was to be resized was equipped with a base transmission (unimproved 6-speed automatic) and absolutely zero improvements in areas that would make the vehicle more efficient such as lower tire rolling resistance or improved aerodynamics. Accordingly, the model attempted to find the optimal size of the engine only in unrealistic vehicle combinations of significant mass reduction combined with no other technological improvements. This results in a systematic underestimation of the appropriate amount of engine resizing. As one would expect, by the time a manufacturer has implemented a significant amount of mass reduction on a vehicle, it has also likely implemented a substantial number of other improvements in the vehicle be it through a more advanced transmission, better tires, improved aerodynamics, or even mild hybridization. Because none of these other improvements are considered when determining the new size of the engine, the engine ends up being oversized for the vehicle resulting in improved performance and a less than optimal reduction in GHG emissions.

This is clearly not reflective of what vehicle manufacturers would do as the decision to resize an engine is made early in the design process of the vehicle and such decisions are made with the knowledge of the intended levels of other technology being applied. It would be completely illogical for a vehicle manufacturer to size an engine for a future vehicle presuming it would use a 6 speed transmission and no other technologies, when the manufacturer knows that the vehicle is actually going to be equipped with a continuously variable transmission and specific levels of improvement in tire rolling resistance and aerodynamic drag. The Agencies could and should have readily done more appropriate modeling to accurately reflect downsizing in concert with the actual technologies being applied and simply chose not to for undisclosed reasons.

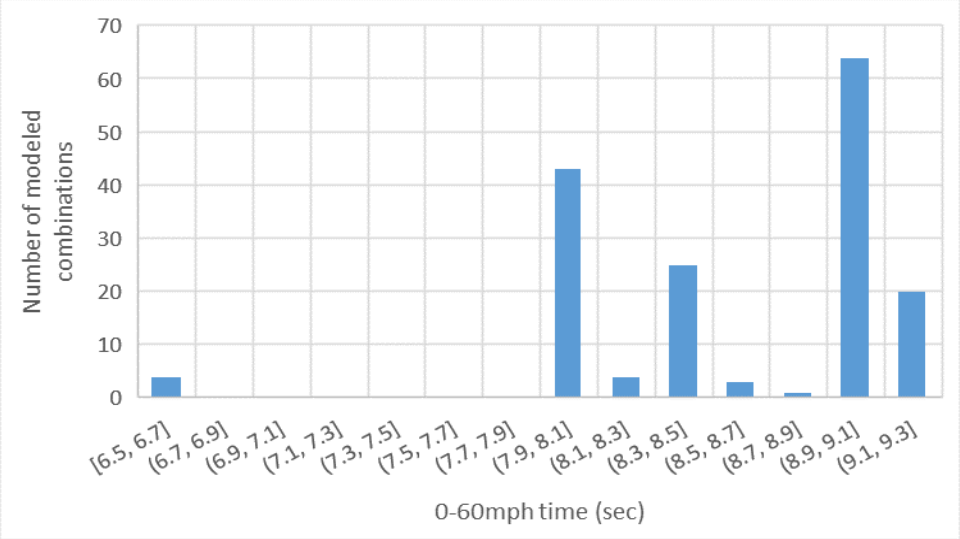
c. The Agencies failed to maintain performance neutrality in resized engines.

Further, in the limited technology cases where the Agencies did engine resizing, they failed to maintain performance neutrality. Table II-7 of the NPRM[336] indicates the target 0-60 miles per hour (mph) acceleration times for each vehicle class. While the NPRM notes the Agencies was looking at passing time as a performance metric to maintain baseline vehicle performance, no defined target is disclosed in the NRPM. However, a look at the ANL data files in the docket disclose both 0-60 mph acceleration time and passing time for each of the modeled combinations of technology. These files consistently show substantial improvement in performance is modeled even when the engines were deliberately resized to *maintain* baseline vehicle performance. For

[336] 83 Fed.Reg. at 43,027.

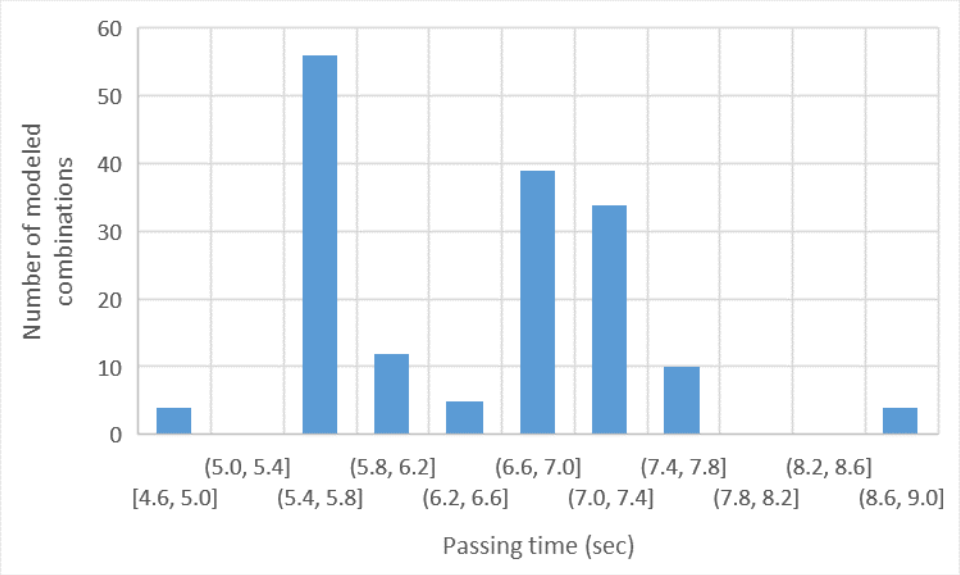
instance, in looking at the 164 cases noted above for the midsize nonperformance vehicle class, the NPRM indicates 9.4 seconds is the performance neutral target for 0-60 mph acceleration time. Yet every single one of the 164 modeled combinations results in a faster time indicative of improved performance. The histogram below shows that every combination is below 9.4 seconds, with half of the results significantly faster by more a margin of more than 0.5 seconds. Even had the target time been 9.0 seconds, effectively half of the simulations resulted in improved performance.

Figure V-22 Midsize non-performance vehicle 0-60 mph acceleration times (in cases where the engine was resized, seconds)



With respect to passing time, the data also shows improved performance. While the target time was not disclosed in the NPRM, one can presume that all modeled combinations met or surpassed the target (because any combinations that failed to maintain performance would have been rejected). From a similar histogram, it is apparent that performance was improved in virtually all cases. Presuming the target time was near 9.0 seconds, all but 4 of the 164 modeled combinations are substantially faster—reflecting over 2.0 seconds faster for most combinations. Even if the target time was intended to be as fast as 7.0 seconds, approximately half of the modeled combinations, *where performance neutrality was specifically being modeled*, result in improved performance.

Figure V-23 Midsize non-performance vehicle passing times (in cases where the engine was resized, seconds)

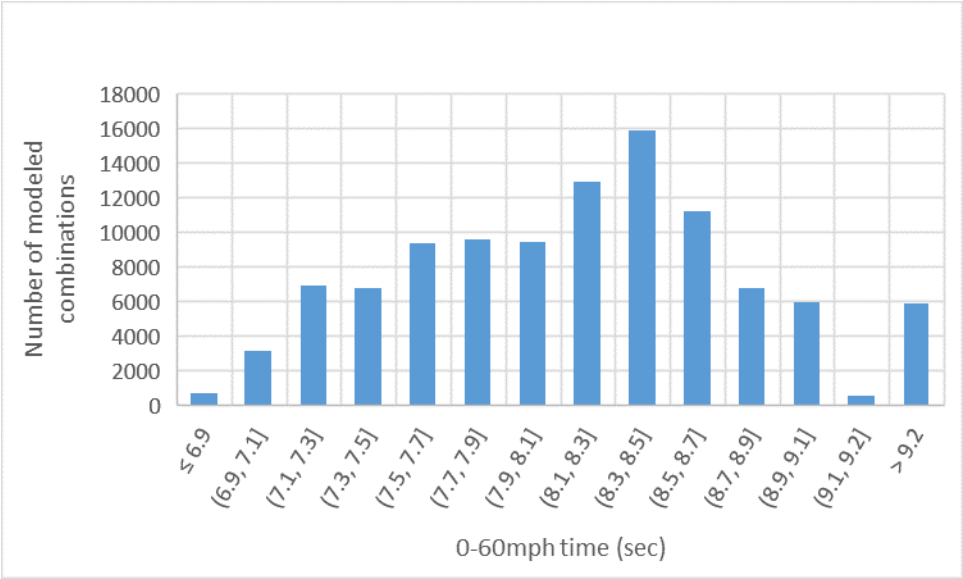


This systematic modeling of improved performance results in an underestimation of the CO_2 reducing effectiveness of the deployed technologies and an overestimation of the level of technology (and corresponding costs) that must be deployed to meet the existing standards.

d. Non-resized engine results in even greater performance improvements.

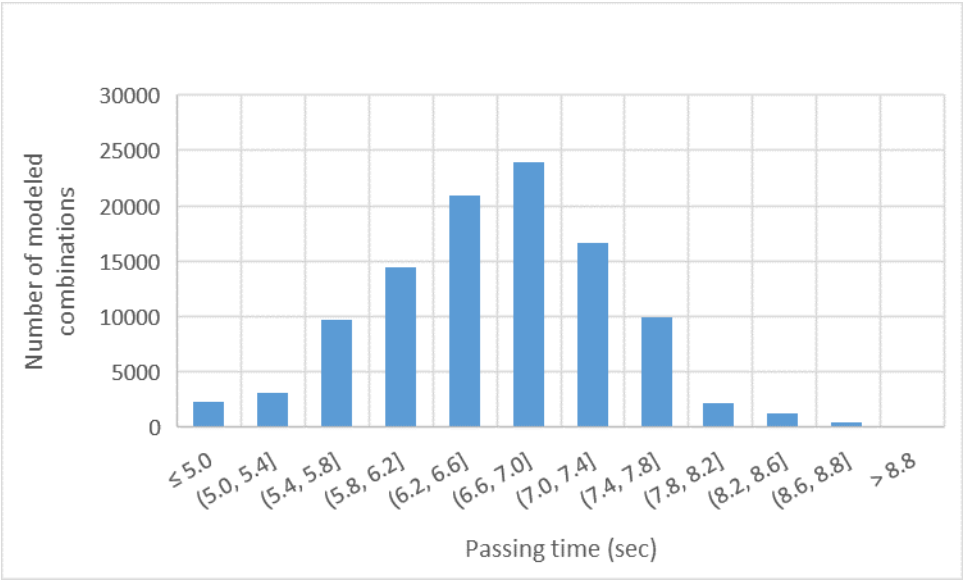
In cases where the modeling did not resize the engine for the specific technology combination, the performance improvement is even more dramatic. For example, as noted above, only 164 of the nearly 106,000 modeled technology combinations for the midsize nonperformance vehicle class involved engine resizing. For the other 99.8 percent of the packages, performance improvements were also falsely included in the modeling. The histogram below shows 0-60 mph acceleration time for the midsize nonperformance vehicle class targeting a 9.4 second time. Over 94 percent of the packages modeled result in improved performance thereby underestimating efficiency improvements of the technology.

Figure V-24 Midsize non-performance vehicle 0-60 mph acceleration times (in cases where the engine was not resized, seconds)



The passing time data shows similar results in the histogram below where effectively 100 percent of the modeled simulations are faster than the presumed target of 9.0 seconds. Again, even if the target was intended to be faster such as 7.0 seconds, more than half of the modeled simulations represent improved performance.

Figure V-25 Midsize non-performance vehicle passing times (in cases where the engine was not resized, seconds)

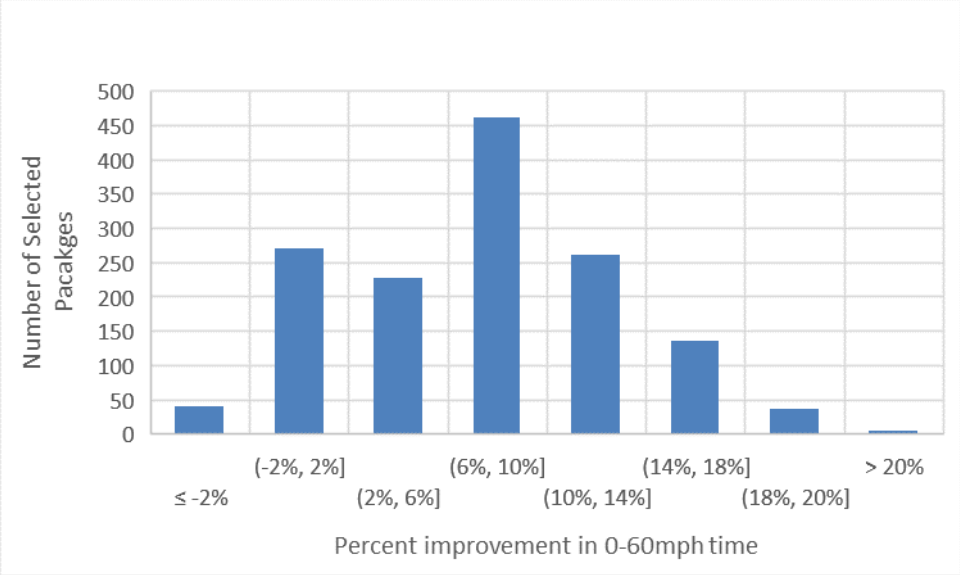


By including such performance improvements in the modeled packages, the overall efficiency improvement from the technology is underestimated. This results in the

CAFE Model making inappropriate decisions as to which technology combinations to deploy as those with additional performance gains will appear to be less effective.

Beyond looking only at the several hundred thousand *possible* technology combinations which are clearly biased towards improved performance, an analysis was done to look at which combinations were actually selected for the approximate 1,600 unique vehicle variants in the final CAFE modeled results for the 2029MY. By comparing the technology combinations identified in the CAFE Model output files with the ANL data files for the same combinations, the analysis found the vast majority of selected technology packages did indeed result in significant performance gains. The chart below shows the percentage improvement (faster) in 0-60 mph acceleration time that the selected combinations represented when applied to the modeled vehicles. Fewer than 20 percent maintained baseline performance with gains of 2 percent or less in acceleration time.

Figure V-26 Range of 0-60 mph acceleration time improvements across modeled technology packages actually used for 2029MY vehicles by the CAFE Model



The fact that this analysis includes such performance improvements is significant. As the Agencies go to great lengths in Section 8 of the PRIA in an attempt to quantify the value of attributes other than fuel economy to consumers, it is noteworthy that the section almost exclusively talks about a potential economic or welfare loss to consumers from more stringent standards. That is, that there is a perceived tradeoff in more stringent standards that will cause vehicles to have fewer improvements in attributes that consumers would value more highly (like performance improvements) than the improved fuel economy. Notably, it talks about a higher valuation of attributes like higher horsepower and faster acceleration and poses a theory that there should be an economic or consumer benefit modeled that represents a monetary value for some presumed amount of performance improvement that would happen in the absence of standards that require improved fuel economy. However, the NPRM analysis for the

existing standards actually includes performance improvements for the vast majority, if not all, of the vehicles. Accordingly, the Agencies should be discussing the added valuation to consumers of this improved performance to offset a portion of the technology costs. Yet the Agencies fail to acknowledge any of this in its analysis and prefer to cherry pick by looking only at the possibility of valuation of a welfare loss to consumers as a result of theoretical foregone performance improvements. Given the amount of mild and strong hybrid electrification the Agencies have modeled as necessary to meet the existing standards, and as discussed further below, significant gains in the noted performance metrics for those powertrains would also need to include a substantial additional valuation to consumers for improved performance. And this would be even without any valuation of improved attributes such as more low end torque or reduced noise, vibration, and harshness that electrification brings—attributes that automotive media, reviewers, and consumer satisfaction surveys often highlight. The failure to appropriately model performance neutrality and falsely attempt to attribute a loss of performance improvements to the current standards indicates the analysis was purposely slanted to justify a pre-determined outcome to weaken the standards.

e. The Agencies overly constrain engine optimization for manufacturers with shared engines across multiple vehicles.

Another contributing factor to NPRM's analysis not being performance neutral is the engine sharing constraints imposed by the model. The NPRM notes:

> *In the current version of the CAFE model, engines and transmissions that are shared between vehicles must apply the same levels of technology, in all technologies, dictated by engine or transmission inheritance.*[337]

The Agencies have stated the intent of these constraints is to better represent industry practices and avoid modeled solutions that represent increased levels of complexity in a manufacturer's product portfolio. However, the CAFE Model solution requires shared engines to be identical in all aspects which is a much more restrictive requirement than current standard industry practice, and leads to less optimization in the powertrain. For example, Honda has often shared an engine across its Acura MDX, Honda Pilot, and Honda Odyssey models. However, it has still made model specific changes to the engine to meet the individual vehicle needs such as a different intake, calibration, and fuel octane specification for the MDX version. Toyota recently indicated its intent to deploy new engines across the vast majority of its global models using technology similar to the new Camry engine. Yet Toyota acknowledges its intent is to "introduce 17 versions of nine new engines by 2021"[338] confirming that the industry practice of sharing engines is not reflected by the CAFE Model constraint requiring shared engines to be identical in all aspects. GM currently utilizes an EcoTec single engine 'family' to create 11 variants of 3 and 4 cylinder engines ranging in displacement from 1.0L to 1.5L, including turbocharged and naturally aspirated variants all built from just two blocks

[337] 83 Fed.Reg. at 43,136.
[338] "Toyota revs engine development", Automotive News. Accessed on October 24, 2018. http://www.autonews.com/article/20180305/OEM03/180309685/.

using common bore and bore spacing. GM indicates these engines are "engineered and manufactured in multiple regions for global use" and that:

> *The global engine family consolidation is part of GM's larger product development strategy to reduce engineering and manufacturing complexity and cost while improving competitiveness, efficiency and quality.*[339][340]

This overly restrictive sharing of identical engines newly imposed in the CAFE Model is not consistent with today's industry practices and results in less optimal engine sizing and causes a systematic overestimation of technology costs to meet the existing standards.

7. Modeling errors were exaggerated for electrified technology packages.

In modeling of the electrified powertrains, the modeling methodology errors have an even larger impact on an underestimation of the efficiency gains from various electrification pathways. These include failure to pair appropriate engines with various electrification levels, use of a fixed final drive ratio and transmission shift pattern, and failure to maintain performance neutral technology packages.

For the Autonomie modeling, a fixed final drive ratio was utilized and, presumably, a fixed shift logic based on the selected transmission. However as noted earlier, mild hybrids such as belt integrated starter generator (BISG) or crank integrated starter generator (CISG) systems can provide low end torque that, when optimized, allows a vehicle manufacturer to operate the engine more frequently in the higher efficiency regions (or, operate less frequently in poor efficiency regions such as near idle). Vehicle manufacturers are now also using such systems to boost engine torque at higher operating speeds such as Daimler's "EQ boost" system so they can keep the engine operating in a more efficient operating region. Manufacturers have also been utilizing such systems to allow a 'sailing' feature whereby the engine can be decoupled and turned off during coasting events, further expanding the effective benefits that deceleration fuel cut-off strategies and idle stop-start systems can obtain. From the information disclosed in the NPRM, it appears that ANL did not utilize the system in these manners nor did they allow for changes in gear ratios, final drive ratio, or transmission shift logic to optimize for efficiency improvements when mated with different electrified powertrains. As noted in the excel files in the docket indicating the technology packages modeled by ANL for the various vehicle classes, the modeling also chose to not resize the engine when coupled with a BISG or CISG system. This omission results in a less than optimized system that does not take full advantage of the mild hybrid system. As describe above, when optimized, vehicle manufacturers can

[339] Future Chevrolets to Benefit from Small Gas Engine Family. Chevrolet. Accessed on October 24, 2018. https://media.gm.com/media/us/en/chevrolet/news.detail.html/content/Pages/news/us/en/2011/Oct/1012_gas_eng.
[340] GM Introduces Extra-Small Block EcoTec Engine Family. Motor Trend. Accessed on October 24, 2018. https://www.motortrend.com/news/gm-introduces-extra-small-block-ecotec-engine-family/.

pair the system with an engine that has been sized and calibrated to achieve improved efficiency at higher torque points but would otherwise not be feasible given its stand alone performance at low torque points or during transient maneuvers (such as a smaller HCR engine or a turbocharged engine with a larger, lower backpressure turbine). Manufacturers incorporating a CISG system often are required to make a engine casting change to accommodate the system which means that planning for the system is done at a very early stage and no manufacturer would fail to pair the system with an optimally sized engine and configured transmission to take full advantage of the system's capabilities.

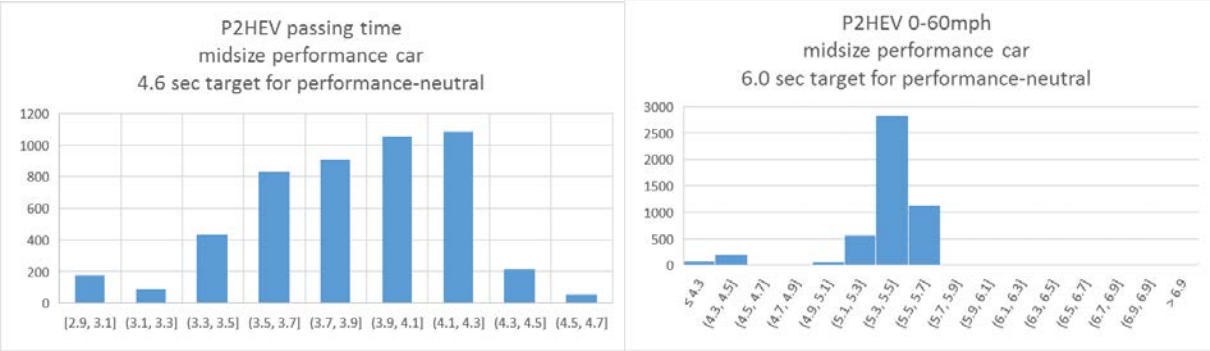
For strong parallel hybrids (P2HEV or SHEVP2), the modeled technology packages also have errors. While the NPRM notes that all power split HEVs (SHEVPS) are mated with HCR engines, the P2HEV has no such restrictions and is often paired with advanced engine technologies (TURBO1, TURBO2, CEGR). These are not likely combinations utilized by manufacturers as they unnecessarily add both gasoline technology and hybrid technology that negates many of the benefits of the advanced gasoline technology. This error in the Agencies' modeling leads to inflated technology costs on vehicles that are converted into P2HEVs. For reference, approximately 35 percent of the final vehicle model configurations in the modeling simulations to meet the existing standards are P2HEVs so this overestimation on costs has a significant impact on fleet average costs.

Lastly, while the Agencies state the intent of the simulations were to define packages that would maintain the baseline vehicle's performance[341] (i.e., performance-neutral); the reality is that the vast majority of electrified packages were sized such that performance was significantly improved. Such improvements sacrifice efficiency improvements that the technology would have otherwise provided. For example, in the medium car vehicle class, the data from the ANL simulations[342] shows that 76 of the 88 strong electrified packages (including P2HPV, SHEVPS, BEV, FCEV, PHEV), *where ANL purposely resized the system to maintain performance neutrality*, resulted in notably faster 0 to 60 mph acceleration times and passing times. Designing packages such that 86 percent of them are improved performance is not a credible attempt at performance neutrality. And in some cases such as the P2HEV as shown in the histograms in *Figure V-27* below for the medium car performance vehicle class, the data shows that every single modeled package resulted in improved performance relative to the original vehicle performance. The histogram on the left shows the distribution of the passing time for all of the modeled P2HEV technology combinations where the original vehicle is presumed to have a target time of 4.6 seconds. As the figure shows, virtually all of the modeled packages end up with passing times faster than 4.6 seconds. On the

[341] 83 Fed.Reg. at 43,026. "In addition, simulation modeling was conducted to determine the appropriate amount of engine downsizing needed to maintain baseline performance across all modeled vehicle performance metrics when advanced mass reduction technology or advanced engine technology was applied, so these simulations take into account performance neutrality, given logical engine down-sizing opportunities associated with specific technologies.
[342] Example of ANL file for midsize non-performance cars is "ANL_MidsizePerfo_07202017" file in the docket.

right hand side, the figure shows the distribution of 0 to 60 mph acceleration times for the modeled packages. The NPRM indicates a 6.0 sec target for this vehicle class yet all of the modeled packages end up faster than the target.

Figure V-27 Distribution of Performance Specifications for P2HEV Systems



For mild hybrids (BISG and CISG), over 82 percent of the 48,600 modeled combinations result in improved acceleration and passing performance. When looking at the data for all of the electrified packages (from mild hybrids through full BEVs) that were not purposely resized yet still intended to represent performance neutrality, 44,878 of the 53,818 packages, or greater than 83 percent, result in improved performance. This failure to maintain performance neutrality with the modeling is a fundamental flaw that makes it impossible to accurately isolate and quantify the impacts of the current standards. Instead, the analysis intermingles performance and efficiency improvements with the added technology but ascribes all of the cost solely to the standards. Given the Agencies spend considerable time in Chapter 8 of the PRIA trying to substantiate how much consumers value added performance, it appears inconsistent that they fail to maintain performance neutrality for the analysis. Such an approach is necessary to ensure the effect of the standards alone are being evaluated. Otherwise, the analysis would need to recognize and quantify added value to the consumer in packages modeled with performance gains or reallocate costs of the technologies applied to apportion a share to enhanced performance rather than the standards. A true performance neutral analysis would have resulted in the technology being applied in its full capacity to improve efficiency while neither reducing nor improving baseline performance. As can easily be predicted, this would have resulted in less technology (and its corresponding costs) to meet the existing standards.

D. The Agencies' vehicle analysis is counter to the state of the art.

An objective review of the rollback proposal in the limited time provided for comment, without all the information used by the federal Agencies, reveals significant shortcomings, omissions, and unsupported assertions. NHTSA and EPA have not considered important aspects of the state of the art for controlling emissions from and efficiently using fuel in motor vehicles. The Agencies have presented an analysis that is counter to the evidence before it, leading to unreasonable increases in the estimated

costs to meet the existing standards. The conclusions about the available technology, and capacity to develop technology, are not based on reasonable inferences or technical expertise. The facts have not significantly changed, just the view of the federal administration.

The failure of the agencies to fairly consider the progress by the industry is shown by their comments on the proposal. At the public hearings on this proposal in Fresno, California, on September 24, and Dearborn, Michigan, on September 25, manufacturers and their trade associations testified they support increasing standards. While they have asked for flexibilities to accommodate a changing market, and CARB remains willing to discuss sensible, supported flexibilities, their conclusions and CARB's are that the standards should steadily improve.

If any changes are warranted, they must be based on sound data and analysis. To that end, CARB has requested information from the manufacturers and the agencies to support their positions. To date, the information provided has not demonstrated the technology has fallen short of its previous assessment.

VI. The Fleet Impact Assessment is nonsensical, disconnected from empirical data and established theory.

Having dramatically and erroneously inflated the costs of compliance, the Agencies next turn to overstating the impacts of these inflated costs. These efforts turn largely on a series of bootstrapped predictions, under which the Agencies purport to forecast consumer behavior as cars become less polluting or more fuel efficient. The models used to make these predictions have not been thoroughly reviewed, and turn out to make predictions that sharply diverge from reality. They are not a proper basis for abandoning the successful national program, much less for ignoring clear statutory directives or attacking California's authority.

As a threshold matter, relying on consumer preferences to generate asserted (and false) benefits of the rollback is improper to consider under Section 202 of the Clean Air Act and Section 43092 of EPCA. "Consumer preference" is not a factor in either statute and so must take a back seat to explicit direction to protect public health and conserve resources. The EPA Administrator is to set emissions standards for pollutants that endanger public health and welfare. When setting these standards, "[t]he driving preferences of hot rodders are not to outweigh the goal of a clean environment."[343] The Secretary of Transportation must set the "maximum feasible" fuel economy standards. While the Secretary may consider "economic practicability," it would violate the statute to treat "consumer preference" as a limiting factor.

Even if it were appropriate to base technical standards on consumer preference, the weight of the evidence shows that while consumers greatly value fuel efficiency, market

[343] *International Harvester Co. v. Ruckelshaus* (D.C. Cir. 1973) 478 F.2d 615, 640.

inefficiencies mask the full extent of their preferences. As Dr. David Greene explains in his attached report, *Consumers' Willingness to Pay for Fuel Economy and Implications for Sales of New Vehicles and Scrappage of Used Vehicles*, discussed in detail below, the "energy efficiency paradox" is a well-established barrier to meeting consumers' demand for efficient products.

The Agencies fail to account for other market behaviors. The analyses do not adequately model how vehicle values will change in response to improving fuel economy, or the competing effects of other attributes.

Besides inappropriately elevating consumer preferences as a decisional factor and failing to recognize the energy efficiency paradox, the federal Agencies rely on an inherently unsound model of how consumers make choices in the vehicle market. The modeling of new vehicle sales, vehicle replacement (scrappage), changes in vehicle miles traveled in response to changing fuel economy (rebound), and changes in expected fatalities due to lightweighting or changes in travel (safety effects) is fundamentally flawed in multiple respects.

The models are reliant upon unfounded assumptions, and the conclusions the Agencies draw from the outputs of these models ignore principles of economics and rules of reliable statistical analysis. The Agencies use improper methods to model new sales, scrappage, and safety effects, which in turn produce incorrect and illogical results. In the case of rebound, the Agencies use an inflated assumption and model the effect incorrectly such that the resultant VMT is overestimated.

These flaws are pervasive and bias the results. Indeed, EPA warned in interagency review comments that the models should be "tested for [their] validity," remarking that "[r]easonable models can predict badly," that stakeholders were concerned, and, in particular, that "[m]any of the policy conclusions of this proposal, especially regarding safety, rely on the new scrappage model's findings. How has the model been reviewed and validated?" It had not.

These failures led NHTSA to flatly wrong conclusions. A closer look at the data by EPA appeared to show that the SAFE proposal was very much unsafe *overall*, including causing more fatalities even using some of the Agencies' underlying (wrong) conclusions and assumptions:

> *When EPA studied the CAFE model results (in CO-2 Mode) and broke them into 3 cohorts of vehicles: 1) MY1975-2016; 2) MY2017-2020; and, 3) MY2021-2029, we found that roughly 7 percent of the proposal's net benefits are attributable to the MY2021-2029 cohort. In other words, over 90 percent of the net benefits are attributable to the MY1975-2016 and MY2017-2020 cohorts. This suggests that over 90 percent of the net benefits are being driven by the scrappage model and highlights concerns that have already been raised. This would also seem to make clear that over 90 percent of the net benefits are actually co-benefits of*

> *the proposal. While co-benefits are still benefits, this break out of where the net benefits are being generated should be made clear and transparent in this preamble. Further, if the "Welfare Loss" associated with electrified vehicles is removed, as EPA believes it should be, then the net benefits of the proposal in the MY2021-2029 cohort moves into the negative (i.e., a net cost rather than a net benefit). In other the net benefits of the MY2021 and later standards is, in fact, positive which is inconsistent with claims made in this paragraph of "updated information on the costs and effectiveness of technologies." Also, the foregone fuel savings in the MY2021-2029 cohort are made clearer and are on the order of $200-201 billion of foregone fuel savings as contrasted to the proposal's foregone fuel savings on the order of $150-160 billion. Regarding VMT and fatalities, a breakout of cohorts as described here would also make clear the confusing VMT estimates generated by the CAFE model where the inclusion of a rebound effect results in considerably lower VMT for the MY1975-2016 cohort whether considering the Augural or proposed standards. It is not clear why rebound have any impact on those vehicles and why would rebound decrease their VMT? It could (if presented) also make clear that, while fatalities are projected to increase under the Augural standards relative to the proposed standards, it appears the fatality rate (fatalities per VMT) is actually higher under the proposed standards or, in other words, the risk of fatality is actually higher under the proposed standards. Further explanation of this issue is necessary.*[344]

It is remarkable that the Agencies ignored EPA's advice. Doing so is the height of arbitrariness, and warrants judicial correction if the proposal is not withdrawn.

These four fundamental errors permeate through the rest of the savings and benefit calculations, which falsely lead to a net benefit of the Agencies' rollback. The analysis supporting the rollback does not and cannot reliably predict the impacts of the existing and proposed standards, given the flaws described below.

A. The New Vehicle Sales Model is flawed.

The first of the Agencies' errors is an assertion that consumers will not buy new vehicles at an appropriate rate because emissions reduction technologies will increase vehicle prices. In addition to the price effects being inflated, as we have discussed above, the consumer behavior projections are also wrong. Future overall new vehicle sales impacts are estimated using inappropriate statistical analysis and falsely premised on the fact that any vehicle price increase will have a negative impact on sales. However, research that the Agencies themselves cite demonstrates that consumers do value some, if not

[344] EPA Comments on the NPRM Sent to OMB (June 29, 2018). U.S. EPA. Accessed on October 24, 2018. https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0283-0453. p. 119.

all, of the future fuel savings that result from improvements in fuel economy and GHG emissions. Furthermore, the Agencies used inappropriate methods to estimate these impacts. This means that one of the Agencies' core premises – that consumers will not buy as many new cars under the existing standards – is unsupported. Indeed, reality confirms: new vehicle sales, and prices, have continued to increase over the last decade, even as the program has been successfully operating.[345]

1. The modeling logic is flawed.

There is no basis to project that vehicle price increases associated with the existing standards will reduce new vehicle sales. The process of new vehicle purchasing is highly complex in a market of over one thousand configurations in any given model year, and consumers consider a wide variety of factors, including fuel economy, when deciding whether to purchase a new vehicle. Certainly if vehicle prices increased as a result of a tariff or tax policy that did not affect any of the vehicles' actual attributes (i.e. paying more for the same good), demand for vehicles would be depressed. However, according to the Agencies' model, vehicle price is the only attribute that matters, and all remaining fluctuations in future annual sales levels are attributed to past sales and macroeconomic factors.

a. Overreliance on average vehicle prices obscures and oversimplifies complex market dynamics.

One issue with relying solely on vehicle price as the only attribute in the sales model is that the Agencies are seemingly[346] using just the average price of a new vehicle sold in each quarter. Thus, when comparing the difference between policy scenarios, the Agencies are effectively treating new vehicles as a homogenous group and ignoring the significant variation in vehicle prices. There are thousands of models and configurations of additional options available for vehicles in every model year as a result of each automaker trying to differentiate itself from their competitors and meet the varied needs of vehicle buyers. Price increases associated with regulatory compliance does not necessarily imply that the average price of all vehicles will rise if consumers shift their purchasing patterns. The regulation does not result in consumers choosing to buy or not buy a car, but may rather just change which car they ultimately purchase -- which may or may not have a higher price. When the CAFE Model simulates manufacturer decisions for achieving compliance, the only type of decision they can make is whether to add fuel saving technology to a specific vehicle, and if so, how much. (The model does not allow for strategic pricing and cross-subsidization.) To the extent that additional technology translates to an increase in vehicle price, in the real world, consumers can choose to: 1) buy the vehicle anyway, 2) shift to a different vehicle, or 3) decide not to buy any vehicle. Only the third choice lowers new vehicle sales. The

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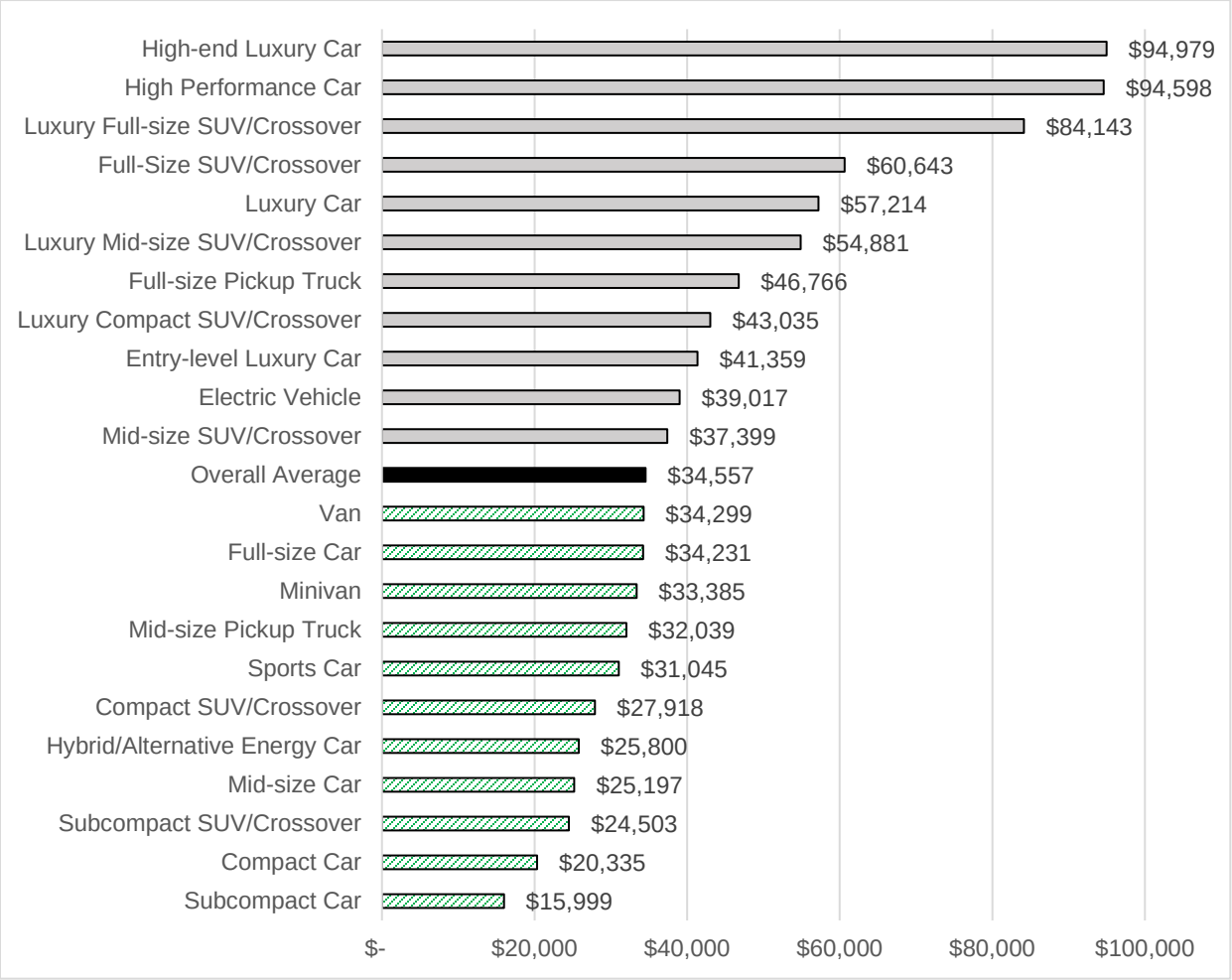
[345] *See* Figure VI-3 Annual U.S. Light Duty Sales, Average New Vehicle Transaction Price, Annual Median Household Income, and Average New Vehicle Fuel Economy (Indexed, 1985 Levels =100, Current Dollars).
[346] The price data were not disclosed, and the data source is unable to supply the data to us, so it is not possible to verify if this is true.

total effect on the new vehicle market is the net effect of these individual vehicle decisions across consumers. Accurately capturing the relative impact of sales shifts versus no-buy decisions would require a more detailed consumer choice model, as recommended by the CAFE Model peer reviewers. The current new vehicle sales model has no way of capturing these types of effects.

By using only a single average price in the model, the Agencies obscure all of the detailed dynamics in the highly competitive vehicle market that influence vehicle pricing and simply assume any price increase will decrease sales. However, vehicle purchasing is determined by many other factors, and consumers do not base their decision solely on trying to minimize costs. To illustrate the wide array of vehicle prices and the effect this could have on the average price of all vehicles, *Figure VI-1* shows the range in average new vehicle prices for different segments. The average of all vehicles during this time period was $34,557, which is a function of all the various vehicle types sold. Some vehicle segments are less than the average and some are more. For example, Kelley Blue Book (KBB) shows that the overall average vehicle transaction prices between 4/2015 and 7/2018 was $34,557, which ranged from a low of $32,414 on 5/2016 to a high of $36,756 on 12/2017. As shown in *Figure VI-1*, though, the range between the most and least expensive vehicles are more than double the average price. The average transaction prices for eleven vehicle segments (those in green) are below the overall average, and start at $15,999. These tend to be smaller vehicle bodies but of all styles: subcompact car, compact car, subcompact SUV/crossover, mid-size car, compact SUV/crossover, sports car, mid-size pickup truck, minivan, full-size car, and van. Notably, the hybrid/alternative energy cars are on average over $8,700 cheaper than the overall average transaction price while the transaction prices for electric vehicles are only $4,460 more expensive than the overall average transaction price. The vehicle segments with higher average transaction prices (those in blue) are those with large body styles as well as those vehicles in the luxury categories: mid-size SUV/crossover, entry-level luxury car, luxury compact SUV/crossover, full-size pickup truck, luxury mid-size SUV/crossover, luxury car, full-size SUV/crossover, luxury full-size SUV/crossover, high performance car, and high-end luxury car.

Figure VI-1 Average Transaction Price of New Vehicles by Vehicle Segment (data compiled from Kelley Blue Book, 4/2015-7/2018, not including applied consumer incentives)



The use of a single average for vehicle price in the model suggests that the prices of all vehicles are increasing uniformly, even though price data also show changes in the mix of vehicles being purchased, varying price changes up and down in different segments, and changes in the extent of luxury options consumers are choosing. As Kelly Blue Book (KBB) reported, the U.S. average transaction price for a compact car decreased by 0.5 percent from December 2016 to December 2017 while that of compact SUVs increased by 2.5 percent over the same time period.[347] KBB explains on multiple occasions:

[347] "Average New Car Prices Set Record High up Nearly 2 percent in December 2017, According to Kelley Blue Book" Kelley Blue Book. Accessed on October 24, 2018. https://mediaroom.kbb.com/2018-01-03-Average-New-Car-Prices-Set-Record-High-Up-Nearly-2- percent-In-December-2017-According-To-Kelley-Blue-Book.

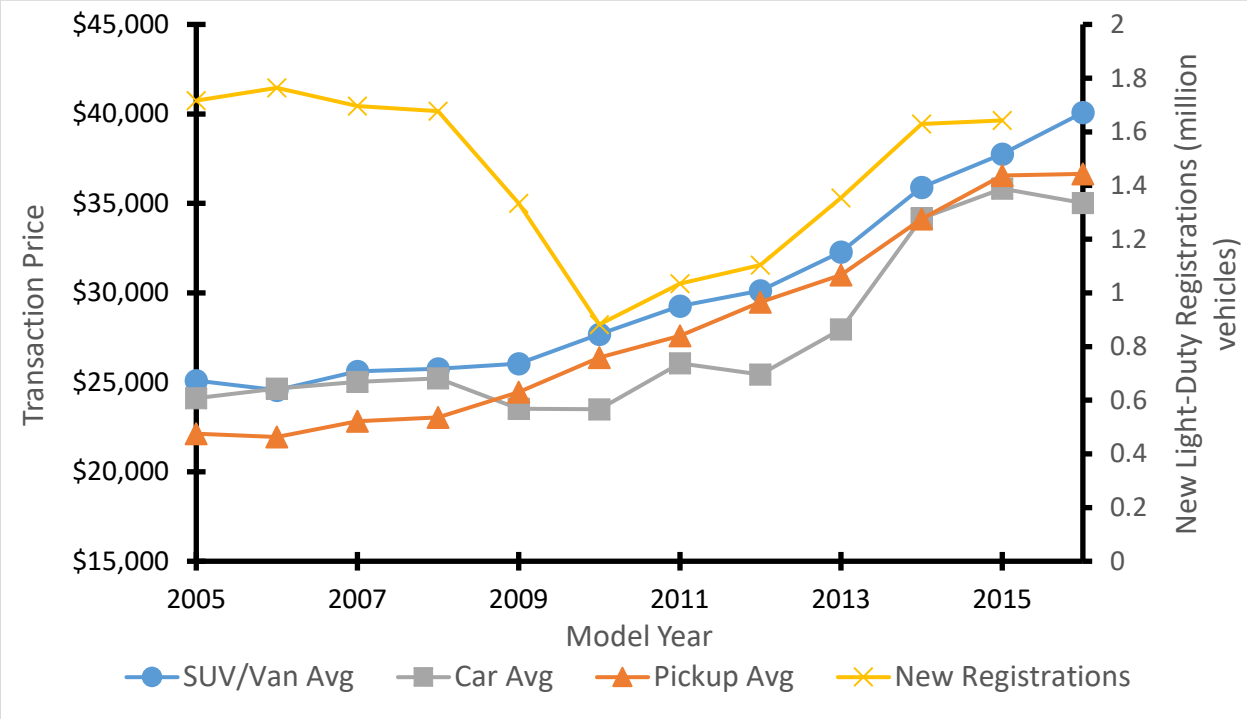
In early 2018, the shifting sales mix to trucks and SUVs has been particularly extreme lately, and as volume shifts away from cars, the average vehicle price ticks up…[348]

Then, average transaction price growth was headlined by SUVs, particularly in the mid-size and full-size segments[349]

And once again, prices are up due to the mix of sales skewing more toward SUVs and away from cars.[350]

This difference in trends is further supported by California DMV transaction price data for body style:

Figure VI-2 Transaction Price by Vehicle Body Style (CA Only)



[348] "Average New Car Prices Rise Nearly 4 percent for January 2018 on Shifting Sales Mix, According to Kelley Blue Book" Kelley Blue Book. Accessed on October 24, 2018. https://mediaroom.kbb.com/2018-02-01-Average-New-Car-Prices-Rise-Nearly-4- percent-For-January-2018-On-Shifting-Sales-Mix-According-To-Kelley-Blue-Book.

[349] "Average New Car Prices Jump 2 percent for March 2018 on SUV Sales Strength, According to Kelley Blue Book" Kelley Blue Book. Accessed on October 24, 2018. https://mediaroom.kbb.com/average-new-car-prices-jump-2-percent-march-2018-suv-sales-strength-according-to-kelley-blue-book.

[350] "New Car Transaction Prices Increase more than 2 percent on Sales Mix Skewed Toward Utility Vehicles, Away from Cars, According to Kelley Blue Book" Kelley Blue Book. Accessed on October 24, 2018. https://mediaroom.kbb.com/new-car-transaction-prices-increase-more-than-2- percent-sales-mix-skewed-toward-utility-vehicles-away-from-cars.

There are also other factors at play, such as dealer inventories: “Prices also are likely to strengthen as the average days in inventory has begun to recede for the first time this decade, which is a sign automakers are managing production well in the post-peak demand era.”[351]

b. The new sales model omits consideration of other vehicle attributes, in contradiction to the Agencies’ own assessment in other parts of the CAFE Model.

The omission of fuel economy/or vehicle operating costs (or any other vehicle attributes besides price) in the new vehicle sales model is inconsistent with the Agencies’ own discussion and treatment of consumers’ valuation of future fuel savings. Within the CAFE Model, the manufacturers are assumed to select technologies that can payback within 30 months, while the scrappage module includes multiple cost-per-mile variables and the dynamic fleet share model includes a miles per gallon parameter. So in multiple parts of the model, producers acknowledge that consumers are willing to pay for vehicle improvements that yield fuel savings and used vehicle buyers consider fuel costs per mile (which is comprised of both a vehicle’s fuel economy and current fuel prices); when it comes to whether new vehicle buyers make a purchase, though, these factors have been completely ignored. The Agencies even acknowledge:

> *Estimating the sales response to changes in average prices at the level of total new vehicle sales likely fails to address valid concerns about changes to the quality or attributes of new vehicles sold – both over time and in response to price increases resulting from CAFE standards.*[352]

The Agencies defend their omission by citing the difficulties in data, analysis, and programming that would be required to address this and yet ultimately conclude:

> *Because the values of changes in fuel economy and other features to potential buyers are not completely understood, the magnitude - and possibly even the direction - of their effect on sales of new vehicles is difficult to anticipate. On balance, the changes in prices, fuel economy, and other attributes expected to result from this proposed action to amend and establish fuel economy and CO_2 emission standards are likely to increase total sales of new cars and light trucks during future model years.*[353]

How the Agencies arrive at this conclusion is unclear for multiple reasons. First, the Agencies claim that consumers could in fact negatively view fuel economy

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[351] “Demand Quickly Backing Away from Cars, Pushing Average New-Car Transaction Prices Up for July 2018, According to Kelley Blue Book” Kelley Blue Book. Accessed on October 24, 2018. https://mediaroom.kbb.com/2018-08-01-Demand-Quickly-Backing-Away-from-Cars-Pushing-Average-New-Car-Transaction-Prices-Up-for-July-2018-According-to-Kelley-Blue-Book.
[352] PRIA, p. 958.
[353] PRIA, p. 959.

improvements but do not support this claim with any research. While it might be true that some consumers value other vehicle attributes like vehicle size, comfort, or performance at the expense of fuel economy improvements, this is not the same as saying consumers would find vehicles with improved fuel economy as *less* appealing solely from this attribute *per se*. However, the Agencies are contending that some potential buyers may actually *prefer* to spend their money on gasoline rather than other goods. This is absurd, and many academic studies confirm that when the price of gasoline increases, demand for gasoline falls.[354] In fact, even the empirical studies cited by the Agencies to support the rebound effect are based on the economic theory that consumers decrease their demand for fuel when its cost increases.

The Agencies also contradict themselves. On the one hand, they conclude that fuel economy and other attributes do play a role in total vehicle sales.[355] On the other, their new sales model completely omits both fuel economy and other vehicle attributes. To simply exclude a variable in a model because it is too onerous to include under the guise of lacking statistical significance is not sufficient justification to negate real-world effects that the Agencies acknowledge exist. In fact, elsewhere in the CAFE Model, manufacturers incorporate consumers' willingness to pay for fuel economy improvements, while the scrappage model considers the cost per mile of both existing and future vehicles when estimating the probability of scrapping a vehicle. To include these other aspects elsewhere while ignoring them within the new vehicle market, whose consumers typically drive the most miles and stand to gain the most from fuel economy improvements, is inconsistent and invalidates the results of this model.

This omission of the fuel savings that would result from the existing standards is also a misapplication of the Gruenspecht effect that the Agencies are trying to include in their model. As noted by Dr. Bunch, the Gruenspecht effect was initially posited for the effect of criteria pollutant emission standards, where the additional costs of compliance were not accompanied by any benefit to the purchaser. In the case of the CAFE and GHG standards, the costs associated with the standards should be net of any fuel savings that may result. So in the absence of including fuel economy or operating costs in the model, the additional vehicle price should be offset by the expected fuel savings for a proper accounting of the Gruenspecht effect.

As shown by historical data, new vehicle sales can increase at the same time as new vehicle prices and fuel economy rise. Given that the documentation is ambiguous as to whether the model uses future price projections in constant or nominal dollars, both are presented here in *Figure VI-3* and *Figure VI-4*. Comparing these trends illustrates the complexity in forecasting new vehicle sales, and minimally that even if fuel economy

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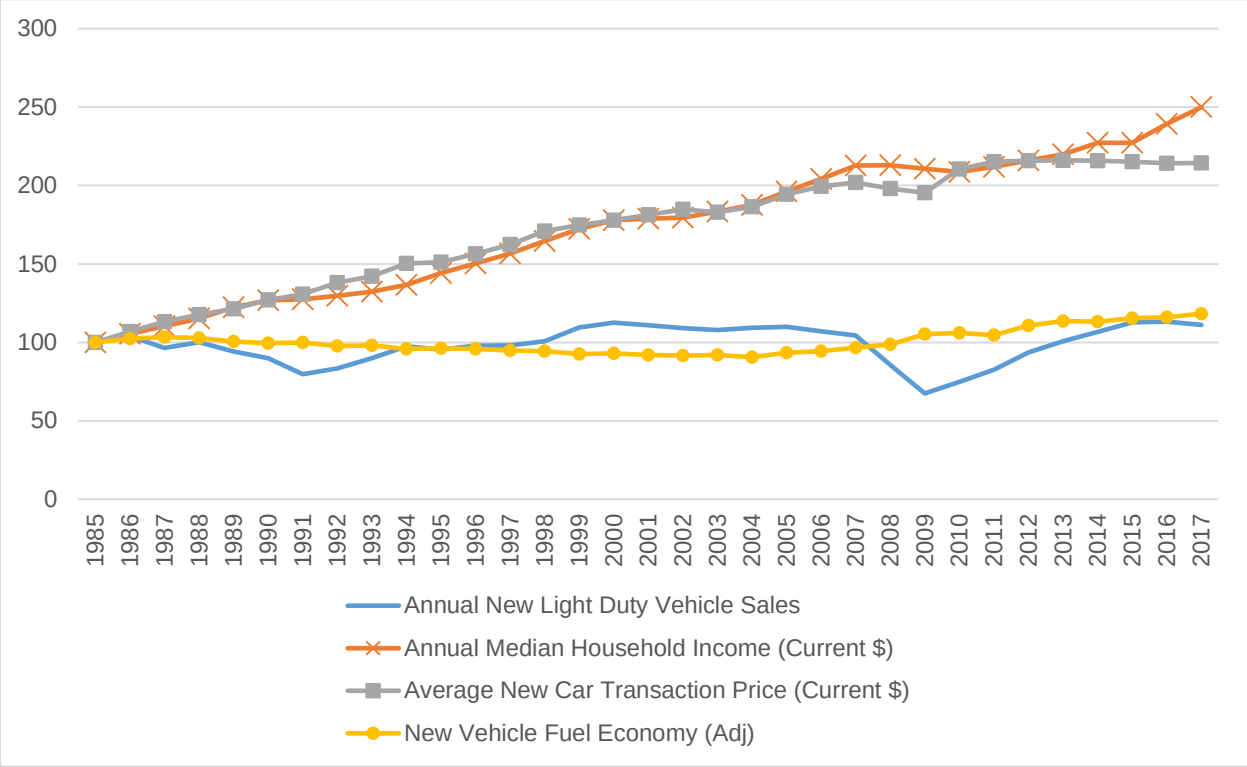
[354] For example: Dahl, Carol, and Thomas Sterner. "Analysing gasoline demand elasticities: a survey." *Energy economics* 13.3 (1991): 203-210.

[355] 83 Fed.Reg. at p. 43075 ("The purpose of the sales response model is to allow the CAFE Model to simulate new vehicle sales in a given future model year, accounting for the impact of a regulatory alternative's stringency on new vehicle prices...").

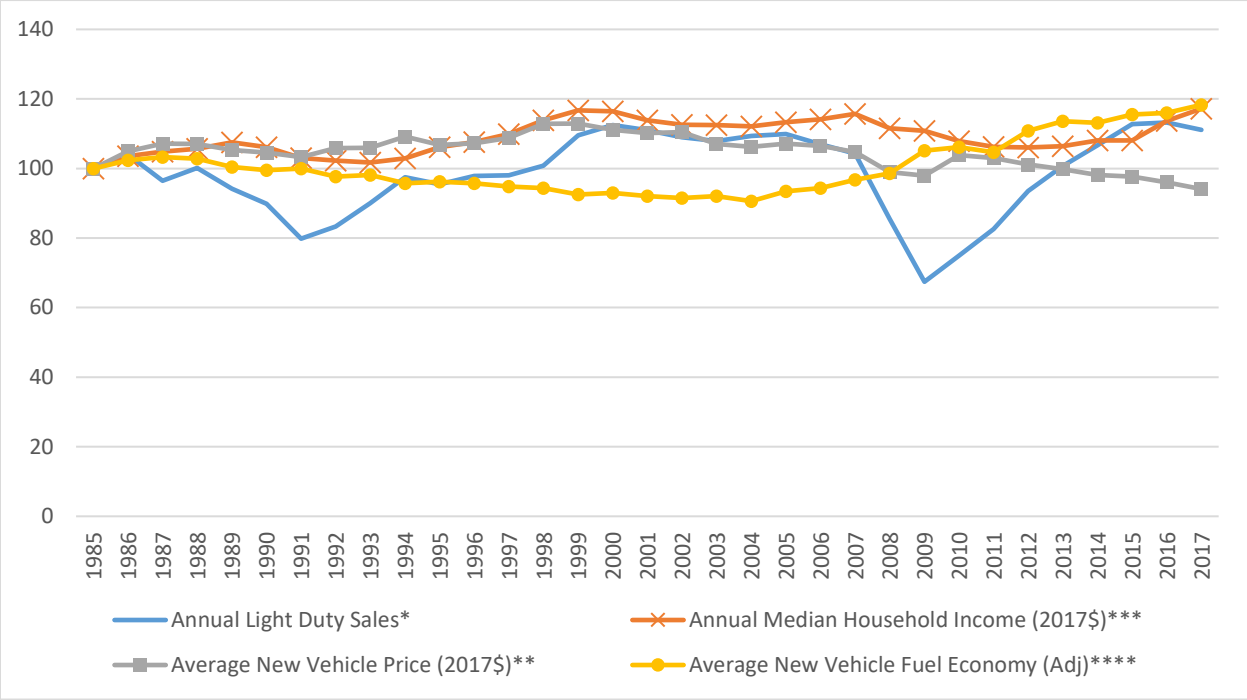
standards were depressing sales, other factors have overridden these price effects such that sales have recently reached record levels despite record prices. Importantly, during 1986-1989 when CAFE standards were relaxed from 27.5 miles per gallon to as low as 26 miles per gallon, there is no perceptible change in the rate of increase in new vehicle prices and yet sales declined regardless. Notably, the inflation-adjusted average price of new vehicles has actually been declining most recently, despite steady increases in fuel economy.

Figure VI-3 Annual U.S. Light Duty Sales, Average New Vehicle Transaction Price, Annual Median Household Income, and Average New Vehicle Fuel Economy (Indexed, 1985 Levels =100, Current Dollars)



*U.S. BEA, https://www.bea.gov/national/xls/gap_hist.xlsx "Motor Vehicles, Table 10" Accessed October 2, 2018
**U.S. BEA, https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=2#reqid=19&step=3&isuri=1&1921=underlying&1903=2055 "Average consumer expenditure per car, Overall" Accessed October 2, 2018
***U.S. Census Bureau, https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-income-households.html "Table H-6 Median Household Income U.S. 1975-2017" Accessed October 2, 2018
****U.S. EPA, https://www.epa.gov/fuel-economy-trends/report-tables-and-appendices-co2-and-fuel-economy-trends "Table 9.1 EPA Adjusted, EPA Unadjusted Laboratory, and CAFE Values by Model Year" Accessed October 2, 2018

Figure VI-4 Annual U.S. Light Duty Sales, Average New Vehicle Transaction Price, Annual Median Household Income, and Average New Vehicle Fuel Economy (Indexed, 1985 Levels =100, 2017 Dollars)



*U.S. BEA, https://www.bea.gov/national/xls/gap_hist.xlsx "Motor Vehicles, Table 10" Accessed October 2, 2018
**U.S. BEA, https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=2#reqid=19&step=3&isuri=1&1921=underlying&1903=2055 "Average consumer expenditure per car, Overall" Accessed October 2, 2018
***U.S. Census Bureau, https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-income-households.html "Table H-6 Median Household Income U.S. 1975-2017" Accessed October 2, 2018
****U.S. EPA, https://www.epa.gov/fuel-economy-trends/report-tables-and-appendices-co2-and-fuel-economy-trends "Table 9.1 EPA Adjusted, EPA Unadjusted Laboratory, and CAFE Values by Model Year" Accessed October 2, 2018

The counterfactual – what would have happened to new vehicle sales had prices and all other market conditions remained unchanged– is difficult to estimate, and future sales impacts are even more difficult to predict. However, there is evidence that shows that consumers will continue to purchase vehicles with reduced operating costs, and even the NPRM acknowledges that "[a] number of recent studies have indeed shown that consumers value fuel savings (almost) fully."[356] At the very least, the NPRM does not prove, and the Agencies provide no supporting evidence for, the connections the Agencies posit between improvements in emission controls and fuel economy, vehicle price, and consumer preference.

[356] 83 Fed.Reg. at p. 43075.

c. The Agencies' assumption that consumers are not willing to pay for vehicle improvements is contradicted by historical trends and market research.

On the contrary, there is evidence that consumers in fact value fuel-efficient vehicles and seek to purchase them. As elaborated below, several analyses of vehicle sales and survey data show that consumers do want fuel-efficient large vehicles (which the footprint-based standards accommodate), are willing to pay for the increased fuel-efficiency, and that SUVs and pickup trucks have seen their sales increase as they have become more fuel-efficient. An analysis by the Consumer Federation of America (CFA) shows that the percent of SUVs and light-duty trucks sales with a fuel economy of 16 mpg or less decreased from 23.5 percent in 2012 to 6.3 percent in 2018, while the percent of these vehicles with a fuel economy greater than 23 mpg increased from 16.1 percent in 2012 to 36.6 percent in 2018[357]. A different analysis by the CFA[358] compared the sales of SUVs, CUVs, and light-duty trucks between 2011, the year prior to when the most recent current CAFE requirements went into effect, with those of 2017 (the sixth year of CAFE increases). This analysis shows that those vehicles with an increase of 15 percent or more in their fuel economy also experienced 20 percent more sales on average than similar vehicles that experienced less than a 15 percent increase in their fuel economy. For example, the Nissan Pathfinder SUV, which experienced an increase of more than 15 percent in its fuel economy between 2011 and 2017, had an increase of 224 percent in annual sales within that time period. In contrast, the Kia Sorento SUV, which did not experience a 15 percent improvement in fuel economy between 2011 and 2017, saw a decrease of 23 percent in sales between the same time period.

Surveys also show that consumers value fuel economy. Annual surveys commissioned by the CFA from ORC International between 2013 and 2017 show that an overwhelming majority of American consumers support fuel economy standards (76-85 percent) and want their next vehicle to have better fuel economy (84-89 percent).[359] The results hold true despite fluctuating gasoline prices during the survey years. Surveys funded by Consumers Union (CU) and administered by GfK in 2017[360] and 2018[361] targeting vehicle owners similarly show that 85-87 percent of respondents agree that automakers should continue to improve fuel economy and 73 percent agree that the U.S. government should continue to increase fuel efficiency standards. Another 78-79

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[357] "Despite Low Gas Prices, Consumers Support MPG Standards" Consumer Federation of America. Accessed on October 24, 2018. https://consumerfed.org/press_release/despite-low-gas-prices-consumers-support-mpg-standards/.
[358] "SUVs, Crossovers and Pickups with High MPG percent Increases Sell Better" Consumer Federation of America. Accessed on October 24, 2018. https://consumerfed.org/press_release/suvs-crossovers-and-pickups-with-high-mpg-percent-increases-sell-better/.
[359] "Despite Low Gas Prices, Consumers Support MPG Standards" Consumer Federation of America. Accessed on October 24, 2018. https://consumerfed.org/press_release/despite-low-gas-prices-consumers-support-mpg-standards/.
[360] "Nearly 9 in 10 Americans want automakers to raise fuel efficiency, according to latest Consumers Union survey" Consumers Union. Accessed on October 24, 2018. https://consumersunion.org/news/2017-fuel-economy-survey/.
[361] Automotive Fuel Economy Survey Report. Consumers Union. Accessed on October 24, 2018. https://consumersunion.org/wp-content/uploads/2018/07/2018-Fuel-Economy-Survey-Fact-Sheet-3.pdf.

percent agree that it is important to make large vehicles, such as SUVs and trucks, more fuel-efficient. Overall, 35-38 percent of respondents identified fuel economy as the top attribute of their current vehicle that has the most room for improvement. Drivers of vehicles averaging less than 20 mpg are almost three times more likely than drivers of vehicles averaging 30 mpg or more to identify fuel economy as an attribute most in need of improvement while drivers of larger vehicles are more than twice as likely as drivers of small and midsize vehicles to select fuel economy as an attribute that needs improvement. At the same time, 9 percent of respondents indicate they plan to move from towards larger vehicles and away from small or midsize cars.

A 2017 AAA survey found that fuel economy was a major purchase consideration. Overall, 70 percent of respondents rated fuel economy as an important factor in selecting any vehicle, which was about equal to the importance of the cost (71 percent), crash rating (70 percent) and performance (69 percent), trailing safety technology (50 percent), brand (48 percent), style, color and design (46 percent) and smartphone connectivity (34 percent).[362] The National Renewable Lab also sponsored a survey partly focused on fuel economy that was administered by ORC International in August 2015.[363] Results from this survey show significant interest in fuel economy and willingness to pay for it. Overall, 46 percent of respondents identified fuel economy as either “one of the most important factors” or the “single most important factor” when considering a vehicle purchase. When asked “compared to your current vehicle, if you were to purchase a vehicle that was several years newer, would you prefer that the newer vehicle use technology advances to primarily…”, 28 percent responded “improve fuel economy”. The only other answer that received a higher percentage was “improve safety” (29 percent). Additionally, when given the choice between three exact vehicles except for one with better zero-to-sixty acceleration performance by one second, one that costs $500 less, and one that uses 10 percent less gasoline, 64 percent chose the more fuel-efficient vehicle, followed by 19 percent for the cheaper vehicle, and 10 percent for the faster accelerating vehicle. Results also show that 62 percent of respondents would be willing to pay an upfront vehicle cost increase for fuel cost savings over the life of the vehicle, with a median upfront vehicle cost of $1,000 for a monthly saving of $50 on fuel. Similarly, 66 percent of respondents would be willing to pay an increased monthly payment for a monthly fuel cost savings of $50, with a median monthly increase of $50 over the life of a 3-year old vehicle loan.

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[362] Fact Sheet: Consumer Attitudes – Electric Vehicles. American Automobile Association. Accessed on October 24, 2018. https://newsroom.aaa.com/download/10155/ .

[363] Singer, M. “Consumer Views: Fuel Economy, Plug-in Electric Vehicle Battery Range, and Willingness to Pay for Vehicle Technology.” National Renewable Energy Laboratory. Accessed on October 24, 2018. https://www.nrel.gov/docs/fy17osti/68201.pdf.

Results from a stated preference survey of vehicle buyers commissioned by the Consumers Union and administered by ORC International[364] found that buyers are willing to pay more for higher fuel economy vehicles, especially at lower fuel economy levels. For example, for an additional 5-MPG increase in fuel economy, respondents were willing to pay $4,365 for vehicles starting at 20-24 mpg versus $3,105 for vehicles starting at 30-35 mpg. When respondents were shown the full EPA-mandated fuel economy label, they were willing to pay the most ($1,200 per each additional mile per gallon) compared to those presented other fuel economy information.[365] Regardless of how fuel economy was shown, respondents were willing to pay an average of $690 more per each additional mpg. The Consumers Union used the survey results to calculate that vehicle buyers were willing to pay $10,730 more to save $1,000 per year in fuel costs. Results also show that vehicle buyers are willing to pay an 11.4 percent premium on a $30,000 vehicle in order to increase the fuel economy of their vehicle by 25 percent. Compared to fuel economy, respondents were only willing to pay 16.8 percent and 15.8 percent more, respectively, to increase reliability and safety ratings by 25 percent each. Notably, buyers particularly valued increasing the fuel economy of more inefficient vehicles. For example, the willingness to pay for an increase of one additional mpg for those interested in purchasing a small car ($450) or a small SUV ($410) was less than half of that of those interested in a pickup truck ($1,140) and about half of those interested in a mid-size SUV ($850). These results are statistically significant.

Consumers Union also analyzed consumer satisfaction based on survey data of about 1 million of its members from the spring of 2016 with five different vehicle attributes. [366] The analysis was performed using EPA fuel economy estimates as well as with fuel economy as reported by vehicle owners. This analysis showed that fuel economy was connected to higher reported levels of satisfaction with their vehicle. For example, the percentage of 2014-2015 Hyundai Genesis owners that reported satisfaction with their vehicle jumped from 45 percent to 70 percent for owners who reported achieving 15 vs 30 miles per gallon. The same analysis by Consumers Union showed that a similar relationship between vehicle owner satisfaction and fuel economy was found among owners of all vehicle types when controlling for mechanical problems. For example, the predicted owner satisfaction for model year 2014 SUVs increases from 68 percent to 78 percent as owners report achieving 15 vs 30 miles per gallon.

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[364] Kormos and Sussman. “Auto buyer’s valuation of fuel economy: a randomized stated choice experiment” Consumers Union. Accessed on October 24, 2018. https://consumersunion.org/wp-content/uploads/2018/06/FINAL-Kormos-and-Sussman-2018- percentE2 percent80 percent93-Auto-buyers-valuation-of-fuel-economy.pdf.

[365] Other information treatments included each of the following parameters on their own: MPG, annual fuel cost, five-year fuel cost, amount saved or spent in fuel cost over five years relative to the average vehicle, and lifetime fuel costs. There was a control group were no fuel economy information was presented.

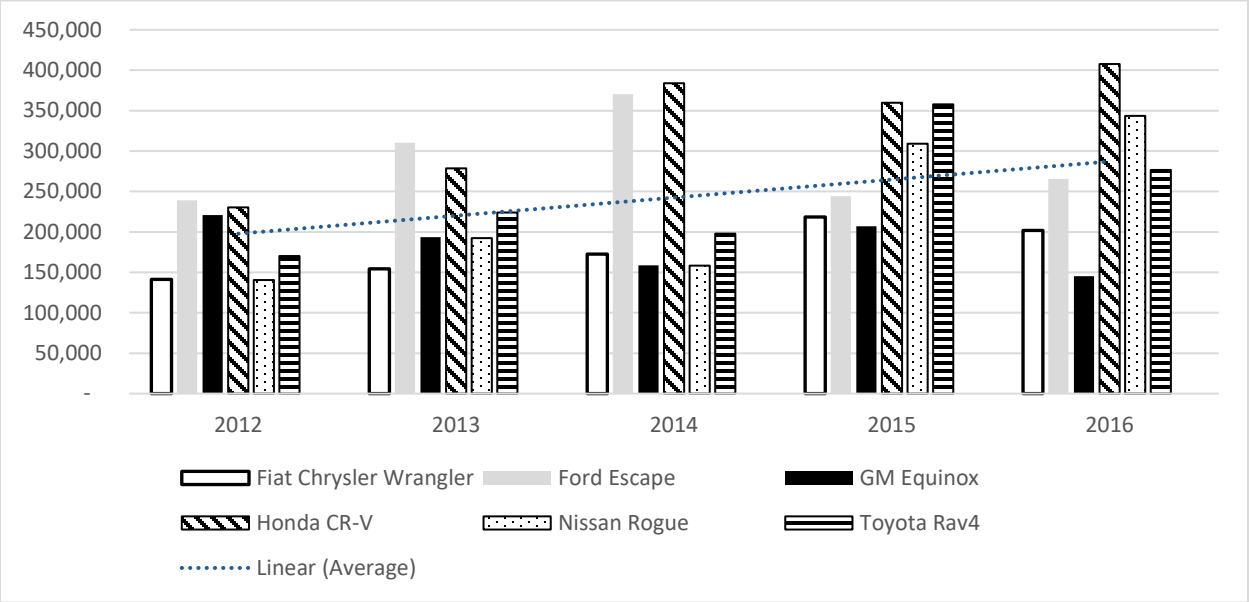
[366] Hazel et al. “Investigation of relationship between fuel economy and owner satisfaction,” Consumers Union. Accessed on October 24, 2018. https://consumersunion.org/wp-content/uploads/2016/06/CU-MPG-Satisfaction-report-final.pdf.

Furthermore, a recent analysis by the Consumer Federation of America based on fuel efficiency increases among "all-new" or redesigned 2018 model year vehicles[367] shows that improvements in fuel efficiency either cost less than in the 2011 predecessor models or improved enough to pay for themselves.[368] The analysis compared the EPA-combined fuel efficiency estimates and vehicle prices of the 29 "all-new" 2018 vehicles with 20 of their direct predecessors in 2011, the year before the current CAFE standards were implemented. Results show that 27 percent of "all-new" 2018 vehicles cost less than their 2011 predecessor despite all having improved fuel economy. A separate 23 percent of these "all-new" 2018 vehicles were more expensive than their 2011 predecessor, but their five-year fuel cost savings due to the increased fuel efficiency offset the entire price increase. The analysis also determined that the average fuel economy improvement was 3.2 miles per gallon, which translates to a cost of $320 using a $100 per mpg cost technology estimate. However, assuming these vehicles are driven 14,000 miles per year with a gasoline price of $2.86, buyers saved an average of $1,184 over five years of ownership, with $864 going back into their pocketbooks.

Consider consumer acceptance of the emerging crossover vehicle segment. Overall, light-truck sales have increased over time, and much of that sales growth is due to small SUVs, commonly referred to as "crossovers" or "crossover utility vehicles" or CUVs. *Figure* VI-5*VI-5* below shows annual U.S. sales of the top selling crossovers for the largest vehicle manufacturers between 2012 and 2016. As shown, crossover sales for these six models have grown an average of 50 percent between 2012 and 2016, with the exception of the General Motors (GM) Equinox, which decreased 5 percent in sales during the same timeframe.

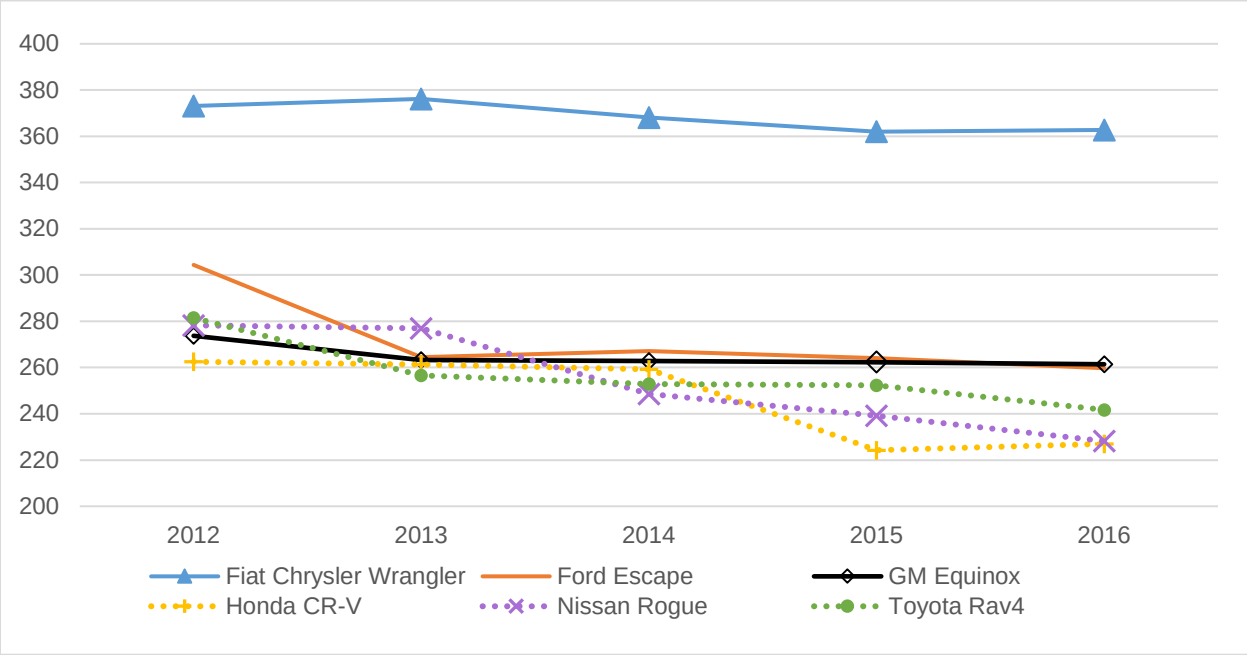
[367] "All-new" refers to vehicle models that are newly released based on a complete redesign and not part of a model series that undergoes small style and feature changes over the years. Typically vehicle models are "newly introduced" or undergo a redesign every 4 to 6 years. For example, the Honda Pilot was "all-new" in 2008 and 2016, although in the interim model years small changes to the vehicle did occur.
[368] "Fuel Efficiency Saves Consumers Almost Four Times Its Technology Cost." Consumer Federation of America. October 24, 2018.

Figure VI-5 Annual U.S. Sales Top Selling CUVs



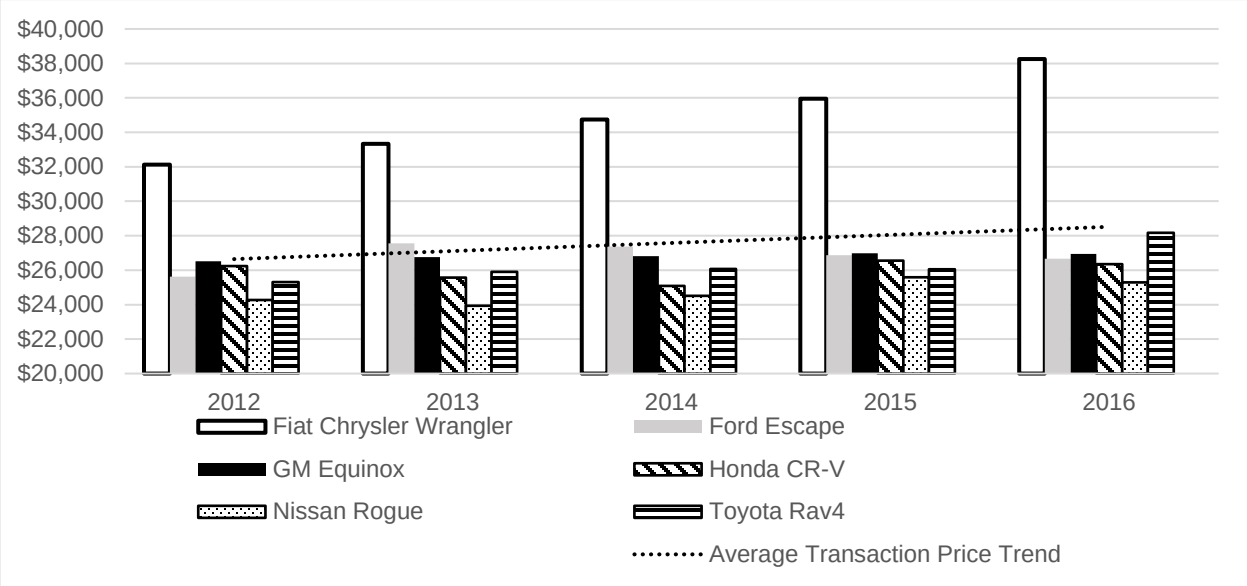
During these same model years, manufacturers improved CO_2 emissions by 9 percent between 2012 and 2016 for the same crossover models (see Figure VI-6 below). The crossovers shown in *Figure VI-6* certify as either passenger cars or trucks, which changes the standard each vehicle should meet in a given year, as well as the number of credits it would earn. The values shown below are weighted averages for each model name and include both passenger car and truck versions of the named vehicle, as well as the earned air conditioning leakage and efficiency credits and off-cycle credits, according to the 2016 EPA GHG compliance report.

Figure VI-6 Average Top Selling CUV Compliance Values (CO_2)



Using data from the California Department of Motor Vehicles (CA DMV), transaction prices for crossovers are steadily increasing during the same period (7 percent on average). The data are shown in *Figure VI-7* below.

Figure VI-7 Average Transaction Prices of Top Selling CUVs



Together, these data show sales are not decreasing as vehicles reduce CO_2 emissions over time. In fact, sales are increasing, as are transaction prices, suggesting consumers are willing to pay for vehicles that are both fuel efficient and providing other desirable attributes.

d. Consumers want and are willing to pay for clean transportation.

Not only do consumers value fuel economy for conventional vehicles, consumers also value and are willing to pay for electrification, something else the Agencies overlooked in their proposal. Annual ZEV and PHEV sales are increasing rapidly as more models are introduced. Notably, Tesla Model 3 sales have been doing so well in the U.S. that it was the top fifth best-selling sedan regardless of powertrain, size or price in the third quarter of 2018.[369] Additionally, according to the California New Car Dealers Association the first two quarters of 2018 saw the California sales of PHEVs, BEVs, and FCEV increase by 41 percent, 29 percent, and 34 percent, respectively, compared to the first half of 2017.[370]

As ZEV and PHEV sales increase, so is consumer interest in advanced-technology vehicles. For example, a 2018 survey commissioned by the American Automobile Association (AAA) shows that 20 percent of Americans will likely go electric for their next vehicle purchase, up from 15 percent in 2017.[371] The same AAA survey shows that 31 percent of respondents are likely to buy a hybrid vehicle the next time they are in the market for a new or used vehicle. Surveys commissioned by CFA show a growing interest in purchasing a plug-in electric vehicle with 31 percent in 2015 and 36 percent in 2016.[372] Interest in acquiring a plug-in electric vehicle was greater among respondents that know about plug-in electric vehicles (55 percent) compared with those who have no knowledge of plug-in electric vehicles (22 percent). When asked, "the next time you buy or lease a car, would you consider an electric vehicle if it costs the same as a gas-powered car, has lower operating and maintenance costs, has a 200 mile range between charges, and can recharge in less than an hour?", Fifty-seven percent of respondents said they would be interested in purchasing this plug-in electric vehicle. Finally, a report by NREL, based on data from a survey administered in 2017 by ORC International, shows that 21 percent and 24 percent of respondents expect to purchase or expect to consider purchasing either a BEV or a PHEV, respectively.[373]

Not only are consumers interested in purchasing a ZEV or PHEV, but they are also willing to pay for these vehicles. Results from a survey commissioned by NREL and

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[369] Randall and Coppola. "Tesla's Model 3 Is Becoming One of America's Best-Selling Sedans" Bloomberg. Accessed on October 24, 2018. https://www.bloomberg.com/news/articles/2018-10-03/tesla-s-model-3-is-becoming-one-of-america-s-best-selling-sedans.
[370] "California Green Vehicle Report" California New dealers Association. Accessed on October 24, 2018. https://www.cncda.org/wp-content/uploads/Cal-Alt-Powertrain-Report-3Q-18-Release.pdf.
[371] "Fact Sheet: Consumer Attitudes Electric Vehicles" American Automobile Association. Accessed on October 24, 2018. https://publicaffairsresources.aaa.biz/download/10790/.
[372] "New Data Shows Consumer Interest in Electric Vehicles Is Growing" Consumer Federation of America. Accessed on October 24, 2018. https://consumerfed.org/press_release/new-data-shows-consumer-interest-electric-vehicles-growing/.
[373] Singer, M. "The Barriers to Acceptance of Plug-in Electric Vehicles: 2017 Update". National Renewable Energy Laboratory. Accessed on October 24, 2018. https://www.nrel.gov/docs/fy18osti/70371.pdf.

administered by ORC International in 2015 found that 35 percent of U.S. adults sampled would be willing to pay an average of $5,607 up front for a BEV with a battery range of 150 miles compared to a similar conventional gasoline vehicle.[374] For a 100-mile range BEV, 29 percent of respondents would be willing to pay an average of $3,941 more than for the conventional gasoline vehicle. Additionally, 23 percent of respondents would consider both the 150- and 100-mile range BEV if it did not have an increased cost compared to the conventional gasoline vehicle. A peer-reviewed study based on a survey of Clean Vehicle Rebate Project (CVRP) participants in 2015 by the Center for Sustainable Energy[375] found that the self-reported average vehicle price or agreed upon value when vehicle was purchased or leased of the rebated plug-in electric vehicle was $35,963, which is slightly higher compared to the average transaction price for all new vehicles in April 2015 (reported to be $33,560, according to authors of the summary report). This shows that between 2012 and 2015 California consumers were willing to pay $2,403 more on average for a plug-in electric vehicle[376] than a conventional vehicle.

The Agencies' assertion that zero emission vehicle demand will be low based on poor historic hybrid electric vehicle sales levels is also not valid. We have survey data to show that the majority of plug-in electric vehicle drivers:

- Have not replaced their hybrid electric vehicle with a zero emission vehicle;
- Have not considered getting one while purchasing or leasing their plug-in hybrid electric vehicle, battery electric vehicle or fuel cell electric vehicle; and
- Do not currently have a hybrid electric vehicle in their household.

A recent peer-reviewed study by Hardman and Tal, based on a 2017 survey of Californian battery electric vehicle and fuel cell electric vehicle owners, shows that only 18 percent of battery electric vehicle households have owned a hybrid electric vehicle previously compared to 33 percent for the fuel cell electric vehicle households.[377] In fact, 49 percent of battery electric vehicle and 43 percent of fuel cell electric vehicle households have never owned alternative electric technology vehicle previously. CARB analyzed survey data from CVRP recipients who bought or leased their vehicle between June 2017 and January 2018[378] and found that only 13 percent of all respondents replaced a hybrid electric vehicle with their plug-in hybrid electric vehicle, battery electric vehicle, and fuel cell electric vehicle, while the majority replaced a gasoline vehicle (62 percent). Table VI-1 shows that about half of those who got a battery electric vehicle

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[374] Singer, M. "Consumer Views: Fuel Economy, Plug-in Electric Vehicle Battery Range, and Willingness to Pay for Vehicle Technology" National Renewable Energy Laboratory. Accessed on October 24, 2018. https://www.nrel.gov/docs/fy17osti/68201.pdf.

[375] Johnson and Williams. "Characterizing Plug-in Hybrid Electric Vehicle Consumers Most Influenced by California's Electric Vehicle Rebate" Transportation Research Record: Journal of the Transportation Research Board, No. 2628, 2017, http://dx.doi.org/10.3141/2628-03. pp. 23–31.

[376] The split of rebated BEVs to PHEVs was nearly equal.

[377] Hardman and Tal. "Who are the early adopters of fuel cell vehicles?" International Journal of Hydrogen Energy, 2018. Volume 43, Issue 37, pp. 17857-17866. https://doi.org/10.1016/j.ijhydene.2018.08.006.

[378] Survey was administered by the Center for Sustainable Energy, who administers the Clean Vehicle Rebate Project, between 8/1/17-3/13/18 for PHEV, BEV, FCEV purchases/leases between 6/1/17-1/31/18.

replaced a hybrid electric vehicle (9 percent) compared to those who got a plug-in hybrid electric vehicle (17 percent). plug-in electric vehicle consumers are repeat buyers, with about a fifth of those who got a battery electric vehicle replaced a different battery electric vehicle, and, similarly, plug-in hybrid electric vehicle consumers replaced with another plug-in hybrid electric vehicle. Furthermore, these consumers did not cross-shop a hybrid electric vehicle; results show that overall only 11 percent of respondents acquiring plug-in hybrid electric vehicle, battery electric vehicle or fuel cell electric vehicle also considered getting a hybrid electric vehicle when they shopped for their current rebated vehicle. For those who got a plug-in hybrid electric vehicle, 17 percent considered getting a hybrid electric vehicle compared to 7 percent of those who got a battery electric vehicle. Instead, when shopping for their vehicle, those who got a plug-in hybrid electric vehicle, battery electric vehicle or fuel cell electric vehicle tended to consider other plug-in hybrid electric vehicles, battery electric vehicles or fuel cell electric vehicles.

Table VI-1 percent breakdown of vehicle technology replaced by rebated technology of CVRP survey

Rebated Technology	Gasoline	HEV	PHEV	BEV	FCEV	Other
BEV (n=1,863)	63.2 percent	9.3 percent	5.0 percent	20.2 percent	0.1 percent	2.0 percent
FCEV (n=167)	73.1 percent	12.6 percent	6.6 percent	4.8 percent	0.6 percent	2.4 percent
PHEV (n=1,257)	59.0 percent	17.2 percent	18.2 percent	2.9 percent	0.1 percent	2.2 percent

The same CARB analysis of CVRP recipient survey shows that only 11 percent of respondents buying and leasing a PHEV, BEV or FCEV also have a HEV in their household compared to 74 percent having a gasoline vehicle, as summarized in Table VI-2. The percentage having other household vehicle technologies varies with the specific PHEV, BEV or FCEV technology they acquired. For example, 17 percent of FCEV households also have another HEV compared to 10 percent of those with BEVs.

Table VI-2 percent breakdownbreakdown of other current household vehicle technology by rebated technology of CVRP survey

Rebated Technology	Gasoline	HEV	PHEV	BEV	FCEV	Other
BEV (n=2,582)	73.0 percent	10.2 percent	4.1 percent	10.0 percent	0.0 percent	2.4 percent
FCEV (n=272)	72.4 percent	16.5 percent	2.6 percent	2.6 percent	3.3 percent	2.6 percent
PHEV (n=1,431)	76.0 percent	11.0 percent	6.3 percent	3.8 percent	0.3 percent	2.5 percent
TOTAL n=4,285)	73.6 percent	10.6 percent	4.5 percent	8.4 percent	0.2 percent	2.4 percent

e. The Agencies' willingness-to-pay estimates for electrified vehicles are flawed.

While neither the existing standards scenario nor the rollback scenario show that significant electrification would be needed to comply with either set of standards, the Agencies discuss the potential welfare or utility value loss that results from any type of electrification that does occur.[379] Although ultimately the Agencies do not include a utility loss in their central analysis, the confusingly named "Utility Value Loss in HEVs"[380] sensitivity case assumes these losses influence manufacturers' decisions on technology deployment. However, this sensitivity case should not be considered on grounds of both a flawed premise and improper implementation.

The premise that electrified vehicles, especially fully electric vehicles, necessarily results in a loss in utility for the consumer is based on outdated information. The Agencies argue – without citing any specific research but rather a nebulous "growing body of literature" [381] – that electric vehicles will force consumers to sacrifice cargo capacity or driving range. As noted in Section V.C, significant improvements have already been made, with more still to come, to increase all-electric travel range (and also reduced charging times). Energy density of batteries also continues to improve, meaning that battery packs do not need to be as voluminous and encroach upon cargo or cabin capacity. Additionally, purpose-built platforms for electrified vehicles can integrate the batteries so as not to result in reductions in cargo capacity and instead even increase cargo capacity, which early versions resulting from conversions of existing platforms were not able to do. Finally, many buyers are attracted to electric vehicles precisely because of their performance, not just the faster acceleration rates

[379] 83 Fed.Reg. at 43,082.
[380] The description for this sensitivity case notes that PHEVs and EVs are included even though omitted from the title.
[381] 83 Fed.Reg. at 43,083. "However, ongoing low sales volumes and a growing body of literature suggest that consumer welfare losses may still exist if manufacturers are forced to produce electric vehicles in place of vehicles with internal combustion engines (forcing sacrifices to cargo capacity or driving range) in order to comply with standards." However, no research literature is cited.

but also the smoothness and quietness of their operation as well as the convenience of home refueling.[382] These benefits do not appear to be accounted for in the Agencies' analysis.

Furthermore, the method by which the willingness-to-pay values for electrified vehicles was calculated is flawed. The Agencies are using the willingness-to-pay model to suggest that consumers' willingness-to-pay for alternative technology vehicles is significantly lower that the technology costs needed to produce the alternative technology vehicles. However, modeling decisions made by the Agencies likely bias the estimates of consumers' willingness-to-pay in a way that makes them smaller than the true willingness to pay. For example, the Agencies describe a process of using data on *used* vehicle prices to estimate consumers' willingness to pay for a *new* vehicle of different technology types. The Agencies do not provide a foundation for why the described methodology is valid.[383] To estimate the price premium on new vehicles, the Agencies should rely on new vehicle transaction price data. The used vehicle transaction price data also represents a lower bound on a consumer's willingness to pay for a vehicle. By purchasing a vehicle at a specific price, a consumer indicates that he or she was willing to pay the observed transaction price. However, it is possible that the consumer would have been willing to purchase the vehicle at a higher price than observed.

There are also several problems with the modeling that bring into question the validity of these willingness-to-pay estimates. NHTSA states that the first step of the analysis was gathering used car fair market values for select vehicles.[384] The select vehicles are said to be "nearly the same" except for powertrain. However, even vehicles within the same model name may still have differences in vehicle characteristics that have not been included in the willingness-to-pay model. For example, consider the case where higher quality interior features are available for the internal combustion vehicle and not available for a hybrid vehicle of the same nameplate. The difference in the transaction prices between the hybrid vehicle and the internal combustion vehicle capture not only differences in the willingness to pay for various powertrain technologies, but also capture differences in the features between the two vehicles. The better interior features of the internal combustion engine vehicle may narrow the gap between the two vehicles' transaction prices. If the model being used to measure the gap between the transaction prices of the two vehicles does not take into account the observable vehicle features, then it will interpret the gap between the two vehicle prices as the willingness to pay for an internal combustion vehicle versus a hybrid. In the case just described, this would lead to an underestimate of the willingness to pay for the hybrid, because the estimated value of the internal combustion engine technology includes the better interior

[382] California's Advanced Clean Cars Midterm Review: Appendix B, B-79. CARB. January 18, 2017.
[383] 83 Fed Reg. at 43,083.
[384] 83 Fed.Reg. at 43,083.

features, and that should not be counted. While some manufacturers have included premium features on hybrid versions of models, or only offered a hybrid version in the model's top trim level,[385] there are also instances where upper trim levels are reserved for the conventional internal combustion vehicle.[386] While the proposed rollback states that trim level and options packages were matched between internal combustion engine and electric powertrains to minimize the degree of non-powertrain differences between vehicle pairs, the regression equations presented in the NPRM clearly show that any remaining observable differences in vehicle attributes were not controlled for. The regression presented only includes regressors for technology type and vehicle nameplate. Other observable variables, such as horsepower, are not included in the regression, which in which will produce biased estimates for consumers' willingness-to-pay for different technologies. [387] Due to the omitted variables and potentially invalid comparisons, there should be little confidence placed on the estimates presented.

Second, studying only "select" vehicles is problematic. No long-range BEV is included in the analysis, yet, long-range BEVs make up 57 percent of all BEVs sold in the U.S. as of September 2018.[388] Similarly, Tesla vehicles are also excluded from the analysis even though they make up 51 percent of all BEVs sold in same time period.[389]

Additionally, the Agencies' strategy of measuring the difference in transaction price between a conventional gasoline vehicle and an alternative powertrain vehicle of the same nameplate is not an appropriate comparison. The majority of consumers do not consider the conventional gasoline vehicle as the alternative to the PEV under the same nameplate. According to a 2018 peer-reviewed study by Sheldon and Dua, if PEVs were not available, many consumers who purchase or lease these vehicles would instead get larger sized vehicles or premium vehicles instead of staying in the smaller compact and subcompact vehicle segments.[390] Similarly, results from a survey of CVRP recipients who bought or leased their a PHEV, BEV, or FCEV between June 2017 and January 2018[391] show that of other vehicles considered while shopping for their rebated vehicle, only 16 percent overall were gasoline vehicles.

Many expressed continuing interest in electric power tram technology. As shown in *Table VI-3*, of those with rebated PHEVs, 39 percent considered a different PHEV and

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[385] Iliff, Laurence. "Lexus testing new hybrid math" Automotive News. Accessed on October 24, 2018. http://www.autonews.com/article/20180219/RETAIL01/180219776/lexus-testing-new-hybrid-math.
[386] Hall-Geisler, Kristen. "2018 Toyota Camry vs. 2018 Toyota Camry Hybrid: Head to Head" U.S. News. Accessed on October 24, 2018. https://cars.usnews.com/cars-trucks/camry-vs-camry-hybrid.
[387] Bias means that the models estimate of a parameter does not reflect the true value of the parameter. For example, a regression model may estimate a consumer's willingness-to-pay for a specific vehicle, but if the model does not properly control for other confounding factors, the model's estimate may not actually reflect the consumer's actually willingness-to-pay.
[388] Per compiled data from hybridcars.com.
[389] Per compiled data from hybridcars.com.
[390] Sheldon and Dua. "Gasoline savings from clean vehicle adoption" Energy Policy. Accessed on October 24, 2018. (120) p. 418-424. https://doi.org/10.1016/j.enpol.2018.05.057.
[391] Survey was administered by the Center for Sustainable Energy, who administers the Clean Vehicle Rebate Project, between 8/1/17-3/13/18 for PHEV, BEV, FCEV purchases/leases between 6/1/17-1/31/18.

24 percent considered a BEV. Those with a rebated BEV were even more interested in a PEV than those with rebated PHEVs: 51 percent considered a different BEV and 24 percent a PHEV. When looking at specific PEV models, fewer conventional gasolines were considered by Nissan Leaf (9 percent) and Chevrolet Bolt (13 percent) consumers than BEV consumers overall (15 percent). A lower percentage of other vehicles considered by Chevrolet Volt consumers were conventional gasoline (15 percent) vehicles compared to PHEV consumers overall (18 percent). In fact, assuming that the other Nissan gasoline vehicles considered by the Leaf consumers were all Nissan Versa, only 3 percent of Leaf consumers would have considered a Versa while shopping for their vehicle. Similarly, less than 1 percent and 2 percent of other vehicles considered by Chevrolet Bolt and Volt consumers were Chevrolet gasoline vehicles, respectively. Of the other vehicles considered by Leaf consumers, a higher percentage were other BEVs (59 percent) compared to Bolt consumers (48 percent) and overall BEV consumers (51 percent). In contrast, a higher percentage of other vehicles considered by Volt consumers were BEVs (33 percent), while a similar percentage considered PHEVs (40 percent) as the average PHEV consumer (24 percent and 39 percent, respectively).

Table VI-3 percent breakdown of powertrain technologies of other vehicles considered (Survey of CVRP Recipients)

Rebated Technology	Gasoline	HEV	PHEV	BEV	FCEV	Other
BEV (n=1,884)	14.6 percent	6.7 percent	24.8 percent	50.8 percent	2.2 percent	0.7 percent
PHEV (n=1,396)	17.5 percent	16.8 percent	39.3 percent	23.9 percent	1.7 percent	0.9 percent
FCEV (n=304)	18.7 percent	11.3 percent	20.7 percent	30.7 percent	18.0 percent	0.7 percent

Third, when the Agencies estimates the value of vehicles at age zero, they assume that depreciation of vehicles is linear. This is at odds with commonly accepted knowledge. For example, Edmunds, the same source that NHTSA used for the used vehicle price data, has articles that show vehicles depreciate the fastest in the first year. After the first year, vehicles depreciate at a much slower rate.[392] Edmunds data indicates that an average midsize sedan selling for $27,660 will lose $7,419 of its value in the first year alone, but in the subsequent three years will only lose an additional $5,976 of its value. Conceptually, the method that is being used by NHTSA estimates the willingness-to-pay for new vehicles by fitting a line through used vehicle transaction prices. This will underestimate the true value that consumers place on a new vehicle because

[392] "Beat the depreciation curve when you buy your next car." Edmunds. Accessed on October 24, 2018. https://www.edmunds.com/car-buying/drive-a-nearly-new-car-for-almost-free.html.

depreciation is not linear and the method that is described will not capture the initial large drop in depreciation that all new vehicles experience.

2. Any remaining weaknesses in the market demonstrate the need for regulation.

For all the foregoing reasons, the Agencies' claims about lack of demand for more efficient and cleaner vehicles do not hold. It is true that the ZEV and advanced technology vehicle market still is relatively small, but this is not an argument for a regulatory rollback. Instead, it is an argument for a regulatory foundation. Such support is appropriate for continued growth of this market, to provide consumers, who individually lack bargaining power for products that serve multiple needs and offer multiple features, a more robust set of choices.

The 2016 Draft TAR described a number of explanations for why regulation is still needed on both the consumer and producer sides. On the consumer side, the reason some consumers do not purchase vehicles that will save them money may be as basic as a lack of information, or when information is presented the consumer may not understand or trust the information that shows the future fuel saving benefits. Alternatively, consumers may fully understand the potential opportunity for fuel savings but nonetheless heavily discount them those fuel savings due to their own uncertainty of how long they plan to own their vehicle or the uncertainty and volatility in fuel prices. A vehicle purchase is highly complex, with pricing and features varying widely between different models, and there is the possibility that fuel economy is not as salient an attribute as some other features, such as styling on performance. The desire for these other features may outweigh the suboptimal fuel costs, so long as the fuel economy is at least acceptable, even if not maximized. Thus, without regulations, especially for GHG emissions that have a less tangible impact on consumers, market demand may not be sufficient to produce the maximum, technologically feasible vehicle improvements.

Since the publication of the 2016 Draft TAR, additional evidence has emerged that supports some of these explanations for why regulation is still needed, revealing that manufacturers are likely undercutting consumer knowledge and the market for these vehicles – a market inefficiency appropriate for government correction. A study of light-duty vehicle marketing ads in the U.S. released in 2005, 2012, 2015, and 2017 across digital video, internet, newspaper, magazines, and television[393] determined that themes related to vehicle performance are about three times more likely to appear than those related to fuel economy,[394] which are present in about 15 percent of the ads. These four years were chosen to maximize the variety in national economic conditions, changing

[393] "Content Analysis of Unique Auto Ads in the United States: 2005, 2012, 2015, and 2017". Consumers Union. 2018. https://consumersunion.org/research/content-analysis-of-unique-auto-ads-in-the-united-states-2005-2012-2015-and-2017/

[394] These also include some ads that relate the fuel economy to the environment, so the category is a little bit broader than fuel economy on its own.

regulatory landscape with the tightening of CAFE standards, and gasoline prices. Overall, emotional appeals were the most frequent theme of all ads, which appears more than twice than the second-ranked theme. Performance and vehicle price promotions are the second- and third-most common themes. The percentage of ads containing fuel economy-related themes changed dramatically between these four years: 9 percent in 2005, 30 percent in 2012, 15 percent in 2015, and 7 percent in 2017. The highest frequency of the fuel economy in vehicle ads in 2012 corresponds to the year in the sample with the highest gasoline prices and poorest economic conditions. The incidence of unique ads promoting SUVs increased 6 percent between 2005 and 2017, while those for plug-in electric vehicles increased from 0 percent in 2005 to 1.41 percent in 2017. Over all four years sampled, the ads for SUVs and pickup trucks had the most frequent inclusion of fuel economy-related themes (19 percent and 24 percent, respectively), compared to cars (16 percent), luxury cars (9 percent), minivans (10 percent), and sport cars (6 percent). However, in 2017, the frequency of unique ads focused on the fuel economy category was ranked last out of 10 categories; only 7 percent and 4 percent of SUV and pickup truck ads were about fuel economy-related themes. In contrast, performance was a top theme of the ads for pickups while safety was the most emphasized theme of SUV ads. Finally, it should be mentioned that there was range of percentages of ads referencing fuel economy related themes among different vehicle manufacturers, ranging from zero percent to 34 percent. The lack of advertising focused on fuel economy may be a reason why consumers may not be choosing fuel-efficient vehicles.

Other studies also suggest a connection between a lack of fuel-efficiency-focused advertising and consumers not choosing fuel-efficient vehicles. The Northeast States for Coordinated Air Use Management (NESCAUM) commissioned a study by Competitrack, which tracks offline, online, and emerging media marketing data and spending estimates. The study shows that U.S. major vehicle manufacturers are spending nothing or very little to advertise their plug-in electric vehicles compared to specific internal combustion vehicles.[395] The study compares the estimated 2017 ad spending in television, radio, print, and online advertising nationwide, and in the major designated marketing areas in California and in the Northeast States.

Specifically, FiatChrysler, General Motors, and Volkswagen did not spend any money in 2017 advertising the Fiat 500e, Volt or the eGolf in the U.S at all. However, FiatChrysler did spend money to advertise the Pacifica Hybrid (a plug-in hybrid electric vehicle) in California and nationwide. For the California marketing area, FiatChrysler spent nearly half of what they spent to advertise the Ram 1500 on advertising the Pacifica Hybrid. However, nationwide they spent less than 5 percent on advertising the Pacifica Hybrid as they did on the Ram 1500. Similarly, General Motors did spend money in 2017 to advertise the Bolt nationwide, with separate regional advertising campaigns in the Northeast States and in California, but they spent about one-sixth the amount compared

[395] "Analysis of Ad Spending on PEVs of Major U.S. Vehicle Manufacturers in 2017." NESCAUM. 2018.

to advertising for the Silverado nationwide. Toyota barely advertised the Prius Prime nationwide, including in the Northeast States, and did not advertise at all in California. In comparison, Toyota spent about 5 percent to advertise the Prius Prime nationwide as they did for the Rav4. Nissan did not advertise the Leaf in the Northeast States or in California, and spent about 5 percent of the amount to advertise the Leaf nationwide compared to what they spent on the Rogue. Similarly, Ford did not advertise the Fusion Energi or C-Max Energi in the Northeast States or in California and spent about 5 percent of the amount to advertise these nationwide as they did for the F-150. It would be perverse if the Agencies rewarded the manufacturers for these feeble efforts by weakening the standards, rather than insisting the manufacturers make fuller efforts to comply.

Finally, behavioral economics helps to explain why consumers may not always opt for vehicles that are seemingly in their self-interest from an economically rational perspective. Dr. Greene notes,[396] and CARB staff agree, that consumers make choices differently within different contexts and tend to be loss averse when choices seem risky, as might be the case when confronted with the choice between a "standard" new vehicle or an "eco" or hybrid version of a new vehicle. In the context of these risky choices, consumers are likely to place much higher value on the option that minimizes risk as opposed to the option that may objectively be more economically rational. From the consumer's perspective, they may perceive the benefits from the eco version as uncertain, as most consumers are aware that "[a]ctual results will vary…"[397] when it comes to advertised fuel economy and that future fuel prices can be unpredictable. Nobel Prize winners have found that people in fact weigh potential losses twice as much as a potential gain.[398] Standards imposed on the entire industry reduce the risks to consumers of not receiving the benefits from fuel economy improvements because all vehicles have been improved. In this context, fuel economy is just one of the many criteria that distinguish one vehicle from another, and consumers are no longer as prone to loss aversion, which results in them purchasing vehicles with improved fuel economy. Thus, the argument that past purchasing patterns are indicative of future purchasing behavior is invalid because the contexts are different for these two periods.

On the producer side, the Draft TAR noted that market competition and the nature of technological innovation may prevent manufacturers from voluntarily adding fuel economy technology to their products.[399] In the highly competitive new vehicle market, with each model year containing hundreds of distinct vehicle offerings, manufacturers strive to differentiate their products along multiple dimensions to tailor products to a

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[396] Greene, D. *How Consumers Value Fuel Economy and Implications for Sales of New Vehicles and Scrappage of Used Vehicles*. October 21, 2018. ("Greene Report").
[397] Disclaimer on fuel economy label required for all new vehicles. Fuel Economy. Accessed on October 24, 2018. https://www.fueleconomy.gov/feg/label/learn-more-gasoline-label.shtml.
[398] Greene Report.
[399] 2016 Draft TAR, pp. 6-7. U.S. EPA. Accessed on October 24, 2018. https://nepis.epa.gov/Exe/ZyPDF.cgi/P100OXEO.PDF?Dockey=P100OXEO.PDF.

wide array of consumers. Fuel economy is just one of the many attributes that manufacturers use, and therefore not all vehicles in a company's portfolio will have the maximum feasible fuel economy if other attributes are being emphasized (such as performance or luxury features that comes at the expense of fuel economy). As a result, fuel economy is inefficiently allocated across different vehicle models–in some cases undersupplied and other cases oversupplied.[400] Secondly, manufacturers may be hesitant to make major innovations in the absence of standards due to potential first-mover disadvantages. That is, being a leader costs more than being a follower, who can leverage learnings or free-ride on the leader's initial investments. Universal standards eliminate these discrepancies. Furthermore, when multiple firms are seeking solutions to comply with tighter standards, there is a greater incentive for collaboration between manufacturers and suppliers are more motivated to innovate for a much larger potential customer base. These economies of scale, as well as the competition between suppliers, can further reduce prices for technologies. However, without standards, the default strategy of firms is inaction.[401]

An overlooked aspect of the new car buyer experience is interaction with dealers. Most every manufacturer uses a system of franchised dealers in order to move their products into the market. By 2002, every state had passed franchise laws governing relations between car dealers and auto manufacturers.[402] Through various comments on numerous rulemakings, manufacturers often contend that they do not have control over this aspect of the supply chain, especially when it comes to advanced and clean vehicles. Dealers choose vehicles and incentives to offer in order to moderate the ebb and flow of their inventory. In a 2014 working paper, researchers found dealers to be instrumental in aiding (or hindering) the PEV market.[403] New car dealers' franchise structures limit their ability and incentives to push advanced vehicles.[404]

For all these reasons, regulation is needed to ensure rational market decisions. Congress has so determined by statute, and the evidence, as we have discussed, supports the conclusion that regulations can support and build rational markets for

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[400] Fischer, C. Imperfect Competition, Consumer Behavior, and the Provision of Fuel Efficiency in Light-Duty Vehicles. Resources for the Future, Discussion Paper DP 10-60, December 2010.
[401] 2016 Draft TAR, pp. 6-7 to 6-8.
[402] Higashiyama, J. "State automobile dealer franchise laws: have they become the proverbial snake in the grass?" SSRN. Accessed on October 24, 2018. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1394877.
[403] Cahill, E., Davies-Shawhyde, J. and Turrentine, T. "New Car Dealers and Retail Innovation in California's Plug-In Electric Vehicle Market" UCD. Accessed on October 24, 2018. https://its.ucdavis.edu/research/publications/?frame=https percent3A percent2F percent2Fitspubs.ucdavis.edu percent2Findex.php percent2Fresearch percent2Fpublications percent2Fpublication-detail percent2F percent3Fpub_id percent3D2353.
[404] Cahill, E. "Distribution Strategy and Retail Performance in the U.S. Market for Plug-in Electric Vehicles: Implications for Product Innovation and Policy ". Institute of Transportation Studies, University of California, Davis, Research Report UCD-ITS-RR-15-29. Accessed on October 24, 2018. https://its.ucdavis.edu/research/publications/ p. 276: "…dealers are optimized to 'facilitate the sale' in high-volume demand environments. The evidence presented here indicates dealers may be much less equipped to undertake activities fundamental to the success of innovative new products like PEVs."

improved vehicles. The Agencies' contrary conclusion – that a rollback is appropriate – is contrary to the evidence and the law.

3. The Agencies' dynamic new sales response modeling is conceptually flawed and mathematically invalid.

In addition to all the conceptual and evidentiary problems discussed above, there are a number of technical problems with the Agencies' dynamic response model of future new vehicle sales. The model was developed using an outdated and inappropriate statistical technique that is not suited for analyzing impacts from the proposed rollback. While the Agencies claim that their sales projections are "qualitatively"[405] similar, our analysis shows no such similarities with future sales projections or any consistency with historical trends. Indeed, modifying parameter values to match with those published in the PRIA resulted in the model crashing. Such serious errors, along with the lack of peer review of this model and the failure to properly validate their results, disqualifies the use of this model for evaluating sales impacts.

a. The overall approach is inappropriate for evaluating the new sales impacts of a rollback.

The first significant problem is that the model was estimated using time-series analysis of aggregate data. An aggregate time-series model identifies the statistical relationship between variables over the time period analyzed, but does not identify the causal relationships between the various factors or institutional features that may link the various factors (i.e. existing standards, other regulations, assumptions about consumer behavior). Using time-series analysis to analyze policies that make structural changes, like the proposed rollback, is inappropriate. Aggregate time-series approaches are typically appropriate for short-term projections where all other factors are stable. In this proposal here by the Agencies, a change in policy could disrupt historical relationships between sales and the other explanatory variables.

The fatal flaw is that the model is unable to credibly predict the impact of vehicle prices on sales. The model tries to use vehicle prices to predict vehicle sales without accounting for the fact that the level of vehicle sales can also impact vehicle prices. Ignoring the fact that vehicle prices and vehicle sales simultaneously affect each other leads to bias in the estimated results, and therefore, the inferences about the effects of vehicle prices on new vehicle sales are invalid.

In this case, a structural model is required to estimate the impact of vehicle prices on vehicle sales. A structural model would clarify how institutional and economic conditions affect the relationships between the variables and make clear what economic assumptions are relied upon to treat the regression results as causal links between the variables (not just a correlation between multiple variables). The most common method for imposing structure on the model would be to introduce an instrumental variable. An

[405] PRIA, p. 960.

instrumental variable would be one that impacts vehicle prices but is not correlated with vehicle sales. Adjusting the modeling strategy to instrument for vehicle prices would allow the model to identify the impact of vehicle prices on sales.

The new sales model also clearly suffers from omitted variables bias. Omitted variables bias occurs when a model leaves out one or more relevant variables that are correlated with both the dependent variable of interest (new vehicle sales) and an independent variable (vehicle prices). As mentioned above, the Agencies have not accounted for the fact that the quality of vehicles impacts how many are sold and the prices of vehicles. Vehicles under the augural standards will have higher fuel economy than vehicles under the proposed standards, so inclusion of measures of vehicle quality are an essential aspect of a new sales model used in the analysis. Omitted variables in the new sales model are another source of bias, and without further analysis on the direction and magnitude of the bias, render the model's predictions about the impacts of changes in prices on new vehicle sales invalid.

Given that this type of time-series statistical analysis (inclusion of instrumental variables and including enough control variables) is not new, it is noteworthy that the Agencies have not employed this method for any past joint rulemakings, despite having a similar need to understand the impacts of assorted vehicle regulations on sales levels. This suggests that the Agencies previously deemed this method inappropriate as well. The rollback proposal does not discuss at all their reasons for this change in approach or the reasonableness of their new methods.

Rather, the development of the dynamic response model appears to be a cursory response to address comments from peer reviewers about the CAFE Model. Although none of the peer reviewers are economists or behavior analysts per se, two reviewers recommended that the model must address "consumer behavior"[406] or "develop, resolve previous issues, and validate an economic behavioral model"[407] to properly capture the effects of the proposed rollback. In response, NHTSA and Volpe Center staff essentially state that prior attempts to incorporate such effects into the CAFE Model did not progress beyond an "experimental context." Furthermore, in response to additional comments related to employment and other macroeconomic impacts, NHTSA and Volpe Center staff responded that the model was updated to estimate impacts on new vehicle sales (and scrappage).[408] However, it does not appear that these updates were subject to further review. And updating the model using this time-series approach was not what was recommended by the peer reviewers.

Had the dynamic sales model been peer reviewed, the Agencies may have been alerted to the fact that the coefficients they describe in the PRIA do not match with those

[406] Docket ID: NHTSA-2018-0067-0055, p. 129.
[407] *Ibid*., p. 301.
[408] *Ibid*., p. 8 and p. 303.

programmed in the CAFE Model source codes. As shown below, although for some of the variables the discrepancy is not large, the difference is more substantial for others– so substantial that when adjusting the CAFE Model values to match exactly those published in the PRIA, the model results in a negative fleet population, which is a nonsensical result.[409] Given that the Agencies have provided insufficient supporting documentation, it is impossible to replicate their model estimation to determine which set of coefficients is correct.

Comparison of Coefficients in PRIA Table 8-1 to Model

Variable	Value shown in PRIA Table-8-1	Value programmed in CAFE Model
Intercept	0.4145	0.5090738477
LD.Sales, lag1	0.6116	0.6117051252
LD.Sales, lag2	0.2068	0.2047812576
GDP.Growth.Rate	0.1435	0.1488134968
Delta.Transaction.Price	-0.00017	-0.0001719814
Labor.Force.Participation	0.00033	0.0002462322
Labor.Force.Participation, lag1	-0.00316	-0.0002292395

Just four days before the close of the comment period, NHTSA responded directly to CARB's letter notifying them of this mismatch and acknowledged the error in Table 8-1 of the PRIA. Their letter notes that a revised PRIA includes a corrected table that has revised the values to match with those programmed in the model.

As a threshold matter, this action compounds and affirms the failure to provide a reasonable opportunity to comment after denying many requests for additional time. Posting a revision to a foundational document of more than 1,500 pages, four days before the end of an already-inadequate comment period, distributing information selectively in response to requests rather than publicly, and failing to provide the information at the inception nullify the proposal. Adding to the inadequacy, the information provided lacked adequate documentation (e.g., of table calculations which used the R scripts) and was incomplete (e.g., the new vehicle sales data from the National Automobile Dealers Association.)[410]

[409] Note that minor changes to the values currently programmed do not result in the model crashing. So the crashing is not related to the act of modifying the parameter values per se but an issue with the values themselves.
[410] We also note the Agencies fail to acknowledge the inconsistency of relying on undisclosed data here, while simultaneously pursuing actions to preclude proposing regulations based on data that has not been publicly disclosed in its entirety. See EPA's advance notice of proposed rulemaking "Increasing Consistency and Transparency in Considering Costs and Benefits in the Rulemaking Process," 83 Fed. Reg. 27,524 (June 13, 2018). CARB has separately commented on that proposal. EPA-HQ-OA-2018-0107-1308.

Adding further confusion as to which set of coefficients is correct, the outputs of the model do not match the values shown in PRIA Table-8-2. The shaded columns in Table VI-4 are new data to compare to the original table (unshaded columns). CARB produced the output data from running the CAFE Model itself. As shown in bold, the values from the model output begin to differ from the PRIA values beginning in 2021, the first year of the proposed changes. While the differences between the two columns are not large, such discrepancies further complicate verification of their model, as users are unable to know whether results cannot be replicated due to their own error or simply the Agencies misreporting their outputs.

Table VI-4 Modified PRIA Table 8-2 Comparing Sales Forecasts under Existing Standards

Year	CAFE Model (PRIA)	CAFE Model (CAFE Output)	CAFE Model (GHG Output)	IHS/Polk	AEO 2017	AEO 2018[411]	CAR Outlook	Actual CY Sales [412]
2016	16.34	16.34	16.34	17.78	16.43	16.24	17.50	17.55
2017	16.83	16.83	16.84	18.20	17.05	15.63	17.50	17.25
2018	17.19	17.19	17.19	18.08	16.91	16.10	17.40	16.78
2019	17.48	17.48	17.49	17.68	16.32	16.05	17.30	16.60
2020	17.66	17.66	17.66	17.23	16.27	15.97	17.00	
2021	17.75	**17.74**	17.79	17.12	16.54	15.60	17.50	
2022	17.76	**17.77**	17.75	17.02	16.40	15.61	17.60	
2023	17.74	**17.75**	17.73	17.08	16.28	15.74		
2024	17.73	**17.75**	17.74	17.16	16.71	15.79		
2025	17.71	**17.74**	17.74	17.30	16.70	15.86		
2026	17.70	**17.76**	17.74	17.33	16.45	16.00		
2027	17.74	**17.77**	17.77	17.41	16.57	16.07		
2028	17.81	**17.83**	17.81	17.21	16.58	16.20		
2029	17.87	**17.88**	17.84	17.08	16.88	16.24		

Note: Shaded cells reflect CARB additions to PRIA Table 8-2.

b. The validation of the Agencies' new sales model fell short.

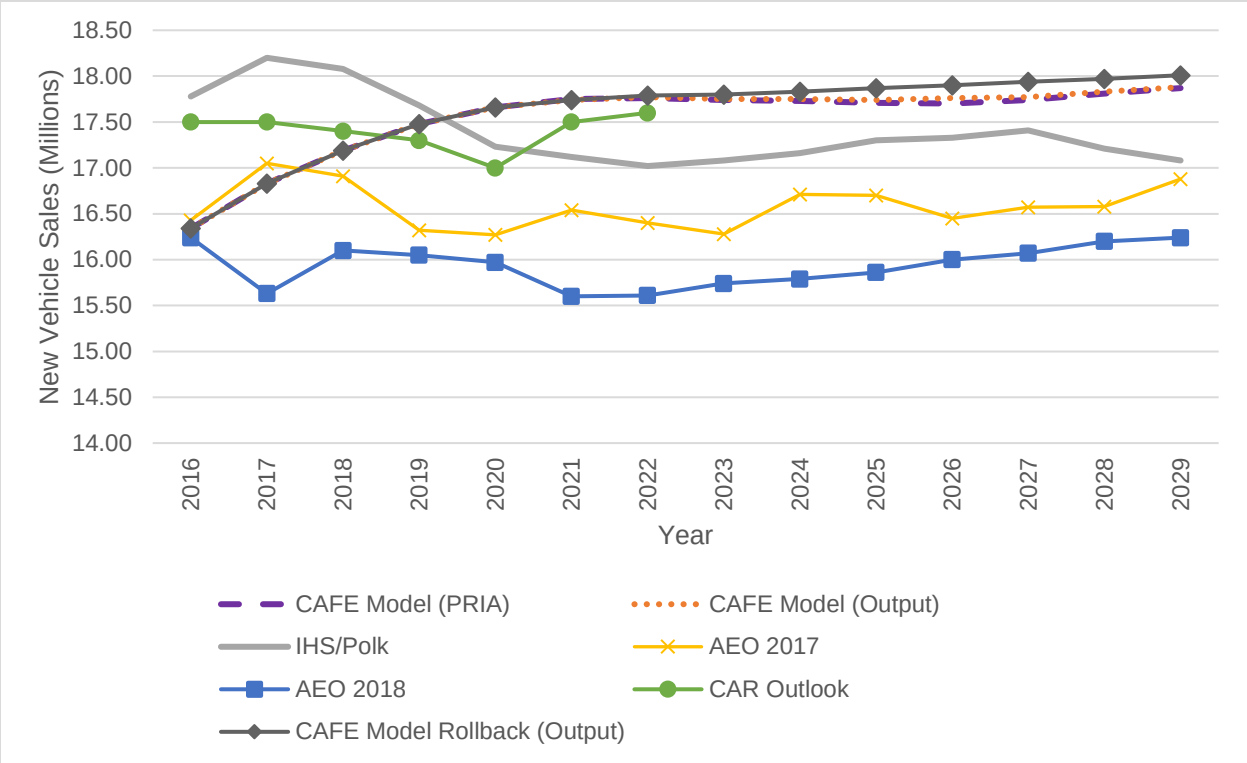
The Agencies also state that "the dynamically produced sales projection from the CAFE Model is not qualitatively different from the others" (i.e., from IHS/Polk, AEO 2017, or CAR[413]) as the only evidence of the soundness of their results. However, when plotting these results of the existing standards, it is difficult to see how these forecasts are even

[411] Reference Case Table 39. U.S. Energy Information Administration. Accessed on October 24, 2018. \https://www.eia.gov/outlooks/aeo/tables_ref.php.
[412] 2018 and 2019 are forecasts based on Stoddard, H. Global and U.S. Automotive Outlook. Wards Intelligence. Accessed on October 24, 2018. https://www.chicagofed.org/~/media/others/events/2018/automotive-outlook-symposium/stoddard-pdf.pdf
[413] PRIA, p. 960

qualitatively similar. The CAFE Model whether analyzing the proposed (CAFE or GHG standards) shows a gradual increase before stabilizing just short of 18 million new sales annually.

Meanwhile, all the other forecasts show some years of decline and other years of increase, and, for those analyses reaching 2029, settle around 17 million new sales. Although a difference of one million vehicles in one year may seem relatively insignificant, note that this is greater than the total volume of additional new vehicles that the Agencies project to be sold as a result of the rollback standards over the entire period of 2021-2029 (not just in a single year). When looking at the most recent AEO forecast released in February 2018, the discrepancy appears even larger, resulting in a difference in annual sales in 2029 of over 1.5 million vehicles. This further puts the Agencies' model results into question. Given the notable differences between these sales projections, it is unclear whether the proposed rollback could actually be attributed to having a real impact on new vehicles sales if the difference between the rollback and existing standards is so much smaller than the variance between the model outputs and other forecasts. This is shown in the figure below.

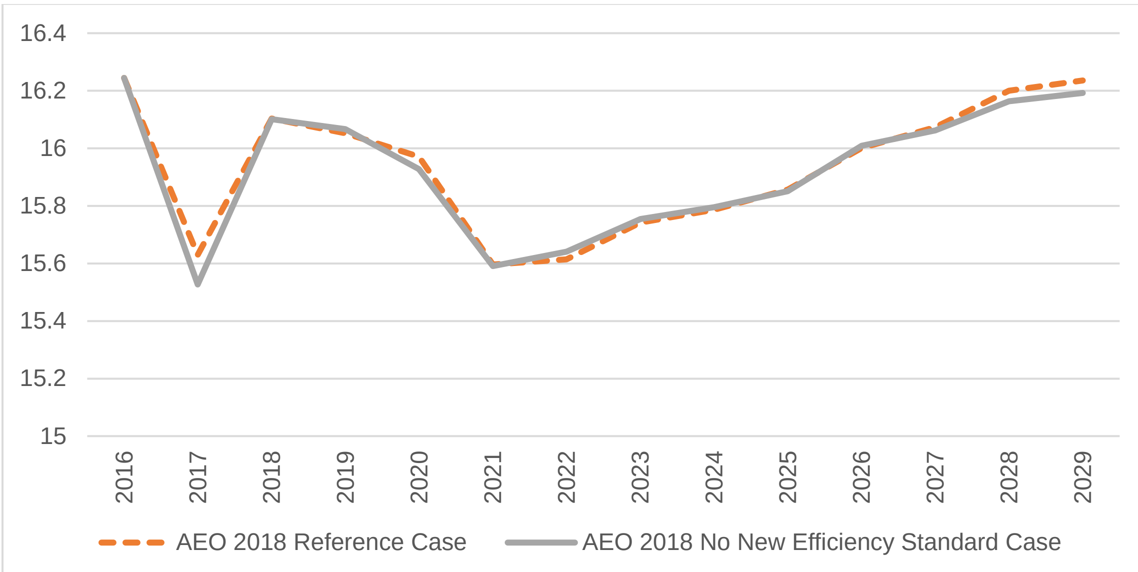
Figure VI-8 Comparison of New Vehicle Sales Forecasts



Moreover, EIA's interactive data tool allows running scenarios to model new vehicle sales using sets of pre-determined assumptions (like high and low fuel price, high and

low economic growth, etc.). EIA's AEO 2018 reference case assumes the existing standards wound in place and held them steady in all subsequent model years after 2025. EIA also includes a scenario called "no new efficiency requirements" which reflects the Agencies' proposed rollback. *Figure VI-9* below shows that under these two scenarios, new vehicles sales are still higher under the Reference case (which assumes the existing standards remain in place), which is the opposite of the Agencies' finding.

Figure VI-9 AEO New Vehicle Sales Projections: Reference Case vs. No new efficiency standard case



Source: U.S. EIA, https://www.eia.gov/outlooks/aeo/data/browser/#/?id=48-AEO2018&region=1-0&cases=ref2018~effrelaxall&start=2016&end=2050&f=A&linechart=~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ref2018-d121317a.67-48-AEO2018.1-0~effrelaxall-d030918a.67-48-AEO2018.1-0&map=effrelaxall-d030918a.4-48-AEO2018.1-0&ctype=linechart&sourcekey=0, Accessed October 9, 2018.

Finally, there are a number of inadequately supported modeling decisions that are poorly supported by the Agencies. The coefficients for the new sales model were derived based on quarterly sales data, while the model itself was applied to calculate sales annually when implementing the CAFE Model. This inconsistency created errors in the annual new vehicle sales forecasts.

Additionally, quarterly data may exhibit seasonal variation, which does not appear to be controlled for when extrapolating to an annual model. The use of quarterly data also likely means that the underlying sales data used to build the model were on a calendar-year basis rather than a model-year basis, as model year data are rarely reported in a quarterly format. The Agencies acknowledge that their analysis conflates these two types of years, but then states that without any evaluation or evidence the difference is

not important in the long run.[414] However, it is unclear the extent to which this conflation contributes to the large variability between forecasts discussed previously. Although the Agencies compare their model results to actual historic sales numbers,[415] the observed sales data shown in PRIA Figure 8-5 are presumably calendar-year-based rather than model-year-based—but this is not specified, which makes the comparison difficult for evaluating the validity of the sales model. Further, there was no model validation based on historic model-year sales rather than calendar year to support their assertion that the conflation does not matter.

Indeed, recent real-world evidence shows that new vehicle sales increase even when prices increase, which is the opposite of the Agencies' new sales model's results. Copeland et al. (2018)[416] conducted a statistical analysis of national monthly data from February 1972 to December 2011 to empirically examine the impacts of real interest rates faced by households and firms on the new light-vehicle market. They found that "real prices [of new light vehicles in the U.S.] are somewhat positively correlated with sales and output." Thus, when new vehicle prices increase, we may also expect new vehicle sales and production to increase to a degree as well. The Agencies' new sales model does not comport with this recent, real-world evidence.

The significant differences between the CAFE Model's sales projections and other forecasts are signs that the model lacked rigorous testing and validation that should have been done before deciding to use the model for this important regulatory analysis. The testing and validation of the new sales model appears to be limited to a single comparison of the model's estimates of annual car and light truck sales to their actual sales.[417] The problem with the NPRM's approach is that the new sales model's results are compared directly to the data that were used to construct the model. As a result, it is unsurprising that the modeled results can closely match the real world data. However, there is no certainty that the model would perform well in predicting new vehicle sales in the future. In other words, the ability of the model to predict out of sample is questionable. A common method that could have been used by the Agencies would be estimating the new sales model on a subset of the data, and then seeing if the model performed well on the data that were withheld initially.

4. The Fleet Share Model is not based on reasonable assumptions.

The dynamic fleet share model is also fatally flawed for a variety of reasons. Although the dynamic fleet share model is its own separate module from the new sales model, it allocates new vehicles between the passenger car and light truck categories. As a matter of public notice and proper procedure there is insufficient documentation about

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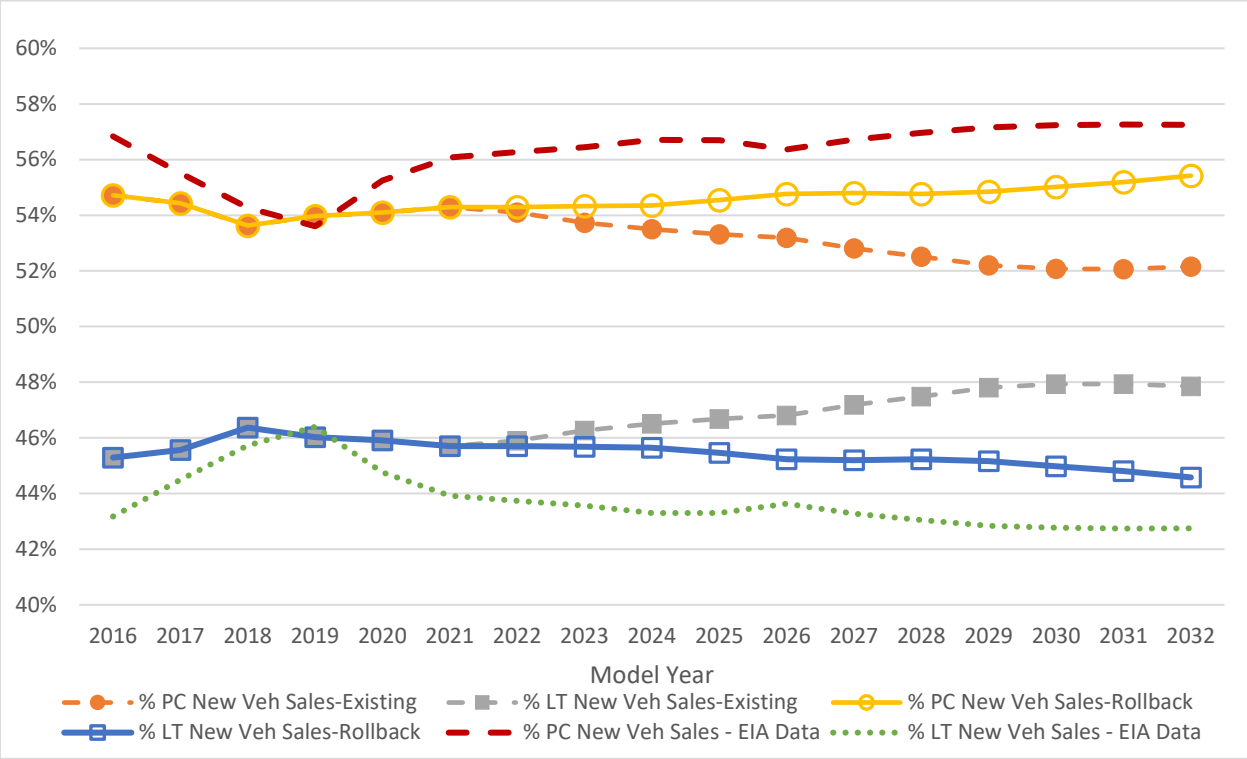
[414] PRIA p. 960, fn. 498.
[415] PRIA Figure 8-5.
[416] Copeland et al., 2018a. Interest Rates and the Market for New Light Vehicles. Working Paper and Appendices. Available at: http://people.brandeis.edu/~ghall/papers/CHM_paper_JMCB_RR_final.pdf (Last accessed 10/24/2018).
[417] PRIA p. 958-959.

this module except to say that the coefficients were taken from the National Energy Modeling System (NEMS), though "applied at a different level" due to the recent increase in crossover utility vehicles that span both compliance categories.[418] The Agencies do not explain why the model needs to be adapted when ultimately the body styles are re-aggregated into two compliance categories in the model output. Additionally, how this process of re-aggregating the three body styles happens is not explained or justified, given that there are physical differences (off-road capability, expanded cargo area, etc.) that determine a vehicle's compliance category, and the Agencies do not specify using data with this level of detail within the fleet share model.

Further, the Agencies provide no explanation or justification demonstrating it is reasonable to apply the coefficients designed for compliance category to body styles. They simply repurpose the coefficients. The results regarding the future fleet composition do not necessarily alleviate concerns about the acceptability of this modification. Part of the rationale for the proposed rollback is that consumers have recently demonstrated a preference for vehicles that fall into the light-truck category. However, the results of the fleet share model show that under the proposed rollback, the fraction of new light trucks that would be sold in the future would be smaller than under the existing standards. This modeling does not reflect moves by some manufacturers, such as Ford and Fiat Chrysler,[309, 310] to shift focus to trucks and away from sedans. Thus, the Agencies seem to be suggesting that the proposed rollback will inhibit the very vehicles it is intended to enable. Finally, as the fleet share model was taken from NEMS used for the EIA's Annual Energy Outlook, there is an expectation that their forecast of the fleet share should match with the CAFE Model's projected fleet shares under the existing standards. However, EIA's fleet share match neither of the CAFE Model outputs, which again raises the question of whether the model coefficients can simply be applied "at a different level."

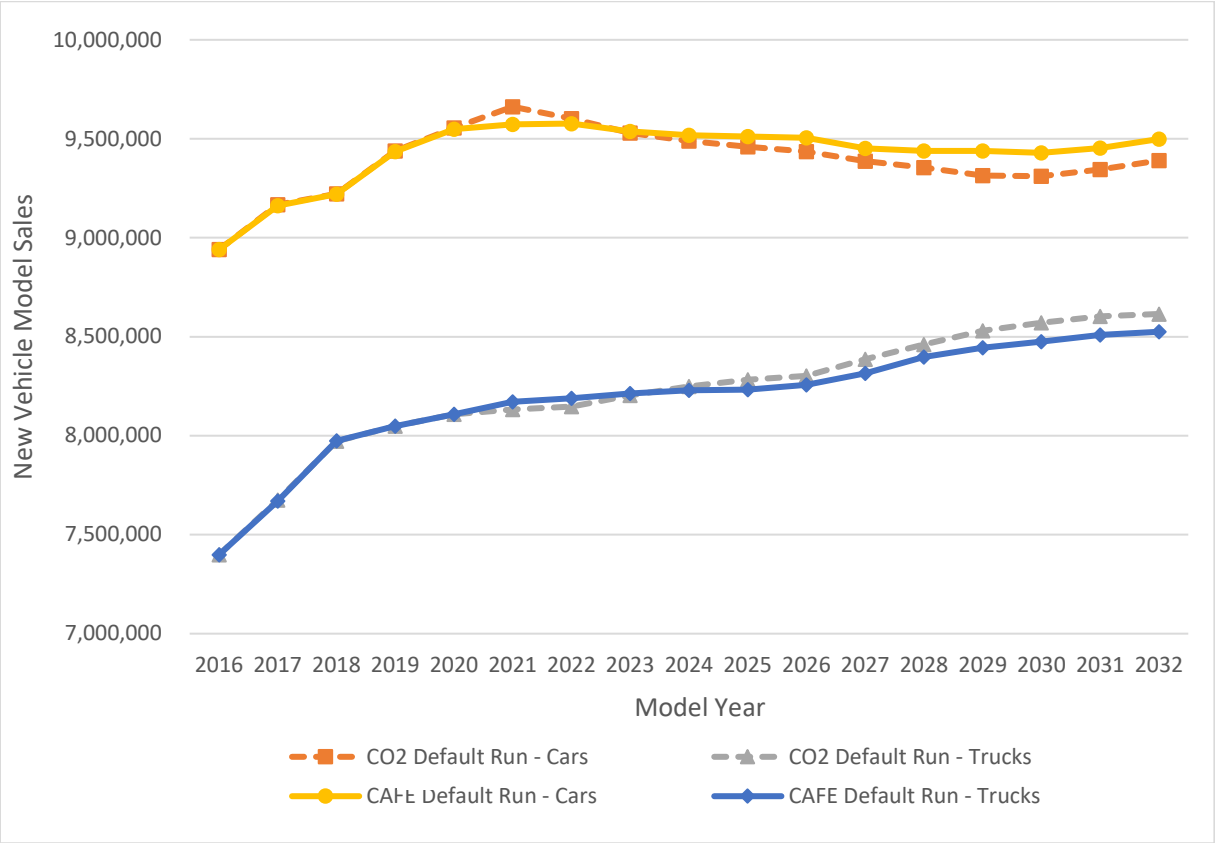
[418] PRIA, p. 961.

Figure VI-10 CAFE Model Default GHG Run New Vehicle Sales PC/LT Fleet Share



Finally, as *Figure VI-11* shows, a greater proportion of new sales are projected to be passenger cars under the CAFE regulation than projected under GHG regulation, particularly in later model years. Although these differences are not as large as the deviations with the EIA projections, even under a so-called harmonized standard, the Agencies produce two separate and slightly inconsistent results.

Figure VI-11 New Vehicle Sales – Existing Scenario (Differences between GHG and CAFE Model Runs)



5. In summary, the new vehicle sales model should be rejected.

In sum, the Agencies' new sales model is invalid and should not be included in the CAFE Model. The new sales model glosses over or ignores the many factors that go into and frame the context of new vehicle purchases. Notably, consumer valuation of fuel savings is completely ignored in this model, despite considerable evidence substantiating that consumers do value fuel savings, as well as the Agencies themselves concluding that consumers likely mostly or fully value future fuel savings at the time of purchase. Moreover, the results produced by the new sales model overestimate future sales projections, as compared to both historical data and other projections of future sales, by over 1 to 1.5 million vehicles. The results published in the NPRM and PRIA also do not match those put out by the CAFE Model. These results seem to be driven by inappropriate modeling methods, such as using quarterly calendar-year data instead of annual model-year data as well as using a time-series approach—a tool suited for short-run projections based on continuing past trends—to predict structural, longer-term responses to a change in standards. However, it is not possible to replicate or verify the Agencies' results from the new sales model because the Agencies did not provide the underlying data for this model, nor, apparently, are

these exact data available anywhere else. CARB requested these data but the Agencies did not provide a response until four days before the end of the comment period, and that response was incomplete. As a result, it is impossible to determine exactly why the new sales model produces its unexpected results. Instead, we are left with inappropriate and unreliable new sales projections. Thus, the Agencies should refrain from using this new sales model.

B. The "Dynamic Scrappage" Model relied upon is flawed.

As with the new sales model, the dynamic scrappage model is similarly flawed. The vehicle scrappage rates estimated by the Agencies are based on a model that produces results that are contrary to fundamental economic theory and good practices for setting public policy.

Although the Agencies justify the rollback due to fatalities from a slowing of new vehicle sales that causes used vehicles to remain on the road longer rather than being scrapped, they have not in fact modeled this dynamic. There is no connection between the sales model and the scrappage model and the number of vehicles sold has no effect on the scrappage model. Rather, the scrappage model and the fatalities it projects are solely a function of the model's dubious projections that an increase in existing vehicle prices will lead to individuals holding onto their vehicles rather than scrapping them, the fleet size increasing as a result, and the unsupportable assumption that those vehicles will be driven just as much as the average vehicle of that type and age, and the fact that increased driving leads to increased risk of accidents and fatalities.

The model is also plagued by improper design and validation that disqualifies its use to predict the effects of sales and scrappage that the federal Agencies contend will occur. Of particular note is that the scrappage model causes vehicle retention (and thus the total number of vehicles) to balloon exorbitantly under the existing standards. Even if the model outputs on the number of vehicles on the road were correct (which we do not believe to be true), the subsequent vehicle miles traveled (VMT) these vehicles are expected to drive is overestimated because the Agencies have failed to consider the realities of what factors influence travel demand. Finally, all of the scrappage effects are premised on the increase in new vehicles prices. However the Agencies have not supported their assumption that rolling back the standard will be passed onto consumers; if vehicle prices are the same between the two standards (but the vehicles are qualitatively different), no scrappage effects would materialize.

The Agencies did not follow good practices and subject the model to peer review. Had this occurred, the Agencies may have been able to correct their analysis.

1. The modeling is illogical and the outputs are wrong.

The scrappage model suffers from a number of inconsistencies with economic theory. Many of these problems result from the lack of interaction with other considerations

within the vehicle market. These problems should disqualify the use of this model for evaluating the scrappage effects from the proposed rollback.

A serious omission is the disconnect between the scrappage model and the new vehicle sales model, as well as the related failure to fully model basic economic relationships. The scrappage model is not connected to the new vehicle market except through the use of a shared new vehicle price variable. However, the reality is that today's new car sales become tomorrow's used car supply. Therefore, changes in new vehicle sales will impact the future supply of used vehicles. This in turn will impact used vehicle prices and scrappage rates. However, the Agencies have failed to include these basic economic relationships in the scrappage model,[419] even ignoring used vehicle prices completely despite the academic literature cited in the NPRM describing how used vehicle prices (not new vehicle prices) are related to scrappage rates.[420] For instance, Mark Jacobsen and Arthur van Benthem, professors at the University of California, San Diego, and the University of Pennsylvania, respectively, commented on the NPRM clarifying that their paper, which the Agencies rely on, estimated changes in scrap rates based on changes in *used* vehicle prices.[421]

Under the NPRM's assumption that the augural standards would result in higher new vehicle prices and fewer new vehicle sales than under the rollback, economic theory would suggest that the total vehicle fleet under the augural standards would be smaller than under the rollback. When new vehicle sales decrease, some households who would have bought new cars would instead choose to buy used cars. This would decrease the demand for used cars and as a result cause used car prices to increase. With both new and used car prices being high, households would decide to own fewer cars and either use their current existing cars more intensively or move to other modes of transportation. This would result in the total fleet of cars being smaller.

The only scenario where the total fleet size could possibly increase is if the augural standards resulted in new car sales to increase. If new car sales increased, this would imply that some households that previously purchased cars were pulled from that market. The decrease in demand for used cars would result in decreased used car prices. Decreased used car prices would in turn lead some households to decide to own more cars, either expanding their fleets or drawing households away from other modes of transportation. At the same time, when used vehicle prices decrease, some households will decide to scrap their vehicle and get another used vehicle rather than repair it – resulting in a decrease of used cars on the road. In this scenario, there could

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[419] *See also* Kenneth Gillingham, Yale University, *How Fuel Economy Standards Affect Fleet Turnover and Used Vehicle Scrappage: Comment on the Safer Affordable Fuel-Efficient (SAFE) Vehicles Proposed Rule for Model Years 2021-2026 Passenger Cars and Light Trucks*, 4-5 (2018) [hereinafter "Gillingham, *Fleet Turnover*"].

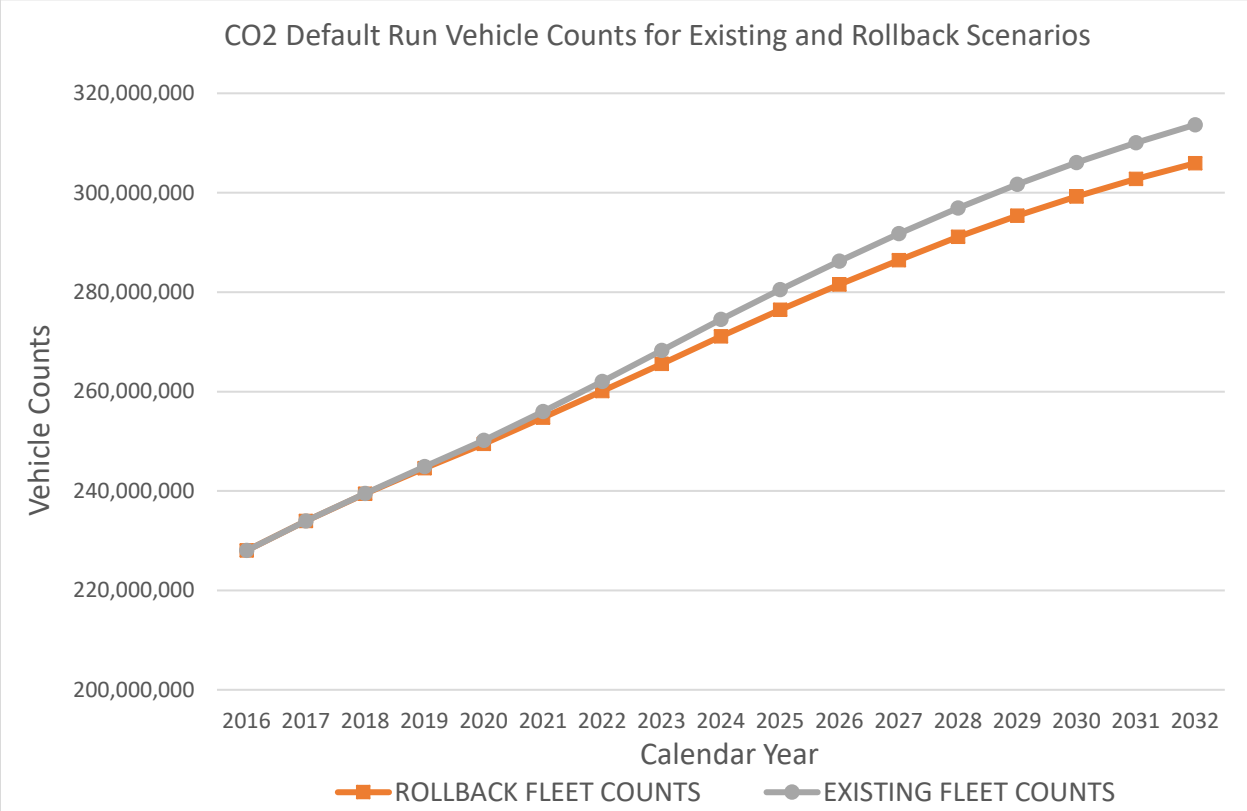
[420] PRIA, p. 1007 cites: (1) Jacobsen, M. R. & Van Benthem. A. A. "Vehicle Scrappage and Gasoline Policy." American Economic Review, vol. 105, no. 3, 2015, doi:10.1257/aer.20130935; (2) Greenspan, A. & Cohen, D. "Motor Vehicle Stocks, Scrappage, and Sales." Review of Economics and Statistics, vol. 81, no. 3, 1999, doi:10.1162/003465399558300.; (3) Bento, A. et al. "Vehicle Lifetime Trends and Scrappage Behavior in the U.S. Used Car Market." The Energy Journal, vol. 39, no. 1, Jan. 2018, doi:10.5547/01956574.39.1.aben.

[421] Comment from Mark Jacobsen & Arthur van Benthem, EPA-HQ-OAR-2018-0283-2650 (Oct. 18, 2018).

be either an increase or decrease in the total size of the fleet. However, the NPRM does not consider the scenario in which the augural standards lead to an increase in new car sales. Instead, the NPRM's assertion that new car sales would decrease should imply that the total fleet shrinks.

However, the NPRM does not consider the interactions between the scrappage model and the new vehicle sales model. Without this feedback between the two models, the resultant fleet sizes produced by the scrappage model under the existing standards are allowed to grow unchecked to unreasonable levels that are inconsistent with theory. In essence, the Agencies are modeling increased durability for vehicles that in many cases has already been produced. Figure VI-12 below shows the total fleet population counts for the existing and rollback standards. Although total fleet size can increase in the future as a result of population and economic growth, the sizeable difference in growth under the two policy scenarios is not supported.

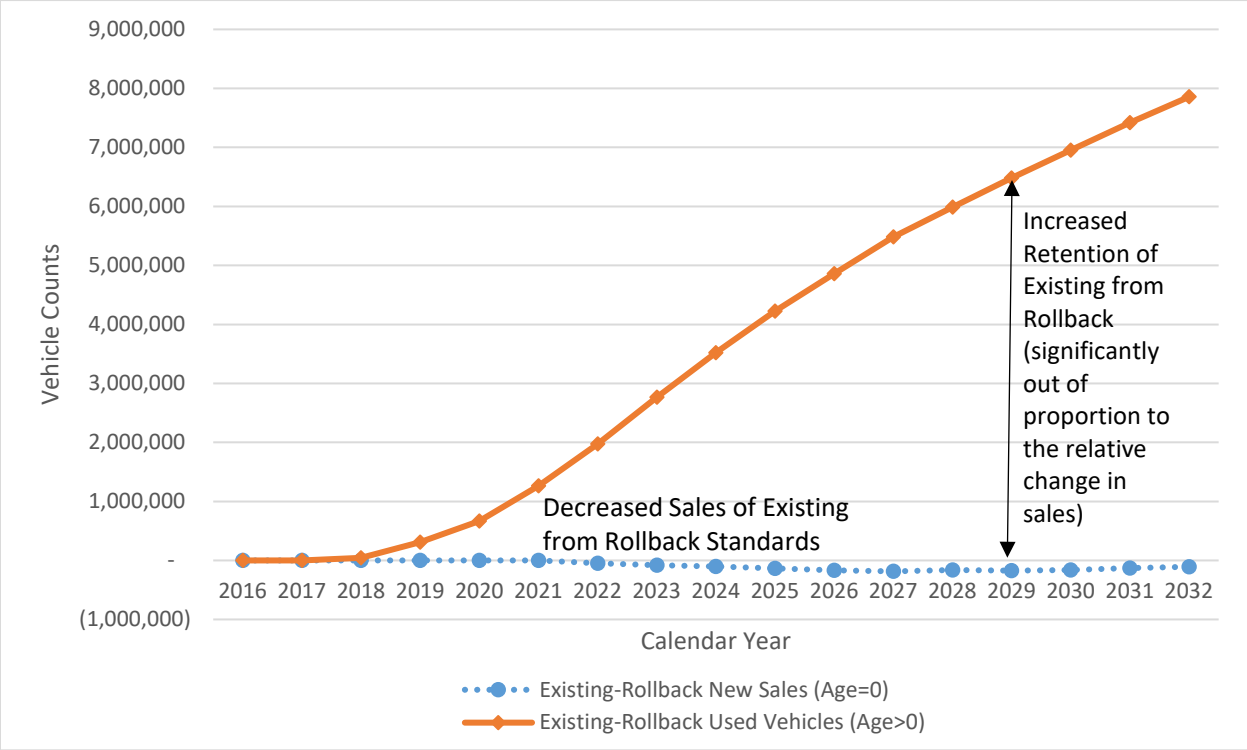
Figure VI-12 Total fleet sizes under existing and rollback standards



Even though new vehicle sales are wrongly estimated to decline under the existing standards, *Figure VI-13* shows that the difference in used vehicle populations grows at a disproportionate level, far outweighing the reduction in new vehicle sales. For every additional vehicle not sold under the existing standards relative to the proposed rollback, 4 to 23 more vehicles are retained in that same year. Looking at it another way, comparing the average year-over-year differences in new vehicle sales and

retained vehicles for the two scenarios yields a ratio of more than 60 used vehicles retained for every new vehicle not sold.

Figure VI-13 Vehicle Count Differences between Existing-Rollback Standards (based on GHG Default Run)



EPA also noticed the illogical and incongruous results between the new sales model and the scrappage model, and the affect this had on total fleet size.[422] EPA informed both NHTSA and the Office of Management and Budget (OMB) that:

> *[t]he new vehicle sales model produces small reductions in projected sales under the Augural standards, while the scrappage model projects an increase in fleet size that far outweighs the sales reductions (by a factor of 60:1). The combined result is a fleet size that grows much more rapidly than AEO projections.*[423]

EPA found it "hard to imagine any real-world scenario under which over 60 additional used vehicles are retained for each new vehicle that the sales model predicts will be unsold as a result of the higher new vehicle prices."[424] Moreover, EPA observed that:

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[422] William Charmley, email message to Chandana Achanta, June 18, 2018. Regulations. Accessed on October 24, 2018. https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0283-0453, Attachment 5, p. 3, 13-15.
[423] *Id.* at p. 3.
[424] *Id.* at p. 14.

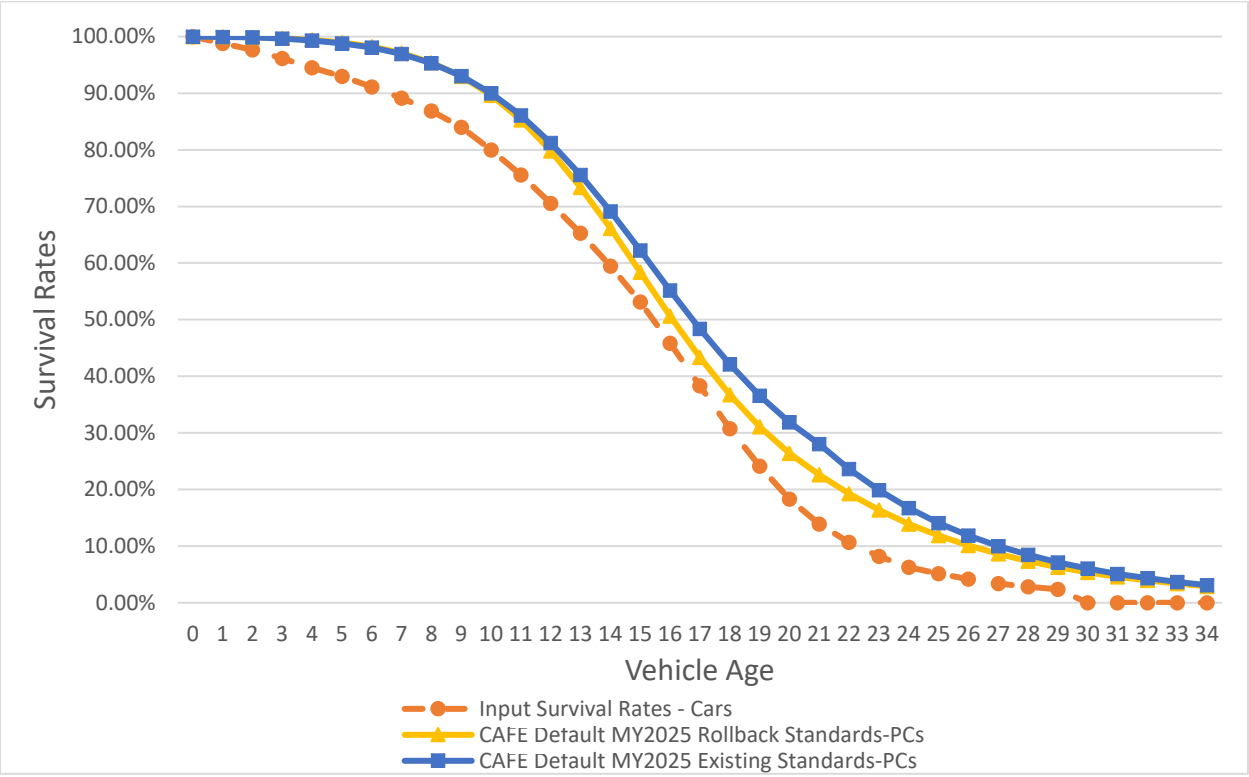
> *NHTSA's written description in the draft NPRM indicates that the intent of the As-Received scrappage model was to capture the effect of changes in new vehicle prices and fleet fuel economy on the composition of total fleet (i.e., the balance between new and old vehicles and proportion of the various vehicle types), rather than the effect on the total fleet size. The emphasis on fleet composition is re-iterated in one of NHTSA's conclusions in the scrappage model section of the draft NPRM, that 'differences in the composition of the baseline fleet and the fleet under each alternative are the source of many of the proposed action's benefits and costs*.'[425]

EPA attempted to fix the scrappage model "to align with NHTSA's state intent, so that the scrappage model predicts fleet composition, but does not dictate total fleet size."[426] However, because these problems persist in the proposal, it would appear EPA's modifications were ignored, and the Agencies proceeded with the flawed scrappage model and its unrealistic projections on used vehicle populations anyway.

The substantial increases in the used vehicle population can also be seen when examining the survival rates under the different policy scenarios. The survival rate represents the portion of a cohort (in this case, all new vehicles initially sold in a single model year) that remains on the road at different ages. *Figure VI-14* shows various survival curves for MY2025 vehicles. The input survival curve is what is included in the CAFE Model parameter file and used in model runs when the dynamic scrappage model is disabled. The two CAFE Default curves are derived from the CAFE Model outputs for MY2025 passenger cars based on the default assumptions used for both policy scenarios. Both of these curves exhibit higher survival rates than the input survival curve, and show limited attrition of vehicles in the early years. For example, according to the input curve, 10 percent of an age cohort will be scrapped by the time the cohort reaches age 6; according to the CAFE Model curves, it will take until age 10 for 10 percent of the cohort to be scrapped, which seems to be a significant delay imposed by the dynamic scrappage model. Scrappage at early ages tends to be from severe accidents and collisions rather than mechanical failures that are more likely to arise towards the end of a vehicle's life.[427] The increased survival rate from the CAFE Model thus inexplicably implies that all newer vehicles will be involved in fewer accidents than historical data indicate.

[425] *Id.*
[426] *Id.*
[427] PRIA, p. 1005.

Figure VI-14 Comparison of CAFE Model input and output survival rates for MY2025 passenger cars



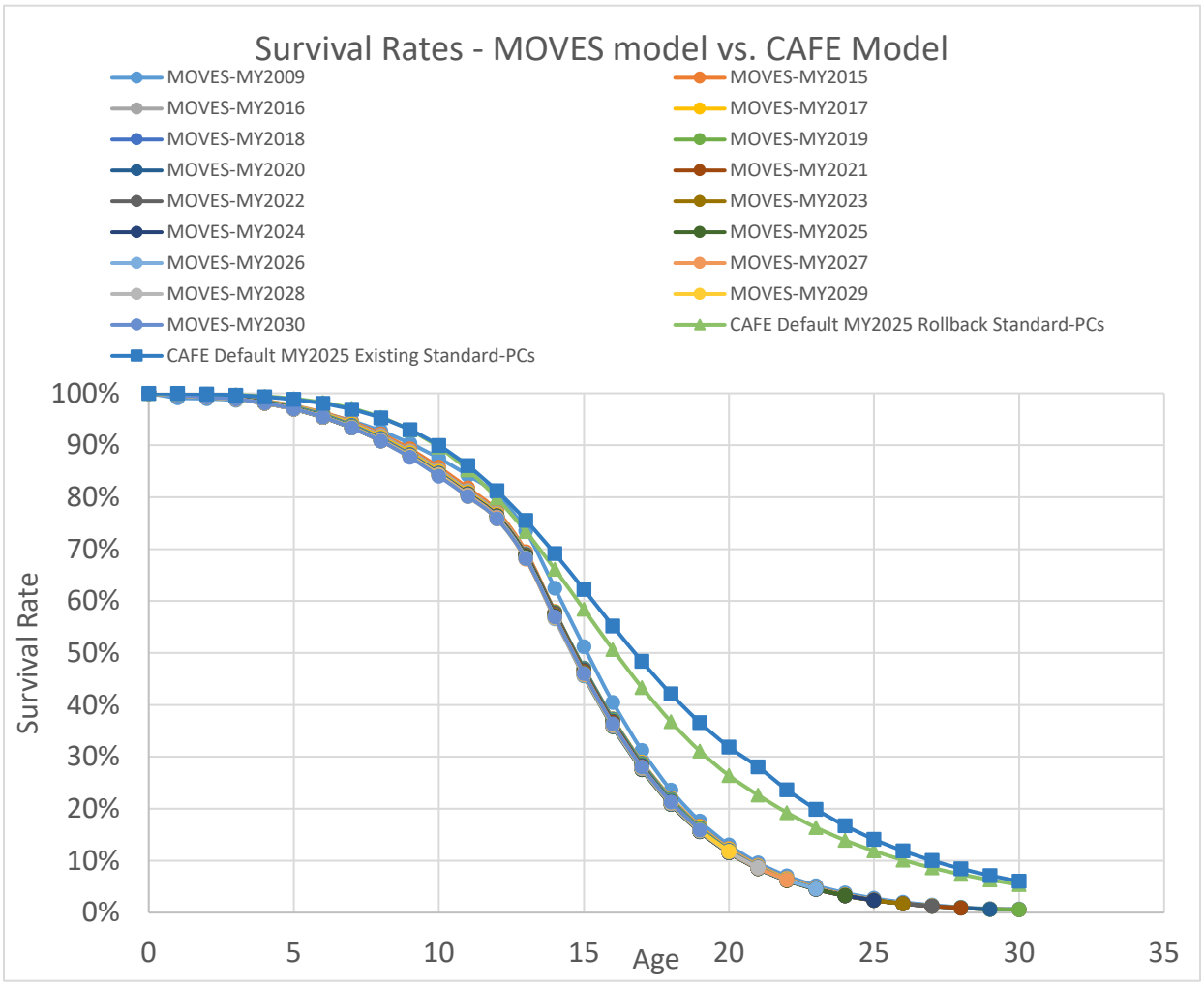
Additionally, the curves show a difference in the survival rates between the two policy cases. The existing standard (baseline) survival curve is higher than the rollback (proposed alternative) survival curve. The difference begins to spread around age 12 and reaching a maximum at age 22, after which the dynamic scrappage model switches the equation is uses to predict vehicle survival to begin using a decay function, which causes the two curves to converge again around age 30 (and presumably to ensure the flawed scrappage model does not produce everlasting vehicles). Although this figure shows only the survival rates for MY2025 vehicles, the existing and rollback curves from the CAFE Model outputs for MY 2017 and MY 2021 vehicles exhibit similar differences even though these model years are not directly affected by the proposal. This artificial shifting of the survival curves produced by the Agencies to delay the scrappage of vehicles is the cause of inflated impacts related to emission benefits and fatalities.

To gauge the soundness of the CAFE Model survival rates, we compare them to the survival rates produced by the EPA's Motor Vehicle Emission Simulator, commonly referred to as MOVES[428]. MOVES is a set of modeling tools for estimating emissions produced by onroad and nonroad mobile sources. This is EPA's required model for evaluating state implementation plans (other than California's EMission FACtors, or

[428] MOVES and Other Mobile Source Emissions Models. U.S. EPA. Accessed on October 24, 2018. https://www.epa.gov/moves.

EMFAC, model) for meeting air quality requirements and is used to estimate the impact of regulations on emission inventories. The model estimates greenhouse gases, criteria pollutants, and certain air toxic emission levels. MOVES' survival curves were developed using national registration data as summarized in the *National Transportation Energy Data Book Edition 32.*[429] While MOVES shows minor fluctuations in survival rates between different model years, the curves are largely consistent with one another. *Figure VI-15* compares the output survival curves from the scrappage module in the CAFE Model to the MOVES curves, showing that the CAFE scrappage curves are much higher than the MOVES curves at ages above 15 years and therefore are inconsistent with the MOVES curves.

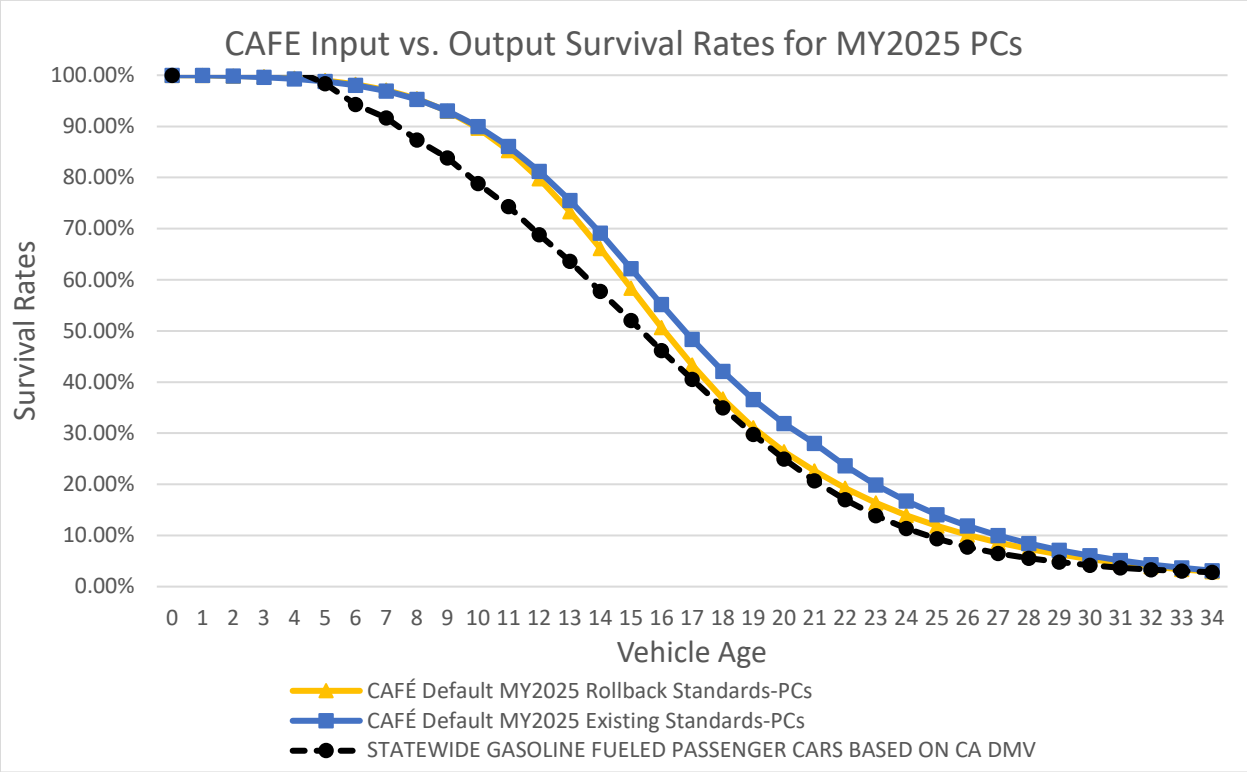
Figure VI-15 Comparison of survival rates in MOVES and CAFE Models



[429] Population and Activity of On-road Vehicles in MOVES2014. U.S. EPA. Accessed on October 24, 2018. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100O7VJ.pdf, § 3.9 on p. 20.

As a second comparison, a survival curve was derived based on California vehicle registration data from the California Department of Motor Vehicles (DMV) to gauge the output survival curves from the scrappage module against empirical data. The California DMV data reviewed the average rates of vehicles that survived at each age from what was originally sold. For example, for a specific vehicle type (such as passenger cars), the survival rate at a given age is the number of those vehicles that still exist at that age divided by the original sales at age zero. The DMV-derived survival curve is substantially lower in the earlier years, but more similar in later years to the CAFE Model survival curves. Because true scrappage is difficult to distinguish from migration out of state (a vehicle that disappears from DMV might have been scrapped or might have moved to another state), state-level DMV-derived survival curves would be expected to be lower than the curves representing the entire country. By that token, though, California-specific data would likely show higher survival rates at older ages than the national average due to the more temperate climate that allows for greater longevity of vehicles. This would suggest that the CAFE Model survival curves for the older ages are still too high as the "best case" California survival curves fall below these levels.

Figure VI-16 Comparison of CAFE Model output survival rates to California data



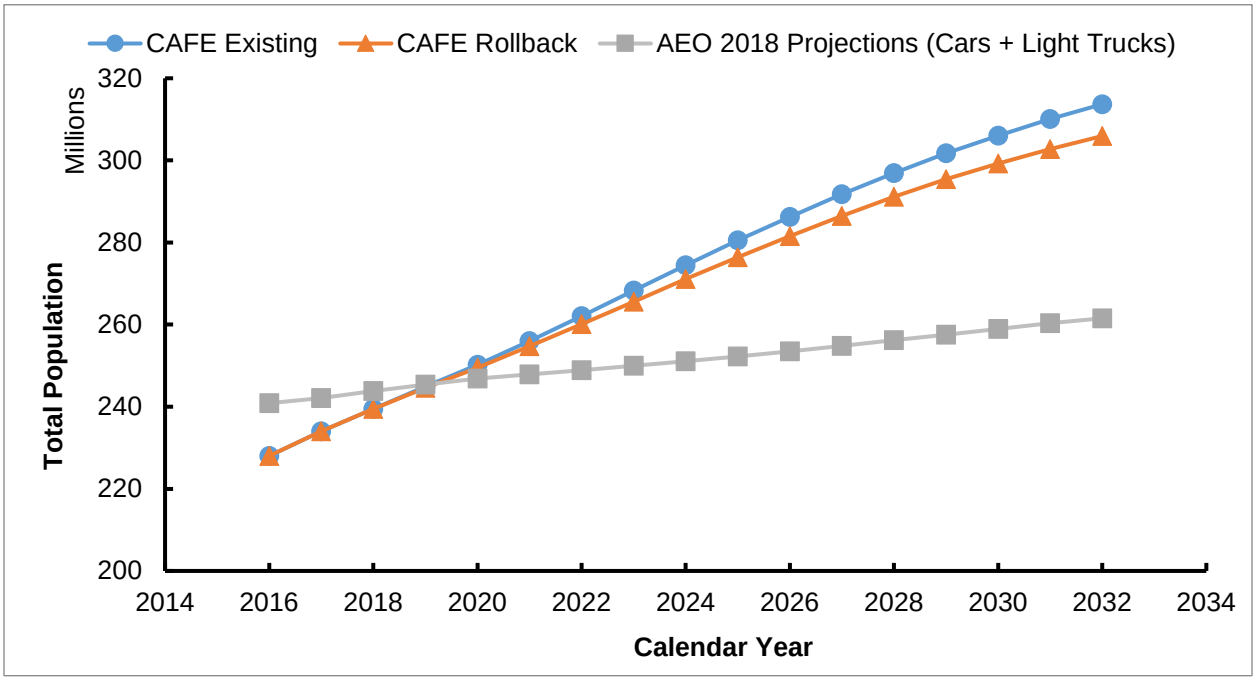
The survival curves for passenger cars are typically slightly different than those for light-trucks, with a greater portion of light trucks still operating in their later ages and overall the longest-lived trucks survive to an older age than passenger cars. The figures above illustrated comparisons only for passenger cars; however, the trends for light trucks also show similar results.

The implication of these higher survival curves is that the scrappage model produces unrealistic fleet population estimates to which unrealistic vehicle miles traveled (VMT) schedules are applied to exacerbate the impacts associated with the existing standards. Figure *VI-17* below shows that the growth in both the fleet size predicted by the CAFE Model differs substantially from those produced for EIA's[430] AEO 2018 for calendar years 2016 to 2032. The total fleet population size of the existing standards scenario is an average of 3.7 million more vehicles than the rollback in calendar years 2016 to 2032, and the difference was as high as 8.2 million in calendar year 2032. The cumulative number of additional vehicles in the existing standards relative to the Agencies' proposed rollback scenario from 2016 to 2032 is 66.5 million vehicles.

The additional VMT attributable to these additional vehicles produced by the scrappage model can be estimated by comparing the difference in VMT for the rollback and existing standards with and without the scrappage model turned on and assuming a zero percent rebound. Using this method, it was observed that the existing standards generate an additional 979 billion VMT from scrappage compared to the rollback standards of pre-model year 2030 vehicles through calendar year 2050.

[430] The EIA is the statistical and analytical agency within the U.S. Department of Energy. EIA collects, analyzes, and disseminates independent and impartial energy information to help promote unbiased policymaking and public understanding regarding energy and its interaction with the economy and the environment. EIA is the Nation's premier source of energy information and, by law, its data, analyses, and forecasts are independent of approval by any other officer or employee of the United States Government. John Maples Testimony to The Future of Transportation Fuels and Vehicle Subcommittee, March 7, 2018.

Figure VI-17 Total Vehicle Population Projections from CAFE Model GHG Default Runs and AEO



AEO Source: https://www.eia.gov/opendata/qb.php?category=2642014&sdid=AEO.2018.REF2018.ECI_STK_TRN_LDV_NA_NA_NA_MILL.A Accessed Aug 29, 2018.

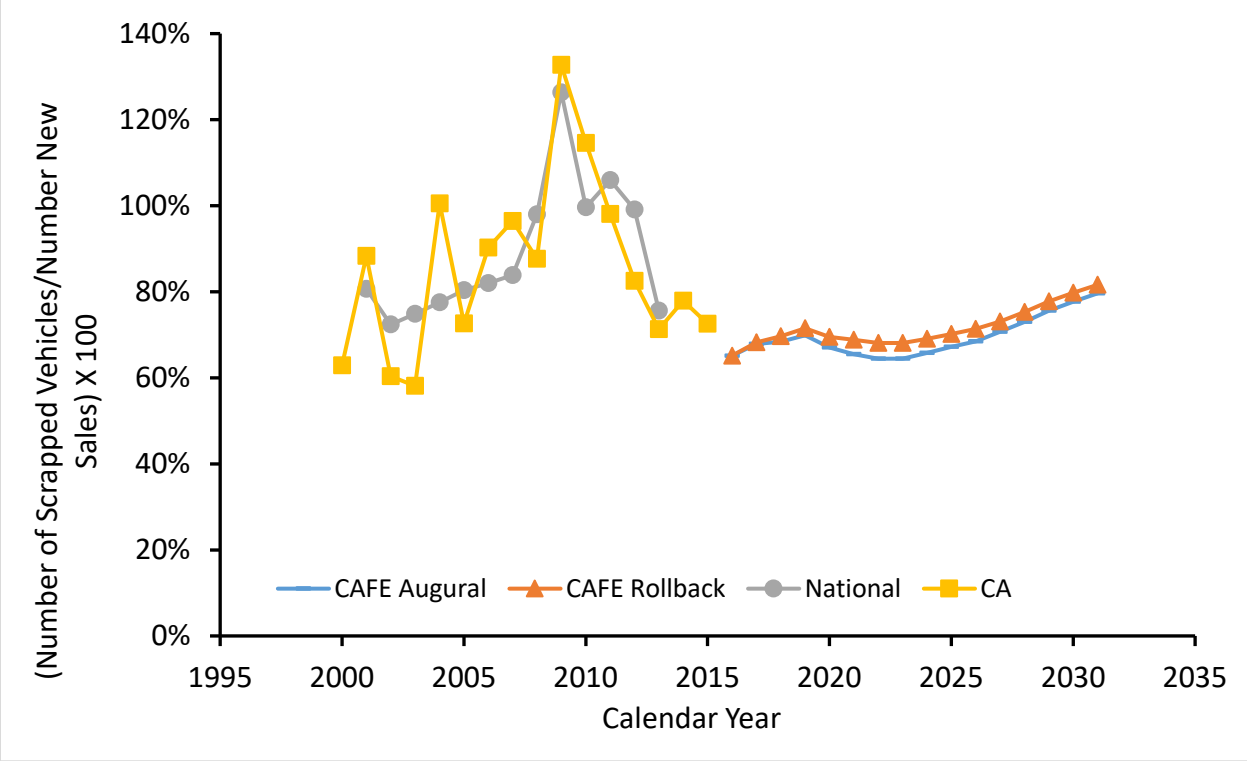
In addition to producing fleet population counts that are inconsistent with AEO predictions, the model also produces results that are inconsistent with historical populations. As shown in *Figure VI-18*, the outputs of the CAFE Model indicate that the number of vehicles scrapped each year as a percentage of new vehicle registrations is on average 69 percent for CY2016 to CY2032 (existing regulation scenario). This value is lower than the national historical average for CY2001 to 2013 (excluding CY2009) of 86 percent.[431]

Furthermore, according to the CARB's mobile emissions inventory model EMission FACtors (EMFAC), which is based on DMV registration data, the scrappage and net emigration[432] share of the total new vehicle registrations in the state averaged 85 percent for CY2006-2016. Additionally, as stated previously, EMFAC 2014 was approved by EPA in December in 2015; with its approval, EMFAC 2014 became the model California is required to use for the majority of SIP planning purposes. Although the data available to CARB preclude observing the difference between a vehicle being scrapped from one that is emigrating out of the state, by definition the number of

[431] Source: Compiled by Earth Policy Institute with 2001 from R.L. Polk & Company data cited in National Automobile Dealers Association, NADA DATA 2012 (McLean, VA: 2012), p.16; 2002-2003 from R.L. Polk & Company data cited in National Automobile Dealers Association, NADA DATA 2013 (McLean, VA: 2013), p.16; and 2004-2013 from IHS Automotive cited in National Automobile Dealers Association, NADA DATA 2014 (McLean, VA: 2014), p.16.
[432] Net emigration reflects the number of vehicles leaving California minus the number of vehicles entering California.

vehicles scrapped cannot exceed the combined scrapped and emigrating vehicle total. Therefore, assuming the emigrating population is non-zero, the scrapped population would be a portion of this total, which would imply a lower percentage of the new sales totals, suggesting the projected scrappage rate may be similar to historic scrappage rates in magnitude but the model does not produce any of the volatility that has occurred in the past.

Figure VI-18 percent of scrapped vehicles per new vehicles sold (historical and projected)



Ultimately, the ballooned vehicle fleet under the Agencies' scrappage model, and its inconsistency with other established fleet predictions, show, as Professor Gillingham notes and with which CARB agrees, that the Agencies fail to acknowledge and incorporate the scale effect of scrappage, instead only focusing on the composition effect. If, for example, the Agencies' fundamental argument were true in that scrappage would increase under the existing standards due to higher used and new vehicle prices and decreased new vehicle sales, the fleet would become older (composition effect), as consumers shift more to used vehicles and hold on to their used vehicles longer, *as well as simultaneously smaller* (scale effect), as consumers buy less new and used vehicles and the supply of used vehicles contracts.[433] In their current scrappage model, the Agencies only include the composition effect and also somehow predict a larger fleet under the existing standards even while vehicle prices increase and consumers do not

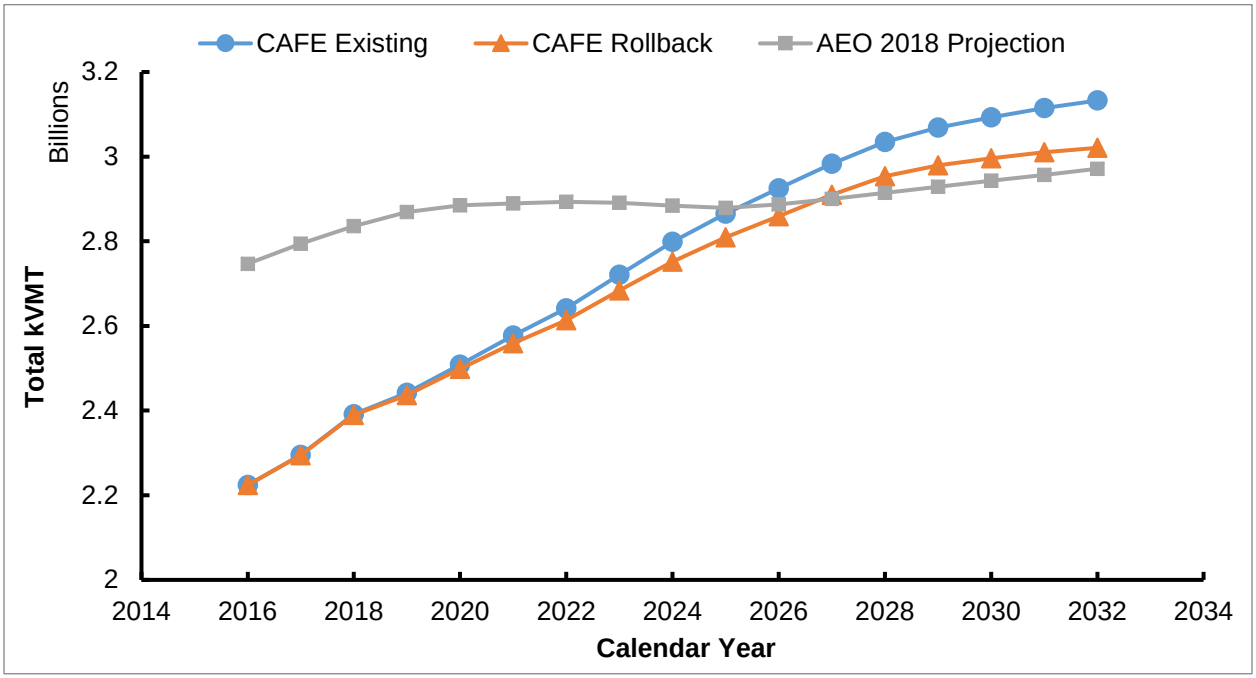
[433] Gillingham, *Fleet Turnover*, pp. 4-5.

value fuel savings at the time of purchase. As Professor Gillingham put it, "straightforward economic logic tells us that [the Agencies'] calculations must be incorrect."[434]

a. The CAFE Model assumes vehicles will be driven for no apparent reason, just because they exist.

This excessive growth in total vehicle population results in unrealistic total VMT estimates. As shown in *Figure VI-19***Error! Reference source not found.**, like the fleet size estimates, the VMT predicted by AEO grows at a much lower rate than VMT output from the CAFE Model. The CAFE Model's average annual VMT growth of approximately 2 percent per year is more than double the Department of Transportation's (DOT) Federal Highway Administration's (FHWA) projections of future VMT growth for light-duty vehicles of 1.1 percent per year.[435]

Figure VI-19 Total VMT Projections from CAFE Model GHG Default Runs and AEO



AEO Source: https://www.eia.gov/outlooks/aeo/data/browser/#/?id=7-AEO2018&cases=ref2018&sourcekey=0 (Accessed August 29, 2018)

The growth in VMT is even greater for the existing standards than for the proposed rollback standards. Part of this increase is due to the increase in driving resulting from the rebound effect (to be discussed in the next section). However, the Agencies note that for calendar year 2050, non-rebound induced VMT is still 0.4 percent higher for the current standards, which they argue is consistent with the larger fleet size.[436] By the

[434] *Id.* at 5.
[435] Special Tabulations. Federal Highway Administration. Accessed on October 24, 2018. https://www.fhwa.dot.gov/policyinformation/tables/vmt/vmt_forecast_sum.cfm.
[436] 83 Fed.Reg. at 43099.

Agencies' logic, aside from the rebound effect, the total number of vehicles is what determines the total number of miles traveled. The Agencies modeling approach is premised on the effects being sequential, as illustrated by only one-way arrows in PRIA Figure 8-20 – price influences sales, to which a regimented schedule of VMT is assigned for each vehicle. As a result, the additional average 5.5 vehicles retained in calendar years 2016 to 2032 in the existing regulation scenario are still being driven according to a fixed, age-dependent mileage schedule (i.e. vehicles of each age group all drive the same annual miles regardless of household characteristics or travel needs; the number of miles driven each year decreases as the vehicles get older).

EPA also noted the unrealistic VMT increase to both NHTSA and OMB. Specifically, EPA stated that:

> *A change in the overall fleet size due to the Augural standards might not in and of itself be problematic, as long as the VMT schedules are adjusted to account for overall travel activity that is distributed over a larger number of vehicles. However, the As-Received version of the [scrappage] model does not adjust VMT schedules, with the result that the additional unscrapped vehicles inflate total VMT proportionally. . . . The effect of this error is to erroneously inflate the total VMT . . . .*[437]

EPA developed mileage accumulation scaling factors in order to produce what it thought would be more realistic total VMT under the scrappage model. However, given that total VMT still is increasing unrealistically in the proposal, it would appear EPA's scaling factors were ignored, and the Agencies knowingly proceeded with this flaw in place anyway.

While implementing a regimented schedule of VMT may simplify the modeling task, this does not reflect how vehicle travel decisions are actually made in real life and overestimates the effect of a larger fleet population. First, this logic is the opposite of traditional travel demand theory and commonly used travel demand forecasting models where households determine the trips needed and then determine how best to accomplish this travel demand (i.e. drive, ride transit, walk, etc.). In other words, households first assess the total amount of travel they need to do, and from there decide whether or not to purchase a vehicle and how many miles to drive it. While the availability of additional vehicles may increase a household's VMT, the amount of the increase will be limited by the number of additional drivers to operate those vehicles. The Agencies do not present any evidence to suggest a greater number of drivers in the population under the existing standards compared to the rollback that would support their methodology. As Dr. Handy notes, "it is not necessarily true that, as the Agencies state in the NPRM, "the overall size of the on-road fleet determines the total amount of

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[437] William Charmley, email message to Chandana Achanta, June 18, 2018. Regulations. Accessed on October 24, 2018. https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0283-0453, Attachment 5, p. 3, 14-15.

VMT"[438] as the relationship between fleet size and the total amount of VMT is moderated by the ratio of drivers to vehicles."[439] Additional VMT needs to be estimated within a household context and not simply based on the total number of vehicles in the fleet.

Furthermore, papers and scholars such as Bento,[440] Jacobsen,[441] and EPA's peer review of Small's work[442] all model the decisions of vehicle ownership, usage, and efficiency as being simultaneously solved. That is, when deciding to own a vehicle, consumers consider concurrently their expected usage of the vehicle and the vehicle's fuel economy. The choice of vehicle fuel economy is also determined by how many miles the consumer expects to travel – the more miles anticipated, the more likely they will choose a vehicle with better fuel economy, while those with fewer travel demands may sacrifice better fuel economy for other vehicle attributes.

Instead, the Agencies' model contends that households first decide whether or not to buy a vehicle and from there the number of miles it is driven is essentially preordained. If households need to travel more miles, by the Agencies' reasoning the solution is purchase another vehicle, not to drive their existing vehicle(s) more miles. Why, under the existing standards, do households need to own one to nine million more vehicles in a single year than they do under the rollback standards when the only difference between these two cases is the price and fuel economy/GHG emission rate of the vehicles after MY2021? Or, conversely, under the proposed rollback, how are those one to nine million households able to fulfill their travel needs without those vehicles? The reader is left to assume that the proposed rollback has made alternative modes of transportation more appealing or simply eliminated the need for passenger vehicle travel.

Households do not decide whether to own a vehicle based simply on the current value of their vehicle as the Agencies' model assumes. As described by Dr. Bunch,[443] levels of vehicle ownership are determined by an assortment of household factors, such as income, size, and employment status. The characteristics of the vehicles themselves play a more limited role in the decision of whether or not to own a vehicle at all; vehicle attributes are more influential in determining *which* vehicle to own rather than the decision to add or not add a vehicle to the household. Furthermore, a vehicle's relative market value does not change households' needs for mobility. In reality, whether people

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[438] 83 Fed.Reg. at 43,098, August 24, 2018.
[439] Handy, S. Potential Federal Actions to Reduce Vehicle Travel. October 2018. p. 3. (Handy Report).
[440] Bento, Antonio M., et al. "Distributional and efficiency impacts of increased US gasoline taxes." *American Economic Review* 99.3 (2009): 667-99.
[441] Jacobsen, Mark R. "Evaluating US fuel economy standards in a model with producer and household heterogeneity." *American Economic Journal: Economic Policy* 5.2 (2013): 148-87.
[442] O'Rourke, Larry. Peer Review of December 2013 LDV Rebound Report by Small and Hymel. Prepared for U.S. Environmental Protection Agency, January 31, 2014.
[443] Bunch, D. *An Evaluation of NHTSA's Economics-based Modeling and Implications for Benefit-Cost Analysis in the NHTSA/EPA August 24, 2018 Notice of Proposed Rulemaking (NPRM) ["The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks"]* (Bunch Report) October 24, 2018.

decide on ow ning any vehicle is not simply based on the price of that vehicle but the price of that vehicle measured against the services that the vehicle can provide; the Agencies have completely ignored this latter aspect. Vehicle ownership still has benefits even if the cost of ownership is higher, particularly if there are no suitable alternatives available (such as in rural areas).

Finally, the Agencies' model produces results counter to economic theory. As the Agencies recognize with the inclusion of a rebound effect on the usage of vehicles, consumption increases with cost decreases. But their scrappage model states the opposite. In the existing standards, vehicles are more expensive than they would be under the proposed rollback, and yet this price increase results in greater consumption levels of vehicles. This is contradictory to basic economic principles of market demand. Further, the increase in vehicle populations occurs largely in the older vehicle ages that are typically owned by lower income households[444]. How these households are now supposed to be able to purchase a relatively *more expensive* vehicle (when presumably they did not own any/as many vehicles) is not at all explained by the Agencies. The fleet size cannot grow unless there is demand for those vehicles. The Agencies have not described why demand for vehicles should be different under the two policy cases. If anything, under the existing standards, the vehicles being retained and contributing to the larger fleet size have worse operating costs than the newer vehicles, and yet for some reason consumers (likely lower income consumers more sensitive to operating costs) are demanding more of these inferior goods, even despite their higher price. Conversely, the Agencies have failed to demonstrate how a rollback of vehicle standards would materially alter the services that are provided by personal vehicle ownership, such that vehicle ownership is less appealing, even though vehicles are relatively less expensive.

Despite these inconsistencies, the Agencies defend the need to use a dynamic scrappage model, rather than retain static retirement schedules, to account for increases in vehicle durability over the past several decades.[445] However, the Agencies fail to explain why vehicle durability should be different, and analyzed differently, in the future between the existing and rollback standards. Based on the CAFE Model outputs, Table VI-5 shows the expected lifetime mileage of model year 2025 vehicles would be about seven thousand and four thousand miles higher for passenger cars and light trucks, respectively, under the existing standards than the proposed standards. Presumably, the rebound effect contributes to much of this increase, as would be expected. What is not explained is how vehicles under the existing standards would not have exhausted their usable life sooner due to their more intensive use earlier in their

[444] Federal Highway Administration, 2017 National Household Travel Survey (NHTS). Tabulation created on the NHTS website at http://nhts.ornl.gov. Households with less than $50,000 in annual income owned older vehicles (11 years and older) on a percentage basis than middle ($50-100k) or higher ($100k+) income groups.
[445] 83 Fed.Reg. at 43,097.

life, such that they have the same lifetime mileage potential but that these potentials are reached at different points in the life of the vehicle.

Table VI-5 Survival-weighted lifetime mileage estimates for model year 2025 vehicles

Units: miles	Passenger Car	Light Truck
Augural	175,445	182,546
Rollback	168,939	178,135

Note: table produced using default CAFE Model assumptions

The Agencies appear to contend that the projected higher initial vehicle price under the existing standards continues to ripple down toward the end of the vehicle's life. This retained value (unlike the retained value of a similarly aged vehicle in the rollback scenario) is asserted to sufficiently greater in the future that it will justify the cost of more significant repairs that will be necessary to keep it on the road. However, this logic does not consider that vehicles with higher mileage tend to have lower resale value than similarly aged vehicles with lower mileage. Therefore, it is questionable whether the resale values – and hence scrappage rates – of vehicles of similar vintages would be appreciably different between the two scenarios.

2. The input assumptions have no basis.

Even assuming that the model structure were appropriate, the results between the current and proposed standards are largely driven by the assumption that new vehicle prices will be lower in the proposed rollback scenario than under the existing standards scenario. However, the Agencies simply assume this to be the case with no supporting evidence. In fact, looking at past trends, even during periods of stagnant vehicle emission standards, inflation-adjusted new vehicle prices continued to increase steadily.[446] While it may be possible that a rollback of the standards could slow the rate of price increases, it is also possible that manufacturers could maintain similar price increases as the existing standards by providing alternate features in lieu of fuel economy/emission reduction technology. Automakers are profit-maximizing entities and will seek to extract the highest price that consumers are willing to pay for their products. Without tighter requirements for fuel economy and emission reductions, manufacturers may instead add additional optional equipment, such as greater connectivity or semi-autonomous driving features (adaptive cruise control, lane keeping assistance, etc.).[447] Alternatively, as noted in the PRIA,[448] during periods of flat standards energy efficiency improvements are diverted towards other attributes like horsepower, torque, weight, or interior volume over fuel economy improvements. Given the research and development costs into powertrain improvements already invested by manufacturers, a rollback of

[446] *See* Figure VI-3 Annual U.S. Light Duty Sales, Average New Vehicle Transaction Price, Annual Median Household Income, and Average New Vehicle Fuel Economy (Indexed, 1985 Levels =100, Current Dollars).
[447] PRIA p. 1099 "…those other attributes that producers are instead likely to make on individual car and light truck models when they face less demanding fuel economy standards."
[448] PRIA Table 8-32, p. 1101.

standards at this time may simply result in companies diverting any planned improvements for fuel economy benefits towards improving these other features. As the technology would have been engineered and installed in both cases, consumers would need to be charged the same amount regardless. As a result, average new vehicle prices could be identical under both the current and proposed standards, which in turn would mean scrappage rates would also be the same under both policy cases.

Similarly, the Agencies argue that used vehicle life can be prolonged due to their increasing value outweighing the repair costs. However, they provide no evidence that vehicle repairs costs would not increase proportionally with higher used vehicle values under the existing standards. Vehicle components are increasingly electronically controlled. While repairing some of these components may be optional, e.g. sunroofs no longer open, repairing others may be required for the vehicle to function at all, or to pass state inspection/maintenance programs. In these situations, the repair costs may still exceed the value of the vehicle, which would result in scrappage occurring at a similar rate in both scenarios.

Both CARB and Dr. Bunch considered all these factors together. When scrappage is not delayed (e.g., when prices are the same in both cases, by turning off the scrappage model), the difference in societal benefits become negative, meaning that the proposed rollback would impose a cost to society as compared to the existing standards.[449] Thus, the scrappage model corresponds to neither the evidence nor best practices, and produces wildly unrealistic results with its flawed input assumptions.

Finally, it is worth noting that the Agencies claim to have run a sensitivity scenario for the scrappage model that held prices constant at model year 2016 levels throughout the model simulation. However, the input parameter files of the model appear to suggest that the sensitivity did something else entirely. Instead of re-estimating the scrappage curves for cars, vans/SUVs, and pickups, holding prices constant at model year 2016 levels, it appears as if dynamic scrappage model itself was re-estimated without *any* new vehicle price variables or variables that were interacted with new vehicle prices. Instead of keeping vehicle prices constant, this method ignores prices completely. This fails to actually test the sensitivity of the model, meaning not even the Agencies can have an accurate understanding of how sensitive/reliable their own model is to different vehicle price assumptions. To base a huge rulemaking in critical part on an unverified model is completely arbitrary.

3. The Dynamic Scrappage Model also has core structural flaws.

Some of the errors reflect deep methodological and structural flaws with the model itself. The Agencies created the dynamic scrappage model seemingly in response to peer review comments on the CAFE Model. However, like the new sales model, the

[449] *See* Bunch Report; CARB modeling.

dynamic scrappage model was not subsequently reviewed by any outside experts. As a result, the dynamic scrappage Model suffers from multiple structural issues, although, as with much of the Agencies' analysis, the underlying data used to estimate the logit function[450] used in the model are not available for inspection, which limits the ability to fully critique the scrappage model. It does not directly account for the impact of used vehicle prices, having no meaningful relationship or interaction between the new and used vehicle markets. It over-fits the data in a way that does not provide reliable predictions of behavior. It was not validated. Its results are inconsistent with economic theory.

a. Approach

Time-series analysis for modeling scrappage is also inappropriate for the same reasons as it was for the new vehicle sales model—particularly because time-series analysis does not capture structural changes, which the scrappage model seeks to illustrate. In particular, as Professor Bunch concludes and with which CARB agrees, the time-series analysis does not have the capability of capturing consumers' behavior in the face of changing vehicle prices and attributes.[451] The decision of whether or not to scrap a vehicle is a complicated decision in that it may depend on many factors and relationships (such as new vehicle price, used vehicle price, use vehicle supply), all of which individually affect consumer behavior. If consumer preferences and behaviors are not adequately captured, a scrappage model cannot meaningfully predict changes in scrappage.

b. Structural issues

In constructing the dynamic scrappage model, the Agencies have not directly accounted for the impact of used vehicles prices. According to the academic literature on scrappage (including some that are discussed in the NPRM and PRIA), the economic rationale behind an entity choosing to scrap a vehicle is that it eventually comes into disrepair and the cost of the repair to restore its functionality exceeds the (scrap) value of the vehicle.[452] The impact of used vehicle prices on scrappage has been studied in the literature, including Bento et al. (2018) and Jacobsen and van Benthem (2015). [453] Both papers find that higher used vehicle prices are associated with decreases in

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[450] PRIA, p. 1020.

[451] David S. Bunch, University of California, Davis, *An Evaluation of NHTSA's Economic-based Modeling and Implications for Benefit-Cost Analysis in the NHTSA/EPA August 24, 2018 Notice of Proposed Rulemaking (NPRM)*, 7 (2018) [hereinafter "Bunch, *Evaluation of Modeling*"].

[452] Note that the decision to scrap a vehicle is slightly different than the decision for a household to replace one vehicle with another. From an emissions perspective, a vehicle can change hands multiple times and have a limited impact on the total emissions inventory. The more important issue is when the vehicle is no longer operating on the roads because it has truly been scrapped. As noted in Jacobsen and van Benthem, households are typically not the decision makers when it comes to scrapping a vehicle; rather, dealers, mechanics, and dismantlers are more likely to be in the position of weighing repair costs and market value.

[453] Bento, Antonio, Kevin Roth, and Yiou Zuo. "Vehicle Lifetime Trends and Scrappage Behavior in the US Used Car Market." *The Energy Journal* 39.1 (2018).
Jacobsen, Mark R., and Arthur A. Van Benthem. "Vehicle scrappage and gasoline policy." *American Economic Review* 105.3 (2015): 1312-38.

scrappage rates. Thus, parameters for repair costs and used vehicle prices towards the end of life should likely be included in a scrappage model. However, neither of these variables appear in the Agencies' model. Instead, the Agencies have relied only on new vehicle prices, which is an indirect determinant, at best, of future used vehicle prices, given variable resale values for different vehicle makes and models based on brand, mileage, condition, etc.

By only including new vehicle prices and no other controls for vehicle quality, the Agencies' scrappage model omits variables that are important predictors of scrappage rates and of vehicle prices. Prior work that has relied on new vehicle prices to estimate scrappage rates have also included some aspects of quality improvements, meaning taking into account that the vehicle is improving in some way. For example, Greenspan and Cohen (1996) include both the Bureau of Labor Statistics (BLS) new vehicle price index and the BLS cost of repair index. In contrast, the Agencies' analysis excludes any quality improvements associated with new vehicle price increases as well as any controls for used vehicle prices or maintenance. As a result, the model's estimates of the impact of vehicle prices may be biased.[454]

Furthermore, the model as constructed cannot be used to identify the causal impact of new vehicle price changes on the scrappage rate. In addition to the omitted variables regarding vehicle quality, the model suffers from an endogeneity problem; in other words, the model tries to rely solely on new vehicle prices to predict scrappage rates without realizing or controlling for the fact that scrappage rates may also affect new vehicle prices. Specifically, the scrappage rates of used vehicles affects the supply of used vehicles, which in turn may impact demand and prices of new vehicles. At the same time, changes in new vehicle prices may cause consumers to substitute between new and used vehicles, which in turn changes the scrappage rate. Because both scrappage rates and new vehicle prices may influence one another, the Agencies would need to utilize different statistical techniques to credibly identify the impact of new vehicle prices on scrappage rates. For example, the Agencies would need to identify an instrumental variable that impacts new vehicle price but that does not impact the scrappage rate. Models that suffer from endogeneity problems will have biased estimates. In other words, the estimates from these models cannot be used to inform policy, because they do not actually tell us how new vehicle prices impact scrappage.

Another issue is a mismatch between the level of aggregation of the scrappage model structure and the underlying price data used to develop the model. The scrappage model uses three different sets of equations to estimate the scrappage probabilities for

[454] The Agencies acknowledge that the cost of maintenance and the value of a vehicle of a vehicle are components of vehicle scrappage. In the case of maintenance, they state that "no model considered for analysis showed the expected signs on that variable… For this reason, the preferred model excludes the variable." (PRIA 1019). In stating this, the Agencies acknowledge that the model is flawed; the model does not conform to what economic theory would suggest. Yet, instead of redesigning the model, the Agencies instead choose to omit these important variables.

each vehicle body style: (1) passenger cars, (2) vans and SUVs, and (3) pickups. However, it appears that the underlying average new vehicle price data, upon which these models were estimated, were not disaggregated into body styles.[455] (Again, despite multiple attempts to obtain the underlying price data, it has not been available to the public for either inspection or purchase, making it difficult to verify all of the Agencies' modeling methods.) This means, for instance, that even if average prices increase only because of higher sales of more expensive, luxury SUVs and pickup trucks, the scrappage model for cars may still identify a correlation between vehicle prices and car scrappage rates, even though average car prices are unchanged.

The aggregation of average new vehicle price is problematic because, as discussed above, vehicle prices between different body types often exhibit different temporal trends from year to year. For instance, as discussed previously, the average price increases seen recently have been the result of a greater share of light-truck sales. Therefore, for recent years, the scrappage model would be capturing changes in scrappage rates of cars, vans and SUVs, and pickups that are associated with price changes that are driven by a greater share of light-truck sales. Future changes in vehicle prices due to the standards may affect prices of different vehicle body types in a different way than shown in the historical data used in the scrappage model. If that is the case, we should not expect that the scrappage rates among the vehicle body styles would react the same way. For example, if the reason average new vehicle prices increased is because car prices increase, there would be a different impact on *car* scrappage than compared to a scenario where average new vehicle prices increased because of *SUV* prices increasing (in the former, we would expect car scrappage to decline, while in the latter we would expect car scrappage to essentially remain unchanged). The model presented by the Agencies suggests that the impact of scrappage rates would be the same in both scenarios regardless of the cause of the price increase.

Additionally, from the final scrappage models shown in PRIA Tables 8-10 to 8-12, the model appears to be significantly overfit and to suffer from multicollinearity. An overfit model means that the model is able to precisely replicate past trends, but only through the use of too many variables. An overfit model fits the data too well, fitting the noise or errors in the data in addition to the underlying relationships between the variables of interest. Because an overfit model also fits the noise and errors of the data, the out-of-sample predictions are unreliable. The overfitting and heavy use of lag variables also results in multicollinearity. Multicollinearity occurs when many highly correlated explanatory variables are included in the regression, making it impossible to identify which of those explanatory variables are responsible for the observed changes in the

[455] "Importantly, these transaction prices were not available by vehicle body styles…" PRIA, p. 1017. Moreover, the "2018_NPRM_parameteres_ref" document provides the prices for MY 1977 through 2015 vehicles. The transaction price data in the file shows the same prices for cars, SUVs, and trucks.

dependent variable of interest. The predictive power models with multicollinearity and overfitting are therefore rather limited.

The scrappage model includes up to 34 variables, many of which are related to each other and also shown to be statistically insignificant. Together, these variables can replicate past trends, but this combination does not capture the underlying relationships driving scrappage for the reasons discussed earlier, such as the omission of used vehicle prices or repair costs. This soup of variables, especially with all the corresponding lagged variables, means the scrappage model's outputs are just unspecific noise. It is impossible to isolate which age variable or which new price variable, for instance, is affecting the probability of a vehicle being scrapped. Because of this, the scrappage model cannot produce adequate or reliable scrappage predictions.

The Agencies' scrappage model clearly suffers from multicollinearity. The Agencies' model includes the explanatory variables of age, age^2 and age^3. For values of age between 0 and 34, a linear combination of age and age^2 are almost able to precisely estimate the value of age^3. Dr. Greene's report discusses that these three variables alone result in measures of multicollinearity that exceed commonly used thresholds applied in the academic literature by at a factor of twenty.[456]

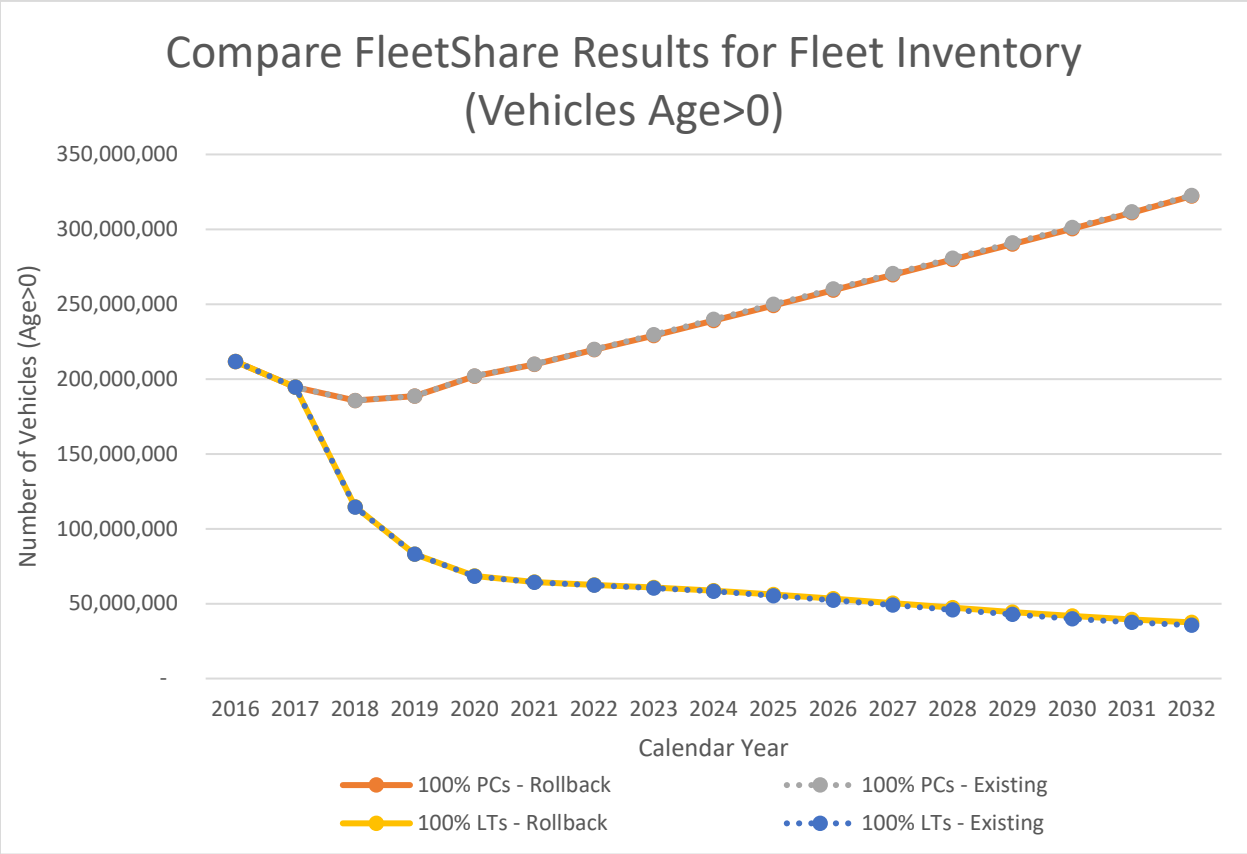
Moreover, potentially due to overfitting and multicollinearity, the estimated coefficients presented in PRIA Tables 8-10 through 8-12 are often counterintuitive and are not explained well by the Agencies. The scrappage model predicts that some variables will have different impacts to cars, trucks, and SUVs when we would expect the impact to be the same. For example, Table 8-10 suggests that new vehicle prices alone are not statistically significant predictors of car scrappage, while Table 8-11 suggests that higher new vehicle prices are associated with higher rates of scrappage for SUVs, and Table 8-12 suggests that higher new vehicle prices are associated with lower rates of scrappage for trucks. As another example, Table 8-10 suggests that the operating costs of new cars do not have a statistically significant impact on car scrappage rates, Table 8-11 suggests that higher operating costs of new SUVs results in higher scrappage of SUVs, and Table 8-12 suggests that higher operating costs of new trucks results in lower scrappage rates for new trucks.

While changes vehicle prices or operating costs may have impacts of different magnitudes on the scrappage rates depending on the vehicle type, it is unlikely that changes in one of the variables should be associated with increases in scrappage rates for one vehicle type and decreases in scrappage rates for another vehicle type. A likely cause of the modules predicting opposite responses in scrappage behavior to similar variables is multicollinearity among the variables.

[456] See Greene Report, p. 24.

As further potential evidence of overfitting, we see that the dynamic scrappage model is not robust enough to handle more extreme input values. When bypassing the dynamic fleet share model in the CAFE Model and simply specifying that all future new vehicles are either 100 percent passenger cars or 100 percent light trucks, the model produces dramatically different results for used vehicle populations. While the case with 100 percent passenger cars produces populations similar to the default fleet share assumptions, the case with 100 percent light trucks produces used vehicle populations only about one-tenth of the default case. This is despite new vehicle sales rates being similar between the two cases (as well as with the default case), implying that the scrappage model is working to quickly eliminate vehicles from the fleet.

Figure VI-20 Comparison of Fleet Share Results based on Vehicle Classification



Turning off the scrappage model restores the used vehicle populations to more expected volumes, which supports the notion that parts of the scrappage model are not functioning properly. Granted this is a rather extreme scenario, the fact that the 100 percent passenger car scenario does not produce such a dramatic result suggests something inherent to the specification in scrappage for the different body styles. As discussed previously, the signs for coefficients are not consistent across the body styles, meaning that the model predicts, for example, that increasing new vehicle prices will reduce the probability of scrapping a passenger car or light truck (i.e. the sign is negative) while increasing the probability of scrapping a van/SUV (i.e. the sign is

positive). While intuition and the economic theory on scrappage would support the notion that the new vehicle price coefficient should be negative, there is no reasoning provided for why the sign for vans and SUVs should be positive or otherwise different from the other body styles, and the Agencies even admit to not understanding why the signs are conflicting.[457] The positive sign may be contributing to the extreme scrappage rates produced by the model when pushed towards a hypothetical future fleet of only light trucks. Without any connection to broader considerations for vehicle ownership, the model is allowed to produce unrealistic retention rates of used vehicles in the future.

c. Model validation and statistical significance.

A further flaw in the model is improper validation. Statistical analyses are typically accompanied by various diagnostics to demonstrate the soundness of the estimate and the confidence with which conclusions can be drawn. In the case of the scrappage model, the Agencies failed to provide customary measures of multicollinearity. Additionally, many variables included in the models were not statistically significant at the 0.05 level. Statistical significance at the 0.05 level means that there is less than a five percent chance that you would incorrectly reject the null hypothesis, that the estimated parameter of the model is different from zero. If a variable is not statistically significant at the 0.05 level, this means there is more than a five percent chance that the true value of the coefficient associated with the explanatory variable is zero, or in other words, the explanatory variable has no effect on the dependent variable. Statistical significance at the 0.05 level has historically been one of the common threshold used in statistical analysis.[458] Tests of statistical significance can indicate how compatible the data are with a specified statistical model, and the 0.05 level often appears as an anchoring value in many economics articles, including those cited in the NPRM.[459]

As evidence that the dynamic scrappage model was not rigorously tested and validated, the dynamic scrappage model results in estimates of the scrap rate elasticity that implausibly large in magnitude and depending on the year considered take on both positive and negative values. Using the CAFE Model's assumptions of new vehicle prices and scrappage rates, Dr. Bunch calculated estimates of the scrap rate elasticity with respect to changes in new car prices. He finds that the dynamic scrappage model implicitly has scrap rate elasticities that range between -142.79 to 163.88.

Between 2018 to 2032, the average scrap rate implied by the dynamic scrappage model is -8.93. In other words, for one of the years, an increase in new vehicle prices of 1 percent is associated with an increase in scrappage of 163.88 percent. This scrap

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[457] PRIA, p. 1025.
[458] Wasserstein, Ronald L., and Nicole A. Lazar. "The ASA's statement on p-values: context, process, and purpose." *The American Statistician* 70.2 (2016): 129-133.
[459] For example: Jacobsen, Mark R., and Arthur A. Van Benthem. "Vehicle scrappage and gasoline policy." *American Economic Review* 105.3 (2015): 1312-38. and Bento, A. et al. "Vehicle Lifetime Trends and Scrappage Behavior in the U.S. Used Car Market." The Energy Journal, vol. 39, no. 1, Jan. 2018, doi:10.5547/01956574.39.1.aben. include markers for which variables are statistically significant at the 0.05 level in their regression tables.

elasticity is working in the opposite direction that economic theory would suggest if the increased prices were associated with more used car retention. In general, the scrap elasticities estimated are significantly higher than estimates in the economic literature and higher than implied scrap elasticities in other models that have implied scrap elasticities in the range of -0.88 to -3.90.[460] The reasons for the illogical results from the scrappage model can be traced back to the previously discussed problems—particularly, that the scrappage model is based on a single-equation aggregate time-series regression where no effort was made to incorporate structure or behavioral factors.

Dr. Bunch finds even more evidence that the dynamic scrappage models was not thoroughly tested and validated when comparing the scrappage model results to results from the recent academic literature and to scrappage curves from historical data. For instance, he finds that the shape of the scrappage curves is at odds with what would typically be expected from theory. Almost all of the scrappage rate response to changes in the input variables is concentrated on vehicles that are more than 18 years old, and the CAFE model produces scrappage curves with kinks and reversals.[461]

All statistical models have inherent uncertainty, and, even though a single output is presented, it should not be interpreted as being the only possible value. Most models therefore report standard errors to represent this uncertainty. Using these errors, Dr. Bunch calculated 95 percent confidence intervals for the coefficients used in the scrappage model – meaning that the analyst is 95 percent confident that the true value lies within this range.[462] The confidence intervals demonstrate that the resultant scrappage rates under the existing and proposed standards lie within each other's confidence intervals and are therefore not statistically significantly different from each other. So, although the scrappage model produces a different and seemingly distinct set of results for the two policy scenarios, the differences are not meaningful due to the uncertainty.

4. In summary, the dynamic scrappage model should be rejected.

In sum, the Agencies' new dynamic scrappage model is invalid and should be abandoned. The model, despite being created to supposedly predict fleet distribution (used versus new cars), is not meaningfully connected to the new sales model; without this connection, the scrappage model actually dictates fleet size unchecked and balloons the fleet size under the existing standards. These fleet populations and lack of connection with the new sales model do not comport with economic theory. Moreover, the differences in predicted vehicle fleet sizes are strictly driven by the predicted differences in vehicle prices, but the Agencies have not supported their assumptions that vehicle prices would increase as substantially as predicated nor that the predicted

[460] Bunch report.
[461] *Id.*
[462] *Id.*

rollback savings would translate into lower vehicle prices. Even if the predicted fleet sizes were correct (which they are not), the subsequent VMT the retained vehicles are expected to drive are overestimated, as they ignore reality and are counter to economic theory. It defies logic to predict a scenario where the cost of vehicles (and, according to the Agencies, the risk of injury or death) increases and yet at the same time people drive more.

Finally, the scrappage model itself is structurally unsound and improperly designed and validated. The Agencies are using a time-series approach, helpful in short-term predictions relying on continuing past trends, to predict structural and longer-term changes in fleet composition and use. The model both excludes important variables for scrappage prediction, like a cost of repair index, while also including too many similar variables, causing it to be overfit and unable to counteract any effects the variables have on each other. The Agencies also failed to have the model peer reviewed, or to test it through any of the standard, accepted means. In other words, the scrappage model is only able to spit out a cacophony and not produce anything adequate or reliable.

Based on these deficiencies invalidating the scrappage module, the CAFE Model should not enable this model and rely instead on the survival rate curves used in prior rulemakings. In fact, this model is so flawed that disabling the scrappage model and making no other changes to inputs results in net societal costs and not net societal benefits as the Agencies claim.

C. The CAFE Model asserts an exaggerated, unfounded rebound effect.

Thus far, the Agencies have wildly overestimated technological costs, overstated their effect on new vehicle sales, and then inappropriately and incorrectly modeled scrappage, resulting in an illusory larger fleet of supposedly dangerous used cars. Piling error on error, the Agencies also insist that lowering fuel economy standards and emissions standards will make these cars more expensive to drive – which, they insist, is a good thing, because driving is dangerous. This paternalistic approach is flawed for many reasons, not least that driving is actually rapidly becoming safer, and because wastefully charging people to drive is an extremely inefficient way of enhancing safety. The analysis around increasing the cost of driving is also overstated, because the so-called “rebound” effect has been set by the Agencies at *double* what the evidence demonstrates.

The rebound effect is the degree to which drivers increase their vehicle miles traveled (VMT) in response to the lower cost of driving resulting from the standards. The Agencies posit that “[a]s the vehicles become less expensive to operate, they are driven

more (20 percent more than the difference between initial and present travel costs, precisely)."[463] That rate is unsupported and higher than reasonable estimates.

As a result of the over-estimate, the Agencies' analysis artificially deflates the criteria, toxics, and GHG emission increases from rolling back the existing GHG standards and augural fuel economy standards, understates the energy security costs, overestimates the congestion and noise benefits, and overestimates fatality impacts. The Agencies should restore their estimate of this effect to 10 percent as used in prior rulemakings, if not something less.

Moreover, regardless of the magnitude of the assumed rebound effect, it is not properly modeled, so the magnitude of the impacts attributed to this phenomenon are erroneous in any event and twice as high as if the rebound effect were correctly applied. The erroneous fatality impacts resulting from this effect should not be included as part of the justification for rolling back the standards.

1. The rebound effect is overestimated.

The Agencies changed their estimate of the magnitude of the rebound effect from 10 percent used in prior rulemakings to 20 percent for their analysis. Their justification for this increase is flawed and based on a selective and misinformed review of the literature on this topic. Although raised in EPA's memo[464] to NHTSA that recent studies on this topic had been omitted from the discussion, these studies remain excluded from the NPRM. Furthermore, these studies all suggest that the rebound effect is *less than* the Agencies' estimate of 20 percent.[465]

Of the studies that are included, some were not interpreted or presented accurately, nor are they all directly comparable to each other. Indeed, the Agencies seem to weight each of the studies it relies upon equally, which is inappropriate. Many of the studies cited are from other countries and therefore inapplicable to the U.S. The domestic studies cited do not use the same type or quality of data; this is discussed further below.

The Agencies particularly emphasizes the study by Hymel and Small (2015) as one of the main justifications for increasing the rebound effect to 20 percent; however, the Agencies do so inaccurately. Hymel and Small (2015) include an estimate of 18 percent, which is higher than the Agencies' previous estimates based on earlier data.[466] Though the 18 percent is cited correctly, what is omitted from the discussion is that the authors also estimate an effect of only 4.0 or 4.2 percent for the same time period when

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[463] 83 Fed.Reg. at 43,105.
[464] William Charmley, email message to Chandana Achanta, June 18, 2018. Regulations. Accessed on October 24, 2018. https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0283-0453, Attachment 5, p 53, 116-122.
[465] *See* Gillingham, K. The Rebound Effect of Fuel Economy Standards: Comment on the Safer Affordable Fuel-Efficient (SAFE) Vehicles Proposed Rule for Model Years 2021-2026 Passenger Cars and Light Trucks. Yale University. October 19, 2018. (Gillingham Rebound Report.).
[466] Hymel, Kent and Kenneth Small. "The rebound effect for automobile travel: Asymmetric response to price changes and novel features of the 2000s." *Energy Economics* 49 (2015): 93-103.

assuming that consumers respond differently to price increases compared to price decreases (i.e. they respond asymmetrically depending on the direction of the change). Indeed, Professor Small commented on the NPRM, explaining that the 18 percent is in fact a long-run rebound estimate produced from a simpler model.[467] The more accurate long-run rebound estimates produced by Hymel and Small (2015) are 4.0 and 4.2 percent under more realistic models capturing consumers' asymmetrical responses.[468]

Even assuming there is no asymmetry, the 18 percent estimate is inappropriate to use for future years because it includes the fuel price shocks of 2008 and 2009, and Hymel and Small have demonstrated that the magnitude of the rebound effect increases with fuel prices. Omitting these two anomalous years from the estimate yields a rebound estimate of 15 percent. Given that the Agencies are contending that future fuel prices will remain stable and that fuel price shocks are unlikely as a result of increased domestic supply,[469] the lower (15 percent) rebound estimate would be more representative; otherwise, should they wish to use the higher (18 percent) estimate, they should adjust their future fuel price assumptions.

Furthermore, also omitted from the discussion is that these rebound estimates from Hymel and Small (2015) are long-run estimates, extending well beyond the lifetime of the vehicle, whereas most other estimates in the literature a short- or medium-run estimates. Short-term impacts are generally considered to be smaller in magnitude than long-term impacts, as often people are not able to respond quickly to changes in driving costs in a manner that would dramatically change their annual VMT, e.g. find a new job or a new home that would reduce commute distances. Hymel and Small indicate that their short-run estimates would be only one-sixth the magnitude,[470] which decreases the possible estimates to 0.67, 0.7, or 3 percent. Because the long-run rebound extends indefinitely, the actual rebound effect for the lifetime of a vehicle, according to Professor Small, would be somewhere between either 0.67 and 4.0 percent or 0.7 and 4.2 percent.[471]

Hymel and Small (2015) also notes that the rebound effect declines with increasing income levels. The NPRM states that incomes have not risen as expected, which may explain why the Hymel and Small's 2015 estimate is higher than prior estimates. However, for assessing this proposal, future income levels are more relevant than past trends, but the Agencies do not provide any reference to support assuming income to only grow at half the level that they previously assumed.[472]

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[467] Comment by Kenneth A. Small, Professor Emeritus, University of California, Irvine, EPA-HQ-OAR-2018-0283-2698 (Oct. 18, 2018).
[468] *Id.*
[469] PRIA, p. 1080.
[470] Comment by Kenneth A. Small.
[471] *See* Comment by Kenneth A. Small.
[472] 83 Fed.Reg. at 43,105.

Many of the studies the Agencies rely upon for this increase in magnitude were focused on evaluating driving cost changes more generally or solely from fuel price changes, such as those resulting from marketplace volatility or tax policies. Such estimates are inappropriate to rely upon, as they do not reflect impacts expected from the proposed or existing standards (i.e. these standards are not expected to significantly alter fuel prices). For example, Bento et al.'s rebound estimate of 34 percent in the NPRM is related to increased fuel taxes and not at all applicable to changing vehicle standards; rather, the rebound estimate for fuel economy standards is in the range of 5 to 10 percent. Similarly, the Agencies cite an estimate from Gillingham (2014) of 22 percent, which is solely from a gasoline price shock. Meanwhile, in a subsequent paper not cited by the Agencies, Gillingham et al. (2015) estimate a 10 percent rebound (as relates to changes in the cost of driving). Likewise, the 40 percent estimate referenced from Liu et al. has no consideration of vehicle fuel economy and is inappropriate to consider. One of the authors, Professor Cirillo, submitted a letter to the docket stating that Liu et al.'s estimate was an elasticity to fuel price, and that "[e]lasticity to fuel price (which is calculated in Liu et al., 2014) and rebound effect are not the same concept."[473] Indeed, Professor Cirillo emphasizes that Liu et al. (2014) was constructed to study "the rebound effect from energy policy aiming at reducing VMT by for example increasing fuel cost," not the rebound effect from changes in fuel economy.[474]

Often, studies assume that a response to fuel price changes is equivalent to responses to the overall cost of driving (which actually includes both fuel prices and fuel economy); however, there is limited evidence to support this. Fuel efficiency improvements have been occurring more recently at a gradual rate of increase, whereas fuel prices reflect much higher variability and, as such, can affect both short- and long-term impacts in a different manner. There is some evidence that the fuel price component may be stronger than the fuel economy component. Few studies attempt to separately examine the impacts of vehicle technology changes resulting in increased fuel efficiency rates, which would be most directly applicable to evaluating the effects from the existing standards. Those that do find the magnitude to be much smaller. For example, Gillingham (2011) found only a one-percent rebound effect specifically relating to fuel economy changes. Additionally, Professor Small explains that when trying to separate the rebound effect just from fuel economy (as opposed to fuel price), studies have not been able to produce rebound estimates statistically distinguishable from zero; in other words, the available literature cannot prove that the rebound effect from changes in fuel economy is greater than zero.[475]

Aside from the variability in the specific effects the researchers are evaluating, the data on which these analyses are based also vary in quality. Studies that rely on multiple odometer readings provide more accurate data on VMT and are often taken from

[473] Comment from Cinzia Cirillo, Professor, University of Maryland, NHTSA-2018-0067-7819 (Oct. 19, 2018).
[474] *Id.*
[475] Comment by Kenneth A. Small.

statewide inspection/maintenance programs that capture a large sample of the population. Studies that rely on survey data may have issues with sample selection bias, as households that are willing to take the time and effort to record detailed data over a day or several weeks may be different from households that choose not to participate in the survey. These surveys may also suffer from poor recall on the part of respondents, such that trips may be inadvertently omitted or travel distances are inaccurately reported.

Joshua Linn, an economics professor at the University of Maryland and whom the Agencies cite, also commented on the NPRM and strongly echoed these concerns around quality and study-weighting. Professor Linn notes that studies using odometer data are less "noisy" (i.e., produce more meaningful and reliable results) and more statistically sound.[476] Professor Linn also explains that studies using odometer data, estimating the rebound effect due to changes in fuel economy (as opposed to changes in fuel price), and within the U.S. should receive greater weight (in fact, Professor Linn also advocates for completely dropping any non-U.S. study).[477] Indeed, isolating the studies using the higher-quality odometer data and excluding international studies yields an average rebound effect of only 8 percent.[478]

2. The rebound analysis fails to account for travel demand.

Another issue arises from the fact that data are collected on individual vehicles when, in reality, the majority (more than 80 percent) of households own more than one vehicle.[479] Therefore, even if the VMT of an individual vehicle increases, this may simply be the result of miles shifting from one vehicle to another, as opposed to being a true increase in miles for the household as a whole. For example, when a new vehicle is purchased by a household, this vehicle may be favored because it is more reliable or contains more amenities that make it more desirable to drive, and the remaining vehicles in the household are driven less. Newly purchased vehicles commonly travel more miles than older vehicles within a given household that has two or more vehicles. A shift of VMT from older, less reliable, and often less fuel-efficient vehicles to newer, more reliable, and often more fuel-efficient vehicles is a typical pattern seen in state odometer data sets as well as the National Household Travel Survey data set. And while individual vehicle data can register this increase, without household identifiers it is not possible to capture the portion of miles that are simply displaced from other household vehicles.

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[476] Comment from Joshua Linn, Associate Professor, University of Maryland, EPA-HQ-OAR-2018-0283-1642 (Oct. 15, 2018).
[477] *Id.*
[478] Kenneth Gillingham, Yale University, *The Rebound Effect of Fuel Economy Standards: Comment on the Safer Affordable Fuel-Efficient (SAFE) Vehicles Proposed Rule for Model Years 2021-2026 Passenger Cars and Light Trucks*, p. 4 (2018) [hereinafter "Gillingham, *The Rebound Effect*"].
[479] Federal Highway Administration, 2017 National Household Travel Survey (NHTS). "Number of Household Vehicles" Tabulation created on the NHTS website at http://nhts.ornl.gov.

When examining typical household annual VMT levels, the results do not indicate that significant increases in household driving patterns occur after purchase of a new vehicle. For example, West et al. (2017) found that households do not drive more, "suggesting that behavioral responses do not necessarily undermine the effectiveness of fuel economy restrictions at reducing gasoline consumption."[480] Ignoring the household effects may therefore overstate the response to fuel economy improvements, and, if indeed overall VMT remains unchanged, the Agencies' projected emission and fatality impacts would not materialize. Furthermore, if VMT in older vehicles is being displaced by VMT in newer vehicles, the model-year effects (see fatality discussion below) would suggest that fatalities can decrease even if total VMT remains distributed across the same vehicle composition.

There are other mechanisms by which the estimates based on historical data may result in overstating the rebound effect that might be expected in the future as a result of increasingly stringent standards. First, many of the studies are based on historical data during periods of stagnant vehicle standards. Aside from needing to rely on fuel price fluctuations as the main source of the change in operating cost discussed above, this also neglects the additional vehicle price consumers would be paying in the future for their reduced operating costs. Consumers may need to apply some of the fuel savings towards their higher vehicle payment, which effectively reduces the change in operating cost and yields a smaller VMT response. Additionally, baseline fuel consumption levels also contribute to the size of the response. Prior to 2005, fuel economy standards (GHG standards were non-existent at this time) for light trucks were stagnant at 20.7 mpg (unadjusted for real-world driving conditions that would reduce actual mileage). When fuel economy is that low, the response is larger. The NPRM projects that by 2020, the fuel economy of light trucks should increase to 31.3 mpg. Diminishing returns would suggest that at a higher baseline fuel economy, a 20% rebound effect would not occur.

Additionally, baseline fuel consumption levels also contribute to the size of the response. Prior to 2005, fuel economy standards (GHG standards were non-existent at this time) for light trucks were stagnant at 20.7 mpg (unadjusted for real-world driving conditions that would reduce actual mileage). When fuel economy is that low, the response is larger. For example, Gillingham et al. (2015)[481] examines heterogeneity the responsiveness of VMT to gasoline prices based on vehicle fuel economy. Using odometer readings from annual vehicle inspections in Pennsylvania over the period of 2000 to 2010, this paper finds that the vehicles in the lowest fuel economy bracket (less than 20 mpg) are the most responsive to change in gasoline prices and appear to be the primary driver of the short-run VMT elasticity with respect to the price of gasoline of -0.1 for the full dataset. In contrast, drivers of vehicles of higher fuel economy (vehicles with fuel economy of 20 mpg and higher) are barely responsive to changes in gasoline

[480] West, J., Hoekstra, M., Meer, J., & Puller, S. Vehicle miles (not) traveled: Fuel economy requirements, vehicle characteristics, and household driving. *Journal of Public Economics*. Volume 145, January 2017, pp. 65-81.
[481] Gillingham, Kenneth, Alan Jenn, and Inês ML Azevedo. "Heterogeneity in the response to gasoline prices: Evidence from Pennsylvania and implications for the rebound effect." *Energy Economics* 52 (2015): S41-S52.

prices. The estimates of the short-run VMT elasticity with respect to the price of gasoline for vehicles in this group range from -0.008 to -0.059 and are not statistically significantly different from zero. One possible explanation for this is that gasoline prices, and therefore vehicle operating costs, are simply more salient to consumers of lower fuel economy vehicles due to the higher fuel bill. The NPRM projects that by 2020, the fuel economy of light trucks should increase to 31.3 mpg. Diminishing returns would suggest that at a higher baseline fuel economy, a 20 percent rebound effect would not occur.

For all of these reasons, the Agencies should at least return to their prior estimate of a 10 percent rebound, which is still likely an overstated estimate of the true effect, but not inappropriate like 20 percent.

3. The CAFE Model improperly considers the rebound effect.

The Agencies have chosen an unconventional method of applying the rebound effect to model the impacts of fuel economy standards on VMT. The Agencies' method of applying the rebound effect leads to overestimating the VMT change between the augural and proposed standards. Overestimating the VMT change leads to the Agencies to inflate the estimates of costs that are associated with additional driving under the existing standards such as noise, congestion, and fatalities.

As pointed out by Professor Gillingham's expert report, the appropriate way to apply estimates of the rebound effect is to begin with a baseline scenario of forecasted VMT in each year that is informed by a credible source. To calculate the VMT change from the rebound effect from fuel economy standards, the baseline level of forecasted VMT in each year would be adjusted by subtracting the rebound effect multiplied by the assumed percentage change in the cost per mile in each year. With this method, the only factor that creates a difference between baseline VMT and VMT under different fuel economy standards is the change in cost per mile caused by changes in fuel economy.[482]

Instead of beginning with a baseline scenario of forecasted VMT in each year, the NPRM uses 2016MY vehicles as a baseline for VMT. In other words, the Agencies established a baseline year for VMT, rather than a baseline scenario of forecasted VMT for each year. The rebound effect in the NPRM is based on the difference in the cost per mile between new vehicles in any given year and the cost per mile of 2016 model year vehicles. Because the cost per mile equals the price of gasoline divided by fuel economy and the Agencies' method is based off comparisons to 2016, the Agencies' method for calculating the effects of rebound in their analysis mixes the impacts of the rebound effect from changes in fuel economy with changes in gasoline prices. Not only

[482] Gillingham, *The Rebound Effect*, p. 15.

has fuel economy of vehicles changed since 2016, but the price of gasoline has also changed.[483]

The Agencies' method of applying the rebound effect biases the estimates of VMT change between the augural and proposed standards. Professor Gillingham finds, with which CARB agrees, that, for model year 2021 vehicles, the VMT change between the existing and proposed standards are more than 20 percent higher when the rebound effect is applied incorrectly versus when the rebound effect is applied correctly.[484] In almost all cases, the NPRM's method overestimates the VMT change.[485] As a result, the NPRM also overestimates costs associated with noise, congestion, and fatal and non-fatal crashes.

4. The federal analysis wrongly attributes fatalities from rebound to the standards.

Lastly, although the societal cost estimates include "mobility benefits" that offset the fatality costs related to the rebound effect, the Agencies still report the total fatalities ascribed to the rebound effect, even though the Agencies acknowledge that additional driving is an individual choice providing utility to the driver. Nevertheless, the Agencies partially justify the rollback of fuel economy standards based on these (supposed) reductions in fatalities. The notion that fuel economy standards should be rolled back in the name of safety is hypocritical, though, when other federal policies would have similar fatality impacts. Recently, this administration has called for both accessing the Strategic Petroleum Reserve[486] and for petroleum-producing countries to increase production[487] in an effort to reduce gasoline prices.[488] Using the underpinning logic of the rebound effect, any resultant decrease in gasoline prices would likewise increase VMT, which, based on the Agencies' modeling, categorically increases fatalities. Nonetheless, this administration continues to pursue policies to reduce gasoline prices and fails – it fails in fact[489] as the average U.S. retail gas price has increased from $2.837 on January 1, 2018, to $2.984 as of October 8, 2018, and it fails to consider the potential change. Similarly, the federal government continues to fund highway expansion projects when the phenomenon of induced demand, i.e. increasing highway

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[483] *See* Gillingham, *The Rebound Effect*, pp. 14-16.
[484] Gillingham, *The Rebound Effect*, p. 15.
[485] Gillingham, *The Rebound Effect*, p. 16.
[486] Natter, A. Trump Considers Tapping U.S. Oil Reserve as Prices at the Pump Rise. Bloomberg. Accessed on October 24, 2018. https://www.bloomberg.com/news/articles/2018-07-13/trump-said-to-mull-tapping-u-s-oil-reserve-as-pump-prices-rise.
[487] Reed, S. & Zaveri, M. Trump Pressures Saudi Arabia to Increase Oil Production. The New York Times. Accessed on October 24, 2018. https://www.nytimes.com/2018/06/30/us/trump-oil-saudi-arabia.html, Said, S. & Nicholas, P. Trump asks Saudi Arabia to pump more oil, citing high prices. Wall Street Journal. Accessed on October 24, 2018. https://www.wsj.com/articles/trump-asks-saudi-arabia-to-boost-oil-production-1530360926.
[488] Note the irony that the Agencies are claiming the existing standards are no longer necessary because future fuel prices are expected to remain low, and yet the administration is considering actions to reduce current fuel prices that are believed to be too high.
[489] *See* US Retail Gas Price: .961 USD/gal for Wk of Oct 15 2018. YCharts. Accessed on October 24, 2018. https://ycharts.com/indicators/gas_price.

capacity, merely increases highway usage and leads to a direct increase in VMT and subsequent fatalities.

5. In summary, the Agencies wrongly consider the rebound effect.

The federal Agencies improperly inflate the rebound effect. They begin with an overestimate that does not comport with academic literature. The Agencies cherry-picked the studies that they included to inflate the number, instead of using studies based on American drivers and using real odometer readings. Then, like the scrappage modeling, this portion of the analysis fails to consider the results in the context of real-world constraints. It does not consider travel demand, congestion limits, or economic constraints. The rebound estimate is then incorrectly applied to improperly double the resultant projected VMT, leading to significantly overstating the fatalities from this travel. In sum, the Agencies' rebound value of 20 percent is overestimated, not supported by the literature, and not including all relevant factors. The Agencies exclude many important studies from consideration while including studies in other countries as well as weighing all studies equally regardless of their origin or type and quality of data. Moreover, the Agencies incorrectly interpret many of the cited studies, like Hymel and Small (2015) and Liu et al. (2014), and conflate a travel response from a change in fuel price with a travel response from a change in fuel economy. The Agencies also fail to account for travel demand, as new vehicles often displace miles traveled from older vehicles, leaving household miles traveled relatively unchanged. These errors lead the Agencies to a rebound value at least twice as high as what the best evidence would support.

The Agencies also incorrectly apply their inflated rebound estimate in the model. The Agencies apply the rebound estimate to the difference between operating costs of a given model year under each scenario (existing and rollback) and operating costs of a 2016 model year vehicle—which greatly exaggerates the impact, as the Agencies are effectively evaluating the response to all vehicle standards after 2016 instead of just the response from this rulemaking. This error results in the doubling of subsequent VMT due to rebound.

D. The Agencies' fatality analysis is flawed and wrong.

Now we will examine the proposition that people will drive 20 percent more if their cars become more fuel efficient. The Agencies are at pains to insist that a great many new fatalities will result, requiring them to act to save the American people from the roads. This fatality analysis is also flatly wrong in several respects.

Almost all of the fatalities NHTSA and EPA are projecting that they can reduce by rolling back the standards come from their projections that people will drive less if the fuel economy and GHG reduction improvements are not achieved. Driving certainly carries risks, and more driving carries more risk, and NHTSA should pursue the many options laid out below to make driving safer and make alternative means of transportation more available. But it is inappropriate for NHTSA and EPA to argue that they cannot fulfill

their statutory obligations to improve fuel economy and reduce harmful air pollution because they need to keep people safe by keeping them from driving.

There are many ways NHTSA can directly improve highway safety. We discuss several below. Because NHTSA concludes that the standards have no statistically significant effect on the safety of new vehicles, it should pursue those measures simultaneously with fulfilling its obligation to conserve resources.

1. There are pervasive flaws in the Agencies' assessment regarding the impacts of CAFE and GHG standards on vehicle safety.

The Agencies' safety assessment is flawed, and the results it produces are based on faulty assumptions and mass safety coefficients that are statistically insignificant, rendering the results inadequate on which to draw reliable conclusions. As explained further below, the following two major categories of flaws lead the Agencies to produce inaccurate estimates about the effects of GHG and fuel economy standards on vehicle safety:

- Scrappage and Rebound Fatalities
  - NHTSA fails to properly account for the safety benefits that new safety technologies in future vehicles will generate for the entire on-road fleet.
  - NHTSA assigns flawed safety coefficients to older vehicles by not controlling for the effects of driver characteristics and calendar year in their safety model.

- Mass Reduction Fatalities
  - NHTSA does not properly take into account how automobile manufacturers have improved, and will continue to improve, vehicle design to reduce mass while increasing crash safety, and therefore:
    - Fails to properly consider the current relationship between vehicle mass and vehicle safety;
    - Improperly presumes that manufacturers will not focus their lightweighting on the larger vehicles that have greater potential for mass reduction and fuel economy benefits without compromising safety.
  - NHTSA utilizes statistically insignificant coefficients to quantify the effect of mass reduction on fatality risk, reaching erroneous conclusions that are no more reliable than guesses.
  - NHTSA's regression analysis is erroneously based on the performance of historical vehicles, which are not a good indicator of the safety performance of future vehicles purposely designed to be lightweighted with lighter yet stronger materials and designs.
  - The analysis mistakenly assigns an incorrectly high median weight to discern between light trucks and heavy trucks, resulting in an underestimation of heavy trucks that have a beneficial impact from lightweighting and overestimation of light trucks that have an assumed detrimental impact from lightweighting.

- The analysis calculates incorrect fatality results because it inappropriately assumes a static future fleet, both in median weights utilized by the model to determine the magnitude of mass reduction impacts and in the weighting of crash type and frequency, while the rest of the analysis uses a dynamic fleet that actually changes in median weight from mass reduction and sales impacts and, accordingly, statistical likelihood of different crash types.

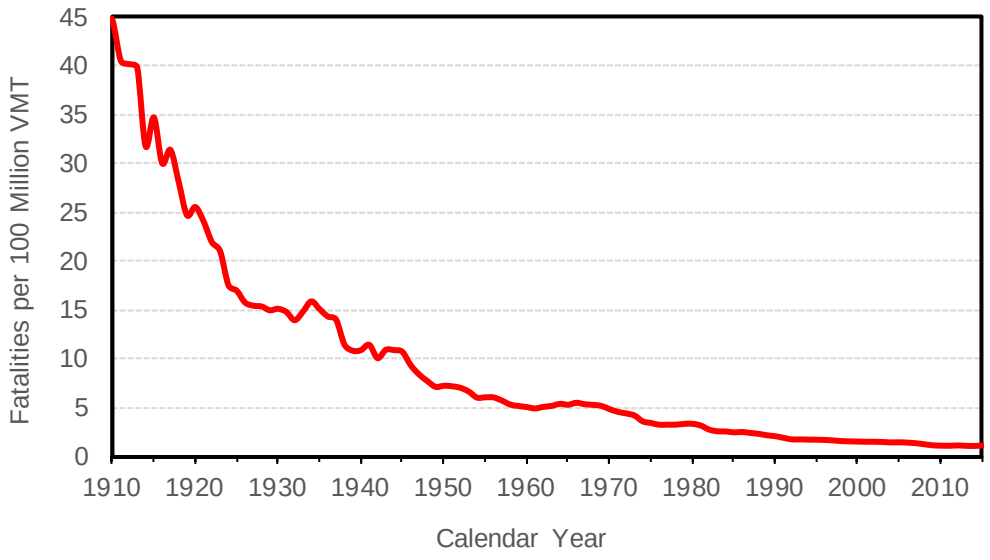
2. The Agencies are wrong about scrappage and rebound fatalities.

a. NHTSA fails to properly account for the safety benefits that new safety technologies will generate for the entire on-road fleet.

Fundamentally, the Agencies' analyses suppose that fatalities should be increasing, because vehicle costs, vehicle pollution controls, and vehicle fuel economy have all been increasing for years. But this is not what has been happening.

Historical data has shown that the number of fatalities per 100 million vehicle miles has steadily decreased from about 44.6 in 1910 calendar year to 1.1 in 2015 as illustrated in *Figure VI-21*. These fatality reductions can be attributed to continual improvements in vehicle safety technology, improvements in road safety design, and positive changes in driver behavior. These safety improvements generally provide systematic safety benefits to all vehicles in the on-road fleet, not only to new vehicles. However, NHTSA's safety model assigns safety coefficients to vehicles solely based on their model year and it fails to incorporate the effect that new safety designs and technologies will have on systematically improving fleet-wide on-road safety. As a result, NHTSA's safety model does not adequately quantify the safety benefits of future improvements to vehicle safety technology, road design, and societal changes in driver behavior.

Figure VI-21: Historical Trend for Fatalities per 100 million Vehicle Miles Travelled



The implementation of vehicle safety features like crash avoidance, pre-collision assist, lane departure warning, and blind spot assist are expected to substantially reduce total fatalities; not just from new vehicles that are equipped with these features but also from old vehicles. For example, new vehicles with crash avoidance features, like blind-spot and pre-collision braking assistance, will reduce crashes of new vehicles that have this feature and will also reduce crashes of the vehicles that they would have potentially collided with in the absence of these safety features. As these safety features penetrate into the on-road fleet, the overall number of fatalities in multi-vehicle crashes will be reduced, including those between new vehicles that have these features and older vehicles that do not have these features. As a result, both old and new vehicles will have reduced fatalities as these new safety features become available in future vehicles. While NHTSA assigns safety coefficients to new vehicles that reflect these technology improvements, it fails to correspondingly adjust the safety coefficients of old vehicles, leading to overestimates for the number of fatalities from older vehicles.

In addition to vehicle safety feature improvements, continual improvements in road safety design are expected to reduce fatality rates of the entire on-road fleet. Examples of past improvements include placement of speed activated speed limit signs to discourage speeding, improvements to roadside signage and signal systems, strategic placements of speed bumps, addition of highway rumble strips as lane departure warnings, strategic placement of roadway medians to avoid dangerous head-on collisions, and placement of roundabouts to reduce collisions at intersections.[490] All of these advances in road safety design improve safety for all on-road vehicles, and we can expect that these improvements will continue into the future. Nevertheless, NHTSA does not capture these systematic safety improvements in their safety model.

The Agencies also fail to account for the safety improvements from societal changes in driver behavior. One example is impaired driving. Various methods have been implemented over the several past decades to reduce impaired driving, including changes in legally allowed blood alcohol concentrations (BAC) for drivers, BAC test refusal penalties, increased enforcement, sobriety checkpoints, implementation of well-defined penalties for impaired driving, mass-media campaigns against impaired driving, and raising social awareness of the issue by grassroots organizations.[491] As a result of these strategies, there was a marked decline in alcohol-impaired driving fatalities from 21,113 in 1982 to 10,497 in 2016.[492] Similar efforts to reduce speeding, distracted

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[490] Ragland, D.R., Grembeck, O., Chen, K., Medury, A., & Cooper, J.F. *Safety Impacts of Potential Rollback of Vehicle Efficiency Standards and Policies/Countermeasures to Increase Safety*. University of California Berkeley. 2018.
[491] Ibid.
[492] "2016 State of Drunk Driving Fatalities in America". Foundation for Advancing Alcohol Responsibility. Accessed on October 24, 2018. https://www.responsibility.org/wp-content/uploads/2018/02/2016-State-of-Drunk-Driving-Fatalities.pdf.

driving, and other traffic infractions also provide systematic safety benefits to all on-road vehicles.

The projected improvement of new vehicle safety features, like the implementation of advanced collision prevention features, and the continued improvements in road safety design and positive societal changes to driver behavior means that the crash probability and the fatalities of the entire on-road fleet will be systematically reduced. NHTSA's safety model is flawed because it only predicts safety improvements for new vehicles based on their model year as shown in Figure II-9 in the NPRM,[493] but it does not model the safety benefits that new crash avoidance features and highway safety improvements will have for older vehicles. As a consequence of this flaw, NHTSA's model overestimates the fatality rates for older vehicles, particularly in the assessment of the effects of vehicle scrappage on fatality risk.

b. NHTSA assigns flawed safety coefficients to older vehicles by not controlling for the effects of driver characteristics and calendar year in their safety model.

To estimate the fatality rate of new and old vehicles, NHTSA conducted a statistical analysis of the crash data in the Fatality Analysis Reporting System (FARS). However, NHTSA's modelling of older vehicles is flawed since it does not control for factors that can have a significant influence on fatality risk, such as crash circumstances and driver characteristics. The Agencies admit this in the NPRM by stating that the "CAFE model lacks the internal structure to account for other factors related to observed fatal crashes – for example, vehicle speed, seat belt use, drug use, or age of involved drivers or passengers."[494] The NPRM further explains that "drivers of older vehicles, on average, tend to have lower belt use rates, are more likely to drive inebriated, and are more likely to drive over the speed limit,"[495] yet the NHTSA model does not adjust for the effect of these driver characteristics when modelling fatality rates for older vehicles. In contrast, Kahane's model controls for seat belt use and the resulting model curve is substantially different than NHTSA's model, as shown in Figure II-11 in the NPRM.[496] Consequently, the fatality rate difference between newer and older vehicles are much smaller in Kahane's model, indicating that NHTSA's model overestimates fatality rates for older vehicles.

To derive fatality rates for older vehicles, the Agencies only consider two factors: vehicle age and vehicle model year. The Agencies confirm this in the NPRM by stating that "rather than looking at each crash and the specific factors that contributed to its occurrence, staff looked at the total number of fatal crashes involving light duty vehicles over time with a focus on the influence of vehicle age and vehicle vintage."[497] The

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[493] 83 Fed.Reg. at 43,143.
[494] 83 Fed.Reg. at 43,136.
[495] 83 Fed.Reg. at 43,143.
[496] 83 Fed.Reg. at 43,145.
[497] 83 Fed.Reg. at 43,136.

Agencies goes on to describe a detailed model developed by NHTSA for the projected fatality rates based on both vehicle model year and vehicle age. However, the model generates implausible results when turning on the vehicle age portion of the model. In analyzing the fatality rate of a 34 year old vehicle, Mike Van Auken, a vehicle safety expert from Dynamic Research Inc., states, "The fatality rate for this 34 year old vehicle predicted by this equation using the estimated model coefficients indicated in the Volpe Model source code is -15.6 fatalities per billion VMT, which is negative and not possible."[498]

Furthermore, Van Auken's analysis of NHTSA's model indicates that only the vehicle model year portion of the model is actually implemented in the rulemaking analysis and that the vehicle age portion of the CAFE Model was not used. NHTSA's fatality rate model is fundamentally incorrect, or at least valid only across a restricted age range of vehicles, but that range is not specified or acknowledged in the proposal. Instead, to address this issue, NHTSA arbitrarily and without supporting data limits fatality rates to values greater than or equal to 2 fatalities per billion VMT.[499]

Another issue, again identified by Van Auken, is that the Agencies only model fatality rate as a function of model year, but fatality rate should be a function of both model year and calendar year since, "Fatality rates for a given model year vehicle are expected to decrease over time due to improved crash avoidance capabilities and crash compatibilities of collision partner vehicles in the fleet, as well as improved safety of roadway designs and infrastructure, human factors such as increased seat belt use, and improvements in crash emergency notification, response, and medical treatment."[500] Incorporating the effect of calendar year on vehicle fatality risk would account for systematic safety improvements to the entire on-road fleet, as discussed in the previous section and would provide a more accurate estimate than NHTSA's model.

Van Auken proposes a simple logarithmic model as shown in the equation below, which calculates fatalities as a function of calendar year and model year. The β_0 coefficient in this equation is 3.151 and it represents the logarithm of the fatality rate of a 1975 model year vehicle in calendar year 2015. The β_1 and β_2 coefficients are both -0.02635, which indicate that "the fatality risk will continue to decrease at a rate of 2.635 percent per model year and 2.635 percent per calendar year in the future based on the historical trends."[501] The annual fatality risk reduction of 2.635 percent for the calendar year effect is similar to values suggested in other sources.[502] The values for these

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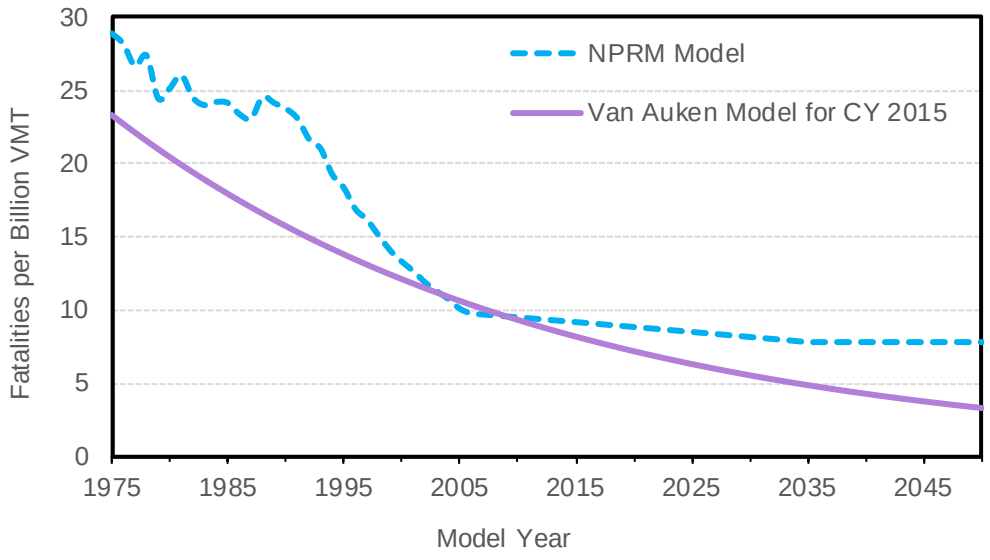
[498] Van Auken, R.M. *Comments on the Preliminary Regulatory Impact Analysis of the Proposed Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Year 2021-2026 Passenger Cars and Light Trucks*. DRI-TR-18-07. October 25, 2018.
[499] *Id*.
[500] *Id*.
[501] *Id*.
[502] Glassbrenner, D., "An Analysis of Recent Improvements to Vehicle Safety". DOT HS 811 572, National Highway Traffic Safety Administration, Washington, D.C., 2012.

coefficients were rough estimates calculated by Van Auken from the limited data provided by the Agencies in the NPRM. More accurate values could be calculated if the Agencies were to provide the full original data that was used to generate Figure II-5 in the NPRM.[503]

$$Log(Fatalities\ per\ billion\ miles) = \theta_0 + \theta_1 * (MY - 1975) + \theta_2 * (CY - 2015)$$

Utilizing the logarithmic equation above will provide more accurate estimates of the fatality risk than NHTSA's model since NHTSA fails to account for the effect of calendar year on vehicle safety improvements that tend to occur and systematically benefit all on-road vehicles. A comparison of the fatality rates per billion VMT from the two different model is illustrated in *Figure VI-22*. The figure shows the differences between the two models and shows the simpler form of Van Auken's model that does not include sharp transitions and waves that can be an indication of over-parameterization and over-fitting based on noise in the data like in NHTSA's model. Furthermore, the safety model only provides a single curve that is a function of vehicle model year as shown in *Figure VI-22*. Conversely, the curve shown in *Figure VI-22* for Van Auken's model is specific to each calendar year (shown only for calendar year 2015) and there would be other similar curves for other calendar years.

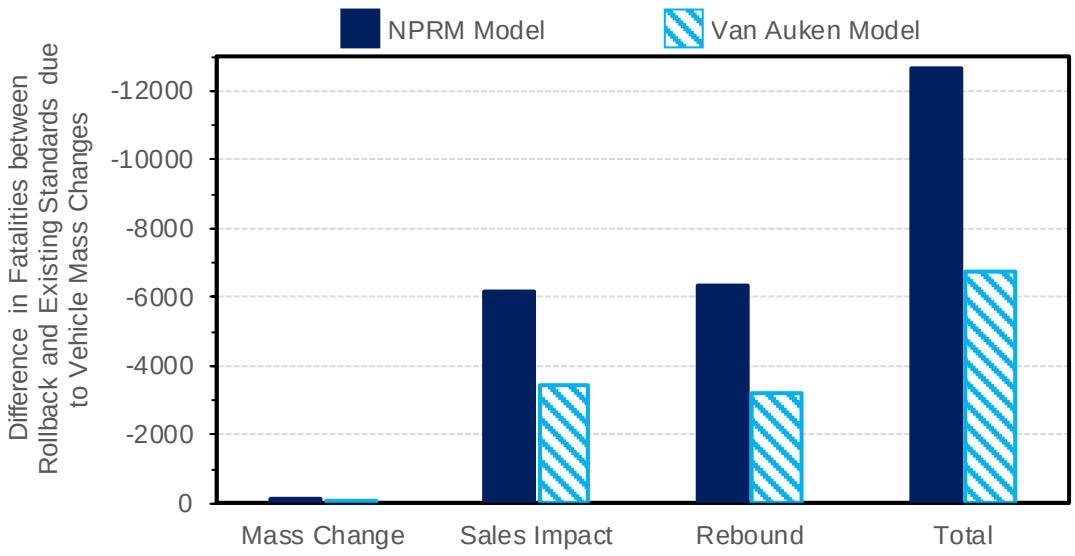
Figure VI-22: Improved Fatality Rate Model that Captures the Effects of Calendar Year and Model Year[504]



[503] 83 Fed.Reg. at 43,137.
[504] Van Auken Report.

To demonstrate the effects of incorporating calendar year effects in the safety model, *Figure VI-23* provides a side-by-side comparison of the results obtained with NHTSA's model (solid bars) and Van Auken's model (hatched bars). The data shows that the difference in fatalities between the rollback proposed by NTHSA and the existing standards is substantially reduced when calendar year effects are properly considered. This illustrates just one example that very different fatality estimates can be derived based on more accurate model assumptions. Ergo, the fatality rate estimates in NHTSA's model are faulty because NHTSA's model only considers the effect of vehicle model year on fatality rates and does not control for calendar year effects, important driver characteristics, and crash circumstances, such as the likelihood of speeding and seat belt use, which are crucial factors in determining the fatality risk of a crash. These flaws in NHTSA's model result in unreliable fatality rate estimates and overinflated fatality numbers.

Figure VI-23: Comparison of NPRM Model with Van Auken's Improved Model that Includes the Effect of Calendar Year on Safety[505]



Van Auken also raised concerns with other issues with NHTSA's fatality rate model, namely, NHTSA's model appears to be numerically ill-conditioned and the age polynomial terms are over parameterized.[506] According to Van Auken, NHTSA's model is

> *numerically ill-conditioned because the range of the age polynomial terms vary from 40 to 40^4=2,560,000. As a result the reported values in the NPRM Table II-67 do not have the accuracy required to calculate the fatality*

[505] Van Auken Report.
[506] Ibid.

rate". Furthermore, Van Auken explains that "*The signs of the age polynomial coefficients also suggest that the age polynomial is over parameterized, which is undesirable and can lead to coefficient instability. Coefficient instability is the condition where the individual terms have nearly equal and opposite effects which tend to cancel out, and the coefficients are very sensitive to small changes in the data.*

Because of these issues, it is possible for NHTSA's model to produce impossible results, such as negative fatalities, as demonstrated by Van Auken in his analysis. The use of a simpler logarithmic model, such as the one suggested by Van Auken in *Figure VI-22* would avoid these problems.

The net effect of these errors is reflected in how the Agencies' model predicts that the majority of fatalities are due to scrappage. The models estimate fatality increases due to the scrappage model and their subsequent additional VMT of 13 percent and 12 percent in the existing and rollback scenarios, respectively, compared to when the scrappage model calculations are turned off.

3. The Agencies are wrong about fatalities from mass reduction.

a. NHTSA utilizes statistically insignificant coefficients to quantify the effect of mass reduction on fatality risk.

The Agencies' core safety argument turns on their unsupported insistence that enhanced vehicle pollution and fuel economy standards will somehow lead to people driving exceptionally more in older cars. But they also offer a fatality analysis rooted in claims that reductions in vehicle mass, which may be made to reduce emissions or improve fuel economy, increase risk. This claim turns out to be entirely unsupported; among other flaws, it is based on statistically insignificant data. Indeed, EPA recognized that lightweighting analyses were wrong, writing:

> *Compared to runs where the mass effect is ignored (by setting the coefficients for fatalities per 100lb reduced to zero), inclusion of the mass effect shows a reduction in fatalities, rather than an increase as stated here. The reduction in fatalities is the result of the safety benefit of mass reduction in heavier vehicle outweighing the safety disbenefit of mass reduction in lighter vehicles.*[507]

To estimate the effect of vehicle mass on safety, NHTSA analyzes historical crash data to develop fatality risk coefficients for five different vehicle size classes, ranging from small passenger cars to heavy light trucks and vans (LTVs). This analysis was conducted without properly accounting for the weakening relationship between vehicle mass and safety. To determine the strength of a relationship between two variables,

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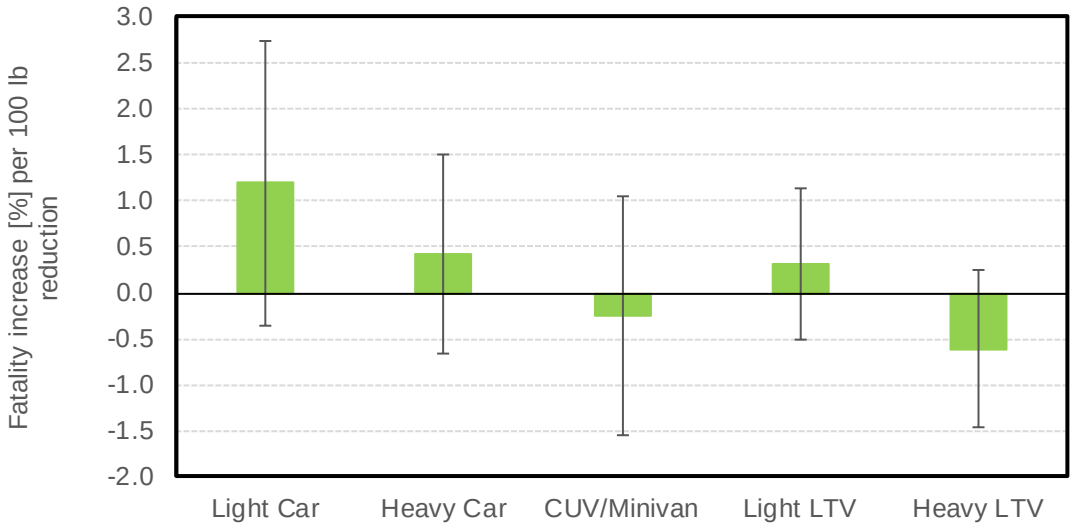
[507] EPA Comments on the NPRM Sent to OMB (June 29, 2018). U.S. EPA. Accessed on October 24, 2018. https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0283-0453. p. 17.

statistical analysis often utilizes a measure called statistical significance. In explaining statistical significance, Kahane states, "When the range in the interval estimate includes zero, the point estimate can be called "not statistically significant." When the interval is entirely positive, or entirely negative, it provides some evidence that the observed effect is "real" – the tighter the interval, the stronger the evidence."[508] Therefore, statistical significance is an indication if an estimate is significantly different from zero.

To illustrate the lack of statistical significance in NHTSA's analysis, *Figure VI-24* shows point estimates and the associated 95 percent confidence intervals for the coefficients used by NHTSA to estimate the effect of vehicle weight reduction on vehicle safety for five different light-duty vehicle classes. These values are all taken directly from the NPRM.[509] The figure shows that two vehicle categories have negative coefficient estimates, indicating potential safety benefits of mass reduction, and that three vehicle categories have positive coefficients, which imply that there may be an increased fatality risk associated with vehicle mass reduction. However, all five coefficient have 95 percent confidence bounds that not only include zero, but also cross over the zero axis. As a result, the five fatality risk coefficients derived by NHTSA are all statistically insignificant at a 95 percent confidence level, the most common confidence interval used in statistical analysis. These facts show that the safety coefficients for all five vehicle class categories used in the Agencies' proposed rulemaking analysis are not significantly different from zero. This was also the case in NHTSA's 2016 Puckett report.[510]

[508] Kahane, C. J. "Vehicle Weight, Fatality Risk and Crash Compatibility of Model Year 1991-99 Passenger Cars and Light Trucks", NHTSA Technical Report. DOT HS 809 662. Washington, DC, 2003. Accessed on October 24, 2018. http://www-nrd.nhtsa.dot.gov/Pubs/809662.PDF. p. xii.
[509] 83 Fed.Reg. 43,111.
[510] Puckett, S.M. and Kindelberger, J.C. (2016).

Figure VI-24: NPRM estimates for the effect of mass reduction on fatality risk while holding footprint constant[511]



The confidence bounds shown in *Figure VI-24* are the 95 percent confidence intervals provided in the NPRM. The use of a 95 percent confidence interval is common in statistical analysis. Van Auken states that "A 95 percent confidence interval, which corresponds to a 0.05 level of statistical significance, is more commonly used and widely accepted" and that "the 95 percent confidence interval is also the default value for many statistical software packages."[512] However, going even beyond the typically utilized 95 percent confidence level, none of the five fatality risk coefficients are statistically significant at a 90 percent confidence level. The NPRM states that only two of the five safety coefficients are statistically significant at an 85 percent confidence level, but one of these two coefficients, that of heavy light-duty trucks above 5014 lbs., indicates a fatality decrease due to mass reduction. Therefore, even at an 85 percent confidence level, an increase in fatality risk is associated with mass reduction for only one vehicle category, that of small passenger cars. However, the use of an 85 percent confidence level is arbitrary since it is not a common confidence interval used in statistical analysis, and Van Auken, in his review, states that "The NPRM suggested the use of an 85 percent confidence interval, which is unusual".[513] Furthermore, the safety coefficients in NHTSA's model for heavy passenger cars, for cross-over vehicles and minivans, and for smaller light-duty trucks are not statistically significant even at an arbitrary 85 percent confidence level and it is unclear at which confidence level the safety coefficients for these three vehicle classes become statistically significant since the Agencies do not provide a statistically significant confidence level for the fatality risk

[511] 83 Fed.Reg. 43,111.
[512] Van Auken Report.
[513] *Id.*.

coefficients for these three vehicle classes and does not provide any supporting documentation regarding the data used to derive these coefficients. In past assessments, NHTSA typically provided hundred page reports to support the derivation of these coefficients.[514]

Consequently, any conclusions made from the use of the five safety coefficients derived by NHTSA and used in its central analysis are not statistically solid. NHTSA admits this in the NPRM by stating that "NHTSA does not consider this conclusion to be definitive because of the relatively wide confidence bounds of the estimates,"[515] yet NHTSA continues to use the 5 safety coefficients, as statistically insignificant as they are, in estimating fatality rates in a definitive manner throughout their analysis. The use of these five coefficients leads NHTSA to estimate that mass reduction will lead to fatality increases for its proposed rollback and the existing standards.[516] However, due to the lack of statistical significance, NHTSA should not be attributing any increases in fatalities due to vehicle mass reduction. The five coefficients that estimate the effect of mass reduction on fatality risk should be set to zero since the estimates are not significantly different from zero.

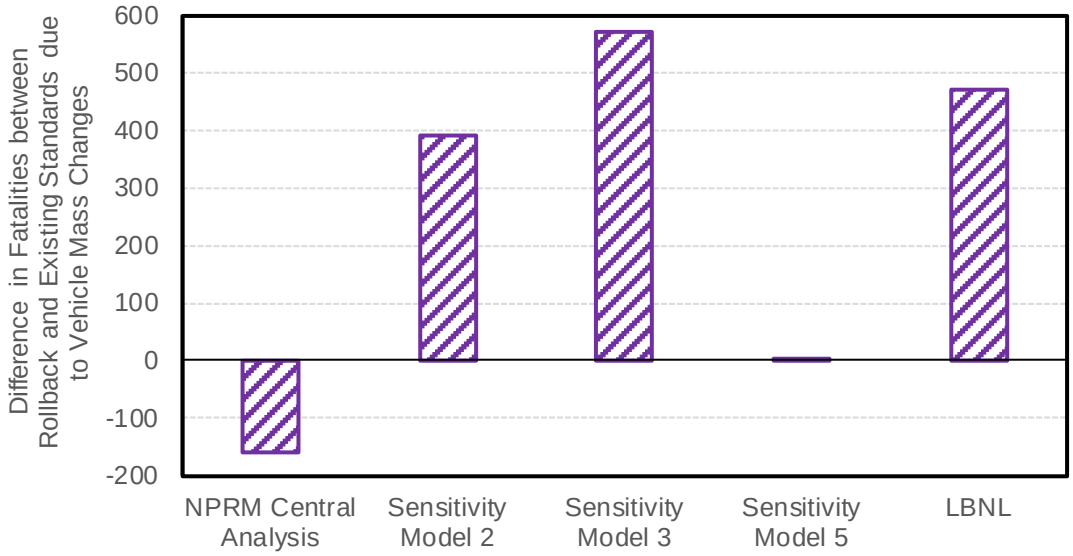
NHTSA also provides alternate safety coefficient estimates for different sensitivity cases in Table II-65,[517] and the table shows that there is quite a large variation in the safety coefficients derived for the sensitivity cases compared to the safety coefficients that NHTSA uses to estimate fatalities in its central analysis. Although the sensitivity cases have large variations in safety coefficients that may lead to different conclusions regarding the effects of vehicle lightweighting on vehicle safety, NHTSA's analysis lacks thoroughness and does not provide the corresponding fatality estimates for the sensitivity cases in Table II-65. To fill-in these missing links, Van Auken utilized some of the alternate safety coefficient estimates for different sensitivity cases in Table II-65 in the NPRM and used NHTSA's CAFE Model to assess the impacts on fatalities.

The results of Van Auken's analysis are demonstrated in *Figure* 5. Except for the Lawrence Berkeley National Laboratory (LBNL) model, all the alternate sensitivity models in *Figure VI-25*5 used mass safety coefficients that were provided by NHTSA itself.[518] The figure shows the relative difference in fatalities due to mass reduction between the proposed rollback and the existing CAFE standards. The results reveal that NPRM's central analysis predicts that the proposed rollback will results in fewer fatalities than the existing standards. However, the alternate sensitivity analyses all predict directionally opposite results, which indicate that the proposed rollback will result in higher fatalities than the existing standards. This outcome is further proof that the safety coefficients used in the Agencies' analysis to determine the effect of vehicle

[514] Kahane, C.J. (2003), Kahane, C.J. (2010), Kahane, C.J. (2012), Puckett, S.M. and Kindelberger, J.C. (2016).
[515] 83 Fed.Reg. at 43,111.
[516] Van Auken Report.
[517] 83 Fed.Reg. at 43,132.
[518] 83 Fed.Reg. at 43,132.

mass on safety do not provide reliable results because the Agencies' fatality estimates are very sensitive to safety coefficient changes. Significantly different results can be obtained by using alternate mass safety coefficients that are provided by the Agencies in the NPRM. This highlights that the Agencies' analysis lacks thoroughness since it does not dutifully conduct this analysis using their own alternate coefficients and underscores the observation that the safety analysis performed for the NPRM for vehicle mass reduction is statistically insignificant and unreliable.

Figure VI-25: Comparison of Fatality Differences in NPRM's Central Analysis and NPRM's Sensitivity Models



b. NHTSA's regression analysis is based on historical non-lightweighted vehicles which are not a good indicator of the safety performance of future purpose-designed lightweighted vehicles.

NHTSA derives the safety coefficients from crash data of vehicles that were sold as model years 2004 to 2011. The use of historical vehicle data from vehicles that were sold as model years 2004-2011, most of which were designed several years before the initial greenhouse gas emission standards were adopted by California for the 2009 model year, does not seem appropriate to represent the future state of safety design that will be available for vehicle model years that are under consideration. The historical crash data that NHTSA uses to model the safety coefficients for mass reduction is mostly limited to comparing differences in vehicles that are intrinsically different weights, but a lighter car is not the same as a purpose-designed lightweighted car. The weight difference in historical vehicles were generally from vehicles that happened to be lighter than some of their contemporary competitor vehicles due to inclusion or exclusion of vehicle features that are irrelevant to safety performance like option content, creature comforts, spare tires, and plush seats. Vehicle safety

technology is constantly evolving and, in contrast to past historical vehicles, future vehicles are expected to implement advanced lightweighting features like the use of advanced high-strength materials and smart designs that improve crash safety.

Tom Wenzel is a Research Scientist for the Energy Efficiency Standards Group at the Lawrence Berkeley National Laboratory. Since 1992, he has analyzed how vehicle technology and government policy affect transportation energy use and emissions and has published extensively on the relationship between mass reduction and vehicle safety. In his study of the same crash data that the Agencies use,[519] Wenzel notes that:

> *"In essence, the regression models are comparing the risk of a 2600-lb Dodge Neon with that of a 2500-lb Honda Civic, after attempting to account for all other differences between the two vehicles. The models are not estimating the effect of literally removing 100 pounds from the Neon, leaving everything else unchanged."*

Yet, the Agencies are using the results of the regression model in that exact manner--to estimate the effect of removing 100 pounds from future cars even though the model is not derived from data representative of that impact.

Future vehicles that are intentionally lightweighted with the use of lighter materials like aluminum and the availability of better design capability, for example, using "3G" optimization for material selection (grade), thickness (gauge), and shape (geometry), will allow manufacturers to reduce vehicle weight while retaining large vehicle size and footprint in a way that is fundamentally different than the historical vehicles used to derive the safety coefficients in NHTSA's model. When deriving the safety coefficients, NHTSA's analysis overlooks these fundamental changes in future vehicle safety design. NHTSA admits to this flaw in its model by stating that "lightweight vehicle designs are introducing fundamental changes to the structure of the vehicle, there is some concern that historical safety trends may not apply."[520] Nonetheless, NHTSA does not adequately address this concern in its mass reduction safety analysis.

As a result, NHTSA's derived fatality risk coefficient are fundamentally flawed because they are not based on vehicles that were intentionally lightweighted with high-strength materials and smart design, in a manner that future vehicles are expected to be designed, but are based on historical data from model year 2004-2011 vehicles that were simply lighter because of less vehicle content. Because of the fundamental differences in safety design between historical and future vehicles, transferring historical fatality rates of MY 2004-2011 vehicles to future lightweighted vehicles that use high strength materials and smart design will not be an accurate representation of the safety impacts of future vehicle lightweighting. Consumers care about safety and studies have

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[519] Wenzel, Thomas P. Assessment of NHTSA's Report "Relationships Between Fatality Risk, Mass, and Footprint in Model Year 2004-2011 Passenger Cars and LTVs" (LBNL Phase 1). 2018. LBNL-2001137.
[520] 83 Fed.Reg. at 43,133.

indicated that vehicle lightweighting can be done strategically without affecting vehicle safety and that lightweighted vehicles will still be able to pass all required crash and safety tests.[521, 522]

Analyses done by Wenzel,[523] looked further at the crash data to try and validate the use of historically *lighter* vehicles as a valid surrogate for future *lightweighted* cars. By looking at higher sales volume vehicles, he was able to track the safety performance of individual models as they became lighter or heavier through redesigns. This analysis more directly looks at the impacts of how a particular vehicle model's safety performance would change if it were lightweighted rather than how one brand or model would perform versus some other brand or model that happened to be lighter or heavier. In the analysis, Wenzel observed that:

> *While the analysis of all vehicle models of a given type suggests that there is a relationship between increased mass and fatality risk, analysis of the ten most popular four-door car models separately suggests that this relationship is weak: in many cases when the mass of a specific vehicle model is increased societal fatality risk is unchanged or even increases. These results suggest that increasing the mass of an individual vehicle model does not necessarily lead to decreased societal fatality risk.*

This finding confirms that the historical correlation is weak and not an accurate indicator of future safety performance and should not be relied upon in the NPRM analysis.

NHTSA's fleet simulation model attempts to estimate the effects of intentional lightweighting on fatality risk, but the fleet simulation model is very limited in scope as it only models a few selected vehicles and only a few limited types of crashes. The fleet simulation model is also flawed since NHTSA explains that the fleet simulation model did not optimize the vehicle restraint systems for lightweighted vehicles, but the use of proper restraints, such as seatbelts, is one of the most critical factors in reducing fatality risk. Moreover, the results of the fleet simulation model in Table II-66[524] for cross-over utility vehicles (CUVs) are directionally inconsistent with NHTSA's regression analysis in the NPRM, the Kahane 2012 report, and the Puckett 2016 report as shown in Table II-45 and Table II-46 of the NPRM.[525] In the latter three studies, cross over vehicles had negative safety coefficients, implying that there are safety benefits when mass reduction

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[521] Singh, H., Kan, C-D., Marzougui, D., & Quong, S. "Update to future midsize lightweight vehicle findings in response to manufacturer review and IIHS small-overlap testing". Report No. DOT HS 812 237. Washington, DC: National Highway Traffic Safety Administration. 2016.
[522] Lotus Engineering Inc. "Evaluating the Structure and Crashworthiness of a 2020 Model-Year, Mass-Reduced Crossover Vehicle Using FEA Modeling". CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/msprog/levprog/leviii/final_arb_phase2_report-compressed.pdf.
[523] Wenzel, Thomas P. "Relationship between US Societal Fatality Risk per Vehicle Miles of Travel and Mass, for Individual Vehicle Models over Time (Model Year)". 2016 LBNL-1006316.
[524] 83 Fed.Reg. at 43,134.
[525] 83 Fed.Reg. at 43,111.

is applied to CUVs. These inconsistencies indicate that the fleet simulation model lacks credibility and that reliable conclusions cannot be drawn from the very limited results of the fleet simulation model. As a result, the NPRM lacks proper analysis of the future use of smart materials and designs for vehicle lightweighting and the NPRM relies too heavily on historical mass/size/safety data for assessing safety impacts of future lightweighted vehicles.

c. NHTSA fails to properly consider the current relationship between vehicle mass and vehicle safety.

NHTSA's safety analysis investigates the impact of vehicle mass reduction on vehicle safety while holding vehicle footprint constant.[526] The motivation for NHTSA's analysis is based on past studies that analyzed data from historical vehicles and found that there was a relationship between vehicle mass and safety, even when holding vehicle size constant.[527] However, these previous studies also found that the effect of mass reduction on safety was only statistically significant for two vehicle categories: small passenger cars and heavier light trucks and vans (LTVs). For large LTVs, historical trends have generally shown that vehicle weight reduction has beneficial effects on safety and is associated with a reduction in fatality risk.[528] The NPRM explains this by stating that "heavier LTVs would reduce societal fatality risk by reducing the fatality risk of occupants of lighter vehicles colliding with those heavier LTVs."[529]

Conversely, historical trends have also indicated that there was an increase in fatality risk when weight reduction was applied to small passenger cars. However, the increased fatality risk for small passenger cars was based on data from vehicles that were simply lighter, rather than those that were intentionally lightweighted with lighter but higher strength materials, as is expected to happen for vehicles under consideration in the proposed rulemaking. Therefore, while past studies have pointed to a historical relationship between vehicle mass and vehicle safety for small passenger cars, those studies rely on data from historical vehicle fleets that do not contain a representative portion of vehicles that were intentionally lightweighted.

As purposely lightweighted vehicles have penetrated the on-road fleet, more recent studies have indicated that the historical relationship between vehicle mass and safety is becoming weaker. This weakening relationship between vehicle mass and safety for small passenger cars is apparent in the data from studies that were sponsored by

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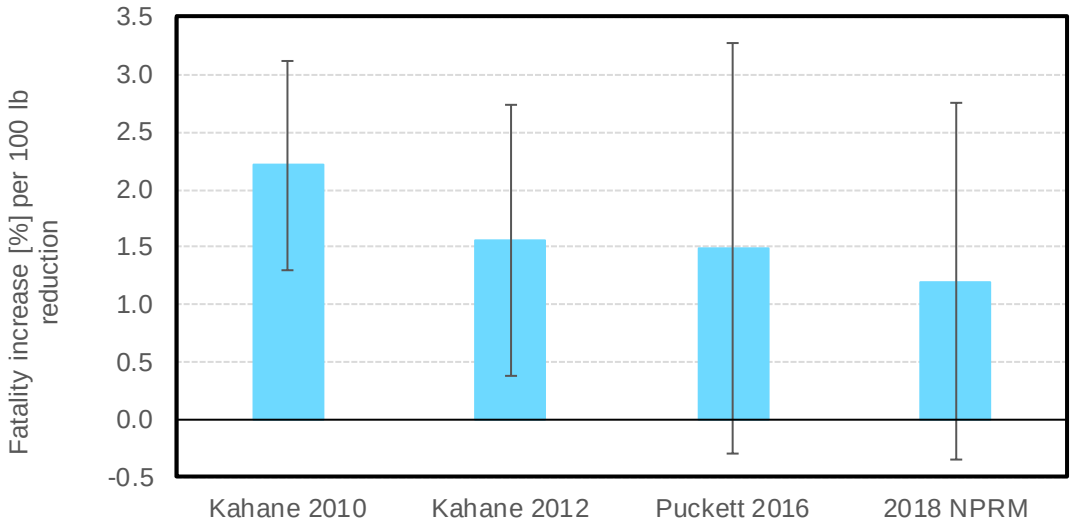
[526] 83 Fed.Reg. at 43,108.
[527] Kahane, C. J. "Relationships between Fatality Risk, Mass, and Footprint in Model Year 1991–1999 and Other Passenger Cars and LTVs", in Final Regulatory Impact Analysis: Corporate Average Fuel Economy for MY 2012–MY 2016 Passenger Cars and Light Trucks, National Highway Traffic Safety Administration. 2010. pp. 464–542.
[528] Kahane, C. J. "Relationships between Fatality Risk, Mass, and Footprint in Model Year 2000-2007 Passenger Cars and LTVs – Final Report," Technical Report. Washington, D.C. – NHTSA. 2012. Report No. DOT-HS-811-665.
[529] 83 Fed.Reg. at 43,109.

NHTSA and cited in the NPRM.[530,531] As shown in Figure 6 the fatality risk for small passenger cars has continually declined in each successive study, from 2.21 percent in NHTSA's 2010 report to 1.20 percent in NHTSA's 2018 NPRM, a relative reduction in fatality risk of 45 percent. Furthermore, as shown in the figure below, the confidence bounds error bars have widened, indicating a weakening relationship between mass reduction and safety. The confidence bounds are also extending further and further into negative values, which imply that mass reduction in smaller passenger cars may have a safety benefit. While the relationship between mass reduction and safety was statistically significant in the Kahane 2010 and 2012 reports, it became statistically insignificant in the latest 2016 and 2018 reports. These changes coincide with the implementation of GHG standards and the introduction of newer vehicles, which use higher strength materials for intentional lightweighting, into the on-road fleet.

The results in Figure 6 were derived from data of historical vehicles, ranging from model year (MY) 1991 to MY 2011 across the four different studies. The weakening of the effect of mass reduction on vehicle safety is already starting to become apparent as some intentional lightweighting was starting to penetrate into the on-road fleet in vehicles at the latter end of the aforementioned model year range. Future fleets, which are under consideration in the proposed rulemaking, would likely apply a higher degree of advanced lightweighting and extend this weakening trend further. Yet NHTSA overlooks and ignores these recent changes and proceeds with their safety assessment without accounting for this weakening relationship between vehicle mass and safety.

[530] Puckett, S.M. and Kindelberger, J.C. Relationships between Fatality Risk, Mass, and Footprint in Model Year 2003-2010 Passenger Cars and LTVs – Preliminary Report. (Docket No. NHTSA- 2016-0068). Washington, D.C. - NHTSA. 2016.
[531] 83 Fed.Reg. at 43,111.

Figure VI-26: Effect of mass reduction on fatality risk, while holding vehicle footprint constant, for small passenger cars in NHTSA-sponsored studies



In addition to the above-mentioned studies that were sponsored by NHTSA, results and comments from independent researchers reinforce the premise that the effects of mass reduction on safety are relatively minor. In his review of the 2010 Kahane report, Lie commented:

> *The report is not stressing enough that vehicle safety mainly comes from design and engineering. Mass and footprint are relatively minor factors in comparison to engineering. A recent study on the effect of good Euro NCAP scores shows that the difference in modern cars is significant. For fatalities the difference between 2 star cars and 5 star cars were 68 ± 32 percent.*[532]

This comment puts into perspective the relatively negligible effect that mass reduction has on fatality risk for small passenger cars, 1.20 ± 1.55 percent, compared to vehicle safety design, which is only expected to improve in future vehicles. Recent studies from LBNL and DRI phase II reports have also indicated that mass reductions in small cars may reduce fatality risk per crash, although it may increase crash frequency.[533, 534] The National Academy of Sciences report cites Wenzel and states that "Other vehicle attributes, driver characteristics, and crash circumstances have a much greater effect on fatality risk than a reduction in vehicle mass or footprint" and also "When discussing

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[532] Lie, A., (2011). Item 0003 in Docket No. NHTSA–2010–0152.
[533] Wenzel, T. *An Analysis of the Relationship between Casualty Risk Per Crash and Vehicle Mass and Footprint for Model Year 2000–2007 Light Duty Vehicles*. Lawrence Berkeley National Laboratory Report. Accessed on October 24, 2018.http://eta-publications.lbl.gov/sites/default/files/lbnl-5697e.pdf.
[534] Van Auken, R.M., and Zellner, J.W. (2013), Docket No. NHTSA–2010–0152-0063.

the vehicle itself, the most comprehensive statistical analyses to date suggest that vehicle footprint has a greater influence on fatality risk than vehicle mass."[535] The comments from these studies imply that the effect of vehicle mass and size on safety is small compared to other factors and that vehicle size has a bigger impact than vehicle mass on vehicle safety. The GHG standards already account for vehicle size changes because they are footprint based standards that discourage manufacturers from downsizing vehicles.

d. The analysis uses incorrect modeling assumptions.

In the analysis, median car and truck weights are determined to segregate lighter and heavier (than median) vehicles so that they can be assigned to the appropriate fatality risk bin for mass reduction. However, the analysis has solely used the weights of vehicles that were involved in fatalities to determine the median weight rather than the weights of all vehicles on the road or even all vehicles in accidents (including non-fatal accidents). This assumption results in inappropriate apportioning of cars and trucks into the corresponding lighter or heavier bins. Further, the analysis mistakenly includes medium-duty pick-ups (class 2b and 3) into the truck bins when determining median vehicle weights. Inclusion of these heavier vehicles, that are not being regulated by this NPRM, has the impact of falsely indicating the median truck weight is higher than it is for the trucks that are subject to this rulemaking. Correspondingly, this causes more of the affected trucks to be put into the lighter truck bin, resulting in a purported detrimental impact from lightweighting instead of the heavier truck bin that would have a beneficial impact. The analysis should continue to include heavier trucks in the crash partner analysis as it does with other categories such as motorcyclists and pedestrians and heavy-duty vehicles that are not subject to this regulation but it should not be including them when determining the assignment of bins used to directly identify impacts of this regulation. The assumption regarding median weight of the trucks results in an overestimation of fatalities in the lighter truck category and an underestimation of the lives saved in the heavier truck category.

Additionally, the model uses static values for the median weights based on fleet composition in the historical data to determine which future cars and trucks are lighter or heavier. However, the NPRM analysis is then looking at impacts of lightweighting (and sales mix changes) that are resulting in the median car and truck becoming lighter over time. As the median weight for the safety determination does not change, the impact of the fleet getting lighter is inappropriately exaggerated. As the whole fleet gets lighter, the actual median weight gets lower even though the assumed median weight for safety classification does not. This results in a higher fraction of the vehicles to be erroneously classified as lighter cars or trucks and assigned a corresponding detrimental impact on safety.

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[535] *Cost, Effectiveness, and Deployment of Fuel Economy Technologies for Light-Duty Vehicles. National Academy of Sciences*. Accessed on October 24, 2018. http://nap.edu/21744.

Failure to account for the change in the vehicle fleet also results in erroneous assignment of the safety coefficients. While the Agencies tend to only show a single point estimate coefficient for each of the five categories of vehicles as in Table 11-1 from the PRIA shown below as *Table VI-7*, each of those point estimates is actually a weighted average based on impacts from different types of crashes.

Table VI-6 Fatality Increase (percent) per 100-Pound Mass Reduction While Holding Footprint Constant – MY 2004-2011 CY 2006-2012

Table 11-1 - Fatality Increase (%) per 100-Pound Mass Reduction While Holding Footprint Constant - MY 2004-2011, CY 2006-2012

	Point Estimate	95% Confidence Bounds
Cars < 3,197 pounds	1.20	-.35 to +2.75
Cars ≥ 3,197 pounds	0.42	-.67 to +1.50
CUVs and minivans	-0.25	-1.55 to +1.04
Truck-based LTVs < 4,947 pounds	0.31	- .51 to +1.13
Truck-based LTVs ≥ 4,947 pounds	-0.61	-1.46 to +.25

From Wenzel's report, Tables 2-2 and 2-3,[536] seen above as *Table VI-7* and below as *VI-8* on the same crash data set, identify the historical frequency of the different types of crashes and the impacts of mass reduction in each of the crash types.

Table VI-7 Baseline fatal crash involvements, by case vehicle type and crash type

Table 2.2. Baseline fatal crash involvements, by case vehicle type and crash type

	Baseline fatal crash involvements: MY07-10 vehicles in CY07-11			Adjusted for full penetration of ESC			Percent difference		
Crash type	Cars	LTVs	CUVs/ minivans	Cars	LTVs	CUVs/ minivans	Cars	LTVs	CUVs/ minivans
1: Rollovers	390	274	33	224	120	26	-43%	-56%	-21%
2: w/object	1,798	659	306	1,459	505	292	-19%	-23%	-5%
3: Ped etc.	1,701	997	707	1,701	997	707	0%	0%	0%
4: w/HDT	609	329	202	587	319	201	-4%	-3%	0%
5: w/lgt car	978	698	414	942	680	413	-4%	-3%	0%
6: w/hvy car	1,062	648	342	1,022	632	341	-4%	-2%	0%
7: w/lgt LT	554	325	178	533	315	178	-4%	-3%	0%
8: w/hvy LT	695	282	203	665	274	202	-4%	-3%	0%
9: Other	2,374	1,277	938	2,290	1,244	934	-4%	-3%	0%
Total	10,161	5,489	3,323	9,423	5,086	3,294	-7%	-7%	-1%

Several items are noteworthy about this data. First, the Agencies already recognize that the historical frequency of different crash types is inappropriate to use for the future

[536] Wenzel, Thomas P. *Assessment of NHTSA's Report "Relationships Between Fatality Risk, Mass, and Footprint in Model Year 2004-2011 Passenger Cars and LTVs* (LBNL Phase 1). 2018. LBNL-2001137.

because new safety technologies have disproportionate impacts on the crash types. Table 2.2 shows the Agencies already reweight the crash frequency for a future expected full deployment of electronic stability control on all vehicles. However, the Agencies make no such attempt to further reweight the crash types based on safety technologies currently being deployed and expected to be prevalent in the future such as lane departure avoidance systems, automated braking, pedestrian airbags or safety improvements, or any form of autonomous cruising or driving. While the Agencies do predict a modest overall improvement in the fatality rate for future model years, they do not account for any reweighting of the different crash types that such technologies would cause. This causes even more uncertainty in accuracy of the assumed point estimates.

Second, the tables show substantial differences in the projected impacts of mass reduction if the crash involves a lighter or heavier vehicle (car or truck). Again, the frequency of these types of crashes is assumed to be static in the analysis yet, for other portions of the analysis, the Agencies are presuming vehicles will become lighter and the sales mix of cars and trucks will shift. Clearly, if the entire fleet is becoming lighter or shifting to a different fleet mix, the likelihood of the particular crash types such as crashing with a lighter car or a heavier car will change. It is contradictory for the Agencies to assume the fleet is static for some portions of the analysis and then turn around and rely on a change in the fleet to derive the vast majority of the calculated benefits and costs used to support the proposed rulemaking changes.

Lastly, Table 2-3, shown below as Table VI-9, shows that the single point estimates are a weighted average of substantially different calculated results for each crash type. For example, the assumed 0.42 percent detrimental impact point estimate on heavy cars reflects a weighted average of values from a -8.89 percent beneficial impact in some crash types to a 3.55 percent detrimental impact in other crash types. Without a doubt, the frequency of the different types of crashes will shift in the future both as the fleet mix changes, as vehicles get lightweighted, and as new safety technologies proliferate through the fleet. With the variability in the impact expected from mass reduction on the different types of crashes, even fairly small changes in the distribution can have significant impacts on the weighted average. Such sensitivity to small changes further highlights the uncertainty in the point estimates and indicates that they should not be relied upon as primary indicators to determine the impacts of the current and proposed standards.

Table VI-8 Estimated effect of mass or footprint reduction on U.S. fatality risk per VMT, by type of crash

Table 2.3. Estimated effect of mass or footprint reduction on U.S. fatality risk per VMT, by type of crash

	Mass reduction					Footprint reduction		
Type of crash	Cars < 3201 lbs	Cars ≥ 3201 lbs	LTs < 5014 lbs	LTs ≥ 5014 lbs	CUVs/ minivans	Cars	LTs	CUVs/ minivans
1: Rollovers	-4.79%	-8.89%	0.65%	0.76%	-3.37%	9.75%	0.10%	7.50%
2: w/object	0.09%	-1.94%	-0.53%	0.99%	0.77%	1.13%	1.76%	1.66%
3: Ped etc.	1.51%	-0.08%	0.78%	0.02%	-2.37%	-0.70%	-0.71%	1.56%
4: w/HDT	3.58%	3.53%	2.10%	0.79%	3.78%	-0.64%	0.42%	1.54%
5: w/lgt car	-1.63%	1.57%	0.48%	-2.56%	0.27%	-0.32%	-0.30%	-0.35%
6: w/hvy car	1.68%	1.38%	-0.46%	-0.36%	0.59%	-0.93%	-0.22%	-1.68%
7: w/lgt LT	1.67%	1.76%	0.54%	-1.81%	-1.07%	-0.19%	0.74%	-0.42%
8: w/hvy LT	2.23%	3.55%	1.91%	0.81%	3.61%	1.25%	-0.54%	-2.87%
9: Other	2.14%	0.31%	-0.23%	-1.20%	-0.96%	0.20%	0.24%	1.07%
All	1.20%	0.42%	0.31%	-0.61%	-0.25%	0.22%	0.07%	0.52%

Estimates that are statistically significant at the 95% level are shown in red.

4. NHTSA should apply its tools for directly improving highway safety.

In sum, there is really no good evidence for the inflated fatality claims that the Agencies have claimed to justify their proposed rollback. Instead, cars, and the roads they drive on, have become steadily safer, even as they have become cleaner and more efficient. Yet, the Agencies are still proposing to reduce highway traffic safety fatalities by making cars worse, a decision which will result in an accelerating climate crisis that threatens to kill millions of people. This is the height of arbitrariness. If the Agencies truly wished to further improve safety, however, there are a host of options that are more effective – and better on net for public health and climate this proposal– than destroying any prospect for a survivable climate, as the Agencies propose to do.

Other strategies that could be implemented to increase traffic safety, and in turn, decrease traffic fatalities include accelerating proven counter measures, supporting emerging technologies and promoting approaches such as safe systems towards zero fatalities. These are discussed in further detail by Dr. David Ragland, director of Safe Transportation Research and Education Center (SafeTREC). [537] Proven countermeasures include seat belts, alcohol related legislation, and minimum drinking age, lower speed limits, and enforcement that are in affect now could achieve substantial gains with continued and accelerated implementation. Since human error is the main factor in 94 percent of serious crashes, automated technologies could have the potential to reduce crashes and should be promoted. In addition, making continued progress towards the "Safe Systems" model would encourage designs where the road is more "forgiving" of errors made by the driver and have a zero tolerance for fatalities

[537] Ragland, D. *Strategies to Improve Traffic Safety in the United States and Comments on Safety Impacts of Potential Rollback of Vehicle Efficiency Standards*. (Ragland Report) 2018.

and serious injuries. All these strategies combined can be effective in reducing fatalities.

The Agencies assume a rebound of 20 percent. Recent studies show a rebound effect of closer to 10 percent.[538] Even if the newer vehicles are driven more, these vehicles come with more safety features and the newer vehicle driver may have different driving habits. There are multiple factors that determine fatalities and an increase in VMT may not be proportionate to an increase in fatalities. If the vehicles are not increasing in MPG, the manufacturers may tradeoff with horsepower and increase horsepower. Depending on the degree to which the manufacturers increase horsepower, this would lead to higher speed, which is a major factor in fatalities. A lower MPG standard may have an opposite effect of increasing horsepower and speed, therefore increasing fatalities.

NHTSA's core responsibility is promoting motor vehicle safety, which is "the performance of a motor vehicle [or its] equipment in a way that protects against unreasonable risk of accidents."[539] The fuel economy of the engine is not a safety design feature. EPA's consideration of safety is related to the risks of emission control devices.[540]

With these directives in mind, the Agencies can directly promote highway safety and the fatalities from driving. As described by Dr. Ragland, these would be through proven counter-measures, such as programs promoting safety belts and reducing impaired driving. Advanced vehicle technologies that are already under development should be encouraged. Automated technologies have the potential to mitigate human error, which NHTSA reports is a leading factor in 94 percent of serious crashes, and save many lives. NHTSA and other governmental agencies should continue their deployment of "Safe Systems" approached to traffic management and roadway design. NHTSA has documented progress toward zero deaths on a state-by-state basis following this approach.[541]

Susan Handy examined other actions the federal government could potentially take instead of relaxing fuel economy standards to reduce vehicle miles travelled (VMT) and offset the rebound effect i.e. to dampen any increase in VMT that might occur in response to an increase in fuel efficiency.[542] The federal government has many direct and indirect tools at their disposal that they could expand. The direct tools include actions that directly affect drivers and indirect tools include actions that influence other

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[538] Tierney, S.F. and Hibbard, P.J. *Vehicle Fuel-Economy and Air-Pollution Standards: A Literature Review of the Rebound Effect. Analysis Group*. Accessed on October 24, 2018. http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/ag_fuel_economy_rebound_effect_june_2018.pdf.
[539] *See* 49 U.S.C. § 30102(9).
[540] 42 U.S.C. § 7522(a)(4).
[541] Ragland Report, pp. 5-6.
[542] Handy Report.

agencies, such as state, regional or local that in turn affect drivers. To reduce VMT, the goal is either to reduce the distances that people drive or increase alternatives to driving. Reducing VMT in this way will have many environmental and social benefits in addition to reducing fatalities.

The top direct action the federal government can take to influence VMT is to increase the gas tax. Increases in gas taxes have shown a strong influence on vehicle miles of travel. In fact, studies show than a rapid change in price is likely to produce a larger effect than a gradual increase.[543] In addition to reducing VMT, a gas tax adjustment is needed to reflect inflation and to keep up with the needs of the highway system. Another direct pathway is tax breaks to transit and bicycling benefits provided by the employer by either exempting employer-provided benefits from income taxes or by allowing employees pre-tax income to pay for transportation services. The effect of this policy will be amplified if employers increased the cost of parking. Expanding employer-based trip reduction programs can also influence VMT. This includes programs such as transit passes, carpool or vanpool, supporting bicycle commuting, alternate work schedules, and telecommuting and compressed work schedules. Expanding such programs for federal employees, could have a measurable impact on VMT and act as a model for other large employers. Lastly, increasing funding in transit-specific categories and creating categories specific to active travel would also increase investments in these modes and reduce VMT.

The federal government influences the actions of other government agencies which directly influences the choices of travelers. Several federal actions could push other agencies towards investments that would, in turn, reduce VMT. The top three actions include enabling states to toll federal highways, increase flexible funding for transit and active modes, and require the use of VMT as a performance measure. Tolls add to the cost of travel, and similar to the gas tax, this cost to the consumer would reduce travel. The federal government could loosen the restriction on states to add tools to federal-aid highways. Additionally, shifting funding from highway-specific to flexible categories would spur investment at a more local level. To bolster that further, implementing a VMT performance measure in state-wide or regional transportation planning provides an opportunity also to influence VMT.

5. In summary, the Agencies wrongly conclude the existing standards will cause highway fatalities.

The Agencies' fatalities analysis is flawed in myriad ways. First, the analysis ignores evidence showing that there has been and continues to be a weakening in the fatality risk from intentional lightweighting. Second, the Agencies ignore data showing that the number of fatalities per 100 million vehicle miles has notably declined over time, as both roads and vehicles have become progressively safer. This trend can only be expected to continue, as features like crash avoidance, pre-collision assist, lane departure

[543] Gillingham, K. *Identifying the elasticity of driving: evidence from a gasoline price shock in California*. Regional Science and Urban Economics, 2014. 47: 13-24.

warning, and blind spot assist permeate the fleet. Third, the Agencies' coefficients are flawed because the safety model fails to control for the effects of driver characteristics or calendar years. Moreover, the mass coefficients are also statistically insignificant at a 95 percent confidence interval, meaning the model is not capable of producing reliable conclusions. NHTSA itself acknowledged the wide range in the confidence bounds yields the results "not definitive," and yet the Agencies still base the proposal in part on these unreliable results. Fourth, the Agencies' historical crash data is based on older vehicles that pre-date California's GHG standards and therefore do not represent intentionally lightweighted vehicles, meaning the data cannot provide an adequate representation of how these vehicles will fare in crash scenarios. Moreover, evidence shows that the relationship between increased mass and fatality risk in crashes in weak at best. Fifth, the Agencies make several inappropriate assumptions in the safety model, including using static values for median weights, even as the fleet becomes progressively lighter.

In sum, the Agencies have created an impressively flawed safety analysis that incorrectly and unreliably predicts more fatalities under the existing standards. The Agencies then propose an unexpected solution: to make driving more expensive as a disincentive. If the main goal of the Agencies is to reduce fatalities, there are many other effective countermeasures that can be taken other than rolling back the existing standards.

VII. The federal proposals undermine public health and impose major costs on California and the public.

We now discussed the many ways the federal proposal's foundations rest on sand. It ignores federal mandates, and it is not support by substantial evidence. We next turn to the damage the proposal will do, including its proposal to rollback key components of state authority.

A. The federal proposal increases emissions, frustrates meeting the NAAQS, harms public health, and threatens the climate.

1. The federal proposal increases criteria emissions and undermines state implementation plans and modeling.

Cooperative federalism is at the core of the federal Clean Air Act. Congress recognized that "air pollution preventing… and air pollution control at its source is the primary responsibility of States and local governments" but that "federal financial assistance and leadership is essential" for this cooperative effort.[544] For years, this partnership has dramatically improved air quality throughout the country, with the benefits vastly

[544] 42 U.S.C. § 7401(a).

outweighing the costs.[545] The Agencies' proposal reverses this progress. It would yank away tools states, including California, need to comply with state and federal ambient air quality standards, and to meet climate mandates. The result is perverse: failure to comply with these standards has serious financial and public health consequences, yet EPA is using its authority to render these standards nearly impossible to meet, and especially so as climate change worsens air quality. Further, EPA is critically undermining a wide range of state laws and policies, developed in reliance upon its current standards and its adjudicatory decision to grant California a waiver for the current standards.

Such interference with states and their police power obligations to protect their publics on behalf of an executive agency is simply improper, raising the same profound separation of powers and federalism concerns we have already discussed. As the Supreme Court reminds us, the "States … retain 'a residuary and inviolable sovereignty.' The Federalist No. 39, at 245. They are not relegated to the role of mere provinces or political corporations, but retain the dignity, though not the full authority, of sovereignty."[546] A core incident of sovereignty, recognized in the scheme of the federal Clean Air Act, is the ability to protect the public. Congress so recognized in general via its recognition of the central role of the states in air pollution prevention, and specifically with regard to its decision clearly to preserve and expand California's specific vehicle regulatory power.

At this stage, many state decisions turn upon these Congressional actions, made against the background of our federal system. "Although the Constitution grants broad powers to Congress, our federalism requires that Congress treat the States in a manner consistent with their status as residuary sovereigns and joint participants in the governance of the Nation."[547] The Agencies' treatment of the states here – breaching a settled unified national program, ignoring decades of precedent, Congress's direction, and the evidence – is simply not consistent with the authorities of the states, including those reserved to them by the Act. The Agencies have created an entirely improper Catch-22 in which the states are stripped of the very authority which Congress relied upon them to use to fulfill their sovereign obligations.

e. States are required to prepare Implementation Plans under federal law.

The State Implementation Plan (SIP) is the instrument by which the states exercise their obligations under their public sovereign responsibilities and under federal law. A SIP is a federally enforceable plan for a state, which identifies how that state will attain and maintain a federal air quality standard. The federal Clean Air Act (CAA) sets out

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[545] *See* U.S. EPA's extensive studies on this point, available at: https://www.epa.gov/clean-air-act-overview/benefits-and-costs-clean-air-act.
[546] *Alden v. Maine*, 527 U.S. 706, 714 (Kennedy, J.).
[547] *Id*., at 748.

requirements for EPA's adoption of air quality standards,[548] as well as the required elements of SIPs.[549] SIPs must identify both the magnitude of reductions needed and the actions necessary to achieve those reductions. SIPs also include a demonstration that: the area will make reasonable further progress toward attainment, is implementing reasonably available control technology on all major sources, has a program in place to address emissions from new stationary sources, and meets transportation conformity requirements.

In the Clean Air Act, the U.S. Congress developed a program based on science and implemented by state and local regulators to provide safe, healthy air to the American population. The scientific community is tasked to determine levels of pollution that are acceptable and will not adversely influence human health and local regulators are tasked to implement programs to lower the pollution-causing emissions. Understanding that science is an iterative process where discoveries lead to not only a better understanding of the actual dangers of pollution but also a new baseline of knowledge to investigate these dangers further, the Clean Air Act requires EPA to revisit the NAAQS on a regular 5-year cycle to verify that the NAAQS are in line with the most recent science.

Since setting the original ozone NAAQS, the NAAQS has been revised three times. The most recent 8-hour ozone NAAQS was set in 2015 at 70 ppb. Lowering ozone levels from the current 75 ppb to the more health-protective 70 ppb 8-hour ozone standard in California is predicted to reduce annual premature mortality by an estimated 72 to 120 deaths, asthma exacerbations for 160,000 people, and lost days at work and school by more than 125,000.[550] Delaying implementation of the latest ozone NAAQS would harm the health and well-being of millions of people, not only in California but throughout the country. Simply put, meeting the ozone standard is a public health imperative.

The NAAQS[551] provide California with achievable goals to protect the health of Californians from health effects associated with air pollution. The Clean Air Act adds deadlines for meeting the NAAQS and consequences if these deadlines are not met. With its health-based air quality standards, meaningful deadlines, and requirements for comprehensive plans, the Clean Air Act has been the tool for achieving California's success in both clean air quality goals and economic success. The Clean Air Act requires early, comprehensive planning and any delays in implementing the Clean Air

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[548] 42 U.S.C. § 7409.
[549] 42 U.SC. § 7410.
[550] *Regulatory Impact Analysis of the Final Revisions to the National Ambient Air Quality Standards for Ground-Level Ozone.* U.S. EPA. Accessed on October 24, 2018. https://www.epa.gov/sites/production/files/2016-02/documents/20151001ria.pdf.
[551] California, like many states, has parallel state ambient air quality standards, for which it must also plan implementation steps. The Agencies' actions offend compliance with these standards in the same ways they undermine NAAQS compliance, and so invade State preregoatives in this regard as well.

Act requirements can increase cost. California uses the early planning required by the Clean Air Act as a tool to minimize costs in the long-term.[552]

If EPA disapproves a submitted SIP, the Clean Air Act requires EPA to issue a finding of failure-to-submit an approvable SIP with notice that, if an approvable SIP is not submitted, sanctions will be applied within 18 months.[553] The Act provides for two types of sanctions required after EPA makes a finding of failure: "offset" sanctions occurs within 18 months of the finding and "highway" sanctions that occur within six months after the offset sanctions (i.e., 24 months after the finding). The offset sanctions apply to new or expanded stationary sources that emit pollutants for which the area is in nonattainment. The source must offset their increased emissions by reducing existing emissions by two tons for every one ton of new emissions. Highway sanctions prohibit the use of federal funds for transportation projects within the area impacted by the failure.

f. California's State Implementation Plan meets federal law.

SIPs must contain enforceable commitments to achieve the level of emissions necessary to meet federal air quality standards, as defined by a plan's attainment demonstration. California's "State SIP Strategy"[554] proposes new mobile source SIP measures and quantifies the State's SIP commitments for covered areas of California to meet these reduction needs. The total emission reductions, and the obligation to propose certain actions, that are contained in the State SIP Strategy become enforceable upon approval by EPA of the elements of the State SIP Strategy that are included in each air district's SIP to meet the planning needs of that district. The measures included in California's 2016 State SIP Strategy incorporate elements of CARB's Mobile Source Strategy, including measures to accelerate the deployment of cleaner technologies.

All of the California ozone and PM2.5 SIPs submitted to EPA since approximately early 2016 have included benefits of the California Advanced Clean Car program in their light-duty vehicle emission inventories. These SIPs include the South Coast Air Basin, the San Joaquin Valley, the West Mojave Desert, the Coachella Valley, Sacramento Metro, Eastern Kern County, Ventura County, Imperial County, Western Nevada County, and San Diego County. Two of California's areas, the South Coast Air Basin and the San Joaquin Valley, with the worst ozone pollution in the nation, will need the next iteration of California's Advanced Clean Car regulations to meet the latest ozone standard. To meet the ozone standard in 2031, these areas require additional emission reductions from light-duty vehicles.

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[552] Legislative Hearing on S. 2882 and S.2072, 2016, Oral Testimony by Kurt Karperos on Examining Pathways Towards Compliance of the National Ambient Air Quality Standard for Ground-Level Ozone.
[553] 42 U.S.C. § 7509.
[554] CARB. Revised 2016 State Strategy for the State Implementation Plan. Accessed on October 24, 2018. https://www.arb.ca.gov/planning/sip/2016sip/rev2016statesip.pdf. (Adopted by Reso. 17-7.)

A clear example of the dire importance of California's Advanced Clean Car program to SIP planning comes from the South Coast Air Quality Management District's plan for how it will meet the 2032 ozone NAAQS. For the South Coast Air Basin to attain this standard, California must reduce NOx emissions by an additional 118 tons per day NOx in 2031 beyond the current programs already providing significant NOx reductions. This means California must ensure more ZEVs are introduced than are required by California's current light-duty fleet ZEV requirements.

Actions at the federal, State and local levels have resulted in a decrease in NOx emissions of over 75 percent in both mobile and stationary source NOx emissions since 1990. New reductions that will continue to accrue from implementation of California's existing mobile source control program will reduce NOx emissions in 2031 by over 50 percent from 2016 levels. These programs will also result in significant reductions in PM2.5 emissions. The key remaining challenges are meeting ozone NAAQS in South Coast and PM2.5 NAAQS in the San Joaquin Valley. Further reductions in the South Coast will also be necessary to provide for attainment in the Coachella Valley and Mojave Desert regions downwind of the South Coast.

Air quality modeling for South Coast indicates NOx emissions will need to decline to approximately 141 tons per day in 2023 and 96 tons per day in 2031 to provide for attainment in the remaining portions of the region that do not yet meet the 8-hour ozone NAAQS.[555] Reaching these levels will require approximately 70 percent reductions in NOx from today's levels by 2023 and an overall 80 percent reduction by 2031.

Achieving an 80 percent reduction in NOx emissions will require comprehensive efforts to address emissions from both stationary and mobile sources through ongoing implementation of already adopted measures as well as new actions. These efforts have been the driver for the substantial air quality progress that has occurred to date in the South Coast region. Looking forward, continued implementation of current control efforts would reduce mobile source NOx emissions a further 50 percent by 2031. Controls on these mobile sources are crucial as more than 80 percent of the current NOx emissions originate from mobile sources,[556] and, while continued implementation of current programs will continue to achieve emission reductions in the future, mobile sources will remain the largest source of ozone-forming emissions.

Achieving the benefits of the current control program will continue to require significant efforts for implementation and enforcement. For example, as part of the Advanced Clean Cars program more stringent passenger vehicle standards began with model year 2017 vehicles. Even absent the potential impacts of this proposal, this will require ongoing efforts associated with vehicle certification and in-use surveillance. Outreach

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[555] *Ibid*. p. 23.
[556]Final 2016 Air Quality Management Plan Appendix III. SCAQMD. Accessed on October 24, 2018. http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/final-2016-aqmp .

and infrastructure development will be needed to continue to grow the market for light-duty ZEVs to meet the ZEV regulation.

g. The proposal increases criteria pollutant emissions.

CARB staff have estimated that the Agencies’ proposal to rollback fuel economy and GHG standards can significantly impact California’s criteria and GHG emissions in future years.

Passenger cars and light trucks are a major contributor to NOx emissions in California. The State’s 39 million residents[557] collectively own about 24 million passenger vehicles[558] and drive more than most other Americans. Over ten million of these vehicles are in South Coast.[559] The vast majority of these vehicles have internal combustion engines and use gasoline. The light-duty vehicle sector is projected to grow to approximately 30 million vehicles statewide by 2031. CARB’s 2016 State Strategy for the SIP[560] calls for reducing NOx emissions by approximately six tons per day from the light duty sector[561] in order for South Coast air basin to attain the 75 ppb ozone standard. According to the State Strategy, a fraction of these emissions reductions (about 0.6 tons per day) will be achieved through a combination of aggressive light-duty vehicle strategies such as higher zero emission vehicle (ZEV) sales requirement, and more stringent tailpipe standards. The remaining NOx emission reductions (about 5 tons per day) need to be achieved through incentive programs by accelerating the turnover of the oldest, highest emitting vehicles. This would mean removing older, dirtier vehicles from the road, either by replacing 1.1 million old vehicles with the cleanest conventional vehicle in 2031 or 700,000 zero emission vehicles.

Passenger cars and light trucks are a major contributor to NOx emissions in California. The State’s 39 million residents[562] collectively own about 24 million passenger vehicles[563] and drive more than most other Americans. Over ten million of these vehicles are in South Coast.[564] The vast majority of these vehicles have internal combustion engines and use gasoline. The light-duty vehicle sector is projected to grow to approximately 30 million vehicles statewide by 2031.

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[559] EMFAC2014. CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/emfac/2014/.
[559] EMFAC2014. CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/emfac/2014/.
[559] EMFAC2014. CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/emfac/2014/.
[562] Department of Finance Population Estimates for Cities, Counties, and the State, 2011-2018 with 2010 Census Benchmark. California Department of Finance. Accessed on October 24, 2018. http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-4/2010-18/documents/E-4_2018InternetVersion.xls.
[562] Department of Finance Population Estimates for Cities, Counties, and the State, 2011-2018 with 2010 Census Benchmark. California Department of Finance. Accessed on October 24, 2018. http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-4/2010-18/documents/E-4_2018InternetVersion.xls.
[562] Department of Finance Population Estimates for Cities, Counties, and the State, 2011-2018 with 2010 Census Benchmark. California Department of Finance. Accessed on October 24, 2018. http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-4/2010-18/documents/E-4_2018InternetVersion.xls.
[563] EMFAC2014. CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/emfac/2014/.
[564] EMFAC2014. CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/emfac/2014/.

As a result of the Agencies proposal, CARB staff has estimated that regional criteria and local toxic emissions would further increase in California non-attainment regions such as South Coast, primarily from increased fuel production activity at refineries and fuel distribution systems. More gasoline consumption means more diesel tanker truck trips to community gasoline stations, and therefore higher diesel PM emissions and refueling evaporative emissions.

According to staff analysis, the proposed rollback creates an additional 1.24 tons per day of NOx emissions in the South Coast air basin,[565] 90 percent of which is from upstream fuel activity increases. Because of the SIP commitments for federal ozone standards, these increased refinery emissions would have to be offset elsewhere. This means that even more vehicles would need to be removed to compensate for the NPRM increased NOx emissions of 1.24 tons per day. Because the dirtiest vehicles would already be removed to achieve the targets set by South Coast, comparatively newer and cleaner vehicles would need to be removed--either an additional 1.3 million clean conventional vehicles or 1 million zero emission vehicles.[566] This will almost double the number of vehicles that were originally supposed to be replaced to meet the region's air quality commitments.

The federal proposal to rollback vehicle standards and withdraw Clean Air Act preemption waivers granted to California for its GHG standards and Zero Emissions Vehicle (ZEV) mandate will not allow California to achieve the 2031 South Coast SIP commitments or statewide 2030 and 2045 GHG requirements. This may result in dramatic counter-measures to meet emission reduction requirements; these measures would be costly and impact the state's economic growth and mobility needs. If such measures cannot be developed within the strict time frames dictated by the Clean Air Act, regions of California could suffer the costs associated with federal "offset" and "highway" sanctions. Such sanctions are onerous and would have lasting impact on the economic development of the impacted area. In addition to the immense direct cost of developing needed counter-measures and the potential sanctions that would flow from a failure to do so, one must consider the costs that would flow from the time-consuming SIP planning process itself. These costs would impact government both at the local district and State levels.

h. The proposal threatens California's federally approved modeling of emissions.

The GHG emission standards and ZEV requirements in California's Advanced Clean Cars (ACC) program, with its approval into California's SIP in 2012, was integrated into the EMission FACtor (EMFAC2014) transportation model. The EMFAC model is a

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[565] Calculated using data from CARB's EMFAC and Vision models.
[566] Calculated using data from the EMFAC model (Attachment – Saved in CARBDOJcollaboration/references/ File Name: EMFAC DATA SHOWING CRITERIA IMPACTS FROM PROPOSAL.xlsx).

computer model that can estimate emission rates for on-road mobile sources operating in California for calendar years 2000 to 2050. EMFAC provides outputs of the modeled emissions for hydrocarbons, carbon monoxide (CO), NOx, PM10, PM2.5, lead, carbon dioxide (CO_2), and sulfur oxides (SOx). Once approved by EPA,[567] EMFAC 2014 became the model California is required to use for the majority of SIP planning.

Accurate modeling of projected emissions is crucial to meeting the Clean Air Act's SIP requirements. The Clean Air Act requires that SIP inventories include motor vehicle emission estimates based on the latest planning assumptions and emission model to calculate inventories that are available at the time the SIP is developed.[568] Accordingly, EPA has agreed that EMFAC2014 meets these criteria; inventories based on EMFAC2014 have thus been used in recent federally-mandated SIPs. The Clean Air Act's general conformity requirements bar federal agencies from supporting any actions that are not consistent with (i.e. "conform to") an approved SIP, while the Clean Air Act's transportation conformity requirements ensure that federally supported regional transportation plans (RTPs), transportation improvement programs (TIPs), and highway and transit projects are consistent with the purpose of the SIP.

If California's programs to achieve reductions from the light-duty sector are invalidated, the inventories based on EMFAC 2014 would no longer be valid, and EPA would disapprove SIPs and associated motor vehicle emission budgets (MVEB) used to demonstrate transportation conformity, as the budgets derived from EMFAC2014 would include the effects of regulations no longer valid. Consistent with 40 CFR section 93.120, if EPA disapproves such SIPs without a protective finding,[569] then the transportation conformity budgets from the SIP may not be used for conformity purposes, resulting in a conformity freeze. This would halt new RTPs and TIPs in the region until the issue causing EPA's disapproval of the SIP is remedied. During a conformity freeze only transportation projects scheduled to occur in the first four years of the conforming RTP and TIP could continue to advance, and no new regional conformity determinations for RTPs, TIPs, or RTP/TIP amendments could be made. If conformity of an RTP and TIP has not been determined within two years of EPA's SIP disapproval using budgets that EPA approves or finds adequate from a new SIP that has replaced the disapproved SIP, then highway sanctions would apply and the conformity freeze would become a conformity lapse.

During a conformity lapse, no new RTPs, TIPS, or regionally significant transportation projects may be adopted or approved unless the project is a Transportation Control Measure or if all necessary approvals were in place prior to the date of the lapse. Either of these scenarios (conformity freeze or conformity lapse) would greatly limit the ability

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[567] 80 Fed.Reg. 77,337 (Dec. 14, 2014).
[568] 40 CFR §§93.110, 93.111.
[569] A protective finding may be made when EPA finds the SIP identifies control measures sufficient to achieve Reasonable Further Progress or attainment and that SIP disapproval does not affect the validity of the mobile source budgets. (40 CFR 93.101.).

of California's Metropolitan Planning Organizations to amend their RTP and TIPs, and so would severely impact their ability to plan, fund, and implement transportation projects.

Another impact that would flow from this proposal's effect on EMFAC2014 is the likely disapproval of numerous California SIPs, as their underlying modeling would be invalidated. This could result in Clean Air Act sanctions being imposed on California. As described above, when SIPs are disapproved, the Clean Air Act requires EPA to issue a finding of failure to submit an approvable SIP with notice that if an approvable SIP is not submitted, sanctions (first "offset" and later "highway") will apply.

All SIPs that California has submitted since January 1, 2016 have utilized EMFAC2014 for modeled attainment demonstrations and Reasonable Further Progress demonstrations, both of which are required by the Clean Air Act to be part of an approvable SIP. As of this writing, 16 California SIPs have been submitted that used EMFAC2014. If EMFAC2014 is invalidated, EPA would most likely disapprove the 14 of those submitted SIPs that they have not yet acted upon and possibly make calls for revisions to the two it has acted on due their being rendered substantially inadequate through the invalidation of their modeling. Other states that have relied on either the federal or California light-duty emission standards would face similar consequences if the proposed rollback is finalized. Through this proposal, the Agencies are effectively breaking approved SIPs throughout the nation, without so much as acknowledging it, much less discussing the impacts and how states can prevent the damage that will come from not meeting legal planning requirements or actually improving air quality – which is what this is ultimately all about.

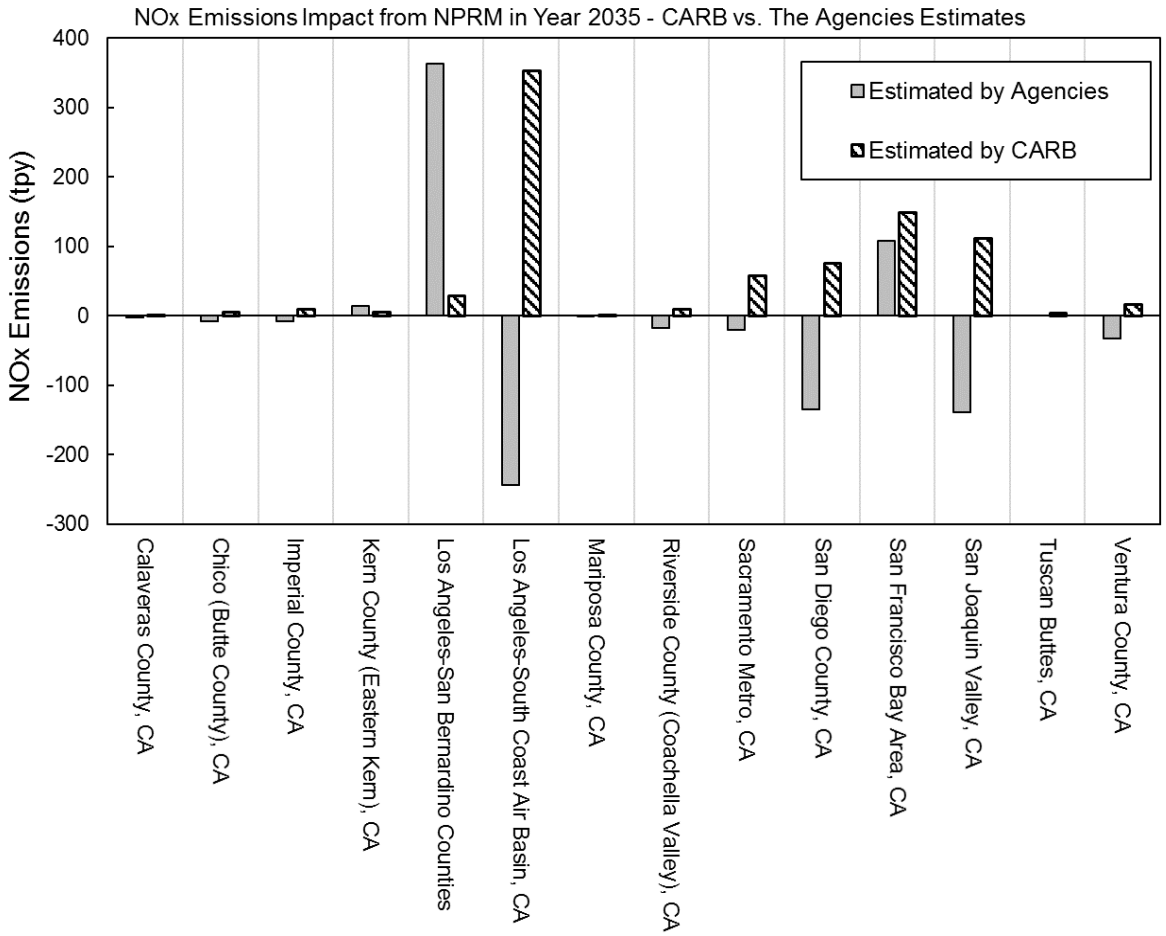
i. The proposal threatens California's Conformity Plan.

Figure VII-1 shows a comparison of CARB's estimated NOx emissions impacts in California non-attainment/maintenance areas[570] versus those estimated by the Agencies in Appendix A[571] of the Draft Environmental Impacts Statement. The Agencies' emissions impact assessment shows reduction in NOx emissions in almost all non-attainment or maintenance areas except for Los Angeles-San Bernardino counties and San Francisco Bay Area, where almost 12 out of 15 refineries that produce transportation fuels are situated. However, CARB's estimates which are based on robust emissions modeling using California specific information that considers the proposal's impacts on tailpipe emissions as well as emissions from fuel production and distribution, reach a different conclusion. CARB's estimates indicate that, as a result of the Agencies' proposal, NOx emissions will increase in all non-attainment regions of

[570] Designations in US EPA Regions for the 2008 8-Hour Ozone National Ambient Air Quality Standards. U.S. EPA. Accessed on October 24, 2018. https://www3.epa.gov/region9/air/maps/pdfs/air1100018-7.pdf
[571] Draft Environmental Impact Statement. NHTSA. Accessed on October 24, 2018. https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/ld_cafe_my2021-26_deis_appendices_0.pdf

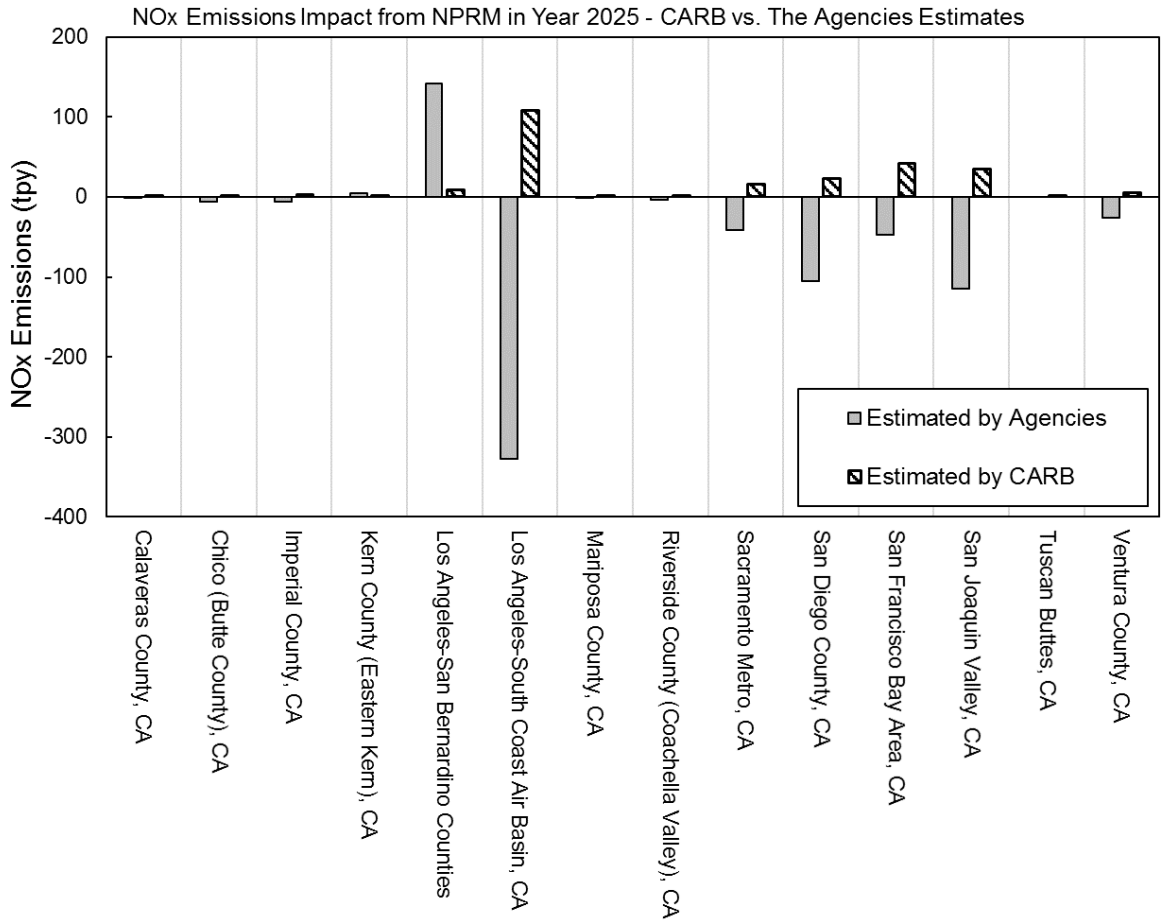
California. CARB's estimates show that 90 percent of these increases flow from upstream fuel activity increases.

Figure VII-1 NOx emissions impact in 2035 from the Agencies proposal in California non-attainments or maintenance areas – CARB vs. the Agencies estimates[572]



[572] Note: to generate Figure VII-1, CARB's statewide estimates were disaggregated to different regions using tailpipe emissions as surrogates. The supporting documentation for this figure is titled "Attachment – Emissions Impact Alternative1.xlsx, included in the submitted DVD.

Figure VII-2 NOx emissions impact in 2025 from the Agencies proposal in California non-attainments or maintenance areas – CARB vs. the Agencies estimates



These increases will have dire implications for SIP planning in some of California's major metropolitan areas. These impacts are not explained in the proposal due to the Agencies' reliance on modeling that is not the most detailed and accurate available, and that is different from the more detailed and accurate modeling that California is required to use in its SIP planning. The Agencies' failure to utilize the appropriate modeling when describing the criteria impacts of the proposal is arbitrary.

As addressed in California's comments on the DEIS, an additional criteria-related issue is whether the proposed action meets the Clean Air Act's general conformity requirements.[573] NHTSA offered a discussion of general conformity in its DEIS, but did

[573] To ensure compliance with SIPs and progress toward NAAQS attainment, the Clean Air Act's conformity provision requires that federal agencies not "engage in, support in any way or provide financial assistance for, license or permit, or approve, any activity" that does not "conform" to a SIP. 42 U.S.C. § 7506(c)(1). EPA is responsible for determining that its action is consistent with the applicable SIP and does not cause or contribute to any new NAAQS violation, increase the severity or frequency of an existing NAAQS violation, delay attainment of a standard, emissions reduction, or other milestone. To guide an agency's conformity determination, the EPA has promulgated

so utilizing modeling other than the relevant EMFAC2014. Regardless, the DEIS lists general conformity thresholds, but it states those thresholds are "provided for information only; a general conformity determination is not required for the Proposed Action.[574] NHTSA arrived at this conclusion because it claims the proposed action would not cause any direct or indirect emissions within the meaning of the General Conformity Rule.[575]

There are three fundamental issues with NHTSA's handling of the Clean Air Act's general conformity requirements. First, NHTSA uses inappropriate modeling to reach its conclusion. NHTSA has – without explanation – chosen not to utilize EMFAC 2014, the model that California is required to use under the Clean Air Act, to generate the numbers relevant to a conformity determination under the Act. Second, NHTSA argues that any emissions flowing from its actions are neither direct nor indirect for general conformity purposes under 40 CFR section 93.152, stating that it cannot control the technologies that auto manufacturers would use or consumer behavior (including purchasing).[576] Yet this assertion flies in the face of the primary reason NHTSA is undertaking this rulemaking, which is that the existing standards' costs purportedly are causing new vehicles to become more costly and thereby negatively impacting consumer purchasing behavior. NHTSA then attempts to justify this course of action by predicting, using new modelling inputs of its own design, the emissions levels that would flow from its action. In other words, the rulemaking is premised on understanding consumer purchasing and the emissions implications of such purchasing, while NHTSA claims on the other hand that it cannot make assumptions about these very things when it comes to satisfying general conformity obligations. NHTSA cannot have it both ways. Indeed, the Ninth Circuit Court of Appeals has previously recognized that "[b]y allowing particular fuel economy levels, which NHTSA argues translate directly into particular tailpipe emissions, NHTSA's regulations are the proximate cause of those emissions just as EPA Clean Air Act rules permitting particular smokestack emissions are the proximate cause of those air pollutants…."[577] Finally, in the context of this joint rulemaking between NHTSA and EPA, it is inappropriate that NHTSA's determination regarding its own conformity obligations, regardless of its independent merit or lack thereof, does not address any conformity-related obligations EPA may have that flow from the joint rulemaking.

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two sets of regulations—a Transportation Conformity Rule, and a General Conformity Rule. The EPA's General Conformity rule requires that federal agencies perform a conformity determination if the action's cumulative direct and indirect emissions in a nonattainment or maintenance area exceed specified thresholds. 40 C.F.R. § 93.153(b).

[574] *See, e.g.*, DEIS, Appendix A, p. A-19.

[575] DEIS at 4-14 and 4-15.

[576] DEIS at 4-14 and 4-15.

[577] *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin*., 538 F.3d 1172, 1217 (9th Cir. 2008).

2. The federal proposal increases community exposures to air pollution.

Removal of CARB's ZEV regulation under the proposed rollback will cause increased air pollution exposures for people living within 200-500 meters of high-volume roadways. This will increase rates of health impacts associated with vehicle air pollution such as cancer, lung disease, asthma, and increased rates of mortality. These impacts are disproportionately imposed on low-income communities and communities of color in California because there are disproportionally higher concentrations of these communities living near major roadways, and this concentration is expected to increase in the next two decades. CARB is committed to prioritizing environmental justice and ensuring that regulatory efforts focus on communities facing cumulative environmental and economic burdens, which include disadvantaged communities. Hindering CARB's regulatory efforts to increase the number of zero-emission cars operating on California's roadways, therefore also hinders environmental justice and CARB's efforts to improve health and quality of life in disadvantaged communities. Specifically, the removal of even one of CARB's mobile source control regulations impedes CARB's efforts to significant reduce air toxic contaminant and criteria pollutant emissions in the most burdened communities under California Assembly Bill Number 617.[578]

a. The federal proposal increases the concentration of harmful pollutants near major roadways.

Near-source exposure from vehicle emissions poses a significant health risk for those living within 300 to 500 meters of a major roadway.[579] As noted in analysis underlying the proposed rollback, locations near to major roadways have elevated concentrations of many air pollutants emitted from vehicles, making these "microclimates" or "hot spots" of harmful pollution.[580]

Traffic on major roadways is the largest source of near-source pollution due in part to the combustion of gasoline.[581] Traffic pollution is a complex mixture of gaseous and particulate pollutants, including particulate matter, NOx, and benzene. The extent of exposure to these components depends on a number of factors, including upwind/downwind location, meteorological conditions, time of day, and season. For instance, high volumes of vehicles on a roadway during early morning commute hours can increase traffic delay and thus concentrations of near-roadway emissions. Differences in meteorology can contribute to pollutants from roadways traveling farther

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[578] Garcia, Cal. Stats. 2017, Ch. 136.
[579] A. Carlson, The Clean Air Act's Blind Spot: Microclimates and Hotspot Pollution, 65 UCLA L. Rev. 1036, 1056 (2018) (hereinafter Hot Spot Pollution); Health Effects Institute, Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects, Special Report 17, available at https://www.healtheffects.org/publication/traffic-related-air-pollution-critical-review-literature-emissions-exposure-and-health (hereinafter HEI 2010).
[580] 83 Fed.Reg. at 43,344; Hot Spot Pollution, 1038.
[581] Hot Spot Pollution, 1056.

into nearby areas at night and during early morning hours than during the day.[582] Also, NO_2 concentrations have been shown to increase with rush hour traffic and areas of traffic delay.[583] At trafficked intersections, levels of PM can be elevated by as much as 40 percent for larger PM (PM 10) and by 16 percent to 17 percent for fine PM (PM 2.5).[584] These pollutants can enter vehicles, further exposing those driving on major roadways. For instance, significantly high levels of PM have been measured inside of Los Angeles-area buses.[585] The vehicle pollutants can also enter homes through open windows and vents in the early morning due to air patterns.[586]

Exposure to vehicle pollution by those living within 300 to 500 meters of a major roadway has been shown to contribute to and exacerbate asthma, impair lung function, and increase cardiovascular mortality.[587] Additionally, there is evidence linking near-roadway pollution exposures to higher rates of heart attacks, strokes, lung cancer, pre-term births, childhood obesity, autism, and dementia. Epidemiological studies have shown that even levels below the PM2.5 NAAQS[588] can increase the risk of health impacts. These studies estimate that "[f]or every increase of 10 micrograms per cubic meter of PM 2.5, mortality increased by 13.6 percent."[589]

California studies have indicated that some groups are more sensitive to traffic-related pollutants than the general population including children, the unborn, the elderly, and those with preexisting conditions. One study found that the total number of deaths from cardiovascular disease associated with near-roadway pollution will increase by 2035 due to an increased number of the elderly in the population at risk, even though the exposures and the risk to individuals will be reduced.[590] Traffic exposure can be linked to an increased prevalence of childhood asthma and bronchitis symptoms.[591] The Children's Health Study, conducted in California, demonstrated that particulate pollution

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[582] Hu et al. Atmospheric Environment 43 (2009) 2541-49.
[583] Hot Spot Pollution, 1057.
[584] Hot Spot Pollution, 1058.
[585] Hot Spot Pollution, 1058.
[586] Hot Spot Pollution, 1057.
[587] Hot Spot Pollution, 1052 and 1057.
[588] *See*, University of Southern California Environmental Health Centers, References: Living Near Busy Roads or Traffic Pollution. University of Southern California. Accessed on October 24, 2018. https://envhealthydrocarbonenters.usc.edu/infographics/infographic-living-near-busy-roads-or-traffic-pollution/references-living-near-busy-roads-or-traffic-pollution.
[589] Hot Spot Pollution, 1053.
[590] Ghosh, R., et al. "Near-roadway air pollution and coronary heart disease: burden of disease and potential impact of greenhouse gas reduction strategy in Southern California" Environmental Health Perspectives, 2016. 124(2):193-200.
[591] Kim JJ, Smorodinsky S, Lipsett M, Singer BC, Hodgson AT, Ostro B. Traffic-related air pollution near busy roads: the East Bay Children's Respiratory Health Study. American Journal of Respiratory and Critical Care Medicine, 2004. 170 (5): 520-6; Delfino RJ, Gong H Jr, Linn WS, Pellizzari ED, Hu Y. Asthma Symptoms in Hispanic Children and Daily Ambient Exposures to Toxic and Criteria Air Pollutants. Environmental Health Perspectives vol 111 number 4 April 2003; Delfino RJ, Gong H, Linn WS, Hu Y, Pellizzari ED. Respiratory symptoms and peak expiratory flow in children with asthma in relation to volatile organic compounds in exhaled breath and ambient air. Journal of Exposure Analysis and Environmental Epidemiology, 2003. 13, 348–363.

may significantly reduce lung development in children, and that these effects are likely permanent.[592] The investigators found associations between children exposed to heavy traffic and slower lung development, as well as significant increases in asthma prevalence, asthma medication use, and wheezing.[593] Living near heavy traffic could also be associated with increased rates of new cases of asthma.[594] Ongoing studies examining long-term health trends in the Children's Health Study participants have found that the recent reductions of air pollution in South Coast are associated with significantly reduced bronchitic symptoms and clinically significant positive effects on lung development in these children.[595] Both regional particulate matter pollution and local near-roadway exposures affect children's health independently, resulting in reduced lung function.[596] Other investigators have found adverse birth outcomes, such as low birth weight seen in infants whose mothers are exposed to traffic pollution.[597] Short-term exposure to PM2.5 causes premature mortality, and long-term exposure additionally may cause reproductive harm, developmental problems in children, and cancer.[598]

The specific component or components of traffic pollution responsible for the health impacts observed are not known and the mechanisms of toxicity are an active area of research. Epidemiological studies worldwide, as well as California-specific studies, however, have clearly shown that adverse health effects are associated with vehicle emissions and are concentrated within a few hundred meters of heavily traveled freeways and major roadways. A comprehensive review of traffic impacts by the Health

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[592] Avol EL, Gauderman WJ, Tan SM, London SJ, Peters JM. "Respiratory effects of relocating to areas of differing air pollution levels," American Journal of Respiratory and Critical Care Medicine, 2001. 164: 2067-2072; Gauderman WJ, Avol E, Gilliland F, Vora H, Thomas D, Berhane K, McConnell R, Kuenzli N, Lurmann F, Rappaport E, Margolis H, Bates D, Peters J. "The effect of air pollution on lung development from 10 to 18 years of age," New England Journal of Medicine, 2004. 351(11): 1057-1067. Erratum in: New England Journal of Medicine 2005 352(12):1276.

[593] Gauderman WJ, Avol E, Lurmann F, Kuenzli N, Gilliland F, Peters J, McConnell R. Childhood asthma and exposure to traffic and nitrogen dioxide. Epidemiology, 2005. 16 (6): 737-43;
Gauderman WJ, Vora H, McConnell R, Berhane K, Gilliland F, Thomas D, Lurmann F, Avol E, Kunzli N, Jerrett M, Peters J. Effect of exposure to traffic on lung development from 10 to 18 years of age: a cohort study. Lancet, 2008. 369 (9561): 571-7; McConnell R, Berhane K, Yao L, Jerrett M, Lurmann F, Gilliland F, Kunzli N, Gauderman J, Avol E, Thomas D, Peters J. Traffic, susceptibility, and childhood asthma. Environmental Health Perspectives, 2006. 114 (5): 766-72.

[594] McConnell R, Islam T, Shankardass K, Jerrett M, Lurmann F, Gilliland F, Gauderman J, Avol E, Künzli N, Yao L, Peters J, Berhane K. Childhood incident asthma and traffic-related air pollution at home and school. Environmental Health Perspectives, 2010. 118 (7): 1021-1026.

[595] Gauderman, W.J., et al. "Association of improved air quality with lung development in children" New England Journal of Medicine, 2015. 372(10):905-913; Berhane, K. et al. "Association of changes in air quality with bronchitic symptoms in children in California, 1993-2012", Journal of the American Medical Association, 2016. 315(14):1491-1501.

[596] Urman, R, McConnell R, Islam T, Avol EL, Lurmann FW, Vora H, Linn WS, Rappaport EB, Gilliland FD, Gauderman WJ. "Associations of children's lung function with ambient air pollution: joint effects of regional and near-roadway pollutants" Thorax, 2014. 69(6):540-547doi: 10.1136/thoraxjnl-2012-203159.

[597] Michelle Wilhelm, Jo Kay Ghosh, Jason Su, Myles Cockburn,Michael Jerrett, and Beate Ritz. Traffic-Related Air Toxics and Term Low Birth Weight in Los Angeles County, California vol. 120 no. 1. January 2012 Environmental Health Perspectives.

[598] Hot Spot Pollution, 1053.

Effects Institute (HEI) concluded that there is evidence to indicate that traffic-related pollution is a public health concern.[599]

The proposed rollback acknowledges that there are elevated concentrations of air pollutants from vehicles near major roadways. This acknowledgement supports the importance of keeping California's ZEV rule in place as an effective method to reduce near-roadway emissions. The proposed rollback asserts that it will reduce such exposures without conducting an analysis of reductions as compared to the ZEV rule.

b. Low-income communities and communities of color are disproportionately burdened by near-roadway exposures.

Many communities in California are located near major roadways. California has three cities in the top ten largest U.S. cities by population, and some of the largest freight corridors in the U.S. are located in or near those cities. Busy traffic corridors have been built adjacent to and through existing neighborhoods (sometimes as a result of planning policies), and new developments have been built near existing roadways due to a variety of factors, including economic growth, demand for built environment uses, and the scarcity of land available for development in some areas. Estimations based on the 2000 Census suggest that 24 percent of all Californians live within 500 meters of a highway and 44 percent within 1000 meters of a highway.[600] In Los Angeles, more than a third of the population lives within 300 meters of a major roadway.[601]

Of those living near major roadways, there is a disproportionate concentration of low income communities and communities of color. In California, Latinos, African Americans, Asian/Pacific Islanders, and low-income individuals and families are more likely to live next to a major roadway than whites or high-income earners.[602] And almost half of Californians living next to major roadways are "poor or near-poor."[603] Economically disadvantaged neighborhoods and individual residences have been linked to higher levels of traffic air pollution[604] and more asthma symptoms, among other health impacts.[605] Near-roadway exposures exacerbate existing health impacts experienced by these communities, and a lack of resources inhibit responses that might otherwise promote healthy outcomes.[606] For instance, lack of access to health care,

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[599] Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects. HEI Special Report 17. Health Effects Institute. 2010. Accessed on October 24, 2018. https://www.healtheffects.org/publication/traffic-related-air-pollution-critical-review-literature-emissions-exposure-and-health.
[600] Census 2000.
[601] Hot Spot Pollution, 1057-58.
[602] Hot Spot Pollution, 1047.
[603] Hot Spot Pollution, 1047.
[604] Gunier RB, Hertz A, Von Behren J, Reynolds P. Traffic density in California: socioeconomic and ethnic differences among potentially exposed children. Journal of Exposure Analysis and Environmental Epidemiology, 2003. 13(3): pp. 240-46.
[605] Meng Y-Y, Wilhelm M, Rull RP, English P, Nathan S, Ritz B. "Are frequent asthma symptoms among low-income individuals related to heavy traffic near homes, vulnerabilities, or both?" 18:343-350 Annals of Epidemiology. 2008.
[606] Gunier, R.B., et al., Traffic density in California: socioeconomic and ethnic differences among potentially exposed children. Journal of Exposure Science and Environmental Epidemiology, 2003. 13(3): pp. 240-246.

historical discrimination, and the inability to move to an affordable, healthier location can present obstacles to fair and equal health and economic outcomes for low income communities and communities of color.

Ultimately, historical inequities can be compounded by the continuation and increase in air pollution, by disproportionately burdening these communities with the health impacts of harmful pollutants from traffic. These unfair outcomes for particular communities are a result of decades of decision-making that did not prioritize fundamentally fair outcomes for all Californians regardless of their economic, racial, or ethnic background. Environmental justice is of critical importance to reduce and eliminate health, environmental, and economic disparities that disproportionately negatively affect communities of color and low-income communities in California and to create a more fair economy and quality of life for all Californians. A priority for CARB is to achieve environmental justice and to make it an integral part of its activities to improve their health outcomes and quality of life. This reflected in the ZEV regulation, which ultimately works to directly reduce near-roadway exposures, improving health outcomes for those living near major roadways.

Despite the EPA's reaffirmed commitment to environmental justice, the proposed rollback does not adequately analyze the effect of removing the ZEV regulation on furthering environmental justice, particularly as a result of increasing near-roadway exposures.[607] In 1994, a federal Executive Order directed federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. The order also directed each agency to develop a strategy for implementing environmental justice. This executive order has not been revoked and is a core statement of federal policy in effect today. Further, EPA's Environmental 2020 Action Agenda creates procedures to consider environmental justice routinely throughout agency decision-making. Additionally, the February 23, 2018 memo by EPA Associate Administrator Samantha Dravis notes that EPA will "[a]chieve measureable environmental outcomes for underserved and overburdened communities in areas of [. . .] reduction of air pollutants [. . .] and [s]trengthen the ability of our partner agencies to integrate [environmental justice] in their work through enhanced coordination and collaboration with states, tries and local governments to address [environmental justice] concerns."[608]

However, this commitment is not reflected in the proposed rollback, which would eliminate CARB's ability to enforce its ZEV regulation. A statement of commitment to environmental justice is ineffective without corresponding action to ensure the commitment and its expected benefits are realized. In the proposed rollback's

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[607] Memorandum on EPA's Environmental Justice and Community Revitalization Priorities. U.S. EPA. Accessed on October 24, 2018. https://www.epa.gov/sites/production/files/2018-02/documents/epa_ej_memo_02.23.2018.pdf. (hereinafter EPA Environmental Justice Memo); Executive Order, 59 Fed.Reg. 32 (Feb. 18, 1994).
[608] EPA Environmental Justice Memo.

Environmental Justice section, it attempts to delegitimize the disproportionate health impacts experienced by low-income communities and communities of color and makes an unfounded and unanalyzed conclusion that the emissions reductions from the proposed rule will have the most direct air quality improvements by those living near-roadways.

Moreover, the proposed rollback's Environmental Justice section appears to misunderstand the purpose of implementing environmental justice. The proposed rollback states that it is other stressors associated with low-income communities and communities of color that are largely to blame for any worsened health outcomes; however, it fails to acknowledge the significant impact social and economic disparities have on exposure disparities. There is no analysis or description in the proposed rollback of how economic circumstances; historical, social, and economic discrimination and inequities; and health are interrelated and can work to exacerbate negative outcomes. As stated above, the proposed rollback acknowledges that vehicle pollution causes significant health impacts for those living near major roadways and the importance of reducing such exposures. Nonetheless, the rollback's Environmental Justice section concludes by stating that direct emissions reductions will occur from the proposed rollback, and thus reduce near-highway exposures, without any supporting analysis.

The fact that there are disproportionate stressors within low-income communities and communities of color is a significant reason for prioritizing environmental justice and fair treatment by government actions. Reducing pollution exposures and improving health can in turn increase economic and social benefits, thereby reducing other disparities experienced in these communities. For example, reducing rates of asthma or asthma symptoms can increase school and work attendance. The existence of other stressors that affect health does not lessen the connection between vehicle pollution and health impacts, as the proposed rollback appears to imply, it strengthens the justification for the necessity of the ZEV regulation to cause direct reductions of near-roadway exposures.

3. Increasing ZEVs are essential to improving the health of those living near major roadways.

Full electrification of all vehicles in California would avoid the majority of near-source exposure health impacts. The ZEV regulation intends to push California towards that goal, and the revocation of California's authority to implement this rule will substantially impair the immediate reductions of near-highway exposures and future anticipated reductions. CARB's policies and plans to reduce car and truck pollution statewide are already improving air quality, but will take time before the full benefits are achieved. Revoking California's authority to implement the ZEV regulation is particularly harmful to ongoing efforts to reduce exposures to the most burdened communities such as through CARB's Community Air Protection Program pursuant to Assembly Bill 617. These direct near-roadway emission reductions are necessary because the size of the population

living near major roadways in California is growing, increasing the risk of health impacts and related harms to these expanding communities.

Under Assembly Bill 617, CARB and local air districts are partnering to transform California's air quality programs to address air pollution disparities at the neighborhood level. The goal is to substantially reduce air toxic contaminants and criteria air pollutant exposures in communities that experience the most significant exposure burdens. CARB selected these first ten communities. The air district for each community must develop and implement a Community Emissions Reduction Program (CERP) that will include strategies to reduce toxic air pollutants and criteria air pollutants from stationary sources in the community in the near-term. CARB, for its part, is to adopt new and implement existing mobile source controls to support the emissions reductions.

The ZEV regulation is a critical part of the existing regulatory regime expected to reduce emissions in these communities. Many of the communities have major roadways that cause near-highway exposures of harmful vehicle pollutants, contributing to the pollution burden of these communities. Without the ZEV regulation, CARB will not have one of the most effective tools to reduce pollution exposures in these communities.

Additionally, according to the U.S. Census Bureau, California is the second-fastest growing state and Los Angeles is also one of the fastest growing cities in the U.S.[609] The Southern California Association of Governments (SCAG), the regional planning agency for Los Angeles, Ventura, Orange, Riverside, San Bernadino, and Imperial Counties estimates that the population in these counties that will live within 500 feet (152 meters) of a freeway will increase by 250,000 by 2035.[610] As populations increase, so do the numbers of vehicles on the roadways, increasing vehicle emissions and exposures for those living near the freeways. In areas where infill development is prioritized, the populations near roadways are also expected to increase in the coming decades.

CARB intended to rely on its existing programs, such as the ZEV regulation, and its new efforts, such as Assembly Bill 617, to attempt to minimize emissions that otherwise would be expected to grow with increasing populations and vehicles operated in California. To remove the ZEV regulation causes substantial harm to this effort and will directly result in increases in near-roadway emissions exposures for Californians during this time of population growth.

4. Reducing near-term exposures must be addressed in part by increasing use of ZEVs.

Reducing near-roadway exposures requires a comprehensive, integrated approach through reducing emissions from the vehicles themselves and reducing emissions

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[609] Census Bureau Reveals Fastest-Growing Large Cities. U.S. Census Bureau. Accessed on October 24, 2018. https://www.census.gov/newsroom/press-releases/2018/estimates-cities.html.
[610] Regional Transportation Plan 2012-2035, Environmental Justice Appendix. SCAG. Accessed on October 24, 2018. http://rtpscs.scag.ca.gov/Documents/2012/final/SR/2012fRTP_EnvironmentalJustice.pdf.

exposures from the transportation system. This comprehensive approach is needed because no one solution can meet the overall reductions that are needed, and the potential to reduce emissions in the near term compared to the longer term differs. Motor vehicle regulations like the ZEV regulation provide an opportunity to reduce emissions in the near- and mid-term, while reductions in emissions from the transportation system and land use, which are equally important, provide an opportunity to reduce exposure and emissions in the mid- and long-term. Further, reducing emissions from vehicles are seen as the "low hanging fruit" from a cost-effectiveness perspective, and are therefore the appropriate first line of defense when developing a strategy to improve air quality and reduce exposure for communities, especially the most vulnerable ones. If removing the ZEV regulation would mean that the State must rely solely on mechanisms to reduce emissions or exposures from the transportation system and land use to achieve the same public health benefits, this would include reducing reliance on vehicles (such as reducing VMT) or creating more distance between communities and roadways. These two options are important and being pursued through existing efforts by the State agencies and local jurisdictions, but they cannot be the sole mechanisms to reduce vehicle pollutant emissions or exposures.

First, the amount of time it takes to implement these solutions means that exposure is prolonged when there are cost-effective measures to address them (i.e. ZEV regulation). Second, it is logistically impractical and costly to expect all near-roadway exposure is achieved solely from changes to all existing and future infrastructure. Lastly, it is a substantial burden to impose on local jurisdictions to use their authorities to reduce this magnitude of near-roadway exposure. Increasing the use of ZEVs is essential to the multi-prong effort to reduce pollution exposures from vehicles and that is best achieved through the ZEV regulation.

There are numerous efforts underway in the policy, planning, and technology areas in California to reduce reliance on vehicles and otherwise reduce VMT. These efforts are undertaken for a variety of reasons, including to improve quality of life (e.g., reducing congestion and commute times), reduce consumer costs, and reduce vehicle pollution. These efforts are also necessary because of the speed of population growth – and personal car ownership – in the State and the inability of existing housing and transportation infrastructure to serve these populations and vehicles. Examples of ongoing efforts to reduce reliance on vehicles include incorporating VMT into the project evaluation and mitigation process through CEQA,[611] Sustainable Communities Strategies to meet regional GHG reduction targets from light-duty vehicles by regional Metropolitan Planning Organizations under Senate Bill 375,[612] and State grants to local jurisdictions to build active transportation infrastructure.[613] These efforts, however, face implementation challenges as a result of a number of factors, including existing federal,

[611] Cal. Senate Bill (SB) 743, Chap. 386, Stats. 2013 (Steinberg).
[612] Cal. Senate Bill (SB) 375, Chap. 728, Stats. 2008 (Steinberg).
[613] Cal. Senate Bill (SB) 99, Chap. 359, States 2013; Cal. Assembly Bill (AB) 101, Chap. 354, Stats. 2013.

state, and local transportation fund structures that favor investments in roads over alternative modes, inadequate affordable housing near jobs, and increases in use of ride-hailing companies, all of which promote the use of vehicles or longer trip lengths.

First, the amount of time it takes to implement transportation infrastructure and land use development solutions means that resident exposure will be unnecessarily prolonged if forced to solely rely on these strategies to achieve near-roadway pollution exposure reductions. In general, transportation infrastructure projects are identified and programmed in a way that helps to influence the distribution of population, employment growth, and associated land use changes. It then takes several years to update local general plans and zoning codes to reflect more sustainable land use planning, followed by several more years to affect land use changes on individual parcels. The elapsed time to affect transportation system and land use change is on the order of several decades. These efforts will be an important strategy to achieve public health benefits, but not at the scale that clean vehicles can provide in the near-term.

Second, it is currently logistically and legally impracticable and costly to solely rely on changes to the transportation system and land use to achieve near-roadway pollution exposure reductions. As noted above, about one third of residents of Los Angeles live near a major roadway. To modify existing infrastructure to reduce the number of residents living near a major roadway, or to reduce the number of vehicles driving on that roadway, could require movement of millions of people and jobs; large amounts of capital and other funds; and or new legal authority to allow for road user pricing strategies.

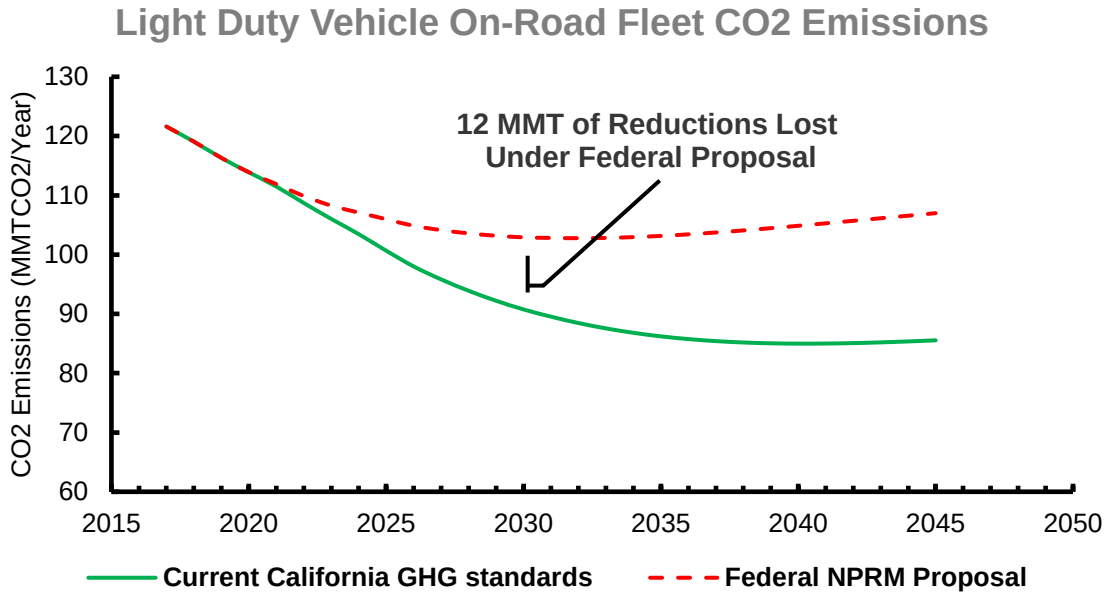
Lastly, it would be a substantial burden on local jurisdictions to solely rely on changes to the transportation system and land use to achieve near-roadway pollution exposure reductions. These local jurisdictions have primary authority to determine transportation and land use patterns within their boundaries within the parameters set by State law. This is a significant responsibility. Local jurisdictions are on the front lines of understanding what their communities need and how funding availability, population growth, new transportation services (such as ride-hailing companies), and housing availability affect the health, prosperity, and wellbeing of their residents. While their role is integral to shaping the low-pollution communities of the future, local jurisdictions should not be expected to use their authority to meet all GHG and pollution reduction goals, especially when ZEV technologies are available today. CARB developed a Technical Advisory that identifies effective strategies that planners and other land use decision-makers can implement locally. The Technical Advisory specifically calls out the ZEV regulation as one of the mechanisms expected to reduce emissions in tandem with local development. ZEVs can be deployed feasibly, cost-effectively, and immediately in large numbers over the next few decades, causing substantial reductions in near-roadway emissions exposures and creating immediate air quality, public health, and environmental justice benefits.

5. The significant climate impacts of motor vehicle emissions compel reductions.

California is one of the most geographically and ecologically diverse regions in the world, with landscapes ranging from sandy beaches to coastal redwood rainforests to snow-covered alpine mountains to dry desert valleys. California suffers from compelling and extraordinary circumstances in part because it is highly vulnerable to climate change. It contains multiple climate zones, and each region could experience a combination of impacts from climate change unique to that area. These include drought, prolonged and extreme heat waves, proliferating wildfires, and rising seas. Climate change poses an immediate and escalating threat to California's environment, public health, and economic vitality.

CARB's estimates indicate that the Agencies proposal can increase the CO_2 emissions in California by almost 12 million metric tons in 2030[614] accounting for both vehicle and fuel production emissions. This is equivalent to about half of the projected annual GHG benefits from the Advanced Clean Cars and represent 9 percent of the GHG reductions needed to meet the targets set by the California Global Warming Solutions Act of 2006.

Figure VII-3 Carbon Pollution in California Increases under Cleaner Cars Rollback



California is already experiencing the effects of climate change, and projections show that these effects will continue and worsen over the coming centuries. Changes in weather patterns can influence the frequency of meteorological conditions conducive to the development of high pollutant levels. Some of the key air pollutants (ozone,

[614] Calculated using data from the EMFAC model.

secondary particulate matter) depend strongly on temperature. Increases in atmospheric GHGs since the Industrial Revolution are well-known to warm global near-surface and tropospheric air temperatures. Some of the other broad range of effects of higher temperatures on air quality could include increases in emissions of biogenic gases year-around, in electric power and vehicle-fuel emissions in summer, in the temperature-dependent rates of photochemical reactions, and vaporization of volatile particle components. Higher temperatures will also impact meteorology by increasing atmospheric stability due to enhanced cloudiness but decreasing in stability due to warmer near-surface temperatures.

The impacts of climate change disproportionately impact the state's most vulnerable populations. The magnitude and rate of climate change in this century will likely exceed that experienced by California's native peoples over past millennia. California is committed to accelerating efforts to incorporate climate science and adaptation into its planning activities. California's leadership in climate change program is built on a strong foundation of scientific research addressing the impacts of climate change on the state. The ability for all Californians to withstand impacts to climate change is dependent on considering climate change impacts in scientific discussions and coordinating public agencies efforts to address these issues. Hence, as climate change exacerbates inland and coastal flooding, wildfires, droughts, extreme heat and other hazards, Californians and their public agencies are working alongside to prioritize long-term safety and resilience. This year two major reports prepared by the Office of Environmental Health Hazard Assessment and California Energy Commission, provide the scientific foundation for understanding climate-related impacts at the local scale that serves the growing needs of state and local-level decision-makers from a variety of sectors.

2018 Report: Indicators of Climate Change in California: The impacts of climate change have been compiled by the California Office of Environmental Health Hazard Assessment (OEHHA) in the Indicators of Climate Change Report, which details a number of already occurring changes. The report documents the growing number of extreme weather-related events in recent years, such as the devastating 2017 wildfires and the record-setting 2012-2016 drought. Some of the long-term warming trends underlying these events, including the rise in average temperatures and the number of extremely hot days and nights, have accelerated in recent decades. The report also tracks a variety of other climate change indicators: the declining snowpack and dramatic retreat of glaciers in the Sierra Nevada, unprecedented tree mortality in California forests, a rise in ocean temperatures off the California coast, and the shifting ranges of many species of California plants and animals. These impacts are similar to those that are occurring globally. The following highlight the report findings:

- Atmospheric concentrations of CO_2 continue to increase. Measurements at California coastal sites are consistent with those at Mauna Loa, Hawaii, where the first and longest continuous measurements of global atmospheric CO_2 concentrations have been taken.

- As atmospheric concentrations of CO_2 increase, so do levels in the ocean, part of a process known as “ocean acidification”. The net result of adding CO_2 to seawater is to increase seawater acidity, a fundamental ‘building block’ for organisms forming shells of calcium carbonate.
- Since 1895, annual average air temperatures have increased throughout the state, with temperatures rising at a faster rate beginning in the 1980s. The last four years were notably warm, with 2014 being the warmest on record, followed by 2015, 2017, and 2016.
- California has become drier over time. Five of the eight years of severe to extreme drought occurred between 2007 and 2016, with unprecedented dry years in 2014 and 2015.
- Since 1950, the area burned by wildfires each year has been increasing, and five of the largest fire years have occurred since 2006. The largest recorded wildfire in the state (Thomas Fire) occurred in December 2017.
- The amount of water stored in the state’s snowpack — referred to as snow-water content — ranges from a high in 1952 of about 240 percent to a record low of 5 percent in 2015. With less spring runoff, less water is available during summer months to meet the state’s domestic and agricultural water demands.
- Compared to the 1930s, today’s forests have more small trees and fewer large trees. Pines occupy less area statewide and, in certain parts of the state, oaks cover larger areas. The decline in large trees and increased abundance of oaks are associated with statewide increases in climatic water deficit.
- Along the California coast, sea levels have generally risen. Since 1900, mean sea level has increased by about 180 millimeters (7 inches) at San Francisco.
- Climate change poses a threat to public health. Warming temperatures and changes in precipitation can affect vector-borne pathogen transmission and disease patterns in California. West Nile Virus currently poses the greatest mosquito-borne disease threat. Heat-related deaths and illnesses, which are severely underreported, vary from year to year. In 2006, they were much higher than any other year because of a prolonged heat wave.

California’s Fourth Climate Change Assessment (Fourth Assessment): California is committed to further supporting new research on ways to mitigate climate change and to understand its ongoing and projected impacts. California’s Fourth Climate Change Assessment further updates our understanding of the impacts from climate change in a way that directly informs State agencies’ efforts to safeguard the State’s people, economy, and environment. The Fourth Assessment report also includes new climate projections with higher spatial resolution to better simulate and project extreme events. These updated projections reinforce past findings about temperature and precipitation extremes. The key findings from the Fourth Assessment are summarized below:

- *Economic Impacts:* Emerging findings for California show that costs associated with direct climate impacts by 2050 are dominated by human mortality, damages to coastal properties, and the potential for droughts and mega-floods. The costs are in the order of tens of billions of dollars. If global greenhouse gas emissions

are reduced substantially from the current business-as-usual trajectory, the economic impacts could be greatly reduced.

- *Wildfire Projections*: By 2100, if greenhouse gas emissions continue to rise, one study found that the frequency of extreme wildfires burning over approximately 25,000 acres would increase by nearly 50 percent, and that average area burned statewide would increase by 77 percent by the end of the century. In the areas that have the highest fire risk, wildfire insurance is estimated to see costs rise by 18 percent by 2055 and the fraction of property insured would decrease.
- *Sea Level Rise Projections:* A new study estimates that, under mid-to high-sea-level rise scenarios, 30 to 70 percent of Southern California beaches may completely erode by 2100 without large-scale human interventions. Statewide damages could reach nearly $17.9 billion from inundation of residential and commercial buildings under 50 cm (around 20 inches) of sea-level rise, which is close to the 95th percentile of potential sea-level rise by the middle of this century. A 100-year coastal flood, on top of this level of sea-level rise, would almost double the costs.
- *Public Health Impact*: Heat-Health Events (HHEs), which better predict risk to populations vulnerable to heat, will worsen drastically throughout the State: by midcentury, the Central Valley is projected to experience average HHEs that are two weeks longer, and HHEs could occur four to ten times more often in the Northern Sierra region.
- *Water Supply Impact:* Current management practices for water supply and flood management in California may need to be revised for a changing climate. As one example, the reduction in the Sierra Nevada snowpack, which provides natural water storage, will have implications throughout California's water management system.
- *Delta Levees and Infrastructure Impact*: New measurements found mean subsidence rates for some of the levees in the Sacramento-San Joaquin Delta of about 0.4 to 0.8 inches per year. This subsidence compounds the risk that sea-level rise and storms could cause overtopping or failure of the levees, exposing natural gas pipelines and other infrastructure to damage or structural failure. At this rate of subsidence, the levees may fail to meet the federal levee height standard (1.5 feet of freeboard above 100-year flood level) between 2050 and 2080, depending on the rate of sea-level rise.
- *Agriculture Impact*: Many of California's important crops, including fruit and nut trees, are particularly vulnerable to climate change impacts like changing temperature regimes and water-induced stress. A Fourth Assessment study indicates that adaptive decision-making and technological advancement may maintain the viability of California agriculture. However, additional studies show that viability of the sector overall may be at the expense of agricultural jobs and the dairy sector.
- *Oceans Impact:* There is increasing evidence that climate change is transforming and degrading California's coastal and marine ecosystems due to impacts including sea-level rise, ocean acidification, and ocean warming. Continued climate-driven changes to the ocean and coast will have significant consequences for California's coastal ecosystems, economy, communities,

> culture, and heritage. Together, historical data, current conditions, and future projections provide a picture of California's changing climate. Sea level rise, droughts, floods, and forest impacts are just some of the impacts affected by climate change, and as GHG emissions continue to accumulate, such destructive events will become more prevalent. The historical record, which has long provided the basis for our expectations for the traditional range of weather and other natural events, is becoming an increasingly unreliable predictor of the conditions we will face in the future. Climate disruption can drive extreme weather events such as coastal storm surges, drought, wildfires, floods, and heat waves. Thus, California's efforts are vital steps toward minimizing risks to public health, safety, and the economy and maximizing equity and protection of the most vulnerable so that they do not simply survive climate-related events, but thrive despite and after these events.

Recognizing the facts, the California Legislature has acted to reduce GHG emissions in California. In 2006, the California Legislature passed, and the Governor signed, Assembly Bill 32, the California Global Warming Solutions Act of 2006.[615] Assembly Bill 32 requires CARB to enact regulations to achieve the level of statewide GHG emissions in 1990 by 2020, authorizes and directs CARB to monitor and regulate sources of GHG emissions,[616] and specifically directs CARB to "adopt rules and regulations … to achieve the maximum technologically feasible and cost-effective greenhouse gas emission reductions from sources … subject to the criteria and schedules set forth in this part."[617]

In 2016 California's Legislature passed, and California's Governor Brown signed Senate Bill 32,[618] which requires CARB to ensure that California's statewide emissions of GHG emissions are reduced to at least 40 percent below the level of statewide GHG emissions in 1990, no later than December 31, 2030.[619]

In addition to its directional shift in 2012 based on the 2009 Vision modeling mentioned above, CARB has reconfirmed it needs to obtain significant reductions in GHG emissions from the transportation sector (which includes mobile sources) in order to comply with the above mentioned statutory mandates, especially since the transportation sector is largest source of GHG emissions in California.[620] CARB has identified strategies to obtain GHG emissions from mobile sources that include policies to move toward a goal of achieving 100 percent ZEV sales in the light-duty vehicle sector and reductions in vehicle miles travelled, and accelerating the use of clean

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[615] Cal. Assembly Bill (AB) 32, Chap. 488, Stats. 2006 (Nunez).
[616] Cal. Health & Saf. Code § 38510.
[617] Cal. Health & Saf. Code § 38560.
[618] Cal. Sen. Bill 32, Chap. 249, Stats. 2016 (Pavley).
[619] Cal. Health & Saf. Code § 38566.
[620] *The 2017 Climate Change Scoping Plan Update*. CARB. 2017. p 98.

vehicle and equipment technologies and fuels through the targeted introduction of zero emission and near-zero emission technologies in other sectors.[621]

These analyses maintain the need for strong GHG fleet-wide standards in congruence with meaningful ZEV requirements. As mentioned above, the ZEV regulation acted as an incubator for hybrid technology, and hybrid technology (once commercialized) was used to help set the 2012 LEV III GHG emission standards for all cars. Now, the aforementioned analyses show ZEV technology is imperative for meeting long-term emission reduction goals. Manufacturers would not likely make a more expensive technology to reduce GHG emissions (like a BEV) if there were other technologies that could still help achieve GHG standards at less cost. The ZEV regulation can help set a floor to ensure manufacturers are developing technologies that can be used to set meaningful GHG fleet-wide standards in the future.

6. California and the nation must reduce greenhouse gas emissions from motor vehicles and promote zero-emission vehicles.

There is an urgent need to help the transportation system take the next step in innovation to reduced- and zero-emission technologies. The ZEV regulation is designed to accelerate technology development through steadily increasing minimum sales. These technologies are necessary to reverse the increasing emissions from the transportation sector. Total ZEV and PHEV sales and the number of available vehicle models are steadily climbing. Manufacturers have over-complied with the requirements, and costs are falling faster than predicted.[622]

As detailed above the rollback scenario creates an additional 1.24 tons per day increase in NOx emissions in the South Coast air basin, 90 percent of which is from upstream fuel activity increases. Because of the SIP commitments for federal ozone standards, these increased refinery emissions would have to be offset elsewhere. This means that even more vehicles would need to be removed to compensate, and because the dirtiest vehicles would already have been removed, more newer and cleaner vehicles would need to be removed - either an additional 1.3 million clean conventional vehicles, or 1 million additional electric vehicles. This will almost double the number of vehicles that must be replaced to meet the region's air quality commitments. To put it plainly, California's ZEV regulation is a practical necessity to meeting the National Ambient Air Quality Standards for ozone.

California is not putting all the burden on manufacturers. To further advance zero-emission technology, California enacted a law to reduce emissions from the next frontier of transportation: ride-hailing, or transportation network, companies.[623] California

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[621] *Id.* at 97-102.
[622] *California's Advanced Clean Cars Midterm Review*. CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/board/books/2017/032317/17-3-8pres.pdf. pp. 21-29.
[623] Cal. Senate Bill (SB) 1014, Chap. 369, Stats. 2018.

requires local governments to reduce greenhouse gas emissions through coordinated land use and transportation planning.[624] California is providing funding, policies, regulatory frameworks, and other resources to provide the necessary incentives for innovation and investment to reach those targets, and to ensure the most advanced technologies are available to all, not just the most affluent.[625]

B. The assumed social cost of carbon in the federal proposal is wrongly discounted.

The social cost of carbon ($SC\text{-}CO_2$) is the cost to society (in U.S. dollars) of adding 1-metric ton of CO_2 to the atmosphere in a particular year—it is intended to provide a measure of the damages from global climate change. Framed alternatively, it is the avoided cost (or benefit) of reducing CO_2 emissions by the same amount in a given year. The $SC\text{-}CO_2$ is a critically important metric to accurately estimate because fuel economy and CO_2 emissions are the very subjects of the proposed regulation. Without an accurate estimation of the $SC\text{-}CO_2$ the Agencies cannot provide the informed analysis required by law.

In 2008, the U.S. Ninth Circuit Court of Appeals set aside NHTSA's 2006 CAFE standard as arbitrary and capricious because it failed to monetize the benefits of GHG emission reductions.[626] There, the Court characterized reductions in carbon emissions as, "the most significant benefit of more stringent CAFE standards."[627] Subsequently, federal agencies have incorporated the social costs of GHGs, including carbon dioxide, methane, and nitrous oxide, into their analysis of regulatory actions in an effort to comprehensively account for the economic impact of regulations that impact GHG emissions.

In 2009, the President's Council of Economic Advisors and the U.S. Office of Management and Budget convened the Interagency Working Group (IWG) on the Social Cost of Greenhouse Gases to develop a methodology for estimating $SC\text{-}CO_2$. This methodology relied on a standardized range of assumptions that could be used consistently when estimating the benefits of regulations across agencies. The IWG, comprised of scientific and economic experts, recommended the use of $SC\text{-}CO_2$ values based on three integrated assessment models (IAMs) developed over decades of global peer-reviewed research. William Nordhaus, awarded the Sverigse Riksbank Prize in Economic Sciences in Memory of Alfred Nobel in 2018 and a member of the IWG,[628] defines IAMs as "approaches that integrate knowledge from two or more domains into a

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[624] Cal. Senate Bill (SB) 375, Chap. 728, Stats. 2008.
[625] *See* Cal. Senate Bill (SB) 1014, Chap. 369, Stats. 2018, § 1.
[626] *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1203 (9th Cir. 2008).
[627] *Id*. at 1199.
[628] The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2018. The Nobel Prize. Accessed on October 24, 2018. https://www.nobelprize.org/prizes/economics/2018/summary/.

single framework."[629] IAMs used in the estimation of the SC-CO_2 combine models of the global economy and atmosphere to estimate geophysical and economic variables over time. Given the complexity of IAMs, the IWG provided guidance in transparency of methodology and assumptions as well as consistency across the input and models used to estimate the SC-CO_2, issued as Technical Support Documents. These models and methodologies have been modified and updated since first being utilized and represent the best available science in the field.

The Agencies are bound to utilize the best available science when setting standards and analyzing alternatives. The Agencies are further directed by Executive Order 12866 (as modified by E.O. 13563) to conduct a cost benefit analysis for all economically significant regulations, be based on the "best available science", use the "best available techniques" to quantify anticipated present and future benefits and costs, and use the best reasonably obtainable scientific, technical, and economic information. The Office of Management and Budget (OMB) Circular A-4 further directs the Agencies' actions in preparing regulatory analysis under E.O. 12866. OMB Circular A-4 requires the Agencies to quantify anticipated benefits and costs of proposed rulemakings as accurately as possible using the best available techniques, and to ensure that any scientific and technological information or processes used to support their regulatory actions are objective.

On March 28, 2017, the Presidential Executive Order on Promoting Energy Independence and Economic Growth, E.O. 13756, disbanded the IWG, withdrew the Technical Support Documents issued by the IWG, and instead directed all federal agencies to follow the guidance in OMB Circular A-4 when monetizing the value of changes in GHG emissions resulting from regulatory changes.[630] E.O. 13753 is internally inconsistent in that it withdrew the IWG's peer-reviewed Technical Support Documents that clarified how to implement and monetize the SC-CO_2 as no longer representative of governmental policy, yet also directed agencies to base their regulatory analysis on the best available science and economics, as well as OMB Circular A-4. The Executive Order's direction to disband the IWG and withdraw peer-reviewed and vetted scientific documents does not call into question the validity and scientific integrity of the IWG's social cost of carbon estimates, or the merit of independent scientific work in regulatory processes. This Executive Order provided no rationale or defense of this withdrawal, and offers no scientific or economic rationale for the changed SC-CO_2 valuation, which is in violation of existing EPA Guidance and against the consensus of experts.[631] E.O. 13753 requires agencies to follow

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[629] Nordhaus, William. Integrated economic and climate modeling. In *Handbook of computable general equilibrium modeling,* ed. Dixon Peter B. Jorgenson Dale W., 1069-1131. Amsterdam: North Holland, Elsevier. 2013.
[630] Presidential Executive Order on Promoting Energy Independence and Economic Growth. White House. Accessed on October 24, 2018. https://www.whitehouse.gov/presidential-actions/presidential-executive-order-promoting-energy-independence-economic-growth/.
[631] Drupp, M., Freeman, M., Groom, B., & Nesje, F. Discounting Disentangled. American Economic Association. Accessed on October 24, 2018. https://www.researchgate.net/publication/322402903_Discounting_Disentangled.

contradictory statutory and executive mandates when monetizing the social cost of carbon that simultaneously require using the best available science, while also purporting to prohibit the use of the best available science on the subject. The IWG's work remains relevant, reliable, and appropriate for use for these purposes. CARB supports continued use of the IWG SC-CO_2 values and strongly suggests that the agency support and promote the IWG SC-CO_2 values for transparency and consistency of regulatory analyses, including this proposal.

1. The federal proposal fails to use the best available science.

"NHTSA . . . cannot put a thumb on the scale by undervaluing the benefits and overvaluing the costs of more stringent [CAFE] standards."[632] The SC-CO_2 analysis presented by the Agencies is undermined by several fatal flaws, including the utilization of an inappropriate and poorly modeled "domestic" social cost of carbon, and presenting only two inappropriate discount rates. These errors lead to social cost values (listed in Table 8-24 of the PRIA) to be dramatically lower than the IWG's SC-CO_2 used in hundreds of regulatory proceedings at the federal level. The revised SC-CO_2 is in direct violation of the Agencies' statutory mandates, E.O. 12866, 13563, & 13783, and Circular A-4.

2. The decision to utilize a "domestic perspective" to calculate social cost is arbitrary and capricious.

The Agencies' analysis utilizes a social cost of carbon (SC-CO_2) valuation that directly contradicts Executive Order 13783's statement that it is essential for estimates of the social cost of greenhouse gases used in regulatory analyses to be, "based on the best available science and economics". The proposed SC-CO_2 is also inconsistent with the guidance contained in OMB Circular A-4 that the analysis "should focus on benefits and costs that accrue to citizens and residents of the United States", and "where . . . a regulation that is likely to have effects beyond the borders of the United States, these effects should be reported separately." The presented domestic-only SC-CO_2 breaks with almost a decade of accepted peer-reviewed methodologies without rationale or justification and does not rely on the best available science and economics.

The domestic-only SC-CO_2 is in violation of E.O. 13783 and Circular A-4. It does not reflect the best available science for evaluating the impacts of carbon pollution that has a global impact. A domestic valuation does not represent the consensus of economic experts, does not rely on best available science and economics, and does not consider the impact to U.S. citizens who either live outside the United States or have significant international investments. As stated on page 1065 of the PRIA, the 2017 National Academy of Science (NAS) report highlighted the challenges in developing domestic SC-CO_2 estimates, given complex interactions related to migration, and economic and political destabilization. The domestic-only SC-CO_2 does not account for these

[632] *Ctr. for Biological Diversity*, 538 F.3d at 1198.

interactions and instead focuses only on the impact of carbon emissions on U.S. soil. In addition, focusing only on domestic impacts does not allow for consideration of U.S. citizens living abroad, including active members of the U.S. military, or U.S. citizens with significant international investments—which is in direct conflict with OMB Circular A-4's direction to focus on benefits and costs that accrue to U.S. citizens.

A domestic SC-CO_2 does not follow the best available science because the existing IAMs used to estimate the domestic-only SC-CO_2 are not calibrated for domestic valuations. In the 2010 Technical Support Document for the Social Cost of Carbon, the IWG states, "As an empirical matter, the development of a domestic SCC is greatly complicated by the relatively few region- or country-specific estimates of the SCC in the literature." The IWG determined that a range of values from 7 to 23 percent should be used to adjust the global SC-CO_2 calculate domestic effects. However, the IWG cautions that, "these values are approximate, provisional, and highly speculative. There is no *a priori* reason why domestic benefits should be a constant fraction of net global damages over time."[633] Revising the SC-CO_2 to consider only domestic impacts without modifying the IAMs is also in direct violation of expert recommendations of the NAS which state, "Estimation of the net damages per ton of CO_2 emissions to the United States alone, beyond the approximations done by the IWG, is feasible in principle; however it is limited by the existing SC-IAM methodologies, which focus primarily on global estimates and do not model all relevant interactions among regions.[634] Peer-reviewed research released in 2017 also suggests that efficient outcomes arise only when countries use the SC-CO_2 and use the global estimate for policy analysis; necessarily, cost estimates limited to domestic impacts may result in lower than optimal action to address the environmental damage cause by carbon emissions.[635] In addition, this research discusses the need for more analysis on any potential domestic SC-CO_2, which is not reflected in the SC-CO_2 utilized in the proposed rule.

Further, it should be noted that the Agencies inconsistently purport whether global or domestic social cost of carbon estimates were considered. On page 43106, the NPRM states, "the costs of CO_2 emissions and resulting climate damages from both domestic and global perspectives were considered." However, on page 43226, in alerting readers to the differences between this and previous rulemakings, the NPRM states, "the social cost of carbon is different and accounts only for domestic (not international) impacts." Further complicating matters, the PRIA states, "the SC-CO_2 estimates used in this RIA focus on the direct impacts of climate change that are anticipated to occur within U.S.

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[633] Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866. U.S. EPA. Accessed on October 24, 2018. https://www.epa.gov/sites/production/files/2016-12/documents/scc_tsd_2010.pdf.

[634] Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide. National Academices of Sicences, Engineering, and Medicine. Accessed on October 24, 2018. https://sites.nationalacademies.org/DBASSE/BECS/Valuing-Climate-Damages/index.htm. p. 12.

[635] Kotchen, M. Which Social Cost of Carbon? A Theoretical Perspective. Yale. Accessed on October 24, 2018. http://environment.yale.edu/kotchen/pubs/whichscc.pdf.

borders."[636] It is unclear from the presented analysis whether domestic, global, or "international" impacts were modeled, considered, or utilized. Despite the PRIA's claim that, "The full set of SC-CO_2 results through 2050 is available in the docket" no such results have been posted. The lack of modeling results and clarity about what the Agencies actually considered makes an informed analysis impossible. Nonetheless, the Agencies report and appear to utilize only the domestic impact numbers presented in Table 8-24 of the PRIA.

Dr. Auffhammer agrees that the domestic-only SC-CO_2 is inconsistent with Circular A-4 as there are important impacts to the United States that do not stop at the U.S. border - including impacts to American owned capital and Americans, including U.S. servicemen and women, living abroad. Dr. Auffhammer also finds the domestic only SC-CO_2 also ignores impacts to national security through potential impacts to trade flows and global commodity markets. In addition, a recent peer-reviewed journal article suggests that a domestic SC-CO_2 for the United States is in the range of $48, rendering the value used in the NPRM inappropriately low.[637]

3. Presenting discount rates of only 3 percent and 7 percent is inappropriate.

The Federal Proposal's SC-CO_2 analysis presents results of only two discount rates—3 and 7 percent. This incorrectly purports to be in compliance with OMB Circular A-4. Circular A-4 suggests that utilizing discount rates of 3 and 7 percent is likely appropriate, at minimum, but it does not provide that only these two discount rates are appropriate in all circumstances. Specifically, in regards to costs and benefits that arise across generations, e.g., intergenerational discounting, Circular A-4 suggests that rates ranging from 1 to 3 percent are more appropriate. The Agencies' choice to examine discount rates of only 3 and 7 percent is also against the IWG recommendations, which utilize 2.5, 3, and 5 percent discount rates.

The SC-CO_2 is highly sensitive to discount rates. Higher discount rates decrease the value today of future environmental damages. The analysis should follow the IWG SC-CO_2 and present results for the three discount rates of 2.5, 3, and 5 percent to represent varying valuation of future damages. These rates are based on peer-reviewed expert input. The value today of environmental damages in the future is higher under the 2.5 discount rates compared to the 3 or 5 percent rates, reflecting the trade-off of consumption today and future damages. The IWG estimates and presents results for the SC-CO_2 across the 2.5, 3, and 5 percent discount rates that encompass a variety of assumptions regarding the correlation between climate damages and consumption of goods and are consistent with Circular A-4.

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[636] PRIA, p. 1062.
[637] Auffhammer, M. "The Use of the Social Cost of Carbon in the Federal Proposal "Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks. [83 Fed.Reg. 42,986 (Aug. 24, 2018)]. (Auffhammer Report).

Further, the 3 and 7 percent estimates included in Circular A-4 represent the before-tax rate of return to private capital and are not appropriate as the central estimates for an intergenerational valuation of the willingness-to-pay to avoid environmental damages like the SC-CO_2 represents. The SC-CO_2 does not represent a 'private return to capital' and therefore the application of the 3 and 7 percent discount rates alone are inappropriate. The 3 and 7 percent discount rates are also not in line with scientific or economic consensus. In a forthcoming peer-reviewed report, researchers surveyed 197 experts on the long-term social discount rates. While there was much variation, the median preferred social discount rate is 2 percent and 92 percent of experts surveyed preferred a social discount rate between 1 and 3 percent, lower than the lower discount rates utilized in the revised SC-CO_2.[638]

Dr. Auffhammer finds that the use of the 3 and 7 percent discount rate places an extremely low value on future generations which is not consistent with the best available science. He cites a forthcoming paper (Drupp, et al.) that shows a median discount rate of 2 percent is consistent with a review of experts in regards to the optimal social discount rate. Dr. Auffhammer also shows the consequences of using an inappropriately high discount rate are substantial. Moving from a 7 percent to a 2.5 percent discount rate (above the median optimal rate in Drupp, et al.) represents a 13.9 fold increase in the SC-CO_2.[639]

4. Potential updates to the best available science all point towards a higher, not lower, social cost of carbon.

It is critical to update estimates of climate damages as the science and economic understanding of climate change and its impact improve over time, there is an active discussion within government and academia about the role of SC-CO_2 in assessing regulations, quantifying avoided climate damages, and the values themselves. At the request of the U.S. federal government, in January 2017, the NAS released a report examining potential approaches for a comprehensive update to the SC-CO_2 methodology developed by the IWG to ensure resulting cost estimates continue to reflect the best available science and economics. The NAS review did not modify the estimated values of the SC-CO_2, but evaluated the models, assumptions, handling of uncertainty, and discounting used in estimating the SC-CO_2. The Report titled, "Valuating Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide," recommends near-term improvements to the IWG SC-CO_2 as well as a long-term strategy to more comprehensive updates. The Agencies should follow the IWG SC-CO_2, including changes outlined in the NAS report, and incorporate appropriate peer-reviewed modifications to estimates based on the latest available science and data.

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[638] Drupp, M.A., Freeman, M., Groom, B. and Nesie, F. Discounting Disentangled. American Economic Journal. Accessed on October 24, 2018. https://www.researchgate.net/publication/322402903_Discounting_Disentangled.
[639] Auffhammer Report, p. 12.

Resources for the Future (RFF) has launched the Social Cost of Carbon Initiative which is a multi-year, multidisciplinary research initiative that will advance the NAS recommendations and lead to a comprehensive update of the IWG SC-CO_2 estimates. The Agencies must rely on the best available science in accordance with E.O. 13783 and must continue to rely on the IWG SC-CO_2 until updates to the estimates are made in accord with the NAS recommendations through the RFF or other peer-reviewed process.

Recent peer-reviewed research also suggests that the IWG SC-CO_2 estimates on sector-specific impacts may be too low as economic and scientific modeling have progressed over time and new data has been incorporated into IAMs. A 2017 report published in Nature Communications presented new damage functions based on current scientific literature and estimate that the agricultural impacts as estimated in the IWG SC-CO_2 are too low.[640] The report finds that the impacts in the agricultural sector increase from a net benefit of $2.7 a tonne under the IWG SC-CO_2 to a net cost of $8.50 per tonne using the latest available science. This update alone of the agricultural impacts would cause the total IWG SC-CO_2 to more than double.

A 2018 working paper from the University of Chicago used subnational data from 41 countries to improve the estimation of mortality impacts due within the IWG SC-CO_2. The updated median willingness-to-pay to avoid excess mortality from warming could increase the IWG SC-CO_2 by up to $39 per tonne. These recent findings point to the IWG SC-CO_2 estimate as too low and that an updated estimate based on peer-reviewed science would be higher than the IWG values.

Dr. Auffhammer finds that the Agencies do not rely on the best available science as it relies on outdated representations of damage functions. As Dr. Auffhammer notes, the 2016 National Academies of Sciences report concluded that the IAMs underlying the IWG SC-CO_2 rely on outdated damage functions. He also points out that no study published after 2010 was cited in the NPRM in regards to the SC-CO_2 – including updates suggested to the IWG SC-CO_2. Finally, Dr. Auffhammer also highlights that while updating the damage functions in IAMs is non-trivial, there are significant research agendas underway to update IAMs that were completely and inappropriately ignored by the Agencies.[641]

a. The federal proposal fails to consider increased congestion and noise.

The VMT estimates in the Agencies' analysis are a crucial input into the CAFE Model's calculation of the costs and benefits of the proposed rule. However, the proposed rulemaking uses a 20 percent rebound effect, which does not follow the best evidence

[640] Moore, F., Baldos, U., Hertel, T., & Diaz, D. New science of climate change impacts on agriculture implies higher social cost of carbon. Nature Communications. Accessed on October 24, 2018. https://www.nature.com/articles/s41467-017-01792-x.
[641] Auffhammer Report.

available. This results in a larger differences in VMT estimated in the proposed rollback versus the existing standards. To estimate economic cost associated with traffic externalities, the Agencies' analysis multiplies the differences in VMT estimates in the rollback and existing standards by estimates of per-mile congestion and noise costs caused by increased use of automobiles and light trucks that were previously developed by the Federal Highway Administration.[642] To estimate economic cost associated with traffic externalities, the Agencies multiply the differences in VMT estimates in the rollback and existing standards by estimates of per-mile congestion and noise costs caused by increased use of automobiles and light trucks that were previously developed by the Federal Highway Administration.[643] As a result of the inappropriate choice of rebound effect, the congestion and noise impacts are overstated. For example, when the model is run with a more appropriate choice of the rebound effect of 10 percent, the noise and congestion benefits of the proposed rule are reduced by approximately 40 percent.

Assumptions regarding scrappage and fleet size also play a role in overstating the noise and congestion benefits presented in the Agencies' analysis. As stated previously, poor modeling decisions with the new vehicle sales model and dynamic scrappage model has resulted in a ballooning vehicle fleet under the existing standards. Because the Agencies' analysis does not adjust vehicle-specific VMT based on the total fleet size, there will be a more noise and congestion impacts when the vehicle fleet is larger. As stated previously, poor modeling decisions with the new vehicle sales model and dynamic scrappage model has resulted in a ballooning vehicle fleet under the existing standards. This also results in overstated congestion and noise benefits for the rollback. With a more appropriate choice of rebound effect of 10 percent and the dynamic scrappage model turned off, the noise and congestion benefits of the proposed rule are more than six times smaller than what is presented in the proposed rulemaking.

C. Energy production and security considerations compel maintaining the existing fuel economy standards.

The federal Agencies acknowledge that the rollback will significantly increase gasoline and petroleum consumption. Besides the significant direct economic harms to consumers, workers, the automobile manufacturing industry, and the national economy that would come from the rollback, and the related costs of the environmental damage, it would significantly diminish U.S. energy security. This is contrary to the President's recent executive order to promote national security, and contrary to the intent of Congress in EPCA. This unnecessarily exposes the nation to significant and avoidable risks. The proposal wrongly disclaims this risk.

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[642] 83 Fed.Reg. at 43,016.
[643] *Id.*

The rollback proposal makes several specious claims to reach the conclusion that the increased demand will not hurt the national economy, consumers, or national and energy security. These are:

1. The U.S. economy will not be adversely impacted because it will be a net energy exporter,
2. Costs to consumers are not important because of overall claimed benefits,
3. The U.S. economy will not impacted by global oil prices, and
4. Energy and national security will not impacted by the increase in demand for oil.

These claims are discussed in turn.

1. The U.S. economy will be adversely impacted because it will be a net energy exporter.

The U.S. is not projected to become a net petroleum exporter, and even if it were, the rollback would have negative impacts on the United States. This argument is faulty because it:

- Ignores short run damages caused by increased oil consumption and imports,
- Relies on projections of net imports of oil which also do not take account of the effects of the proposed rule, and
- Is not supported by the evidence.

Even if becoming a net exporter would insulate the nation from negative effects of the rollback, it will not lead to greater energy security until at least 2029, the first year which the 2018 Annual Energy Outlook (AEO) report from the U.S. Energy Information Administration (EIA) forecasts that the U.S. will stop being a net importer of oil.[644] However, even that is optimistic and unfounded. Energy insecurity will likely extend beyond 2029, since the 2018 AEO forecast does not take into account the effects of the rollback, which will invariably lead to higher net import numbers and a net import condition beyond 2029. The AEO forecast assumes that motor gasoline consumption will decrease by 27.6 percent (or 2.57 million barrels per day (MMb/d)) from 2016 level by 2035, while the rollback assumes that fuel consumption will increase by 9.2 percent in the same period (see NPRM Table VII-75[645]). This increase in oil consumption will preclude the U.S. from becoming a net exporter and will lead the U.S. to remain a net importer.[646]

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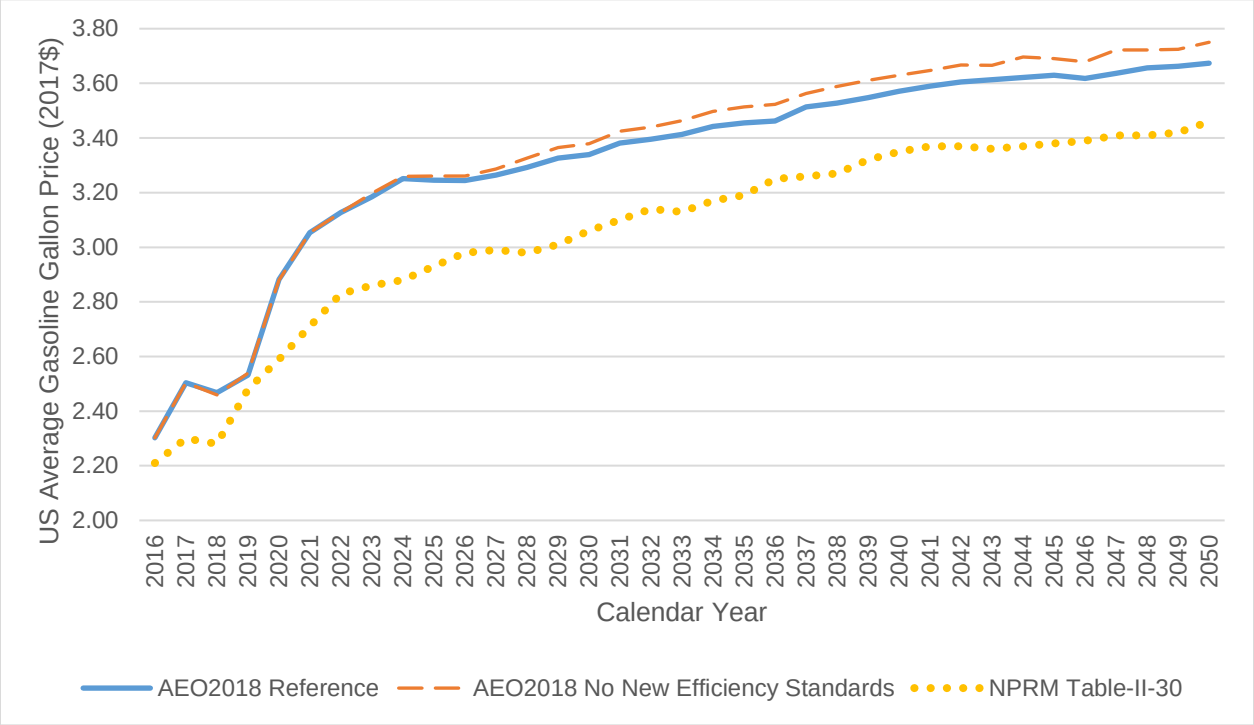
[644] Applied Economics Clinic, Sept. 2018. *Review of August 2018 NHTSA/EPA Proposed Rulemaking Reducing the Stringency of CAFE and CO_2 Standards.* p. 5.
[645] 83 Fed.Reg. at 43,327.
[646] The AEO 2018 forecast that net exports will peak at 0.65 MMb/d by 2037. This is dwarfed by the Agencies' assumption of higher gasoline consumption. The Agencies' assumptions such as the ones included in Figure VII-2 and Table VII-75 (83 Fed.Reg. at 43326 and 43327 respectively) contradict the finding that the United States will ever

The rollback proposal relies on the 2017 AEO forecast, which suffers the same analytical omission and fails to account for increased prices from increased demand.[647] "The supply of refined transportation fuels is expected to be moderately sensitive (or "elastic") to increases in its price – that is, increasing fuel production will exert some upward pressure on petroleum prices, refining costs, and ultimately on fuel prices – so increased demand is expected to raise fuel prices modestly."[648] However, the fuel price used in the Agencies' analysis is the AEO2017 reference case, which assumes adopted regulations (including the California ZEV regulation) are in place, and therefore are being used incorrectly when modeling impacts of the Agencies' proposed rollback.

In February 2018, EIA released an updated analysis with a "no new efficiency standard" scenario, which assumes fuel economy standards remain constant for 2021 and subsequent model years (reflecting the Agencies' preferred rollback). The figure below shows that indeed, fuel prices would be higher under the rollback.

Figure VII-4 Comparison of Gasoline Fuel Price Proejctions[649]



become a net exporter, but in fact the proposed rule will reverse the trend and further erode the U.S. oil trade position.

[647] 83 Fed.Reg. at 43,070. However, using the publically available interactive data tool available on the EIA AEO website, CARB was unable to recreate Table-II-3 in the NPRM.

[648] PRIA, p. 1068.

[649] Real Petroleum Prices: Transportation: Motor Gasoline. U.S. Energy Informaiton Administration. Accessed on October 24, 2018. https://www.eia.gov/outlooks/aeo/data/browser/#/?id=12-AEO2018&region=0-0&cases=ref2018~effrelaxall&start=2016&end=2050&f=A&linechart=~~ref2018-d121317a.30-12-AEO2018~effrelaxall-d030918a.30-12-AEO2018&sourcekey=0.

The Agencies did include a sensitivity analysis that uses more recent and higher AEO2018 reference case fuel prices (but not the "no new efficiency standard" case mentioned above), which shows a smaller overall benefit from the existing standards.

The federal Agencies do not support their claim that the U.S. economy will be more insulated from oil price shocks and supply disruptions because of increased domestic oil production. This is a tenuous and unsubstantiated assumption. To the contrary, current conditions are more prone to risk due to lower available spare oil production capacity in major oil producing countries, meaning that a supply disruption is more likely to have a more pronounced effect on oil prices and U.S. energy security. Dr. Stanton questions the rule of thumb that the Agencies' used to calculate the economic costs of a sudden price increase.[650] The Agencies estimate is based on an analysis that has a wide range of results which has not been updated to reflect more recent developments. She argues that the use of this estimate is not adequate for the purpose of calculating the potential adverse costs of sudden price shocks or supply disruptions.

2. Consumer costs will increase even if there is a claimed overall benefit – which there is not.

The rollback asserts that costs to consumers are not important because of overall claimed benefits, particularly gains for oil producers. The rollback does not account for the inequitable and regressive distribution of economic harm of the rise in oil prices. The effect of the proposed rule changes will disproportionally hurt consumers of lower economic means.

The relationship between global oil prices and gasoline prices faced by customers in the United States are still strongly linked. See Figure 4 in Dr. Stanton's white paper.[651] The federal Agencies failed to investigate the economic impacts of reduced consumer spending on other goods due to the effective reduction in disposable income due to their higher expected spending on gasoline.

Oil price increases affect poorer households more acutely, as their share of total expenditure spent on gasoline is higher than households with higher incomes as shown below.

Table VII-1 2017 Household annual expenditure on gasoline and motor oil as a percentage of total expenditure by income before taxes.[652]

	Gasoline and motor oil as percent of total expenditure
Less than 15,000	11.0 percent

[650] Stanton, E. *Review of August 2018 NHTSA/EPA Proposed Rulemaking Reducing the Stringency of CAFE and CO2 Standards*. Applied Economics Clinic. October 24, 2018. p. 14.
[651] *Review of August 2018 NHTSA/EPA Proposed Rulemaking Reducing the Stringency of CAFE and CO2 Standards*. Applied Economics Clinic. 2018. p. 11.
[652] Applied Economics Clinic, Sept. 2018. *Review of August 2018 NHTSA/EPA Proposed Rulemaking Reducing the Stringency of CAFE and CO_2 Standards.* p. 11.

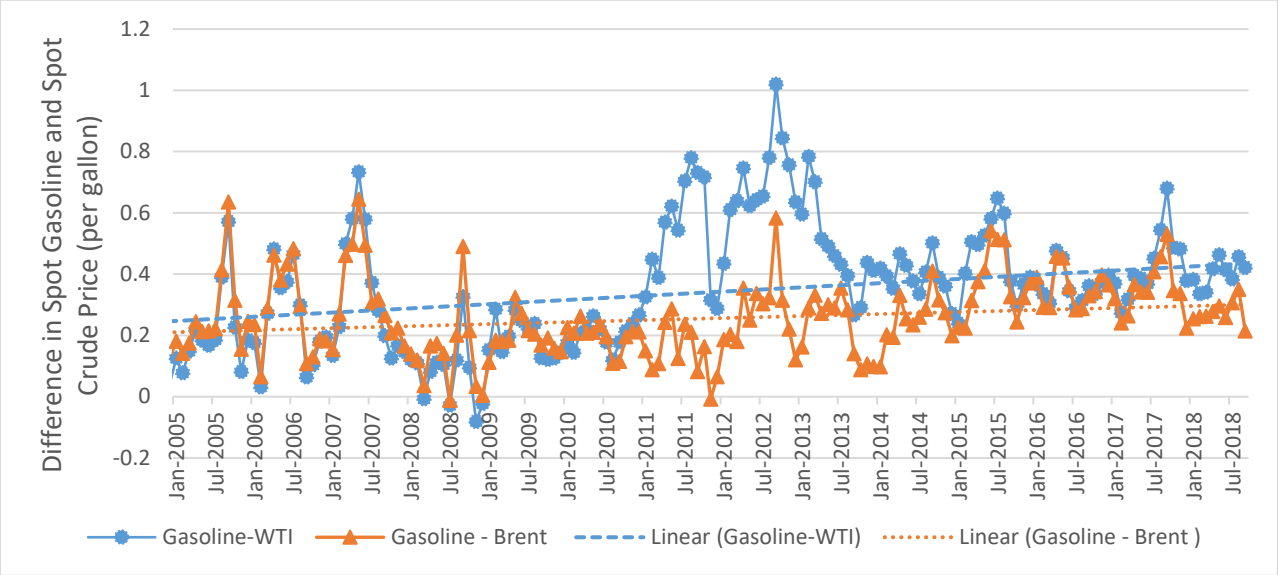
$15,000 - $29,999	5.5 percent
$30,000 - $39,999	4.8 percent
$40,000 - $49,999	4.1 percent
$50,000 - $69,999	3.4 percent
$70,000 - $99,999	3.0 percent
$100,000 - $149,999	2.4 percent
$150,000 -$199,999	1.7 percent
$200,000 and over	1.0 percent
All households	2.7 percent

Even if the United States becomes a net exporter of oil products and higher spending on gasoline will result in a transfer within the country, the transfer will still have a regressive effect. Not only will poorer household have to spend disproportionately more, most of the profits due to higher oil prices will accrue to wealthier households, as they own a high share of financial stocks.[653]

In fact, in recent years, gasoline prices in the United States increasingly reflect a higher premium compared to oil prices, as shown below, countering the Agencies' claim that lower oil imports will somehow lead to greater energy security. This trend appears considering multiple benchmarks over an extended time.

[653] *Yes, stocks are up. But 80 percent of the value is held by the richest 10 percent.* Washington Post. Accessed on October 24, 2018. https://www.washingtonpost.com/posteverything/wp/2017/03/02/perspective-on-the-stock-market-rally-80-of-stock-value-held-by-top-10/?utm_term=.2bda91f84648.

Figure VII-5: Difference between spot gasoline price at New York Harbor (Brent) and spot crude oil prices (WTI) [654]



3. The U.S. economy will be impacted by global oil prices.

The U.S. economy remains vulnerable to oil price shocks, despite increased in domestic production. The federal Agencies concede this on page 1072 of the PRIA:

> *Although the vulnerability of the U.S. economy to oil price shocks is widely believed to depend on total petroleum consumption rather than on the level of oil imports…*

First, and as discussed above, it is unreasonable to conclude that the United States will not in the future become a zero net importer of oil under the rollback. Thus, supply disruptions will continue to pose serious risks to the U.S. economy. Second, short term disruptions do and will continue to impact global oil prices, which leads to potentially higher gasoline prices faced by consumers in the United States and subsequently to disruptions to the U.S. economy. The complex effects of these potential disruptions needs to be carefully quantified using an updated and substantiated model. Without such a model, the Agencies' assessment likely substantially underestimates the negative impacts of the proposed rules. Recent events show that the United States is still vulnerable to supply disruptions; unrest in two OPEC producers (Iran and

[654] To report prices in similar unit, the crude oil price was divided by 42 to reflect the fact that each barrel of oil contains 42 gallons of oil. WTI and Brent are two of the main benchmark prices for spot prices of crude oil. WTI, or West Texas Intermediate, is the spot price of oil at Cushing, Oklahoma and is the main benchmark for crude oil prices in the United States. Brent is world's most referenced benchmark, and it refers to the spot price of crude produced in the North Sea.

Venezuela) has pushed oil prices to a four-year high;[655] gasoline retail prices in the beginning of October of 2018 are 19 percent higher than when President Trump took office. Lastly, recent news articles from the financial press support the inference that the lack of spare capacity in oil production is increasingly leading to higher oil prices, with some suggesting that $100/barrel oil is in the near horizon.[656]

The federal Agencies contradict their arguments about a reduced need to protect energy security. In the rollback proposal,[657] the Agencies downplay the risks of oil price shocks and supply disruptions and make an arbitrary reassessment of EPCA stating:

> *Considering all of the above factors, if gasoline price shocks are no longer as much of a threat as they were when EPCA was originally passed, it seems reasonable to consider what the need of the United States to conserve oil is today and going forward.*

This however contradicts recent statements by the President to convince and pressure Saudi Arabia to increase oil production to counteract recent rapid increases in the price of gasoline.[658] Additionally, in a memo leaked by Bloomberg that details the Department of Energy's (DOE) plan to promote national security by directly subsidizing coal and nuclear power plants, the DOE describes the increasing insecurity in the use of pipeline infrastructure (for natural gas and petroleum products) due to cybersecurity threats. It follows from this logic that the increased consumption of gasoline due to this proposed rulemaking will increase the energy security risk of the U.S. due to increased reliance on an increasingly insecure pipeline network.

The federal Agencies assert that the level of imports are more important to evaluating the macroeconomic costs of U.S. consumption stating that:

> *While total U.S. petroleum consumption is the primary determinant of potential economic costs to the nation from rapid increases in oil prices, the estimate of these costs that have been relied upon on in past regulatory analyses –and in this analysis –is expressed per unit (barrel) of imported oil.*

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[655] DeCambre, M., and Saefong, M. Oil prices rally back to nearly 4-year highs despite biggest weekly U.S. crude supply rise of the year. Market Watch. Accessed on October 24, 2018. https://www.cnbc.com/2018/10/03/oil-markets-us-crude-inventories-us-sanctions-on-iran-in-focus.html, https://www.marketwatch.com/story/oil-prices-resume-climb-toward-four-year-highs-2018-10-03. https://www.bloomberg.com/news/articles/2018-09-13/iea-warns-of-higher-oil-prices-as-iran-venezuela-losses-deepen.

[656] Eberhart, D. Lack of Spare Capacity In World Oil Markets Signals Higher Prices. Forbes. Accessed on October 24, 2018. https://www.forbes.com/sites/daneberhart/2018/06/28/lack-of-spare-capacity-in-world-oil-markets-is-red-flag-to-bulls/#ddedcb647882. Meredith, S. Spare oil capacity could be 'stretched to the limit' by OPEC's supply boost, IEA says. CNBC. Accessed on October 24, 2018. https://www.cnbc.com/2018/07/12/spare-oil-capacity-could-be-stretched-to-the-limit-by-opecs-supply-.html.

[657] 83 Fed.Reg. at 43,213–15.

[658] *See* for example, President Trump's tweet on June 30th stating that "Just spoke to King Salman of Saudi Arabia and explained to him that, because of the turmoil & disfunction[sic] in Iran and Venezuela, I am asking that Saudi Arabia increase oil production, maybe up to 2,000,000 barrels, to make up the difference...Prices to [sic] high! He has agreed!" https://twitter.com/realDonaldTrump/status/1013023608040513537.

No substantial justification was given to explain why the Agencies chose to focus solely on imports, which are a subset of total consumption, to calculate the cost of the macroeconomic impacts of the proposed rule. Focusing on a subset of the total consumption could result in a lower estimate of the costs of increasing consumption in the calculation of the economic harm that will result from adopting the proposed rules.

The federal Agencies also claim that increased taxes due to lessened fuel economy and higher gasoline consumption are beneficial to the economy defy fundamental economic logic that taxes are only beneficial if they fix a market failure, such as in cases of excessive market power or to address a heretofore unaccounted externality. In page 1060 of the PRIA the Agencies state:

> *Increased fuel purchases by drivers of cars and light trucks will contribute additional tax revenues at both federal and state levels, which will be available to fund increased spending on highways or other transportation infrastructure. This effect represents an economy-wide benefit, which will offset some of the increase in fuel costs to new car and light truck buyers.*

This faulty analysis points at a larger and more serious deficiency in the Agencies' analysis of the economic impacts of the proposed rule in that the analysis does not take into account the macroeconomic impacts and equity implications of the reduction in consumers and businesses disposable income, and the secondary effects of such reduction, on the U.S. economy.

The federal Agencies failed to account for economic benefits of maintaining a higher fuel economy standard. Sivaram and Levi (2015)[659] calculated that using NHTSA's model assumptions, the net benefits of stricter CAFE standards are positive even at low long-term oil prices. The majority of these benefits are fuel savings, and even if one excludes all other benefits of the policy, the net economic benefits will exceed the costs. Sivaram and Levi (2015) also describe other benefits of adopting higher fuel economy standards such as enhancing the United States monophonic position in the oil market and the value of real options associated with a higher fuel economy that the Agencies fail to consider.

The implicit definition of energy security that the Agencies use is inconsistent with commonly accepted definitions of energy security used by other agencies, including NHTSA's and EPA's previous definition. For example, the International Energy Agency (IEA), an independent organization of which the United States is a member, defines energy security as "the uninterrupted availability of energy sources at an affordable

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[659] Sivaram, V. & Levi, M.A. Automobile Fuel Economy Standards in a Lower-Oil-Price World. Council on Foreign Relations Discussion Paper. Accessed on October 24, 2018. https://cfrd8-files.cfr.org/sites/default/files/pdf/2015/10/CAFE_Standards_Paper.pdf

price".[660] The Draft TAR[661] defines it as "the continued availability of energy sources at an acceptable, stable price". The Agencies confuse this point by stating that:

> *[t]o an increasing extent, however, the additional payments by U.S. consumers that result from upward pressure on the world oil price are a transfer entirely within the nation's economy, because a growing fraction of domestic petroleum consumption is being supplied by U.S. producers.*[662]

While it is potentially true that an improving U.S. oil trade balance will result in smaller transfers to foreign oil producers, it is also true, by the admission of the Agencies, that this change in trade balance will not alter the fact that the proposed rulemaking will result in higher global oil prices[663] which will reduce the affordability of petroleum products to U.S. consumers, and hence a decrease in U.S. energy security.

4. Energy and national security will be impacted by the increase in demand for oil.

As for national security, military spending is likely to increase in response to higher oil imports. In absolute terms, oil consumption and military expenditure both increased during the last decades. AEC also cites a recent literature survey article that demonstrates that military expenditures, especially in the Middle East region, are linked to the U.S.'s interest in maintaining security of oil production and logistical infrastructure.[664]

U.S. presidents over the past the thirty years have recognized the potential use of military means to secure oil production and imports.[665] In the 1980 State of the Union Address, President Carter emphasized that the United States is prepared to use military action to secure oil supplies from the Middle East in what would later be referred to as the Carter Doctrine:

> *Let our position be absolutely clear: An attempt by any outside force to gain control of the Persian Gulf region will be regarded as an assault on the vital interests of the United States of America, and such an assault will be repelled by any means necessary, including military force.*

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[660] What is energy security? International Energy Agency. Accessed on October 24, 2018. https://www.iea.org/topics/energysecurity/whatisenergysecurity/.
[661] 2016 Draft TAR. NHTSA. Accessed on October 24, 2018. https://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/Draft-TAR-Final.pdf.
[662] PRIA, p. 1066.
[663] PRIA, Figure 8-42, p. 1067.
[664] *Review of August 2018 NHTSA/EPA Proposed Rulemaking Reducing the Stringency of CAFE and CO_2 Standards. Applied Economics Clinic. 2018.* p. 16.
[665] *See* Sovacool, B.K & Brown, M. Competing Dimensions of Energy Security: An International Perspective. Georgia Tech and Ivan Allen College School of Public Policy. Accessed on October 24, 2018. https://smartech.gatech.edu/bitstream/handle/1853/27736/wp45.pdf.

President Reagan highlighted the connection between National Security and oil imports, especially from the Middle East, in a 1986 Radio Address to the Nation when he said:

> *But the oil harvest of the eighties is not just an economic story; it also has implications for our national security. When I came into office the United States was consuming about 17 million barrels of oil a day—6 million imported. A big part of that oil came from the Middle East. Today we consume less than 16 million barrels of oil a day, and only 4 million are imported. But what may prove to be even more significant is that we've changed who we buy our imported oil from. Back in 1981 most of it came from the OPEC countries, but now most of it comes from Canada, Mexico, the Caribbean, and Great Britain. As Vice President Bush pointed out recently, we've assured that our supplies won't be as vulnerable to international politics as they've been in the past. We need a strong U.S. energy industry to keep it that way.*

President Reagan also pledged to expand the Carter Doctrine in what is referred to as the Reagan Corollary which pledges that the "the U.S. has guaranteed both the territorial integrity and internal stability of Saudi Arabia".[666] President Reagan has stated that protection of oil is a justification for this stance "[t]here's no way that we could stand by and see that taken over by anyone that would shut off that oil".[667]

More recently, President Trump reiterated the substance of the Carter Doctrine by making a claim that Saudi Arabia's Monarchy rests on U.S. military support in a bid to put pressure on the Kingdom to pump more oil.[668]

The rollback proposal failed to account for the direct increase in the military expenditure that will result from higher prices. The U.S. military is the largest user of oil in the world, consuming about 100 million barrels of oil annually.[669] Many U.S. allies are also net oil importers and higher oil prices will negatively affect the U.S. allies' national and energy security positions.

In conclusion, CARB believes that the Agencies cost estimates fail to account for many important economic damages that will result from reduced energy security which is precisely why EPCA was passed. The analysis fails to properly account for the effects of the proposed rule change to make a capricious claim that the U.S. energy security is no longer a paramount priority for the security and well-being of the nation. The

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[666] Safire, W. Essay; The Reagan Corollary. New York Times. Accessed on October 24, 2018. https://www.nytimes.com/1981/10/04/opinion/essay-the-reagan-corollary.html

[667] Weisman, S. Reagan Says U.S. Would Bar A Takeover In Saudi Arabia That Imperiled Flow Of Oil. The New York Times. Accessed on October 24, 2018. https://www.nytimes.com/1981/10/02/world/reagan-says-us-would-bar-a-takeover-in-saudi-arabia-that-imperiled-flow-of-oil.html.

[668] *Trump says Saudi king wouldn't last 2 weeks without U.S. support.* CBS News. Accessed on October 24, 2018. https://www.cbsnews.com/news/donald-trump-saudi-arabia-king-salman-us-military-support-opec-oil-prices/.

[669] The U.S. military uses more oil than any other institution in the world—but it's also a leader in clean vehicle technology. The Union of Concerned Scientists. Accessed October 24, 2018. https://www.ucsusa.org/clean_vehicles/smart-transportation-solutions/us-military-oil-use.html#.W5BNzuhKjIV

direction in EPCA to set the maximum feasible fuel economy standards was adopted to preserve and enhance energy security through conservation of resources, not wasteful consumption.

VIII. The federal Agencies' Macroeconomic Impact Analysis understates the negative effects of the proposal.

Thus far, we have focused our attention on the many ways the proposal's modeling and assumptions are flawed with regard to the vehicle world, resulting in grossly overstated projected costs of the existing standards and benefits of the proposed rollback. We now broaden our focus to the larger economy and societal impacts. The Agencies failed their duty to analyze the impacts of the proposed rollback on the macro-economy fully and properly; as a result, and combined with their flawed modeling and assumptions, their assessment of the societal costs of the proposed rollback are wrong. More specifically, the proposed rollback is accompanied by, among other flaws, significant macroeconomic damage, huge costs from climate change, and a host of other economic harms.

OMB guidance on economic analysis directs federal agencies to evaluate distributional and economy-wide impacts of proposed regulations. OMB Circular A-4 states:

> *Those who bear the costs of a regulation and those who enjoy its benefits often are not the same people. The term "distributional effect" refers to the impact of a regulatory action across the population and economy, divided up in various ways (e.g., income groups, race, sex, industrial sector, geography). Benefits and costs of a regulation may also be distributed unevenly over time, perhaps spanning several generations. Distributional effects may arise through "transfer payments" that stem from a regulatory action as well. . . .*
>
> *Your regulatory analysis should provide a separate description of distributional effects (i.e., how both benefits and costs are distributed among sub-populations of particular concern) so that decision makers can properly consider them along with the effects on economic efficiency. . . . You should be alert for situations in which regulatory alternatives result in significant changes in treatment or outcomes for different groups. Effects on the distribution of income that are transmitted through changes in market prices can be important, albeit sometimes difficult to assess. Your analysis should also present information on the streams of benefits and costs over time in order to provide a basis for assessing*

> *intertemporal distributional consequences, particularly where intergenerational effects are concerned.*[670]

The Agencies did not conduct any analysis on distributional or economy-wide impacts or otherwise evaluate the economic practicability of the proposed rollback. The closest the Agencies came to this necessary analysis was employment impacts—but even then the Agencies only briefly discussed employment impacts solely on the automotive sector. The Agencies did not even discuss any effects of the proposed rollback on gross domestic product (GDP).

Dr. Frank Ackerman[671] with Synapse Energy Economics[672] (Synapse) analyzed the Agencies' (lack of) macroeconomic analysis. Synapse noted, and CARB agrees, that the Agencies used some assumptions in their macroeconomic analysis that are inappropriate, unsupported by the evidence, and contradictory.[673] First, the compliance costs assumed by the Agencies are grossly overstated, as discussed earlier. Second, the purported rebound effect is at least double what the literature supports, also as discussed earlier. Third, the Agencies assume that any increase in oil prices will essentially be an internal transfer payment and thus do not have any notable economic impacts, since a growing proportion of U.S. oil consumption is being produced domestically. At the same time, the Agencies also recognize that fuel prices do have economic implications, such as on the type of vehicle purchased or the distances driven. Dr. Ackerman also presented modeling results that offered economy-wide economic impacts that could result from the NRPM rather than the myopic automotive industry only focus; Synapse ran both a scenario expanding the NPRM assumptions economy-wide and a revised scenario in which the three problematic assumptions listed above. Expanding the macroeconomic analysis to the entire economy and correcting the Agencies' inaccurate assumptions show that the proposed rollback has larger negative impacts than the Agencies suggest. We will turn first to broader macroeconomic impacts and then more specifically to employment impacts.

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[670] OMB, Circular A-4. White House. Accessed on October 24, 2018. https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/circulars/A4/a-4.pdf. p. 14.
[671] Dr. Frank Ackerman is a Principal Economist at Synapse Energy Economics. He is an environmental economist who has written widely on energy, climate change, and related issues. He has studied the employment benefits of clean energy scenarios, critiqued a number of flawed economic studies related to clean energy and the environment, and been published widely on these topics.
[672] Synapse Energy Economics is an energy, economic, and environmental research and consulting firm. The firm has extensive experience in energy and environmental economics, economic modeling, energy efficiency, emissions modeling, and cost-benefit analysis, among others. Synapse has compiled a myriad of reports for a wide range of clients, from environmental organizations to state agencies to the European Parliament.
[673] Ackerman, F., Synapse Energy Economics, *Assessment of Macroeconomic Impacts from Federal SAFE Proposal*. Synapse Energy Economics. October 22, 2018. pp. 4-5 ["Synapse Report"].

A. The analysis fails to adequately analyze gross domestic product impacts.

Aside from the automotive employment discussion, the NPRM does not discuss any macroeconomic impacts. Again, the Agencies do not provide any analysis on the impacts of the proposed rollback on GDP, let alone other sectors of the economy (like automotive suppliers), contrary to OMB guidance.

Dr. Ackerman's analysis, expanded to evaluate impacts on the entire economy, found that the federal proposal will have a negative impact on the national economy. Specifically, GDP would likely decrease by $14 billion in 2025 and $16 billion in 2035 under their NPRM expanded economy-wide scenario, and $16 billion in 2025 and $21 billion in 2035 under their revised scenario.[674] CARB agrees with the comments made by Dr. Ackerman in regards to these projections.

Further, in another instance within the CAFE Model of it being internally disconnected, this finding that GDP would decrease under the rollback has been completely ignored by the new sales model, which includes GDP growth rates as one of its variables. The GDP forecasts therefore should differ between the existing standards and proposed rollback should the Agencies continue to stand by the new sales model despite its many flaws (see Section VI.A). In the case of the rollback, the decrease in GDP could offset some to all of the increases in new vehicle sales that the Agencies are estimating.

B. The analysis fails to adequately analyze employment impacts.

Of its 515 pages, the NPRM only devotes about two of them to employment impacts, and limits their assessment to just the automotive sector.[675] The Agencies conclude, apparently based on their scant analysis, that the proposed rollback would result in 60,000 fewer jobs by 2027.[676] This employment impact is limited to the automotive industry "because adjacent employment factors and consumer spending factor for other goods and services are uncertain and difficult to predict."[677]

The narrow focus on direct, automotive employment impacts is inconsistent with the EPA Guidelines for Preparing Economic Analysis (Guidelines), which state that the Agency should analyze "indirect effects of the policy options as well, as these may prove to be important."[678] In addition, Guidelines state:

> *Many analyses only present the employment effect on the regulated industry as a result of higher regulatory compliance costs. In doing so, these*

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[674] Synapse Report, pp. 17-18.
[675] 83 Fed.Reg. at 43,077-79.
[676] 83 Fed.Reg. at 43,291.
[677] 83 Fed.Reg. at 43,078.
[678] Guidelines for Preparing Economic Analysis. U.S. EPA. Accessed on October 24, 2018. https://www.epa.gov/sites/production/files/2017-08/documents/ee-0568-50.pdf. p. 7-3.

> *analyses make simplifying assumptions that employment in a given industry is proportional to output, i.e., if production goes down by 1 percent, employment goes down by 1 percent. These limited assessments on employment impacts from regulation examine how higher manufacturing costs lead to fewer sales and therefore lower employment in that sector. However, empirical and theoretical modeling suggests that these simplified relationships are faulty and should not be used.*[679]

The sole focus in the NPRM on direct employment impacts thus does not comply with existing EPA guidance on the estimation of regulatory impacts.

Aside from failing to meet their own guidance on employment analysis, the Agencies' employment analysis is insufficient, as it excludes important factors, such as effects on automotive supply chains, impacts on the petroleum sector, and economy-wide impacts (from changes in consumer spending on vehicles and fuel).[680] The effects here are likely to be striking, as the international automotive market transitions to zero-emission technologies. China, the largest national vehicle market in the world, is planning for its domestic manufacturers to sell 3 million electric vehicles a year, making up 80 percent of total domestic sales, while the top two EV makers would have 10 percent of their total overseas, by 2025.[681] The U.S. should support its manufacturers and workers with policies to help them compete – not be disqualified.

Even so, the Agencies still project negative automotive employment impacts. When expanding the analysis to the economy-wide level, Dr. Ackerman found that the proposed rollback would actually have a starker employment impact: 90,000 job-years in 2025 and over 180,000 job-years in 2035.[682] When correcting the Agencies' inappropriate assumptions (essentially using compliance costs from the 2016 Draft TAR, a 10 percent rebound effect, and updated gas prices from AEO 2018), Dr. Ackerman found that the proposed rollback would decrease employment even further: almost 160,000 job-years in 2025 and over 350,000 job-years in 2035. These are significant impacts the Agencies at best glossed over and at worst ignored.

C. Equity and affordability are harmed by the proposed rollback.

The Agencies claim that a rollback of standards is necessary to preserve new vehicle affordability; however they do not present evidence that the existing standards would negatively affect affordability. As discussed in Section VI, average prices can be distorted by the mix of vehicles being sold. An analysis by Consumer Union shows that the price of the most expensive of the top 30 high-end vehicles has increased by 40

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[679] *Id.* at p. 9-8.
[680] Synapse Report, p. 2.
[681] *See* https://subscriber.politicopro.com/trade/article/2018/10/made-in-china-2025-worlds-biggest-auto-market-wants-to-be-most-powerful-maker-of-electric-cars-872985.
[682] Synapse Report, p. 16. A "job-year" is one job that lasts for one year.

percent from 2005 to 2015. Meanwhile, the price of entry-level vehicles has remained relatively constant over this same period, even with tightened standards.[683] The most affordable vehicles among the top 30 sold in 2015 cost the same as the most affordable top 30 vehicle sold in 2005 when adjusted for inflation. Thus, consumer choices at the lower price ranges have not been any more limited with tighter standards than they were without them.

Indeed, it should be noted that the proposed rollback would harm the consumers the Agencies are claiming they are trying to help. A peer-reviewed study by Greene and Welch (2018) evaluated the how fuel economy improvements over a 25-year period affected households of different income levels.[684] Based on authoritative estimates of technology cost and reputable data on household spending on fuel, and even accounting for the rebound effect, the authors found that historically the technology added to vehicles has been cost effective so that they produce net savings. Furthermore, used vehicle buyers can enjoy the same fuel savings as the new owners of those same vehicles, but at a fraction of the price. As a result, although higher income households enjoy the most savings in absolute terms, lower income households saved the most as a share of their income. Looking forward, Greene and Welch estimate that similar patterns would hold for further improvements through MY2025.

IX. When properly analyzed, the cumulative effects of the proposed rollback are profoundly damaging.

The analysis done for the 2016 Draft TAR and updated for EPA's 2016 Proposed Determination was much more thoroughly validated, documented, and transparent to stakeholders than this NPRM analysis. That analysis found, even in the presence of lower fuel price forecasts than the Agencies are now using, that the benefits of the existing standards outweighed the costs. Just looking at the impacts on consumers found the standards would increase new vehicle prices by $800 to $1,115 but payback of that increased cost from fuel savings alone would take only 5 years and lifetime savings to a consumer were approximately $1,650.[685]

For this NPRM, the Agencies have systematically evaluated only select components in isolation and failed to connect these elements to analyze correctly how the proposed rollback would play out in reality. As discussed in the previous sections, all of the models are fundamentally flawed, and a large number of assumptions used by the Agencies are incorrect and unsupported. To evaluate how such errors may compound upon each other, we present a set of illustrative results using corrected assumptions for a few of the noted errors combined with abandoning of flawed models. These results,

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[683] Comings and Allison 2017 "More Mileage for Your Money: Fuel Economy Increases While Vehicle Prices Remain Stable" https://consumersunion.org/wp-content/uploads/2017/03/Synapse-CU-Affordability-Report-3-15-corrected-1.pdf.
[684] See Greene Report, p. 30 for more details about this study.
[685] EPA, Proposed Determination, pp. ES-4 through ES-7.

however, do not reflect what a properly done comprehensive analysis correcting all of the deficiencies would yield. Such an effort would take far more time than the 60 days provided for comment would allow. Nonetheless, applying only a few directionally more appropriate corrections finds substantially different results. Rather than the net benefits of the rollback touted by the Agencies, we find that such an action would indeed result in net costs to society.

Based on the previous findings that certain elements of the CAFE Model should be wholly abandoned or substantially modified, the following modifications were made to the CAFE Model input files and model run settings (refer to the supporting documentation for a more specific description of the modifications):

- Modified technology ranking algorithm to select cost-effective technologies.
- Modified cost and effectiveness for mild hybrid belt integrated starter generator (BISG) technology consistent with latest Argonne National Laboratory estimate
- Expanded availability of high compression ratio engine technologies.
- Limited the amount of over-compliance with the rollback standards by reducing the in-compliance payback period to 0.1 years
- Upper levels of mass reduction for small and medium cars restricted in identical manner as done by NHTSA in the 2016 Draft TAR.
- Non-statistically significant point estimate coefficients in mass reduction model set to zero
- New sales and dynamic fleet share model off
- Dynamic scrappage model off
- 10 percent rebound effect
- Global value for the social cost of carbon (changed to same as the values used in prior Agency rulemakings)

These modifications do not reflect an exhaustive list that addresses all of the Agencies' nearly countless errors. For example, the technology cost and effectiveness inputs are too numerous to correct within the limited comment period. Rather, the changes made here are intended to be representative of the more glaring errors that are likely to have a strong influence on the outcomes of the analysis. Turning off the new sales model resulted in future sales being projected to remain at constant CY2017 levels; to correct this model flaw, the market input for vehicles sales was scaled to match AEO 2017 projections.[686] Otherwise, unless listed, inputs and settings remained at the default values used by the Agencies for the NPRM. Although not explicitly described in the

[686] Annual Energy Outlook 2017, Table: Light-Duty Vehicle Sales by Technology Type, Reference case, Region: United States. Available at https://www.eia.gov/outlooks/aeo/data/browser/#/?id=48-AEO2017&region=1-0&cases=ref2017&start=2015&end=2050&f=A&linechart=~ref2017-d120816a.26-48-AEO2017.1-0~ref2017-d120816a.52-48-AEO2017.1-0&map=ref2017-d120816a.5-48-AEO2017.1-0&ctype=linechart&sourcekey=0 (Accessed October 19, 2018).

documents, the CAFE Model was run setting the last credit trading year as CY2032 in order to match the results published in the NPRM and PRIA.

The following outputs illustrate the cumulative impacts of each of the improper decisions made by the Agencies. One of the primary justifications used by the Agencies to support the proposed rollback is that this policy "would save over 500 billion dollars in societal costs."[687] However, when presenting this estimate, the Agencies neglect to highlight that the proposed rollback by their own estimates would produce $360 billion in lost benefits for a net societal benefit of only $200 billion. Using some corrected and appropriate assumptions, though, Table IX-1 shows the proposed rollback will result *not* in net benefits, and instead result in $168 billion net *costs.*

Table IX-1 Partially Corrected GHG Program Societal Costs and Benefits

GHG Program Societal Costs and Benefits of a Rollback Through MY2029 ($billions) using 3 percent Discount Rate	**NPRM Table VII-51**	**Improved CARB Run**	**Difference Between CARB and Agencies**
Technology Costs	-259.8	-141.0	118.8
Pre-tax Fuel Savings	*-143.8*	*-206.0*	*-62.2*
Mobility Benefit	*-69.6*	*-32.3*	*37.3*
Refueling Benefit	*-9.4*	*-11.1*	*-1.7*
Non-Rebound Fatality Costs	-46.3	0.0	46.3
Rebound Fatality costs	-47.8	-22.2	25.6
Benefits Offsetting Rebound Fatality Costs	*-47.8*	*-22.2*	*25.6*
Non-Rebound Non-Fatal Crash Costs	-72.3	0.0	72.3
Rebound Non-Fatal Crash Costs	-74.7	-34.8	39.9
Benefits Offsetting Rebound Non-Fatal Crash Costs	*-74.7*	*-34.8*	*39.9*
Congestion and Noise	-62.5	-16.2	46.3
Energy Security Benefit	*-11.9*	*-17.6*	*-5.7*
Pollutant Damages	*-5.5*	*-57.9*	*-52.4*
TOTAL COSTS	-563.8	-215.0	348.8
TOTAL BENEFITS (in italics)	*-362.6*	*-382.0*	*-19.4*
NET BENEFITS	**200.8**	**-168.0**	**-368.8**

The bulk of this reversal stems from the inflated technology costs of the existing standards that arise for all of the reasons described in Section V. Disabling the scrappage and mass reduction models for the reasons discussed in Section VI completely eliminates all of the supposed avoided costs related to non-rebound fatal and non-fatal incidents resulting from the rollback. The only fatalities that remain are those associated with additional driving resulting from the rebound effect, which the

[687] 83 Fed.Reg. at 42,986.

Agencies themselves ascribe to individual choice and costs that should not be assigned to the proposal. With the more appropriate 10 percent rebound assumption, the fatalities associated with rebound are less than half of the Agencies' estimate, and if the calendar year adjustments discussed in Section VI.D.2.ii were applied, these fatalities would be about one-quarter of the Agencies' estimate. Similarly, combined with the rebound change, disabling the scrappage model to reduce overall fleet populations reduces the avoided congestion and noise impacts from the rollback to about one-quarter of what the Agencies claim.

Furthermore, as discussed in Section V., the Agencies' net benefits rely on manufacturers overcomplying with the rollback standards by 10 g/mi because they assume that manufacturers will continue to add some technology and increase the cost of their cars even after they are in compliance with the standards. Adjusting so that manufacturers overcomply by less than 3 g/mi – a more realistic assumption consistent with historical compliance levels – increases the additional fuel expenditures that will result from the rollback by over $60 billion, for a total of over $200 billion in lost fuel savings. As shown in Table IX-2, on a per vehicle basis, this translates to a MY2030 new vehicle buyer missing out on $2,590 in fuel savings, compared to the Agencies' underestimate of $1,830, a difference of $760 per vehicle. Importantly, while the Agencies show the reduction in vehicle price to be greater than increase in fuel costs, yielding a net benefit to the consumer, our partially corrected results show the opposite, yielding a net increase in cost of at least $1,000 per vehicle.

Table IX-2 Key Metrics from Partially Corrected CAFE Model GHG Run

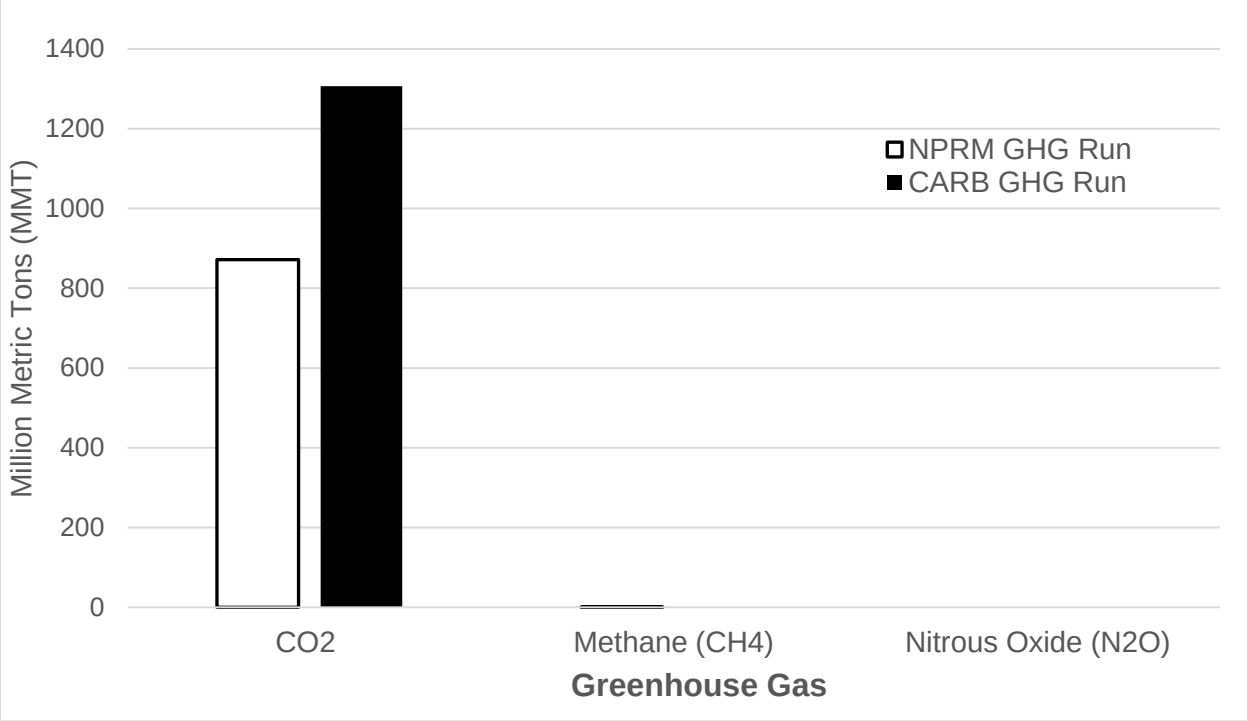
Impact of Rollback Relative to Existing Standards	**NPRM[688]**	**CARB Run**
Per Vehicle Effects for MY2030		
Average Price Decrease per Vehicle	$2,260	< $1,600
Additional Lifetime Fuel Costs per Vehicle (3 percent Discount Rate)	$1,830	$2,590
Net Consumer Impact per Vehicle	$290 benefit[689]	> $1,000 cost
Lifetime Effects for All Pre-MY2030 Vehicles		
Total Additional Lifetime Fuel Consumption for all pre-MY2030 Vehicles	79 billion gallons	118 billion gallons
Total Additional CO_2 Emissions	872 MMT	1307 MMT
Total Additional CH_4 Emissions	1,520 kMT	2,290 kMT
Total Additional N_2O Emissions	10.7 kMT	35.0 kMT
Total Additional CO Emissions	-6.0 MMT	0.1 MMT
Total Additional VOC Emissions	-140 kMT	353 kMT
Total Additional NOx Emissions	-190 kMT	169 kMT

[688] PRIA Table 3-4, p.127 for GHG emissions; PRIA Table 10-83, p. 1290 for criteria pollutant emissions; PRIA, Table 1-78, p. 92 for all others.
[689] As reported in PRIA, Table 1-78, p. 92, though when comparing the price and fuel costs, the difference is $430, which is the result using the posted R scripts.

Total Additional SO_2 Emissions	71 kMT	72 kMT
Total Additional PM Emissions	-4.4 kMT	13 kMT
Decrease in Non-Rebound Fatalities	8,350	0
Decrease in Rebound-Related Fatalities	7,300	3,385

The associated additional 118 billions of gallons of gasoline consumed under the rollback scenario by MY2017-2029 vehicles over their lifetimes (relative to the Agencies' estimate of 79 billion additional gallons) intensifies the lost energy security benefits. Finally, the additional fuel consumption increases total lifetime greenhouse gases emissions as shown in Figure IX-1. Combined with restoring the value of the social cost of carbon the pollutant damages increase ten-fold.

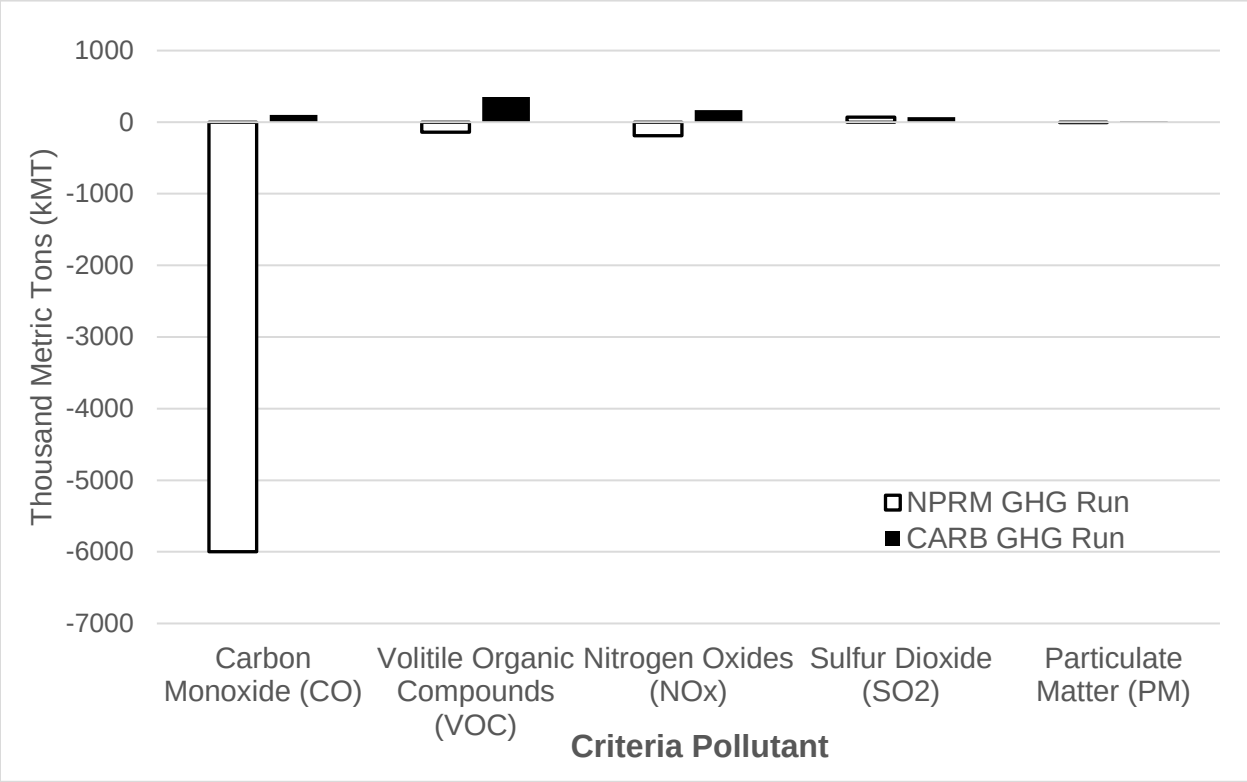
Figure IX-1: Additional lifetime greenhouse gas emissions from rollback for pre-MY2030 vehicles based on partially corrected CAFE Model GHG run



Air quality from criteria pollutant emissions are similarly influenced by this flaw. For the five summarized pollutants (CO, VOC, NOx, SO_2, and PM), the Agencies claimed the rollback standards would actually reduce cumulative emissions from four of the five (all but SO_2). However, Table IX-2 and Figure IX-2 show that, even with only a partially corrected run, the rollback standards actually cause increased emissions for all five pollutants relative to the existing standards. Part of this change is the result of the elimination of over-compliance in the rollback scenario which increases the cumulative amount of fuel needed for vehicles and, in turn, increases the 'upstream' pollutant emissions associated with extracting, refining, and delivering that fuel. The other major

factor is the disablement of the scrappage model which falsely projected a massive reduction in driving for 1977MY to 2016MY vehicles and was responsible for 65-85 percent of the total reductions in VOC, NOx, and PM emissions in the Agencies' analysis.[690] With scrappage turned off, any changes in vehicle tailpipe pollutant emissions are fairly minor relative to the upstream emissions and the explanation is simply that the production and delivery of more fuel with the rollback standards causes increased criteria pollutant emissions and directionally worsens ambient air quality.

Figure IX-2: Additional lifetime criteria pollutant emissions from rollback for pre-MY2030 vehicles based on partially corrected CAFE Model GHG run



To be clear, our analysis illustrating these corrected costs and impacts is exceedingly conservative. For example, the price decrease per vehicle from the rollback has been lowered from $2,260[691] to $1,600 with just a handful of changes to the model; if the additional errors identified in Section V that were not corrected in this run were included, the vehicle price change would be even smaller than our estimate here, which would further increase the net costs of the rollback. We corrected some of the more obvious errors, but we did not, for instance, fully account for macroeconomic damages; costs to the states (including industries and the public) for failing to comply with air quality standards, resulting in a wide range of public health consequences and regulatory needs; the full bound of climate and air quality costs; costs to global competitiveness;

[690] PRIA, Table 10-83, p. 1282.
[691] PRIA, Table 1-78, p. 92.

costs to industry from uncertainty; and so on. We also did not alter many data points embedded in the federal models, given limited time and information.

Our analysis also provides the Agencies with the benefit of the doubt that manufacturers will actually pass onto consumers any savings generated by the rollback. However, the Agencies themselves concede that "there is a known pool of technologies for improving fuel economy and reducing CO_2 emissions. Many of these technologies, when actually implemented on vehicles, can be used to improve other vehicle attributes such as ''zero to 60'' performance, towing, and hauling, etc., either instead of or in addition to improving fuel economy and reducing CO_2 emissions."[692] Should manufacturers utilize these technologies exclusively to enhance these attributes under a rollback, they would charge new vehicle buyers the same price as they would under the existing standards. As a result, the technology cost savings would be completely negated and the net costs of the rollback would increase to over $300 billion.

That the total costs are still overwhelmingly negative despite this conservative approach shows how remarkably bad the federal proposal is. It is not surprising that it could be presented only through the exceptionally misleading and convoluted analysis offered by the Agencies.

X. EPA's proposed revocation of California's waiver for its GHG and ZEV standards is unlawful.

A. Introduction

Having made a meritless case to roll back federal standards, the Agencies go further and propose to revoke California's waiver for components of its current vehicle program. EPA's proposed action to revoke California's existing waiver for the State's greenhouse gas (GHG) and zero emission vehicle (ZEV) standards for model years 2021-2025 has no basis in the text, structure, or purpose of the Clean Air Act; is entirely unsupported by evidence; contravenes congressional intent and the cooperative federalism model established by Congress; and would impermissibly interfere with California's ability to protect its people and its resources from an existential threat.

EPA proposes this unlawful action "in response to . . . a change in administration."[693] The plain text, structure, and legislative history of the Clean Air Act, all evidence Congress' intent to ensure California has broad authority and discretion to establish and administer its own vehicle emissions control program, free from the whims of changing administrations. As discussed in greater detail below, the Clean Air Act's waiver provision does not authorize EPA to revoke the already granted waiver for California's Advanced Clean Cars program, in whole or in part, on any grounds, let alone the grounds proposed here. EPA's proposed action is unlawful, and the proposal should be withdrawn.

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[692] 83 Fed.Reg. at 42991.
[693] 83 Fed.Reg. at 43,242 (internal quotations omitted).

B. Background

State efforts "designed to free from pollution the very air that people breathe clearly fall[] within the exercise of even the most traditional concept of what is compendiously known as the police power."[694] As set forth in detail in Section III of CARB's comments, California was exercising this police power with regard to vehicular emissions long before the federal government took steps to address those emissions.

Congressional recognition of the States' traditional authority to control air pollution is, in fact, a foundational and animating principle of the Clean Air Act.[695] The Clean Air Act's waiver provision—Section 209(b)(1)—exemplifies this principle by expressly preserving California's traditional police powers and its pioneering role with respect to regulating vehicle emissions.[696] Section 177, which allows other States to adopt California's waiver standards, under specified conditions, likewise reflects Congress' recognition that California is not the sole State with substantial sovereign interests in controlling vehicle emissions in ways that differ from the vehicle emission controls adopted by EPA.[697]

> *The history of congressional consideration of the California waiver provision, from its original enactment up through 1977, indicates that Congress intended the State to continue and expand its pioneering efforts at adopting and enforcing motor vehicle emission standards different from and in large measure more advanced than the corresponding federal program; in short, to act as a kind of laboratory for innovation.*[698]

And EPA itself:

> *has stated that the text, structure, and history of the California waiver provision clearly indicate both a congressional intent and appropriate EPA practice of leaving the decision on 'ambiguous and controversial matters of public policy' to California's judgment.*[699]

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[694] *Huron Portland Cement Co. v. City of Detroit*, 362 U.S. 440, 442 (1960); *see also Exxon Mobil Corp. v. EPA*, 217 F.3d 1246, 1255 (9th Cir. 2000) ("Air pollution prevention falls under the broad police powers of the states, which include the power to protect the health of citizens in the state.").
[695] *See* 42 U.S.C. § 7401(a)(3) ("[A]ir pollution prevention … and air pollution control at its source is the primary responsibility of States and local governments").
[696] *See* 42 U.S.C. § 7543(b)(1); H.R. Rep. No. 95-294 at 301 (1977) ("California was afforded special status due to that State's pioneering role in regulating automobile-related emissions, which pre-dated the Federal effort.").
[697] H.R. Rep. No. 95-294 at 309–310 (1977) (describing preemption of state vehicle emissions regulations as "interfer[ing] with legitimate police powers of States [and] prevent[ing] effective protection of public health").
[698] *Motor & Equip. Mfrs. Ass'n, Inc. v. EPA* ("*MEMA I*"), 627 F.2d 1095, 1110–11 (D.C. Cir. 1979).
[699] 74 Fed.Reg. 32,744, 32,748 (July 8, 2009) (quoting 40 Fed Reg. 23,102, 23,104 (May 28, 1975); 58 Fed.Reg. 4,166 (Jan. 13, 1993)); *see also Ford Motor Co. v. EPA*, 606 F.2d 1293, 1301 (D.C. Cir. 1979) ("[T]he statute does not provide for any probing substantive review of the California standards by federal officials.").

Congress recognized that permitting California to continue leading the way on the regulation of vehicle emissions would have benefits beyond California: "The Nation will have the benefit of California's experience with lower standards, which will require new control systems and design."[700] Congress expressly intended California standards to drive innovation in vehicle emissions control technologies—developments from which other States, and the Nation as a whole, would also benefit, as they had in the past.

Consistent with its intent to provide California broad authority to establish its own motor vehicle emissions program, Congress intentionally structured into the waiver provision a presumption that California would be granted a waiver, and intentionally limited the criteria upon which EPA could deny a waiver request.[701] Moreover, in 1977 Congress not only reaffirmed the waiver provision's intended deference to California but broadened the scope of that deference to ensure California had the "'broadest possible discretion'" to make policy decisions regarding its entire motor vehicle pollution control program.[702] At the same time, Congress also expanded the potential reach of California's waiver standards, allowing other states to adopt them.[703]

In the long history of waiver proceedings since 1967, neither EPA nor its predecessor agency has ever revoked a previously issued waiver, as EPA now proposes to do. Indeed, while EPA has occasionally partially denied a waiver request (often requiring additional lead time for, say, the first year of standards), EPA has only once denied a waiver in full, and that denial was later reversed. There is, thus, quite literally *no* precedent for the revocation action EPA proposes here.

Further, in the many decades over which EPA has characterized its role as *adjudicating* waiver requests, EPA has also never put itself in the untenable position it puts itself in here—that of being both the arbiter of California's waiver and its biggest opponent.[704]

EPA's unprecedented proposal to revoke California's waiver for its GHG and ZEV standards for model years 2021–2025 is unlawful. Despite unequivocal congressional intent and decades of administrative practice respecting California's sovereign interests and leadership in air pollution control, EPA now proposes, *sua sponte*, to withdraw a waiver it granted to California *over five years ago*. And it proposes to take this step on patently unlawful grounds—that, due to a change in administrations, a federal administrative agency now believes Section 209(b)(1) should be interpreted differently than it was when the waiver was granted.

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[700] S. Rep. No. 90-403 at 33.
[701] 42 U.S.C. § 7543(b)(1) (EPA "*shall* . . . waive" unless the Administrator makes one of three findings (emphasis added)); *see also MEMA I*, 627 F.2d at 1121 ("The language of the statute and its legislative history indicate that California's regulations, and California's determination that they comply with the statute, when presented to the Administrator are presumed to satisfy the waiver requirements.").
[702] *MEMA v. Nichols*, 142 F.3d 449, 453 (D.C. Cir. 1998) (quoting H.R. Rep. No. 95-294, at 301–02 (1977)).
[703] 42 U.S.C. § 7507 (§ 177).
[704] *See* 74 Fed.Reg. at 32,781 ("EPA has been conducting its waiver proceedings [as informal adjudications] for decades."); *MEMA I*, 627 F.2d at 1121 ("[T]he parties opposing the waiver request bear the burden of *persuading the Administrator* that the waiver request should be denied.") (emphasis added).

As discussed below, EPA has no authority to revoke a waiver. But even if it has some revocation authority, it plainly lacks the authority to revisit its prior adjudication, on which California and other States have relied for five years, simply because this administration wants to make policy changes. The notion that EPA could take such a step, under such circumstances, flies in the face of Congress's intent that *California* determine its own policies, thereby upsetting the balance of federal and state interests that Congress carefully struck; EPA's notion would also undermine another of Congress' objectives—that California regulate aggressively, and with certainty, to drive pollution control innovation for the good of the Nation. EPA's proposal is unmoored from, and directly contravenes, the statutory text and congressional intent. It is unlawful and should be withdrawn.

C. EPA lacks authority to revoke a previously granted waiver.

1. The plain text and statutory framework of the Clean Air Act establish that EPA has no authority to revoke a previously granted waiver.

Section 209(b) of the Clean Air Act only expressly authorizes EPA to consider California's requests for waivers. EPA admits there is no explicit statutory authority for the action it proposes here, arguing that its purported revocation authority "is implicit in Section 209(b)" and asserting a "judicial principle that agencies possess inherent authority to reconsider their decisions."[705] These assertions of implied or implicit authority to revoke an already granted waiver are entirely without merit.

To the extent EPA asserts that its supposed "inherent authority" to revoke is distinct from any revocation authority EPA claims is implicit in Section 209(b), that assertion fails. EPA suggests that some kind of "inherent authority" is supported by case law).[706, 707] But those cases are inapposite because none of them involved the type of action EPA proposes here—the retrospective application of a new interpretation of a statute to a five-year-old decision the agency itself described as adjudicatory.[708] *Chevron USA, Inc. v. NRDC, Inc.*[709] and *National Cable & Telecommunications Ass'n v. Brand X*

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[705] 83 Fed.Reg. at 43,242.
[706] *Id.*
[707] EPA appears to suggest, in a footnote, that several previous statements by EPA "not[ing] the authority to 'withdraw a waiver in the future if circumstances make such action appropriate'" support EPA's claim to "inherent authority to reconsider." 83 Fed.Reg. at 43,242 n.564. EPA's prior statements, which are based on the same single statement in the 1967 legislative history on which EPA relies here, do not establish such authority. Indeed, the absence of any other support for those statements, combined with the fact that EPA has never revoked any of the more than 50 waivers it has granted over the course of more than 40 years, underscores that EPA's prior statements about its hypothetical authority are essentially a form of dicta, unworthy of any weight or deference.
[708] 74 Fed.Reg. at 32,781 ("EPA believes that its waiver proceedings and actions therein should be considered an informal adjudication rather than a rulemaking. EPA has been conducting its waiver proceedings in this manner for decades, and while Congress has amended provisions in § 209 on two separate occasions, Congress has not chosen to alter EPA's administrative requirements. Instead, Congress has expressed support for EPA's practice in applying and interpreting § 209(b).").
[709] 467 U.S. 837, 863 (1984).

Internet Services[710] involved rulemakings announcing prospective changes in agency interpretations, while *FCC v. Fox Television Stations, Inc.*[711] involved application of a previously announced statutory interpretation to actions that contravened that interpretation. Further, while some cases may have described non-express powers of agencies "as inherent, the more accurate label is statutorily implicit."[712] "As a creature of statute[,] [EPA] has only those powers conferred upon it by Congress."[713] Thus, EPA may only take its proposed action "if some provision or provisions of the Act explicitly or implicitly grant it power to do so."[714] The lawfulness of EPA's proposed revocation, then, turns on whether, as EPA claims, Section 209(b) contains an implicit authorization to revoke an already granted waiver. It does not.[715]

Contrary to EPA's conclusory statements, the existence of explicit authority to grant a waiver does not, by itself, automatically imply authority to revoke a previously granted waiver. Rather, statutory language, structure, and context determine whether explicit authority to take an action provides implicit authority to reverse that action.[716]

EPA has not advanced a theory that supports its purported implied authority to revoke. That, alone, suffices to render the proposed action here unlawful. Nor can EPA advance such a theory, for the first time, in a final revocation action here.

In fact, no such theory is available. The unique text and structure of the waiver provision unambiguously forecloses EPA's argument that this provision encompasses implicit authority to revoke a granted waiver. The text plainly contemplates EPA's consideration of a request from California. And with its use of the mandatory term "shall" and the limited bases for denial, the waiver provision establishes a strong presumption that California's requests will be granted.[717] Accordingly, EPA has long read Section 209(b) as providing it with "considerably narrower" discretion to deny a waiver than it has to take other actions in other contexts.[718] The unique text and structure of this section *limits* EPA's authority, contrary to EPA's assertion of open-ended revocation authority in the proposal.

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[710] 545 U.S. 967, 981 (2005).
[711] 556 U.S. 502, 515 (2009).
[712] *HTH Corp. v. N.L.R.B.*, 823 F.3d 668, 679 (D.C. Cir. 2016) (internal quotation omitted).
[713] *Id.*
[714] *Id.*
[715] Although it is not clear from the conclusory text (in a footnote), EPA may also believe that authority to reconsider a denial of a waiver request implies authority to revoke a waiver grant. 83 Fed.Reg. at 43,242 n.564. EPA makes no definitive statement to this effect nor provides any basis for this possible belief. *Id.* It may not, therefore, finalize any such finding or interpretation in the final rule.
[716] *E.g.*, *United States v. Seatrain Lines*, 329 U.S. 424, 432–33 (1947) (rejecting agency's authority to revoke previously granted certificates of public convenience and necessity, based on consideration of statutory text and structure as well as factual context); *HTH Corp.*, 823 F.3d at 679–80 (rejecting implied authority argument based on "contextual concerns").
[717] *MEMA I*, 627 F.2d at 1121.
[718] 40 Fed.Reg. at 23,103.

In fact, the text expressly establishes a congressionally-crafted balance between state and federal powers, one that preserves California's inherent police power while authorizing a narrow and deferential review by EPA. By design, "the statute does not provide for any probing substantive review of the California standards by federal officials." Congress expressly tilted the balance heavily in favor of California's discretion here, not EPA's. And the waiver provision cannot be read as authorizing EPA to upend that balance by pulling the rug out from under California's existing state program at any time of its choosing. If Congress must make its intent "unmistakably clear" when Congress itself seeks "to alter the usual constitutional balance between the States and the federal Government," Congress would need to be even more clear, if it wanted an *administrative agency* to have authority to intrude on a State's authorized exercise of its congressionally-recognized police power.[719]

The improper intrusion on California's sovereignty inherent in implied revocation authority is further apparent from the nature of the waiver criteria themselves. Under Section 209(b)(1), EPA deferentially reviews California's determinations that it has designed its regulatory program to be at least as protective as the federal program and to address "compelling and extraordinary conditions" in the State. California's decisions concerning how best to respond to conditions in the State—how best to protect the State's people and resources—are at the core of its state police power.[720] Ongoing review of such decisions by a federal administrative agency would be extraordinary and should not be implied into federal law.[721] Indeed, there is no way to reconcile that ongoing review with Congress' express intent that EPA not second-guess California's policy judgments.[722] The waiver provision cannot be read as authorizing this intrusion on California's sovereignty, and certainly cannot be read as *implicitly* doing so.

Finally, Section 177 underscores the absence of any implied revocation authority in Section 209(b). Section 177 allows other States to adopt California's waiver standards, if those States choose to do so and meet specified criteria. Section 177 unambiguously reflects Congress' concern that the blanket preemption in Section 209(a) "interfere[d] with legitimate police powers of States, prevent[ing] effective protection of public health."[723] EPA's proposal assumes, albeit implicitly, that Congress expressly permitted multiple other States to escape federal preemption by adopting California's waiver standards while simultaneously leaving the door open for EPA to retroactively pull the

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[719] *See Gregory v. Ashydrocarbonroft*, 501 U.S. 452, 460-61 (internal quotations omitted); *see also Murphy v. Nat'l Collegiate Athletic Ass'n*, 138 S. Ct. 1461, 1477 (2018) ("[A] healthy balance of power between the States and the Federal Government [reduces] the risk of tyranny and abuse from either front." (internal quotation omitted)).
[720] *Huron Portland Cement*, 362 U.S. at 442.
[721] *See Rice v. Santa Fe Elevator Corp*., 331 U.S. 218, 230 (1947) (requiring 'clear and manifest purpose" to preempt "historic police powers of the States"); MEMA I, 627 F.2d at 1119 ("The EPA Administrator does not have authority to regulate … the State of California under a broad charter to advance the public interest.").
[722] *See MEMA I*, 627 F.2d at 1122 ("[Congress intended] to provide California with the broadest possible discretion in setting regulations *it* finds protective of the public health and welfare.") (emphasis added).
[723] H.R. Rep. No. 95-294 at 309.

rug out from under California and those other States. This assumption begs credulity, to say the least.[724]

Interpreting Section 209(b) as impliedly authorizing EPA to retroactively preempt state standards after previously waiving preemption also disregards the substantial reliance interests of California and the Section 177 States—reliance interests that begin developing when the waiver is granted and that only grow stronger as the States make more and more decisions based on the existence of the waiver standards. "It would be arbitrary or capricious to ignore" *private parties'* reliance interests when changing an agency rule prospectively.[725] Congress should not be presumed to have ignored *States'* reliance interests, by impliedly authorizing an agency's retroactive revocation of a waiver intended to allow the States to reduce dangerous air pollution. The Clean Air Act should not be read as disregarding such reliance interests and authorizing preemptive action after preemption was waived: "Where coordinate state and federal efforts exist within a complementary administrative framework, and in the pursuit of common purposes, the case for federal pre-emption becomes a less persuasive one."[726]

In fact, once EPA grants a waiver, California (and Section 177 States) incurs regulatory costs in reliance on that decision to implement the program. Perhaps more significantly, the States make decisions about other regulatory actions to take (or not take) based on expectations of emission reductions the waiver standards will produce. For example, and relevant here, California's Legislature has established an aggressive GHG emissions reduction target for 2030.[727] Meeting this target requires a multi-pronged approach demanding GHG emissions reductions from various sectors, including the transportation sector, which is the largest contributor to California's GHG emissions.[728] California's Advanced Clean Cars program, including the State's GHG and ZEV standards, is a crucial part of the State's multi-pronged approach, and California has made, and is continuing to make, decisions about other regulatory actions in reliance on the emissions reductions the Advanced Clean Cars program will produce.[729] A revocation of the waiver for the GHG and ZEV standards will undermine the basis of California's planning for its emission reduction goals, infringing on the State's core police power and ability to protect its citizens. If finalized, EPA's waiver revocation may also force California to strengthen other GHG-reducing programs, making those programs more costly.

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[724] *See* H.R. Rep. No. 95-294 at 213 ("[California waiver] standards may be implemented and enforced [by § 177 States], notwithstanding any provision of § 209 of the present act.").
[725] *Fox Television*, 556 U.S. at 515.
[726] *New York State Dep't of Soc. Servs. v. Dublino*, 413 U.S. 405, 421 (1973).
[727] Cal. Health & Safety Code § 38566.
[728] CARB, California's 2017 Climate Change Scoping Plan (Nov. 2017) at ES-4 (and throughout).
[729] *See, e.g.*, *id.* at 22, 28.

There is no basis in the plain text and structure of Sections 209(b) and 177 to support EPA's claim of implied authority to revoke an already granted waiver.

2. Legislative history confirms the absence of authority to revoke.

Implicitly acknowledging the absence of any support in the statutory text or structure for its purportedly implied revocation authority, EPA relies on a single statement in a 1967 Senate Report as its sole support.[730] But the legislative history supports the unambiguous absence of revocation authority.

First, the statement upon which EPA relies says only that a waiver might be withdrawn if "the State of California no longer complies with the conditions of the waiver."[731] The reference to the State's compliance suggests a concern that California might conduct itself in a way contrary to "the conditions of the waiver"—for example, that it might not enforce its standards in accord with the waiver. The preceding paragraph of the committee report, in fact, suggests this kind of concern.[732] This statement does not, then, express an intention that EPA have the authority to continually revisit its determination that California's waiver application met the statutory criteria.

Second, the existence of implicit revocation authority was unclear to at least one member of the House.[733]

Third, the very notion of implied authority to revoke is inconsistent with congressional objectives that were regularly expressed in the lengthy legislative history from 1967. Congress expressly intended that California continue its role as a pioneer, driving the development and implementation of pollution control technology for the benefit of Californians and, eventually, all Americans.[734] The uncertainty created by the existence of revocation authority could undermine California's ability to achieve Congress' technology-forcing objectives.[735] For example, if manufacturers knew that EPA could revoke an already granted waiver, they could have perverse incentives to reduce their efforts to comply so that they could later seek revocation of the waiver, arguing that California's standards have proven infeasible. This is not the scheme Congress designed.

And, finally, EPA's sole quotation from the 1967 legislative history ignores the actions Congress took ten years later. In 1977, Congress amended the waiver provision, adopting the text in effect today, and adding Section 177 to authorize certain other

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[730] 83 Fed.Reg. at 43,242 (quoting S. Rep. No. 50-403, at 34 (1967)).
[731] S. Rep. No. 50-403, at 34.
[732] *Id.*
[733] 113 Cong. Rec. H30951 (daily ed. Nov. 2, 1967) (statement of Cong. Herlong) (asking "[W]ould the Secretary be able to withdraw the exemption once it has been granted? In short, once the exemption has been granted, does it exist in perpetuity or until the statute is changed by the Congress?").
[734] *See, e.g.*, S. Rep. No. 90-403 at 32-33.
[735] *See Am. Methyl Corp. v. E.P.A.*, 749 F.2d 826, 840 (D.C. Cir. 1984) (noting that authority to revoke a fuels waiver would create market uncertainty and "the public and this nation would suffer from lack of innovation in fuels and fuel additives, to the ultimate detriment of air quality").

States to adopt California waiver standards. Although by that point EPA (and its predecessor agency) had issued numerous waivers, Congress made no mention of the possibility of revocation or of any implied authority to revoke an already granted waiver. This is noteworthy because the 1977 amendments to Section 209 were expressly intended "to ratify and strengthen" the waiver provision and to "afford California the broadest possible discretion" to design and implement its own standards.[736] In ratifying the waiver provision, Congress noted that EPA had been "liberally constru[ing] the waiver provision so as to permit California to proceed with its own regulatory program." *Id.* Congress' intent that California continue with its pioneering program, under a waiver provision liberally construed to support that intent, cannot be reconciled with EPA's notion that Congress intended it to be able to upset California's program in the middle of a period covered by an already granted waiver.

Congress' expansion of the potential reach of California's waiver standards to the Section 177 States underscores the point. EPA has no explanation for why Section 209(b) should be read as impliedly authorizing it to upset California's and other States' settled expectations that they may implement protective standards pursuant to a previously granted waiver. Indeed, in this very proposal, EPA concedes that the path to unraveling the Section 177 States' reliance on California's waiver standards, including the inclusion of those standards in approved State Implementation Plans (SIPs), is uncertain[737] confirming that this is a complex problem involving important state and federal interests as well as other provisions of the Clean Air Act. If Congress intended EPA to have the implied authority it proposes to assert here, Congress would have at least discussed, and probably expressly provided for, a waiver revocation process. The absence of any reference to implied revocation authority in the 1977 legislative history speaks volumes.

The legislative history undermines, rather than supports, EPA's claim that one statement in 1967 establishes an implied authority to revoke in Section 209(b). EPA's assertion of implied authority unambiguously contravenes the statute and congressional intent.[738] EPA's proposed revocation is unlawful.

D. If EPA has any implicit authority to revoke waivers, that authority is very limited, and the conditions for it do not exist here.

Even if Section 209(b) could be read as providing EPA with some implied authority to revoke an already granted waiver, that authority would have to be very limited in scope for the same reasons discussed above. The presumption in favor of California receiving

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[736] H.R. Rep. No. 95-294, 301–02 (1977).
[737] 83 Fed.Reg. at 43,244.
[738] EPA has not suggested that the *Chevron* framework could apply to its claim of implied authority and, in any event, points to no specific text it is interpreting as supporting that claim. If *Chevron*'s framework did apply, EPA's interpretation regarding its authority would fail at step one and would also be unreasonable at step two. *See Bates v. Dow Agrosciences LLC*, 544 U.S. 431, 449(2005)("[Court has] a duty to accept the reading that disfavors preemption.").

a waiver, the express preservation of sovereign police power interests, the limited and deferential-to-California nature of EPA's review, the carefully balanced state and national interests, the States' reliance interests, and congressional intent that California continue driving the development of additional pollution control technology (an objective which requires regulatory certainty) all counsel in favor of strictly limited authority to revoke, if any such authority exists at all. Relevant case law and legal principles, none of which EPA addresses, also support strict limits on any revocation authority. EPA's proposal to revoke California's waiver for its GHG and ZEV standards is unlawful because the basis for that revocation falls far outside the bounds of any limited, implied authority that could even conceivably exist.

Indeed, the bases for EPA's proposed revocation are the agency's reinterpretations of Sections 209(b)(1)(B) and (C)[739] and NHTSA's proposal to interpret EPCA as preempting California's GHG and ZEV standards. Even if these reinterpretations were permissible (and they are not), they could not be retroactively applied to a decision made five years ago upon which California, other States, and private parties have considerably relied. Further, while EPA claims to have evidence to support its proposed revocation, EPA fails to identify this evidence and, more importantly, articulates no rationale that could support revoking a waiver simply because the agency now views the facts differently than it did five years ago. There is no basis for the proposed revocation, and it should be withdrawn.

1. EPA's proposed revocation is unlawfully premised on the agency's reinterpretation of the law.

One significant limitation on EPA's authority, if any, to revoke a previously granted waiver is that any such revocation cannot be based on an agency's new interpretations of the law. This limit is grounded in several well-established principles, none of which EPA even mentions.

First, EPA has consistently characterized its waiver decisions as adjudicatory. When it acts in an adjudicatory capacity, an agency's authority to reconsider may be analogized to that of courts, which retain authority to "correct judgments which contain clerical errors of judgments which have issued due to inadvertence or mistake."[740] But any "power to correct inadvertent ministerial errors may not be used as a guise for changing previous decisions because the wisdom of those decisions appears doubtful in the light of changing policies."[741] Courts have repeatedly applied this principle to reject the Agencies' assertion of authority to reopen final adjudicatory decisions due to changes in

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[739] While EPA occasionally references § 209(b)(1)(A) (*see* 83 Fed.Reg. at 43,240, 43,242, 43,243), the proposal expressly discusses only §§ 209(b)(1)(B) and (C). EPA cannot, therefore, lawfully finalize any decision with respect to § 209(b)(1)(A), as it has not actually proposed any such action.
[740] *Am. Trucking Ass'ns v. Frisco Transp. Co.*, 385 U.S. 133, 145 (1958).
[741] *Id.* at 146.

agency policy.[742] Where the "only basis for reversal of its prior decision is that, after some . . . years of elapsed time . . . , [the agency] has adopted a different policy, and therefore seeks to apply retroactively its new policy," courts reject such attempted reversals to avoid the "chaos and uncertainty" that would otherwise result for "those who must rely on [the agency's] findings."[743] EPA cites no precedent to the contrary. Indeed, EPA does not even acknowledge this line of cases or this constraint on any authority it might have to revoke California's waiver.

Second, regardless of whether waiver decisions are adjudicatory, agencies may not give their new statutory interpretations "retroactive effect unless [the statutory] language requires this result."[744] Application of a new law, or new legal interpretation, is "retroactive if it takes away or impairs vested rights acquired under existing law."[745] EPA itself has characterized waiver grants as "directly determin[ing]" the "legal rights … of the State of California to adopt and enforce its state regulations."[746] Application of the agency's changing legal interpretations to already granted waivers would impermissibly and retroactively unsettle this determination. And it is difficult to imagine a right more "vested" than that of a sovereign State to enforce its own laws. The unfairness of undermining a State's ability to do so—and the reversal of settled expectations that it may do so—underscores that EPA lacks any authority to revoke a previously granted waiver based on a change in the agency's view of the law.[747]

Third, the notion that EPA could revoke a waiver based on its reinterpretation of the law flies in the face of the legislative history of the waiver provision. Congress intended specifically to preserve California's authority to develop and enforce its separate motor vehicle emissions control program and to do so in a way that would permit California to continue its pioneering, technology-forcing role. It did not intend to subject the unique authority it preserved for California —and the technology-forcing incentives created by California standards—to the whims of changing policies resulting from turnover in presidential administrations.[748] The text of Section 209(b) must be read "consistent with the congressional intent to provide California with the broadest possible discretion in adopting and attempting to enforce emissions standards."[749] Congress did not intend to provide EPA with the "standardless and open-ended authority to revoke waivers"—the

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[742] *See, e.g.*, *Consol. Rail Corp. v. Surface Transp. Bd.*, 93 F.3d 793, 801 (D.C. Cir. 1996); *Coteau Properties Co. v. Dep't of Interior*, 53 F.3d 1466, 1479 (8th Cir. 1995).
[743] *Upjohn Co. v. Penn. R. Co.*, 381 F.2d 4, 5 (6th Cir. 1967).
[744] *See Bowen v. Georgetown Univ. Hosp.*, 488 U.S. 204, 208 (1988).
[745] *Ass'n of Accredited Cosmetology Sch. v. Alexander*, 979 F.2d 859, 864 (D.C. Cir. 1992) (internal quotation omitted).
[746] 74 Fed.Reg. at 32,781.
[747] *Landgraf v. USI Film Prod.*, 511 U.S. 244, 270 (1994) ("The presumption against statutory retroactivity has consistently been explained by reference to the unfairness of imposing new burdens on persons after the fact.").
[748] *E.g.*, H.R. Rep. No. 95-294 at 301 (1977) ("In general, the Environmental Protection Agency has liberally construed the waiver provision so as to permit California to proceed with its own regulatory program in accordance with the intent of the 1967 Act.").
[749] *MEMA I*, 627 F.2d at 1113.

ability to make up new standards and retroactively apply them to waiver decisions years after those decisions became final.[750] In fact, changes in *federal* policy should be largely irrelevant to California's waiver requests, since, by design, Congress left policy judgments for California's standards *to California*.[751] ("[T]here are overwhelming indications in the legislative history that Congress intended California to enjoy the broadest possible discretion in selecting a complete program of emissions control.").

Fourth, waiver decisions were designed to be primarily factual determinations, as evidenced by the waiver criteria, which include questions of relative stringency and technological feasibility.[752]

If EPA may revoke a waiver at all, it may not do so based on a retroactive application of its decision to change its interpretation of the law. Nor may EPA revoke a previously granted waiver based on NHTSA's reinterpretation of EPCA. This limiting principle alone renders the entire waiver revocation proposal unlawful because EPA and NHTSA's proposed reinterpretations are the foundational premise for the proposal.

2. The other bases EPA asserts also provide no lawful support for the proposed revocation.

EPA's purported factual bases for the proposed revocation likewise cannot support the proposed action. As explained below, all of the purported factual bases are tied to improper reinterpretations of the law that cannot be applied to California's already granted waiver. In addition, while EPA claims it has "clear and compelling evidence" that supports its proposed revocation, it points to no such evidence, as discussed in more detail below.[753] In any event, EPA cannot revoke an already granted waiver simply because the Agency thinks the facts have changed, and EPA points to no authority indicating that it could.[754] Further, EPA does not acknowledge the substantial state reliance interests that are implicated by its proposed action, let alone explain why, if there could be a factual basis for revocation, the standard of proof would not be elevated beyond clear and compelling, given that "the nature of the risk of error involved" is enormous.[755] Finally, EPA does not even attempt to explain how its proposed revocation could be construed as "timely" under any understanding of that term, although reopening of such decisions, when allowed at all, must be done within a "reasonable time period."[756]

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[750] *See Am. Methyl Corp.*, 749 F.2d at 834.
[751] *MEMA I*, 627 F.2d at 1108 n.22.
[752] *See* 42 U.S.C. § 7543(b)(1); *see also MEMA I*, 627 F.2d at 1121 (noting that Administrator "'is required to waive application unless he finds'" one of the *factual* circumstances set out in § 209(b)(1)(A)-(C)") (quoting S. Rep. No. 90-403, 90th Cong., 1st Sess. 33 (1967)).
[753] *See* 83 Fed.Reg. at 43,244.
[754] *See also Am. Trucking Ass'ns*, 385 U.S. at 145.
[755] *See MEMA I*, 627 F.2d at 1122.
[756] *See Dun & Bradstreet Corp. Found. v. U.S. Postal Serv.*, 946 F.2d 189, 193 (2d Cir. 1991) (questioning whether reconsideration within 81 work days was reasonable); *see also Am. Methyl Corp.*, 749 F.2d at 835 (construing judicial review period as measure of reasonableness).

EPA's assertion of broad revocation authority is plainly erroneous and unlawful, and, as discussed in the following sections, the proposed revocation also lacks any basis in law or fact.

E. Any limited authority to revoke California's waiver must also follow a lawful and adequate process, but EPA has not done so.

The process EPA has followed in proposing the revocation of parts of California's Advanced Clean Cars waiver is unmoored from any statutory authority, prevents adequate comment, and disregards the very sovereign state interests that Congress expressly sought to protect when it enacted Section 209(b). EPA's process, therefore, is unlawful and provides an independent ground on which the proposal should be withdrawn.

As previously discussed, the Clean Air Act does not expressly contain any text establishing EPA's ability to revoke an already granted waiver. Even assuming EPA has some limited revocation authority, it must exercise that authority through a process that reflects Section 209(b)'s text and purpose. However, EPA is proposing to revoke a waiver granted more than five years ago and to do so by simultaneously taking on the role of California's adversary and the arbiter of the controversy, which is entirely inconsistent with California's "entitlement to a tribunal graced by an unbiased adjudicator . . . in administrative proceedings."[757] EPA has also provided only a 63-day comment period, during which it also sought comments on EPA's proposal to rollback the federal GHG standards and on NHTSA's proposals to rollback its fuel economy standards and to find California's GHG and ZEV standards preempted under EPCA. This plainly inadequate comment period prevents, rather than fosters, public comment.

The above mentioned procedural inadequacies especially impact California because the waiver provision was expressly designed to *respect and preserve* California's sovereign police power and its policy judgments. Forcing the State to respond to this unprecedented attack on those very interests in an incredibly short period of time and without opportunity to develop and submit a full response is plainly arbitrary and capricious and unlawful. It also improperly seeks to place the burden on California to show that it remains entitled to a waiver it was granted more than five years ago. That contravenes the statute and congressional intent: "Congress specifically declined to adopt a provision which would have imposed on California the burden to demonstrate that it met the waiver requirements."[758]

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[757] *See Doraiswamy v. Sec'y of Labor*, 555 F.2d 832, 843 (D.C. Cir. 1976).
[758] *MEMA I*, 627 F.2d at 1121.

F. EPA's proposed conclusion that it must withdraw California's waiver is unfounded and unlawful.

EPA contends that "if NHTSA finalizes a determination that California's GHG and ZEV standards are preempted, then it would be necessary to withdraw the waiver separate and apart from the analysis under section 209(b)(1)(B), (C)."[759] This proposed conclusion is unlawful.

First, NHTSA's proposed determination is, itself, unlawful. California's waiver standards, including its GHG and ZEV standards, are not preempted by EPCA, and NHTSA has no authority to declare otherwise, as explained in section XI of CARB's Comments.

Second, as discussed above, EPA cannot revoke an already granted waiver based on a change in legal interpretation. Whatever conclusion NHTSA might reach about EPCA, and whatever EPA may think of that conclusion, it is irrelevant to waivers already granted, including all parts of California's Advanced Clean Cars waiver.

Third, as EPA concedes, it "has historically declined to consider as part of the waiver process whether California standards are constitutional or otherwise legal under other federal statutes apart from the Clean Air Act."[760] EPA has not justified its departure from this traditional understanding or explained how this departure could be consistent with congressional intent. EPA's mere statement that its proposal presents a "unique situation"[761] is insufficient to support such a move or to explain the agency's about-face on the scope of its waiver analysis.

Fourth, although EPA "proposes to interpret section 209(b)(1) to only authorize it to waive Clean Air Act preemption for standards that are not independently preempted by EPCA," it does not identify the text it is interpreting in this way.[762] It is impossible to respond meaningfully, in comments, to this statement because it is entirely unclear what text EPA is purporting to interpret, let alone what the rationale is for the interpretation. EPA may not lawfully finalize a new interpretation of statutory text without first explaining, and taking comment on, the textual source and rationale for that interpretation.

Finally, a conclusion by another agency regarding preemption does not and may not dictate EPA's actions. EPA has conducted no independent analysis to justify either concluding that EPCA preempts California's standards or to justify adopting NHTSA's analysis. This is particularly noteworthy given that the two courts to address this very

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[759] 83 Fed.Reg. at 43,240.
[760] *Id.*; *see also* 74 Fed.Reg. at 32,747 (relying on 36 Fed.Reg. 17,458 (Aug. 31, 1971)).
[761] 83 Fed.Reg. at 43,240.
[762] *Id.* at 43,244.

question disagree with NHTSA's proposed action.[763] To revoke California's waiver based on NHTSA's analysis would be an abdication of EPA's responsibility. "[A]n agency literally has no power to act, let alone pre-empt the validly enacted legislation of a sovereign State, unless and until Congress confers power upon it."[764] EPA "is not empowered to administer [EPCA]."[765] EPA has "no legal authority" to decide the preemptive effect of EPCA or NHTSA's regulations.[766] Consequently, any statements by EPA regarding the scope of EPCA's preemption provision can be "nothing more than" general statements of policy with no legal effect—including the legal effect of revoking an already granted waiver.[767]

G. EPA's proposed findings under Section 209(b)(1)(B) are unlawful.

EPA's proposed findings that California does not need its GHG and ZEV standards to meet compelling and extraordinary conditions solely rely on a proposed reinterpretation of Section 209(b)(1)(B).[768] As discussed above, revocation of a previously granted waiver may not be based on an agency's new view of the law.[769] EPA's proposed interpretation is also unlawful, underscoring the absence of any basis for revocation.

1. EPA's proposed interpretation of "such State standards" in Section 209(b)(1)(B) is unambiguously foreclosed and unreasonable.

a. EPA's proposed interpretation is an unjustified departure from EPA's traditional interpretation.

For more than 30 years, EPA "has traditionally interpreted [Section 209(b)(1)(B) of the Clean Air Act] as requiring a consideration of whether California needs a *separate motor vehicle program* to meet compelling and extraordinary conditions."[770] And EPA has consistently maintained this "whole motor vehicle program" interpretation despite repeated requests to adopt an interpretation like the one it now proposes—one where, for certain pollutants, EPA would consider California's need for a particular standard rather than for its motor vehicle program as a whole.[771]

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[763] *Cent. Valley Chrysler-Jeep, Inc. v. Goldstene*, 529 F. Supp. 2d 1151, 1153 (E.D. Cal. 2007); *Green Mountain Chrysler Plymouth Dodge Jeep v. Crombie*, 508 F. Supp. 2d 295, 305 (D. Vt. 2007).
[764] *Louisiana Pub. Serv. Comm'n v. F.C.C.*, 476 U.S. 355, 374 (1986).
[765] *See Nat'l Park Hospitality Ass'n v. Dept. of Interior*, 538 U.S. 803, 809 (2003).
[766] *See American Tort Reform Ass'n v. OSHA*, 738 F.3d 387, 393 (D.C. Cir. 2013).
[767] *See Nat'l Park Hospitality Ass'n*, 538 U.S. at 809.
[768] EPA has not proposed to find that the waiver should be revoked based on the agency's historical interpretation of § 209(b)(1)(B)—the one EPA applied in 2013 when it granted the ACC waiver—and, therefore, may not make such a finding in its final action.
[769] EPA suggests that this 1984 decision can be explained by what EPA characterizes as Congress' intent to "allow[] California to adopt less stringent CO standards at the same time when California wanted to adopt NOx standards that were tighter than the Federal NOx standards." 83 Fed.Reg. at 43,247. This narrow reading of congressional intent does not explain this decision, which concerned a pollutant—particulate matter—wholly distinct from CO and NOx.
[770] 78 Fed.Reg. at 2125 (emphasis added); *see* 49 Fed.Reg. at 18,887; 78 Fed.Reg. at 2131.
[771] *See* 49 Fed.Reg. at 18,887 (rejecting argument that determination under § 209(b)(1)(B) should be specific to the pollutant at issue rather than based on "California's continued need for its own mobile source emissions control program."); *see also* 44 Fed.Reg. 38,660, 38,661 (July 2, 1979); 74 Fed.Reg. at 32,760-762.

In fact, EPA has only departed from this traditional interpretation once in the decades since the waiver provision was enacted, and only for a brief time.[772] EPA reverted to its traditional interpretation because that "is the most straightforward reading of the text and legislative history of section 209(b)."[773]

EPA now proposes to interpret the phrase "such State standards" as referring to California's whole program for "local" or "regional" pollutants, but to individual standards for "global" pollutants. This interpretation is unambiguously prohibited and unreasonable, as described below.

EPA acknowledges that this interpretation constitutes a departure from its historic "whole program" interpretation, and obliquely acknowledges this is also a departure from EPA's long-standing position that a pollutant-specific reading of Section 209(b)(1)(B) is impermissible.[774] EPA further acknowledges that it "is required to articulate a reasoned basis for the changes in its positions."[775] However, despite citing to the case that describes this requirement, EPA does not acknowledge that its justification must be "more detailed than what would suffice for a new policy created on a blank slate" because EPA's "prior policy has engendered serious reliance that must be taken into account."[776] As described above, California and other States have made numerous substantial policy and regulatory design decisions in reliance on their ability to implement and enforce the standards for which California received a waiver more than five years ago. EPA never mentions these interests, nor explains why its proposed interpretation of Section 209(b)(1)(B) is so important that it must be applied, retroactively, to a five-year-old decision, thereby undermining serious reliance interests of sovereign States. "[T]o ignore such matters" is "arbitrary and capricious."[777]

EPA attempts to justify its change in policy by stating, "a review of the grant of the 2016 Draft TAR program waiver and the agency reasoning underpinning the grant are appropriate at this time," because CARB supposedly asserted in its request for the 2016 Draft TAR waiver that the ZEV standards in the Advanced Clean Cars program produce no criteria emissions benefits.[778] This statement underscores that EPA is overstepping its statutory role here—undertaking a *sua sponte* review, because of a change in administrations, as though California's waiver request may be picked up and scrutinized anew, five years after it was granted and based on statements allegedly made six years ago when the request was submitted. . This is an absurd reading of Section 209(b) and cannot justify EPA's further reinterpretation of the statute or its reconsideration of a five-year-old decision. Further, EPA mischaracterizes CARB's waiver request, which as discussed below, described criteria emissions benefits attributable to its ZEV program. Finally, EPA's statement directly contradicts the agency's findings in 2016 when it approved inclusion of the ZEV standards in California's SIP. Just two years ago, EPA

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[772] *See* 73 Fed.Reg. 12,156 (March 6, 2008); 74 Fed.Reg. 32,744 (July 8, 2009).
[773] 74 Fed.Reg. at 32,761.
[774] 83 Fed.Reg. at 43,241.
[775] *Id.* at 43,245
[776] *Fox Television*, 556 U.S. 515.
[777] *Id.*
[778] 83 Fed.Reg. at 43,248.

found that the ZEV standards are "enforceable emission limitations and other control measures" and "support the various RFP [reasonable further progress], attainment, and maintenance plans" related to criteria pollution.[779] EPA has not acknowledged that it approved the ZEV standards into California's SIP, let alone explained how the action it proposes here could possibly be consistent with that approval.

EPA also attempts to justify its changed interpretation of Section 209(b)(1)(B) by contending that "an agency must consider the wisdom of its policy on a continuing basis," particularly "in response to . . . a change in administration."[780] But EPA provides no justification for applying that change in policy *retroactively* to upend a five-year-old decision to which substantial reliance interests have attached.

Finally, rather than justifying its departure from its traditional interpretation, EPA itself asserts that its traditional interpretation remains reasonable.[781] There is accordingly no justification for EPA's departure from this admittedly reasonable interpretation in order to upend a five-year-old waiver grant upon which considerable reliance interests now rest.

b. EPA's interpretation of "such State standards" under Section 209(b)(1)(B) as varying for different pollutants is unambiguously foreclosed and unreasonable.

EPA's reinterpretation reads the scope of "such State standards" differently for different pollutants, permitting EPA to consider California's *whole program* for "local or regional air pollution problems" and only individual emission standards for "globally distributed air pollutant[s]." This pollutant-specific interpretation is logically incoherent and also entirely at odds with EPA's previous position, *restated in this same proposal*, that it would be "inconsistent" with congressional intent and the text of Section 209(b) for "EPA to look at each air pollutant separately for purposes of determining compelling and extraordinary conditions."[782] Nothing in the statute's text or legislative history gives EPA authority to review California's standards differently, based on the pollutant at issue. EPA has previously recognized that "Congress did not use [the Section 209(b)(1)(B)] criterion to limit California's discretion to a certain category of air pollution problems."[783] Yet, EPA now proposes to diverge from its prior interpretation of Section 209(b)(1)(B) without justification. EPA's conclusory statement that it is "appropriate" to examine California's "program as a whole" for criteria pollutants while simultaneously examining the GHG standards individually is notably not a justification.[784]

EPA's longstanding interpretation was correct. EPA may not apply a different interpretation of "such State standards" when it is considering GHGs and when it is

[779] 80 Fed.Reg. 69,915, 69,924 (Nov. 12, 2015) (proposed); 81 Fed.Reg. 39,42 (June 16, 2016) (final).
[780] 83 Fed.Reg. at 43,248 (internal quotations omitted).
[781] *Id.* at 43,246 (listing traditional whole program interpretation as one of three reasonable interpretations).
[782] 83 Fed.Reg. at 43,247.
[783] 78 Fed.Reg. at 2,131.
[784] 83 Fed.Reg. at 43,247.

considering criteria pollutants.[785] Further, as the Clean Air Act thoroughly demonstrates, Congress knows how to indicate expressly that certain pollutants should be treated differently than others.[786] It gave no such indication here.

EPA's proposed interpretation is also logically inconsistent. EPA asserts that "such State standards" in Section 209(b)(1)(B) "refers at least to all of the standards that are the subject of the particular waiver request before the Administrator."[787] But EPA then proceeds to reconsider the grant of the Advanced Clean Cars waiver *as to only two* of the three standards that were part of that request, despite acknowledging that the Advanced Clean Cars program "is a single coordinated program comprising a suite of standards that California intended to be a cohesive program."[788] This unexplained rejection of EPA's own interpretation of the statute defies logic. EPA's explanation is so incoherent and irreconcilable as to call into question what EPA's position actually is.

c. Interpreting "such State standards" in Section 209(b)(1)(B) as referring to individual standards is unambiguously foreclosed and unreasonable.

Under Section 209(b)(1)(B), EPA must consider California's need for its motor vehicle program *as a whole* to address compelling and extraordinary conditions in the State.

The plain language of Section 209(b)(1)(B) dictates this result. The plural "standards" belies EPA's standard-by-standard approach.[789] EPA stated more than 30 years ago, "[t]he use of the plural . . . confirms that Congress did not intend EPA to review the need for each individual standard in isolation."[790] Congress' use of the word "such" to modify "standards" further confirms this reading. The ordinary meaning of "such" is "of a kind" or "of the same class, type, or sort."[791] Therefore, the relevant question under Section 209(b)(1)(B) is whether California needs standards (plural) of the sort relevant to the Section 209(b)(1) inquiry, not whether California needs a particular standard.

EPA's standard-by-standard interpretation also fails to account for the larger structural context of the Clean Air Act. Congress specifically amended Section 209(b)(1) in 1977 to maximize California's discretion in administering its own motor vehicle program, and advanced that goal by inserting "in the aggregate" to modify "State standards" in Section 209(b)(1) so that California could adopt a *set* of standards that, in the aggregate, was at least as protective as the federal standards, even if *individual* standards might not be. EPA's proposed interpretation cannot be reconciled with that congressional intent or with the express reference to standards "in the aggregate" in the preceding reference to

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[785] *United States v. Santos*, 553 U.S. 507, 522–23 (2008) (plurality) (superseded by statute on other grounds) (noting that "giving the same word, *in the same statutory provision*, different meanings *in different factual contexts*" would "'render every statute a chameleon'" (quoting *Clark v. Martinez*, 543 U.S. 371 (2005))).
[786] *See, e.g.*, 42 U.S.C. §§ 7408, 7410, 7411, 7412.
[787] 83 Fed.Reg. at 43,246.
[788] *Id.*
[789] 42 U.S.C. § 7543(b)(1)(B).
[790] 49 Fed.Reg. at 18,890; *see also Metro. Stevedore Co. v. Rambo*, 515 U.S. 291, 296 (1995).
[791] "Such." Merriam-Webster Dictionary. Accessed on October 24, 2018. https://www.merriam-webster.com/dictionary/such.

"State standards."[792] And EPA does not even attempt to explain why Congress would require EPA to consider the protectiveness of California's standards by looking at them in the aggregate but permit EPA to consider California's "need" on an individual, standard-by-standard basis.

EPA's contention that "such State standards" in Section 209(b)(1)(B) relates back to the singular "any standard" in Section 209(a) is implausible.[793] It ignores Congress' use of the plural "standards" and illogically and unjustifiably skips over the immediate antecedent use of "standards" in Section 209(b)(1) to reach "standard" in Section 209(a). EPA claims the Dictionary Act[794] supports its reading of "standards" as "standard."[795] But, pursuant to its own terms, that provision of the Dictionary Act is relied on only very rarely when "doing so [is] 'necessary to carry out the evident intent of the statute.'"[796] EPA identifies no intent for which its reading is necessary, and EPA's reading of "standards" as "standard" *undermines* congressional intent. The Dictionary Act does not create any ambiguity. It does not even apply.

The disconnect between EPA's interpretation and congressional intent is evident from the statutory text and relevant legislative history. As discussed in more detail below, "extraordinary and compelling conditions" is, and was intended to be, a capacious phrase. It strains plausibility to read the plural and broadly worded phrase "such State standards" narrowly where the nature and scope of the inquiry—involving the conditions in California—is plainly much broader than any single standard. EPA's narrow reading also cannot be reconciled with Congress' goal "to afford California the broadest possible discretion in selecting the best means to protect the health of its citizens and the public welfare."[797] Reviewing the need for California's vehicle emissions program on a standard-by-standard basis deprives California of this discretion by positioning EPA to micro-manage California's program, essentially allowing EPA to second-guess California as to the State's need for each of its individual standards. That is not the role Congress established for EPA.

As EPA has itself noted, Section 209(b)(1)(B) reflects *Congress'* determination that California's need for its own vehicle emissions control program was significant enough to overcome automakers' concerns about having to comply with two sets of standards.[798] It is, therefore, California's need for a separate vehicle emissions control program, not the need for any given standard, that EPA must evaluate under Section 209(b)(1)(B): "the 'need' issue went to the question of standards in general, not the particular standards for which California sought a waiver in a given instance."[799]

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[792] *See* 49 Fed.Reg. at 18,890 (noting that § 209(b)(1)(B) "apparently refers back to the phrase "State standards . . . in the aggregate," as used in the first sentence of § 209(b)(1), rather than to the particular standard being considered").
[793] *See* 83 Fed.Reg. at 43,246.
[794] 1 U.S.C § 1.
[795] 83 Fed.Reg. at 43,246 n.576.
[796] *United States v. Hayes*, 555 U.S. 415, 422 (2009) (quoting *First Nat. Bank in St. Louis v. Missouri*, 263 U.S. 640, 657 (1924)).
[797] *See* H.R. Rep. No. 95-294, at 301.
[798] 49 Fed.Reg. at 18,890.
[799] *Id.* (internal quotation omitted).

And EPA is simply wrong when it claims that this whole-program reading inappropriately "limits the application of the criterion" in all but EPA's first waiver decision. Rather, Section 209(b)(1)(B) requires EPA to consider, each time California seeks a waiver, whether California still has "compelling and extraordinary conditions" that warrant its separate vehicle emissions program. Thus, should California reach a point where it no longer experiences serious and significant problems with air pollution from motor vehicles, Section 209(b)(1)(B) could, under the traditional, whole-program interpretation, limit California's ability to continue its separate program. The fact that California still has some of the most serious air pollution challenges in the nation does not change the meaning of the statute. Rather, California's continued challenges with vehicle emissions means the very types of conditions Congress intended California to be able to address are still present and, therefore, California should be able to continue its efforts to address them.

Finally, Congress has ratified EPA's traditional "whole program" reading. EPA expressly articulated and applied its traditional interpretation in granting a number of waiver requests (including the 1984 particulate matter waiver discussed above) before the 1990 Clean Air Act Amendments, at which time Congress added language nearly identical to that of Section 209(b)(1) in Section 209(e)(2).[800] By nearly replicating the language of Section 209(b)(1) in 1990, Congress ratified EPA's consistent interpretation of "such State standards" in Section 209(b)(1)(B).[801]

d. EPA's attempt to establish ambiguity regarding the meaning of "such State standards" in Section 209(b)(1)(B) fails.

Notably, EPA does not assert that its pollutant-specific, sometimes standard-by-standard, interpretation of "such State standards" in Section 209(b)(1)(B) is required. Rather, EPA's proposed interpretation is premised on an ungrounded and logically inconsistent assertion that this phrase is ambiguous. To support this contention, EPA advances three interpretations of the phrase that it claims are reasonable: 1) California's entire motor vehicle program (EPA's traditional interpretation); 2) California's program for similar vehicles; or 3) the particular standards for which California seeks a waiver. But only the first of EPA's three proposed interpretations is permissible, let alone reasonable. As described above, the statutory text and structure, congressional intent, and basic tenets of statutory construction necessitate this interpretation.

EPA's second proffered interpretation—California's program for similar vehicles—is entirely divorced from the plain language of the statute. EPA does not even attempt to explain how the other relevant words in this provision—"need" and "compelling and extraordinary conditions"—would allow for such an interpretation. For example, EPA does not point to any conditions related to vehicle emissions that vary by vehicle type. And, of course, the history of EPA's own regulation of vehicle emissions (as well as California's) suggests the opposite—that a given pollutant (e.g., NOx) is often emitted

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[800] *See, e.g.*, 43 Fed.Reg. 998, 1000 (Jan. 5, 1978); 44 Fed.Reg. 38,660, 38,661 (July 2, 1979).
[801] *See Merrill Lynch, Pierce, Fenner & Smith, Inc. v. Curran*, 456 U.S. 353, 381–82 & n.66 (1982) ("re-enact[ing] a statute without change" or "incorporating sections of a prior law" demonstrates congressional intent to "le[ave] intact" contemporary interpretations).

by a variety of different vehicle types. In essence, for this second purportedly reasonable interpretation, EPA reads "caused by similar vehicles" into the statutory text after "compelling and extraordinary conditions." Such readings are impermissible, particularly where a permissible construction—EPA's traditional one—is, by the agency's own admission, at least reasonable.[802]

The third interpretation—standards within a specific waiver request—is likewise impermissible. This interpretation, like the preceding one, ignores the rest of the provision and congressional intent by focusing EPA at a granular level on the particular set of standards submitted by California rather than on the State's broader "need." Given that air pollution is routinely addressed in incremental steps, it makes no sense to assess California's "need" based solely on the set of standards presented to EPA in a waiver request, particularly when those standards are often amendments that make incremental improvements to existing standards. Further, California might well submit a request for a single standard, and, as permitted under the 1977 amendments, that single standard might increase one type of pollution (in order to strengthen or maintain a standard for a different pollutant). EPA's third interpretation would have it consider whether California needs this single standard, which would (permissibly) *increase* pollution. That inquiry makes little sense, as demonstrated by the very situation Congress contemplated and expressly authorized—California having standards that are only at least as protective as the federal standards when viewed *in the aggregate*.

Only the first of EPA's "reasonable" interpretations is permissible. In establishing and strengthening the waiver provision, Congress ensured that California could continue exercising leadership with respect to motor vehicle emissions control and employing its technical expertise for the good of the entire nation.[803] The "whole program" interpretation is consistent with that intent. EPA's other two allegedly "reasonable" interpretations are not. Notably, EPA actually proposes to adopt a *fourth* interpretation—one that permits the agency to review *parts* of the package of standards California submits with a waiver request based on the *pollutant* those parts of the package address. This is an unambiguously impermissible interpretation, and neither it nor the purportedly reasonable alternative interpretations EPA pulls from thin air establishes that the statute is ambiguous.

Finally, EPA's attempt to establish ambiguity now—after almost 35 years of interpreting this provision as unambiguously requiring a review of the whole program—fails for the additional reason that this dramatic departure from long-standing interpretation "'count[s] against' its persuasiveness."[804]

EPA cannot manufacture ambiguity here, where none exists. However, even if EPA could establish that "such State standards" in Section 209(b)(1)(B) were ambiguous, EPA's proposed interpretation would still fail, because it is impermissible, for the reasons discussed throughout this Section.

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[802] *See Lamie v. U.S. Trustee*, 540 U.S. 526, 538 (2004).
[803] *See Ford Motor Co.*, 606 F.2d at 1297 ("Congress consciously chose to permit California to blaze its own trail with a minimum of federal oversight.)
[804] *Orton Motor, Inc. v. United States Dep't of Health & Human Servs.*, 884 F.3d 1205, 1214 (D.C. Cir. 2018) (quoting *Landmark Legal Found. v. IRS*, 267 F.3d 1132, 1137 (D.C. Cir. 2001)).

2. EPA's proposed interpretation of "compelling and extraordinary conditions" to exclude GHGs and Climate Change is also unambiguously foreclosed and unreasonable.

Departing from tradition, again, and further contravening congressional intent, EPA proposes to reinterpret "compelling and extraordinary conditions" to exclude GHGs and climate change.[805] This interpretation is impermissible and unreasonable, as discussed below. It is also irrelevant because, as discussed above, EPA cannot revoke an already granted waiver based on a new interpretation of the waiver criteria.

a. EPA's proposed interpretation of "compelling and extraordinary" is an unjustified departure from EPA's traditional interpretation.

EPA is proposing to interpret "compelling and extraordinary" conditions to mean "conditions specific to California" or "unique problems" absent from other States.[806] EPA is also proposing to conclude that GHG emissions and their impacts in California do not meet this test.[807] For the reasons discussed below, this interpretation is unambiguously foreclosed and unreasonable, and this conclusion is arbitrary and capricious. As with EPA's proposed reinterpretation of "such State standards," this interpretation is also an unjustified departure from the agency's historical one. And EPA must particularly justify its reinterpretation here because it is proposing to rely on it to revoke a waiver to which serious reliance interests have attached.[808]

With one very short-lived exception, EPA has never interpreted "compelling and extraordinary conditions" as only conditions "unique" to California. Indeed, the agency cannot do so, particularly in light of Section 177. (See below.) EPA has not explained its reinterpretation here, other than to point to a single statement in the legislative history that pre-dates the 1977 and 1990 amendments. This statement does not justify EPA's adoption of a uniqueness requirement, in general, let alone application of any such requirement to a five-year-old decision on which numerous States have relied.

Further, while EPA briefly re-states its prior interpretation of "compelling and extraordinary conditions," it does not acknowledge that it is departing from it. In fact, EPA's historic interpretation defines "compelling and extraordinary conditions" far more capaciously than EPA proposes here—as "primarily factors that tend to produce" substantial levels of pollution.[809] While EPA has previously illustrated those "factors" by way of examples such as "geographical and climatic conditions," it has never said that was an exclusive list or suggested that effects of air pollution could not be "conditions."[810] In fact, in 1984 EPA granted California a waiver for amendments to its motor vehicle emissions control program that established particulate matter emission standards and test procedures for 1985 and subsequent model year diesel fueled light-

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[805] 83 Fed.Reg. at 43,247–48.
[806] 83 Fed.Reg. at 43,248.
[807] *Id.*
[808] *See Fox Television Stations*, 556 U.S. at 515.
[809] *E.g.*, 74 Fed.Reg. at 32,759–62.
[810] *Id.*

duty motor vehicles.[811] EPA noted that CARB had adopted such standards "in response to compelling and extraordinary conditions, including the impact on the health and welfare of its citizens caused by decreased visibility, as well as adverse health effects and the economic cost of soiling, anticipated from diesel vehicular particulate emissions."[812]

Thus, under its traditional interpretation, EPA would have to consider the "factors that tend to produce" substantial levels of pollutants, including GHG emissions—such as the forty percent of California's GHG emissions that come from the transportation sector, California's large population of vehicles and the number of miles driven, and the geographic and climatic conditions of the State. It would also have to consider the adverse impacts of GHG emissions on California and its residents. These are all plainly "compelling and extraordinary conditions" within the meaning of EPA's historic interpretation.[813]

Finally, EPA fails to acknowledge that, with one short-lived exception, it has never before required that the regulated pollutant cause local harm as part of its interpretation of "compelling and extraordinary conditions."[814]

b. EPA's proposed interpretation of "compelling and extraordinary conditions" is inconsistent with the plain text and congressional intent.

To support its new interpretation, EPA posits that "GHGs are not the kind of local or regional air pollution problem Congress intended to identify in the second criterion of section 209(b)(1)(B)."[815] There is no basis for this reading in the statutory text, and this reading contravenes congressional intent.

First, there are no words in Section 209(b)(1)(B), such as "local" or "regional," that even arguably limit the provision to pollutants with any particular characteristics. This absence is telling. As noted above, Congress knows how to limit the scope of a Clean Air Act provision by pollutant or type of pollutant.[816] It did not do so here, and EPA may not read the words "local" or "regional" into the text.[817]

Second, EPA reads "compelling and extraordinary conditions" far too narrowly and in a way that does not comport with the plain meaning of these words or congressional intent. Contrary to EPA's contention[818] the terms "compelling" and "extraordinary" differentiate conditions based on *degree*, not geographic scope. For example, courts

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[811] 49 Fed.Reg. 18,887 (May 3, 1984).
[812] *Id.* at 18,889.
[813] EPA cannot now find otherwise, having failed to address these issues in its proposal.
[814] *See* 43 Fed.Reg. 25,729, 25,735 (June 14, 1978) (permitting California to regulate even "harmless exhaust constituents such as methane").
[815] 83 Fed.Reg. at 43,250.
[816] *See, e.g.*, 42 U.S.C. §§ 7408, 7410, 7411, 7412.
[817] *See Bates v. United States*, 522 U.S. 23, 29–30 (1997) ("Where Congress includes particular language in one section of a statute but omits it in another section of the same Act, it is generally presumed that Congress acts intentionally and purposely in the disparate inclusion or exclusion." (internal quotation omitted)).
[818] 83 Fed.Reg. at 43,247.

have understood "compelling" as meaning "of a higher order" or "paramount."[819] And courts have accepted interpretations of "extraordinary" based on the "unusual nature and infrequent occurrence" of the relevant event.[820] Notably, EPA cites no authority for the proposition that it may read a geographic distinction into these terms. And EPA's proposed distinction is illusory. Either local or global pollution could cause conditions serious enough to be compelling or extraordinary. Further, emissions typically considered "local" can travel across the country or the globe to produce, or worsen, conditions in remote locations, and "global" emissions can have disproportionate local impacts. Congress was, in fact, well aware that air pollution does not respect borders, further underscoring that it did not intend unwritten geographic lines to be read into Section 209(b)(1)(B).[821]

In addition, while the terms "extraordinary" and "compelling" differentiate conditions based on degree, they are nonetheless broad terms. Indeed, the D.C. Circuit called this identical phrase, which also appears in Section 209(e), "expansive statutory language."[822] EPA does not explain why these broad terms should be narrowed on a geographic basis or to exclude an air pollution problem that happened not to be at the forefront of Congress' mind when it wrote the text. "[T]he fact that a statute can be applied in situations not expressly anticipated by Congress does not demonstrate ambiguity. It demonstrates breadth."[823] The phrase "compelling and extraordinary conditions" is broad for a reason—to provide "regulatory flexibility" to respond to "changing circumstances and scientific developments" and "forestall obsolescence."[824]

Third, EPA's interpretation ignores the statutory structure—improperly reading Section 209(b) without consideration of the relationship between Sections 202(a), 209(a) and 209(b). Specifically, EPA proposes to read Section 209(b) as excluding GHGs at the same time that it proposes to continue regulating GHGs under Section 202(a) and presumes, albeit implicitly, that Section 209(a) preempts other States from regulating GHGs. This interpretation is implausible and impermissible.

Section 202(a) requires EPA to set "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in [the Administrator's] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." Section 209(a) preempts States from adopting such standards. Section 209(b), in contrast, provides that California may adopt and enforce its own emissions standards for new vehicles or engines, unless EPA finds that one or more of the deferentially applied waiver criteria are not met. As the plain text and congressional intent indicate, the scope of pollutants covered by Section 209(b) is not more limited than the scope of Section 202(a) or

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[819] *United States v. Hardman*, 297 F.3d 1116, 1127 (10th Cir. 2002) (quoting *Wisconsin v. Yoder*, 406 U.S. 205, 215 (1972) and *Sherbert v. Verner*, 374 U.S. 398, 406 (1963)).
[820] *Amerada Hess Pipeline Corp. v. FERC*, 117 F.3d 596, 602 (D.C. Cir. 1997).
[821] *See* 42 U.S.C. §§ 7415, 7426.
[822] *Am. Trucking Ass'ns, Inc. v. EPA*, 600 F.3d 624, 627 (2010).
[823] *Massachusetts v. EPA*, 549 U.S. 497, 532 (2007) (quoting *Pennsylvania Dept. of Corrections v. Yeskey*, 524 U.S. 206, 212 (1998)).
[824] *See id.* at 532.

Section 209(a), as EPA suggests. Rather, Section 209(b) exists to allow California to take more aggressive action than EPA—including the regulation of pollutants EPA might not yet be regulating under Section 202(a). California's history of doing precisely that is a primary reason Section 209(b) exists.[825]

EPA also ignores the relationship between Sections 209(a) and (b). Specifically, EPA appears to assume that Section 209(a) preempts States from adopting their own GHG emissions standards for new vehicles. Yet, EPA reads Section 209(b) as precluding a waiver for California's GHG standards. In other words, EPA reads the scope of Section 209(a)'s preemption as broader than the available scope of a waiver under Section 209(b). Nothing in the text, structure or legislative history supports this reading.[826] Rather, the text, structure and legislative history indicate the opposite—that for any standard that could be preempted by Section 209(a), California may obtain a waiver of that preemption.[827]

Finally, reading "compelling and extraordinary conditions" as limited to "local" or "regional" pollutants undermines Congress' intent that California retain its own regulatory program and continue to lead the nation as a "laboratory of innovation."[828]

EPA's reading of Section 209(b)(1) is, in fact, remarkably similar to the interpretation it advanced—and the Supreme Court rejected—regarding the scope of Section 202(a). Rejecting EPA's position that "Congress designed the Clean Air Act to address *local* air pollutants rather than a substance that 'is fairly consistent in its concentration throughout the *world's* atmosphere,'" the Court held that Section 202(a) unambiguously embraces "all airborne compounds" despite the provision's silence as to carbon dioxide and other greenhouse gases.[829] Specifically, the Court reasoned:

> *While the Congresses that drafted § 202(a)(1) might not have appreciated the possibility that burning fossil fuels could lead to global warming, they did understand that without regulatory flexibility, changing circumstances and scientific developments would soon render the Clean Air Act obsolete. The broad language of § 202(a)(1) reflects an intentional effort to confer the flexibility necessary to forestall such obsolescence.*[830]

There is no reason Section 209(b)(1)(B) should be interpreted more narrowly than Section 202(a), and EPA has not even acknowledged it is proposing such an interpretation, let alone attempted to justify it.

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[825] *See MEMA I*, 627 F.2d at 1109; H.R. Rep. No. 95-294 at 301 ("California was afforded special status due to that State's pioneering role in regulating automobile-related emissions, which pre-dated the Federal effort.")
[826] *See also MEMA I*, 627 F.2d at 1108 ("The legislative history of § 209 supports the Administrator's interpretation that the waiver provision is coextensive with the preemption provision . . . .").
[827] *See* 42 U.S.C. § 7543(b)(1) (authorizing "waive[r] of application of [§ 209(a)]").
[828] S. Rep. No. 90-403 at 81; *see also MEMA I*, 627 F.2d at 1108 n.22 ("there are overwhelming indications in the legislative history that Congress intended California to enjoy the broadest possible discretion in selecting a *complete* program of emissions control") (emphasis added).
[829] *Massachusetts*, 549 U.S. at 512, 529 (emphasis in original).
[830] *Id.* at 532.

c. Congress' discussion of California's challenges with smog does not limit Section 209(b)(1)(B) to smog-related pollutants.

EPA states that the legislative history for the original 1967 waiver provision "focused on California's smog problem, which is especially affected by local conditions and local pollution."[831] But the fact that Congress discussed smog when it considered enacting the waiver provision does not permit a reading that limits Section 209(b)(1)(B) to air pollutants that contribute to smog. In fact, the use of the plural "conditions," along with the expansive phrase "compelling and extraordinary," indicates just the opposite.[832]

Congress did not limit application of the waiver provision to smog or any other pollution or pollutant. As noted above, Congress knows how to limit provisions of the Clean Air Act in those ways; it did not do so here; and EPA cannot read words into the statute. Rather, Congress chose to use "expansive statutory language"[833] and "to afford California the broadest possible discretion in selecting the best means to protect the health of its citizens and the public welfare"[834] Congress expressly and intentionally drafted Section 209(b)(1)(B) broadly to enable California's continued exercise of leadership and technical expertise to respond to emerging threats "from various pollutants."[835] EPA cannot rely on legislative discussion of smog to limit Section 209(b)(1)(B)'s express and expansive terms and prevent California from addressing GHG emissions.

Finally, EPA has granted California waivers for standards to reduce pollutants that do not contribute to smog, such as particulate matter.[836] So EPA itself has not read the provision as limited to the specific pollution problem—smog—that is discussed in the legislative history. It has not proposed to change this reading here. Nor could it lawfully do so.

d. "Compelling and extraordinary conditions" do not need to be unique to California or sufficiently different from the nation.

EPA contends that "compelling and extraordinary" must mean "unique" or "sufficiently different from" the rest of the country.[837] This position is inconsistent with the clear statutory language of Section 209(b)(1)(B), other provisions of the Clean Air Act, and the legislative history.

Neither "unique" nor "sufficiently different from" is in the language of Section 209(b)(1)(B). And courts have declined to interpret the words that are in the statute—"compelling" or "extraordinary"—as requiring uniqueness. For example, the court in *Shell Oil Co. v. United States Dep't of Labor*[838] considered statutory language

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[831] 83 Fed.Reg. at 43,247.
[832] *See Metro. Stevedore Co.*, 515 U.S. at 296 ("The use of 'conditions,' a word in the plural, suggests that Congress did not intend to limit the bases … to a single condition.").
[833] *Am. Trucking Ass'ns*, 600 F.3d at 627.
[834] (H.R. Rep. No. 95-294, at 301).
[835] *See, e.g.*, *id.* at 23; S. Rep. 90-403 at 81.
[836] *E.g.*, 49 Fed.Reg. 18,887.
[837] 83 Fed.Reg. at 43,247.
[838] 106 F. Supp. 2d 15 (D.D.C. 2000).

authorizing OSHA to approve state plans when the state standards in those plans were, among other things, "required by compelling local conditions."[839] The court rejected the argument that such conditions must be "unique to California."[840] Requiring "uniqueness," the court noted, would "minimize, not maximize" the role Congress had established for the states and, therefore, would be "anathema to the [Act's] scheme of federalism."[841] Similarly, in *Amerada Hess Pipeline,*[842] the D.C. Circuit dismissed the argument that, because oil spills are common occurrences, they could not be "extraordinary." Notably, EPA cites no case interpreting "compelling" or "extraordinary" as "unique."[843]

EPA relies exclusively on a few excerpts from the legislative history that note California's "unique problems."[844] As noted, Congress inserted no such phrase into the statutory text. In addition, the rest of the legislative history—of which there is a lot—undermines EPA's reading "unique to California" into the statute. For example, consistent references in the legislative history emphasize California's leadership as a laboratory of innovation that had benefited, and would continue to benefit, the rest of the country.[845] If the problems facing California were truly "unique," Congress would have no reason to value this function of California's historic role, let alone to preserve that role for the future.

Moreover, each of the legislative history references on which EPA relies is from 1967, a decade before the 1977 amendments that expanded the waiver provision and added Section 177. Congress' addition of Section 177 establishes that the phrase "compelling and extraordinary" does not require California's problems to be entirely unique or sufficiently different from those in other States. If it did, Congress would have had no reason to allow other States to adopt California's standards. The legislative history from 1977 underscores the point: Congress wanted California to continue to lead the nation in addressing the serious pollution concerns it, *and other States*, faced. In Congress' own words, it "intended to ratify and strengthen the California waiver provision and to affirm the underlying intent of that provision, i.e., to afford California the broadest possible discretion in selecting the best means to protect the health of its citizens and the public welfare."[846]

And to the extent EPA's analysis of "compelling and extraordinary" looks at effects, EPA cannot claim that these effects must be "unique" to California. Otherwise, it would be a rare air pollution problem, indeed, that could satisfy this exacting and unrealistic standard.

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[839] *Id.* at 17.
[840] *Id.* at 20.
[841] *Id.*
[842] 117 F.3d 596
[843] EPA is also interpreting the phrases it pulls from the legislative history (not the statute) incorrectly. EPA has interpreted "unique" to mean "singular" or "unlike any other." But "unique" can refer to "remarkable, special, or unusual." Similarly, "sufficiently different from" is not the same as "entirely different from", as EPA asserts in its proposal. 83 Fed.Reg. at 43,247.
[844] *See* 83 Fed.Reg. at 43,247.
[845] *See, e.g.*, S. Rep. 90-43 at 33, 81; H.R. Rep. No. 95-204 at 301.
[846] H.R. Rep. No. 95-294 at 301–02.

e. "Compelling and extraordinary conditions" includes greenhouse gas emissions and the climate change impacts they cause.

As the discussion above demonstrates, Congress intentionally used the broad language of "compelling and extraordinary conditions" to afford California substantial discretion in deciding which problems to address and how, and to allow California to continue exercising leadership in the field of vehicle emission control. Congress also intended Section 209(b)(1)(B), like many other sections of the Clean Air Act, to leave space to address problems Congress "might not have appreciated" when it drafted the waiver provision.[847] Consistent with the statutory language, legislative history, and congressional intent, "compelling and extraordinary conditions" in Section 209(b)(1)(B) must be read as encompassing conditions connected with climate change—both its causes and its impacts.[848] This reading is the only one that advances Congress' intent to "confer[] broad discretion on the State of California to weigh the degree of health hazards from *various pollutants* and the degree of emission reduction achievable for *various pollutants*."[849]

3. California's *need* for its separate Motor Vehicle Control Program does not require that an individual standard will materially affect its air pollution problems or that California vehicles are the primary cause of the problem.

EPA impermissibly and unreasonably reinterprets Section 209(b)(1)(B) to require California's GHG and ZEV standards to "meaningfully address" and "materially affect" California's GHG concentrations or the effects in California of climate change.[850] Alternatively, EPA proposes to reinterpret this language to require that the pollution California's GHG and ZEV standards seek to address must be a fundamental or primary cause of California's extraordinary and compelling conditions.[851] EPA has not justified its change in course and cannot justify its unambiguously prohibited and unreasonable reinterpretation.

The statutory language of Section 209(b)(1)(B) forecloses EPA's reinterpretation. Nothing in the statutory language limits California's need for emissions control standards to situations where those emissions are the primary cause of a pollution problem or to standards that will have what EPA believes are meaningful effects on that pollution problem. Indeed, as discussed above, Congress chose capacious language—leaving "broad discretion" to California "to weigh the degree of health hazards from various pollutants and the degree of emission reduction achievable for various pollutants."[852] And EPA's long established policy and practice accordingly has been to defer to California's judgment with respect to "need."[853] EPA's narrow reading

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[847] *Massachusetts*, 549 U.S. at 532.
[848] *See id.*
[849] H.R. Rep. No. 95-294 at 23.
[850] 83 Fed.Reg. at 43,248.
[851] *Id.* at 43,247.
[852] H.R. Rep. No. 95-294 at 23.
[853] *See* 43 Fed.Reg. at 25,735 ("it is EPA's practice to leave the decisions on controversial matters of public policy, such as whether to regulate [harmless] methane emissions, to California").

impermissibly constrains California's discretion and improperly positions EPA to second-guess California's policy judgment. Nor should a federal statute intended to preserve state authority be read to intrude on core sovereign decisions such as whether or not certain emissions controls are needed to protect the State's residents and resources.

EPA's reinterpretation also conflicts with the well-established principle that incremental progress is progress nonetheless—that governments need not fully solve a problem with each and every step they take to address that problem.[854] EPA has long recognized this principle and the value of incremental progress, granting California waivers and authorizations for numerous regulations that would contribute incrementally to addressing California's air pollution challenges.[855] And Congress itself plainly recognized the same in 1990 when it created Section 209(e) and preserved California's authority to regulate non-road vehicles and engines, using language virtually identical to that in Section 209(b). Neither Congress nor EPA has ever required California to show that non-road vehicles or engines are some kind of primary cause of California's air pollution challenges, in order for California to seek to reduce emissions from those vehicles and engines.

In *Massachusetts*, the Court recognized that incremental progress is particularly necessary and appropriate in the context of GHGs and climate change: "[w]hile it may be true that regulating motor-vehicle emissions will not by itself *reverse* global warming, it by no means follows that we lack jurisdiction to decide whether EPA has a duty to take steps to *slow* or *reduce* it. . . . A reduction in domestic emissions would slow the pace of global emissions increases, no matter what happens elsewhere."[856] Similarly, a reduction in GHG emissions from motor vehicles in California would slow the pace of global emissions increases, regardless of the emissions from other sources in other parts of the world. EPA's proposed interpretation directly contravenes this well-established principle and precedent.

Congress' desire that California continue to experiment also undermines EPA's argument that California cannot "need" its ZEV standard because it allows manufacturers to generate credits for fuel cell vehicles sold in Section 177 States.[857] This "travel provision" does not negate California's "need" for its ZEV standards. Rather, it recognizes the need to encourage the development, application, and commercialization of these technologies and the challenges these technologies can face (because they require new and different fueling infrastructure, for example). Policies, like the travel provision, that encourage the development and deployment of emissions-reducing technology underscore, rather than undermine, the need for that technology. California is doing what Congress intended, and EPA's interpretation would

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[854] *See Massachusetts*, 549 U.S. at 524 ("Agencies, like legislatures, do not generally resolve massive problems in one fell regulatory swoop. . . . They instead whittle away at them over time, refining their preferred approach as circumstances change and as they develop a more nuanced understanding of how best to proceed.").
[855] *E.g.,* 61 Fed.Reg. 69,093 (Dec. 31, 1996) (granting authorization under § 209(e) for standards regulating non-road recreational vehicles, including golf carts and certain go-karts).
[856] *Id.* at 525–26.
[857] 83 Fed.Reg. at 43,249.

prevent the effectuation of congressional intent.[858] Further, the long-term effects of such innovation cannot always be evaluated at the time a technology-forcing standard is adopted, demonstrating that whether a single standard, or set of standards, will necessarily have a "material" effect (however that is defined) is not the question Congress intended EPA to ask under Section 209(b)(1)(B).

Notably, EPA has not imposed this heightened "need" standard in prior waiver requests, even where the pollution, like GHGs, is produced by a variety of sources, including mobile and stationary sources. Nor has EPA imposed this heightened requirement where the standards under consideration will enable incremental progress on serious air pollution challenges. To the extent EPA is proposing to interpret "need" differently for different pollutants, as it appears to be doing, that interpretation is impermissible for the reasons discussed above.[859] And, as with so many of EPA's proposed interpretations, this one departs from EPA's long-standing interpretation without any, let alone sufficient, justification.[860]

4. The proposed revocation is arbitrary and capricious and otherwise unlawful under the proper "whole program" interpretation of Section 209(b)(1)(B).

EPA may not revoke any part of California's already granted 2013 waiver. Even if EPA had any authority to consider revoking an already granted waiver, it could only do so under its longstanding (and proper) interpretation of Section 209(b)(1)(B). Under that standard, there is no question that California needs its motor vehicle program as a whole, including its GHG and ZEV standards, to meet compelling and extraordinary conditions.

As EPA acknowledges, California continues to have compelling and extraordinary conditions for which its motor vehicle program is needed.[861] The same conditions that have trapped air pollution inland for decades remain today. Despite stringent regulations and other efforts, parts of the State continue to face some of the worst air quality in the country. EPA recently recognized this fact (as it has regularly done), awarding millions of dollars of funding to San Joaquin and South Coast Air Basins to address air pollution problems.[862] Acting Region 9 EPA Administrator Alexis Strauss explained that, "[d]espite significant efforts, the South Coast and San Joaquin air basins still experience some of the worst air quality in the nation."[863] Eight of the top ten cities in the United States experiencing the highest levels of ozone and seven of the top ten

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[858] As a practical matter, EPA is simply wrong when it suggests that *California's* needs are not addressed by the fuel cell vehicle travel provision. ZEV sales in California have met or exceeded targets. The fact that § 177 States might count California sales toward their targets cannot demonstrate that *California* does not need its targets.
[859] *See also Santos*, 553 U.S. at 522-23 (plurality) (the same statutory term cannot be applied differently in different factual scenarios); *Clark*, 543 U.S. 371 (2005) (same).
[860] *See Fox Television*, 556 U.S. at 515.
[861] *See* 83 Fed.Reg. at 43,241 n.555.
[862] California to Receive $12.75 Million to Improve Air Quality in San Joaquin Valley, South Coast (May 2, 2018). U.S. EPA. Accessed on October 24, 2018.https://www.epa.gov/newsreleases/california-receive-1275-million-improve-air-quality-san-joaquin-valley-south-coast.
[863] *Id.*

cities in the United States experiencing the highest levels of short-term particulate matter (24-hour PM2.5)) are in California.[864]

Notably, EPA has not proposed to find that, under the proper "whole program" approach, California would not satisfy Section 209(b)(1)(B) for its entire motor vehicle program, including the GHG and ZEV standards. Nor could it lawfully do so.

Further, and contrary to EPA's claims, the compelling and extraordinary threats and challenges California faces from climate change, discussed in more detail below, underscore the State's need for its motor vehicle program. These threats and challenges are relevant under EPA's traditional and proper consideration of California's whole program because they are themselves compelling and extraordinary conditions that support California's need for its own vehicle emissions program. They are, further, relevant to California's long-standing compelling and extraordinary conditions regarding criteria pollution because of the relationship between ozone formation and climate change which is discussed in more detail below.

EPA's proposal to revoke California's waiver for certain model years of its GHG and ZEV standards under Section 209(b)(1)(B) is unlawful because California still needs its entire vehicle emissions program to meet compelling and extraordinary conditions—the same ones Congress initially recognized as well as conditions that have emerged since enactment of the waiver provision.

5. EPA's proposed revocation of California's waiver is arbitrary and capricious and otherwise unlawful even if EPA looks at the GHG and ZEV standards rather than California's whole program.

a. California needs its GHG-reducing standards to meet the extraordinary and compelling conditions caused by GHG emissions.

Climate change poses an existential threat to California. CARB described this threat, with supporting evidence, in its Advanced Clean Cars waiver request, and EPA does not dispute the evidence or California's findings. Nor could EPA reasonably do so, given the overwhelming evidence and EPA's own endangerment findings.[865]

Rather, EPA's proposal to revoke California's GHG and ZEV standards is based on a new interpretation of Section 209(b)(1)(B) that permits EPA to review these standards separate from California's whole vehicle emissions program (and separate from the rest of the Advanced Clean Cars program); precludes "global" pollutants and their impacts from being considered "compelling and extraordinary conditions"; and requires

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[864] *State of the Air 2018*. American Lung Association. Accessed on October 24, 2018. https://www.lung.org/assets/documents/healthy-air/state-of-the-air/sota-2018-full.pdf.

[865] EPA attempts to distance itself from the logical consequence of its own endangerment findings by claiming those findings are a "completely different determination than whether California needs its mobile source pollution program." 83 Fed.Reg. at 43,249. EPA relies on a statement it made in 2014 when it applied its traditional "whole program" interpretation of "such State standards." *See id.* (quoting 79 Fed.Reg. 46,256, 46,262 (Aug. 7, 2014)). If, as it is proposing to do, EPA now rejects that interpretation, it cannot rely on this statement, particularly since it has provided no justification for them. In any event, whether or not the endangerment findings were "completely different determination[s]," California plainly needs its GHG-reducing standards to meet compelling and extraordinary conditions.

California to show that its standards will address the primary cause of California's climate impacts or will have an (undefined) meaningful effect on those climate impacts. As discussed above, these interpretations are unambiguously foreclosed and unreasonable and, in any event, cannot lawfully be applied retroactively to a waiver approved five years ago.

But even under an interpretation that considers California's GHG-reducing standards separately from its other vehicle emissions standards, EPA's proposed revocation is unlawful. There is no basis to find that GHG concentrations, the vehicles that contribute to them, and the climate impacts that result from them are not "compelling and extraordinary conditions" or that California does not need its own vehicle emissions standards to address those conditions.

California recognized the severe threats the State faces from climate change, and the causal relationship between vehicular GHG emissions and those threats, as early as 2002.[866] Specifically, the California Legislature found that "[g]lobal warming would impose on California, in particular, compelling and extraordinary impacts."[867] The identified impacts included reductions in water supply, more catastrophic wildfires, damage to the State's sizable coastline and ocean resources, and adverse health impacts from increasing air pollution due to higher temperatures. The Legislature also recognized that vehicles—particularly passenger vehicles and light-duty trucks—contribute significantly to California's greenhouse gas emissions and that reducing those emissions would, thus, necessarily have to be an important part of the State's efforts to reduce climate threats to the State and its people.

Since 2002, evidence of the severe threats facing California from climate change has only become clearer, as scientific understanding has advanced and California has begun to feel significant impacts. California's Fourth Climate Change Assessment documents some of the existing and expected impacts from climate change specifically in California, including:

- Air quality: rising temperatures "could lead to increases in ground-level ozone and reduce the effectiveness of emission reductions taken to achieve air quality standards."[868]
- Sea-level rise and coastal erosion: "If emissions continue at current rates, Fourth Assessment model results indicate that total sea-level rise by 2100 is expected to be 54 inches, almost twice the rise that would occur if greenhouse gas emissions are lowered to reduce risk."[869] "31 to 67 percent of Southern California beaches may completely erode by 2100 without large-scale human interventions."[870]

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[866] Cal. Assembly Bill (AB) 1493, Chap. 200, Stats. 2002.
[867] *Id.*
[868] California's Fourth Climate Change Assessment, California's Changing Climate 2018: Statewide Summary Report 40 (Aug. 2018), *available at* http://www.climateassessment.ca.gov/state/docs/20180827-StatewideSummary.pdf.
[869] California's Fourth Climate Change Assessment, California's Changing Climate 2018: A Summary of Key Findings from California's Fourth Climate Change Assessment 6 (Aug. 2018). Climate Assessment. Accessed on October 24, 2018. http://www.climateassessment.ca.gov/state/docs/20180827-SummaryBrochure.pdf.
[870] *Id.* at 15.

- Precipitation and water supply: "California has the highest variability of year-to-year precipitation in the contiguous United States."[871] By 2050, "the average water supply from snowpack is projected to decline by 2/3 from historical levels."[872]
- Drought and land subsidence: The frequency of droughts is likely to increase due to climate change. "A secondary, but large, effect of droughts is the increased extraction of groundwater from aquifers in the Central Valley, primarily for agricultural uses. The pumping can lead to subsidence of ground levels, which around the San Joaquin-Sacramento Delta has been measured at over three-quarters of an inch per year. This subsidence impacts the canals that deliver water across the region."[873]
- Agriculture: "Agricultural production could face climate-related water shortages of up to 16 percent in certain regions. Regardless of whether California receives more or less annual precipitation in the future, the state will be dryer because hotter conditions will increase the loss of soil moisture."[874]
- Wildfires: "One Fourth Assessment model suggests large wildfires (greater than 25,000 acres) could become 50 percent more frequent by the end of century if emissions are not reduced. The model produces more years with extremely high areas burned, even compared to the historically destructive wildfires of 2017 and 2018."[875] "By the end of the century, California could experience wildfires that burn up to a maximum of 178 percent more acres per year than current averages."[876] Increased wildfire smoke will also lead to more respiratory illness.[877]
- Extreme heat events and human health: "Heat-Health Events (HHEs), which predict heat risk to local vulnerable populations, will worsen drastically throughout the state by mid-century. The Central Valley is projected to experience average HHEs that are up to two weeks long, and HHEs could occur four to ten times more often in the North Sierra region."[878] "The 2006 heat wave killed over 600 people, resulted in 16,000 emergency department visits, and led to nearly $5.4 billion in damages. The human cost of these events is already immense, but research suggests that mortality risk for those 65 or older could increase ten-fold by the 2090s because of climate change."[879]
- Infrastructure: Airports in major urban areas will be susceptible to major flooding from sea-level rise and storm surge by 2040-2080, and 370 miles of coastal

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[871] California's Fourth Climate Change Assessment, California's Changing Climate 2018: Statewide Summary Report at 24.
[872] California's Fourth Climate Change Assessment, California's Changing Climate 2018: A Summary of Key Findings from California's Fourth Climate Change Assessment at 5.
[873] *Id.* at 14.
[874] *Id.*
[875] *Id.* at 6.
[876] *Id.*
[877] *Id.* at 8.
[878] *Id.* at 7.
[879] *Id.*

highway will be susceptible to coastal flooding by 2100.[880] Land subsidence and sea-level rise could cause overtopping or failure of the levees in the Sacramento-San Joaquin Delta, "exposing natural gas pipelines and other infrastructure to damage or structural failure."[881]

There can be no question that California faces "extraordinary and compelling conditions"—now and in the future—from GHG emissions.

In fact, California is "one of the most 'climate-challenged' regions of North America."[882] While other States will experience their own substantial climate harms, California's extensive coastline, reliance on snowpack for water storage, susceptibility to drought, potential for land subsidence, and other geographic and climatic factors render it particularly vulnerable and impacted. Further, the impacts to California's agricultural sector have the potential to dramatically affect the Nation as a whole because California currently produces more than a third of the country's vegetables and two-thirds of the country's fruits and nuts.[883] Thus, even if EPA's unlawful requirement that California's conditions be "sufficiently different" from the rest of the nation could apply here, climate change impacts would still constitute such conditions.

California needs its GHG-reducing vehicle standards to meet these compelling and extraordinary conditions. As the Legislature found in 2002, and as remains true today, motor vehicles in California contribute significantly to total GHG emissions.[884] In 2016, the transportation sector accounted for approximately 40 percent of California's total GHG emissions.[885] And within the transportation sector, light-duty vehicles account for the majority of GHG emissions, representing approximately 60 percent of the GHG emissions from the transportation sector.[886] Therefore, any effective approach to reducing GHG emissions in California must include regulations to reduce emissions from motor vehicles.

EPA maintains that the Clean Air Act precludes California from addressing these substantial sources of the very pollution that poses an existential threat to California because other sources, in other states and other countries, also contribute to this pollution. In other words, EPA proposes to find that California may not reduce its contributions to an enormous problem because those reductions will not fully solve the problem. This is an absurd interpretation of one of the country's most comprehensive environmental laws. Indeed, EPA's interpretation reads the Clean Air Act as *requiring* of California the very inaction which leads to the tragedy of the commons. If California

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[880] California's Fourth Climate Change Assessment, California's Changing Climate 2018: Statewide Summary Report at 54-55.
[881] *Id.* at 12.
[882] California's Fourth Climate Change Assessment, California's Changing Climate 2018: A Summary of Key Findings from California's Fourth Climate Change Assessment.
[883] California Agricultural Production Statistics. California Department of Food and Agriculture. Accessed on October 24, 2018. https://www.cdfa.ca.gov/statistics/.
[884] *See also* Fifth Assessment Synthesis Report: Summary for Policymakers. IPCC. 2014. p. 4.
[885] Greenhouse Gas Inventory. CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/cc/inventory/inventory.htm.
[886] Fast Facts on Transportation Greenhouse Gas Emissions. U.S. EPA. Accessed on October 24, 2018. https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions.

is prevented from acting, it may well decrease the incentives others have to take the collective action necessary to solve the problem. Congress intended California to lead, not for EPA to tie California's hands when the scale of a problem gets "too big."

CARB recently compared the GHG emissions from California's light-duty vehicle on-road fleet under CARB's existing GHG standards and under a federal rollback (assuming flatlined standards beginning in 2021). CARB's standards would reduce CO_2 emissions by 57.37 million metric tonnes (MMT) from 2021 to 2030 relative to the scenario where only the federal, rolled-back standards are in effect.[887] There is no question that these reductions are necessary, as part of larger efforts within California and around the world, to minimize the threats of catastrophic climate change.

In fact, these policies are especially critical now to avoid a tipping point with respect to climate change, at which juncture the GHG emissions baked into the atmosphere will result in abrupt climate change and rapid warming even without additional emissions. An international team of scientists has published a study in Proceedings of the National Academy of Sciences (PNAS)[888] that indicates there is a risk of Earth entering what the scientists call "Hothouse Earth" conditions, even if the carbon emission reductions called for in the Paris Agreement are obtained.[889] According to that study, a "Hothouse Earth" climate will stabilize in the long term at a global average of 4–5 degrees Celsius higher than pre-industrial temperatures with sea level 10–60 meters higher than today. Lead author Will Steffen from the Australian National University and Stockholm Resilience Centre explained, "our study suggests that human-induced global warming of 2 [degrees Celsius] may trigger other Earth system processes, often called 'feedbacks,' that can drive further warming - even if we stop emitting greenhouse gases."[890] It is therefore critical, the authors conclude, to greatly accelerate the reduction, and ultimately elimination, of these emissions. CARB's GHG and ZEV standards are designed to advance that objective.

Indeed, when it adopted its Advanced Clean Cars program, CARB expressly recognized the importance of "the transformation of California's light-duty vehicle fleet" to enable the State's long-term air quality and climate objectives.[891]Accordingly, it designed this program to "be the catalyst to that transformative process."[892] The ZEV mandate is a crucial part of this strategy; it "act[s] as the technology forcing piece of the 2016 Draft TAR program" which is necessary because "the new vehicle fleet [in California] will need to be primarily composed of advanced technology vehicles … by 2035" in order to

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[887] Proposed Amendments to the Low-Emission Vehicle III Greenhouse Gas Emission Regulation: Standardized Regulatory Impact Assessment (SRIA) Equivalent Document at A-1–A-2 (June 7, 2018). CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/regact/2018/leviii2018/appd.pdf. p. A-1 to A-2.
[888] Steffen, et al., *Trajectories of the Earth System in the Anthropocene*, PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. Accessed on October 24, 2018. 10.1073/pnas.1810141115.
[889] *Id.*
[890] Planet at risk of heading towards "Hothouse Earth" state. Stockholm University. Accessed on October 24, 2018. https://www.stockholmresilience.org/research/research-news/2018-08-06-planet-at-risk-of-heading-towards-hothouse-earth-state.html.
[891] Staff Report: Initial Statement of Reasons Advanced Clean Cars 2012 Proposed Amendments to the California Zero Emission Vehicle Program Regulations (Dec. 7, 2011) ("ZEV ISOR"). CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/regact/2012/zev2012/zevisor.pdf. p. ES-2.
[892] *Id.*

meet the State's 2050 GHG goal.[893] Put simply, "[t]o achieve full commercialization and place the industry on a pathway consistent with meeting long term goals, volume sales of ZEVs need to ramp up quickly."[894]

As discussed in detail above, EPA's consideration of the wisdom of California's policies in reducing GHG emissions and climate impacts in California is unlawful. Indeed, it has long, and appropriately, been "EPA's practice to leave the decisions on controversial matters of public policy . . . to California."[895] EPA's intrusion on California's sovereign policymaking role here is inconsistent with the Agency's past practice and, more importantly, inconsistent with congressional intent and principles of federalism.

Finally, by inaccurately faulting California for not having demonstrated the connection between its "GHG standards and reducing any adverse effects of climate change *in California*"[896] EPA is improperly shifting the burden of proof to California. *EPA* has the burden to demonstrate that no causal connection exists.[897] EPA may not revoke California's waiver simply after concluding (erroneously) that *California* has not shown a causal connection. And EPA cannot meet its burden. For one thing, well-established law recognizes the importance and legitimacy of incremental progress, and the Clean Air Act, generally, and Section 209(b)(1), specifically, were designed to do so as well. For another, in other contexts, EPA is taking a position opposite to this one—asserting that incremental reductions in GHG emissions from major sources of those emissions are important and meaningful.[898] EPA cannot have it both ways.

For all of these reasons, EPA has not demonstrated, and cannot demonstrate, that California does not need its GHG-reducing standards to meet compelling and extraordinary conditions of climate change.

b. California also needs its GHG-reducing standards because those standards address California's on-going criteria pollution challenges.

California's GHG and ZEV standards are also justified even if EPA focuses solely on their contribution to criteria pollution. And contrary to EPA's baseless contention, CARB explained in its 2012 waiver request, and explains further here, how its GHG and ZEV standards would help reduce criteria emissions.[899]

Rising temperatures exacerbate California's ozone problem by increasing ground-level ozone concentrations.[900] Several studies indicate that a warming climate is expected to exacerbate surface ozone in California's two major air basins: South Coast Air Basin

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[893] *Id.* at ES-5.
[894] *Id.* at 53.
[895] 43 Fed.Reg. at 25,735; 41 Fed.Reg. at 44,210; *see also* 47 Fed.Reg. 7306 (Feb. 18, 1982) (granting deference to California in weighing policy matters); 36 Fed.Reg. 17,458 (Aug. 31, 1971); 40 Fed.Reg. at 23,104.
[896] 83 Fed.Reg. at 43,249 (emphasis in original).
[897] *MEMA I*, 627 F.2d at 1118.
[898] *See, e.g.*, 93 Fed.Reg. 44,746, 44,749 (Aug. 31, 2018) ("This regulation will … caus[e] affected EGUs to begin to internalize the negative externality associated with CO_2 emissions.").
[899] Clean Air Act § 209(b) Waiver Support Document Submitted by the California Air Resources Board 15–16 (May 2012).
[900] *Id.*

and San Joaquin Valley.[901] Median surface temperatures during the ozone season over western North America, including in the South Coast Air Basin and San Joaquin Valley, are projected to increase by the end of the 21st century. These temperature increases could counter the benefits from pollution control strategies used in an effort to meet established air quality standards, resulting in a "climate penalty." This penalty is an increase in emission control requirements needed to offset changes in climate that increase the severity and frequency of air pollution episodes. Hence, while many analyses still show improvements in air quality over the coming century, climate change reduces the degree of improvement. Thus, efforts to reduce climate change by reducing GHG emissions are important as part of California's broader efforts to reduce ozone levels in the State and achieve attainment with national standards that have become more stringent over time and may well continue to do so.[902] This, in itself, is sufficient justification for California's GHG standards, even under a narrow interpretation of "compelling and extraordinary conditions." It also underscores that EPA cannot propose this revocation on the basis of an alleged distinction between "global" and "local" pollution when there is no hard line between the two.

In addition, and contrary to EPA's misleading assertion[903] the ZEV standards reduce criteria pollutant emissions—emissions EPA does not dispute contribute to "compelling and extraordinary conditions" in California. EPA takes out of context a statement in CARB's 2012 waiver request, in which CARB stated that there is "no criteria emissions benefit from including the ZEV proposal *in terms of vehicle (tank-to-wheel or TTW) emissions*."[904] The paragraph continues to explain that this is simply because the tailpipe criteria emissions reductions of the Advanced Clean Cars program are attributed to the LEV III criteria pollutant standards.[905] Even so, there is no question that ZEVs emit zero tailpipe criteria pollutant emissions. Moreover, the ZEV standards would effectively reduce *upstream* criteria pollutant emissions by decreasing emissions from gasoline production and refineries.[906] CARB projected the ZEV standards would reduce statewide reactive organic gas emissions by 6 tons per day, non-methane organic gas and NOx emissions by 3.5 tons per day, and particulate matter emissions by 0.2 tons per day in 2030, over and above the criteria emission reductions projected for the LEV III criteria program.[907] EPA may not ignore these criteria pollution benefits, especially since it has approved this measure as part of California's SIP and, thereby, acknowledged these very emission reductions, as discussed above. Notably, in its proposal EPA acknowledges that all components of California's Advanced Clean Cars

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[901] Jacob & Winner. *Effect of Climate Change on Air Quality*, 43:1 ATMOS. ENVIRON. 51 (Jan. 2009); Wu, et al., *Effects of 2000−2050 Global Change on Ozone Air Quality in the United States*, 113, D06302, J. GEOPHYS. RES.-ATMOS. (Mar. 19, 2008), *available at* https://doi.org/10.1029/2007JD008917; Rasmussen, et al., *The Ozone-climate Penalty: Past, Present, and Future*, 47:24 ENVTL. SCI. & TECH. 14258 (Dec. 17, 2013), *available at* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3990462/.

[902] *See* California's Fourth Climate Change Assessment, California's Changing Climate 2018: Statewide Summary Report at 40.

[903] 83 Fed.Reg. at 43,249.

[904] Clean Air Act § 209(b) Waiver Support Document Submitted by the California Air Resources Board 15 (May 2012) (emphasis added).

[905] *Id.*

[906] *Id.* at 16; *see also* ZEV ISOR at 72, 75-79..

[907] *Id.*

program are designed to work together, but EPA fails to provide any analysis of whether the program could still achieve its criteria emissions reductions benefits, including those anticipated in the approved SIP, if EPA breaks this integrated program apart. EPA cannot, therefore, determine that California does not need its GHG or ZEV standards to address the State's criteria pollution challenges, which EPA admits qualify as compelling and extraordinary.

Further, as CARB has consistently explained, California needs its Advanced Clean Cars program, and specifically its GHG and ZEV standards, now to increase adoption of technologies that will allow for greater emissions reductions required in future years.[908] This "coordinated package of requirements … assures the development of environmentally superior cars that will continue to deliver the performance, utility, and safety vehicle owners have come to expect."[909] As part of this integrated program, the ZEV standards provide a crucial "technology-forcing piece … by requiring manufacturers to produce increasing numbers of pure ZEVs and plug-in hybrid electric vehicles in the 2018-2025 model years."[910] This increasing ZEV deployment is critical to achieving the statewide 2030 and 2045 GHG requirements and 2031 South Coast SIP commitments (the 2016 State SIP Strategy identified the need for light-duty vehicles to reduce NOx emissions by over 85 percent by 2031 to meet federal standards).[911]

California needs both its GHG and ZEV standards to meet compelling and extraordinary conditions associated with climate change and criteria pollutants. There is no basis for EPA to revoke California's waiver for its GHG and ZEV standards based on Section 209(b)(1)(B).

H. EPA's proposal to find that California's ZEV and GHG standards are inconsistent with Section 202(a) is unlawful.

EPA also proposes to revoke California's waiver for its GHG and ZEV standards under Section 209(b)(1)(C) based on a proposed finding of inconsistency with Section 202(a). EPA's proposed finding under Section 209(b)(1)(C) is unlawful because the sole basis for it is EPA's reinterpretation of this provision which, as explained above cannot lawfully be applied retroactively to an already granted waiver.[912] EPA's proposed finding is also unlawful because it is based on an unambiguously foreclosed and unreasonable reinterpretation of the statute, and an improper and inadequate evaluation of the facts.

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[908] CARB Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Public Hearing to Consider the "LEV III" Amendments (December 7, 2011) ("ACC ISOR"). CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/regact/2012/leviiighg2012/levisor.pdf. p. ES-3.
[909] *Id.*
[910] *Id.*
[911] Revised Proposed 2016 State Strategy for the State Implementation Plan 11, 12, 24 (2017). CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/planning/sip/2016sip/rev2016statesip.pdf.
[912] EPA has not proposed to find that the waiver should be revoked based on the agency's historical interpretation of § 209(b)(1)(C) and, therefore, may not make such a finding in its final action.

1. EPA's interpretation of Section 209(b)(1)(C) is unambiguously foreclosed and unreasonable.

Section 209(b)(1)(C) allows EPA to deny a waiver request if it finds that California's standards "are not consistent with [Section 202(a)]." "In the waiver context, section 202(a) 'relates in relevant part to technological feasibility.'"[913] Accordingly, "EPA has traditionally examined whether the necessary technology exists today, *and if not*, what is the cost of developing and implementing such technology."[914] Where the necessary technology does not yet exist, EPA has considered those costs as part of its analysis of whether the lead time for the standards is adequate: "Previous waivers of federal preemption have stated that California's standards are not consistent with section 202(a) if there is inadequate lead time to permit the development of technology necessary to meet those requirements, giving appropriate consideration to the cost of compliance within that time."[915] Indeed, EPA has (very occasionally) partially denied a waiver request in order to allow adequate lead time.[916]

a. In an unacknowledged and unjustified departure from its historical interpretation of Section 209(b)(1)(C), EPA impermissibly and unreasonably proposes to allow consideration of costs of compliance for technology that already exists.

EPA articulates its traditional interpretation—that it must first consider whether "adequate control technology is presently available or already in existence and in use"[917] and, if not, then "whether CARB has provided adequate lead time for the development and application of necessary technology prior to the effective date of applicable standards."[918] However, rather than apply this traditional interpretation, EPA proceeds to turn it on its head, without acknowledging it is doing so, let alone providing an adequate justification for the change in course. Indeed, EPA's discussion of the technological feasibility of California's standards is internally contradictory and confusing to the point of being arbitrary and capricious on that basis alone.

EPA concedes that technology exists to meet California's GHG and ZEV standards. For example, EPA states: "In light of the wide range of existing technologies that have already been developed, have been commercialized, and are in-use on vehicles today,

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[913] *Nichols*, 142 F.3d at 463 (quoting *Ford Motor Co.*, 606 F.2d at 1296 n.17).
[914] 78 Fed.Reg. at 2,142 (emphasis added).
[915] 74 Fed.Reg. at 32,767; *see also Nichols*, 142 F.3d at 463 ("[§ 209(b)(1)(C)] obligates California to allow sufficient lead time to permit manufacturers to develop and apply the necessary technology."); *MEMA I*, 627 F.2d at 1118 (noting that "cost of compliance" "relates to the timing of a particular emission control"); *id.* at 1114 n.40.
[916] *See, e.g.*, 36 Fed.Reg. 8172 (April 30, 1971) (partially denying request for 100 percent assembly-line testing requirements for 1973 model year vehicles on the basis CARB had not presented sufficient evidence that manufacturers were afforded sufficient time to develop and apply the requisite technology, reflecting an appropriate consideration of the cost of compliance within such period); 40 Fed.Reg. 30,311 (July 18, 1975) (denying waiver request for model year 1977 but granting for model year 1978 and subsequent years).
[917] EPA characterizes this as "in use at the time CARB adopts standards for which it *See*ks a waiver." 83 Fed.Reg. at 43,251. However, given the amount of time since EPA approved this waiver request and EPA's own consideration of the new analysis of the federal standards, that characterization, at least in this context, is inconsistent and nonsensical.
[918] 83 Fed.Reg. at 43,251.

including those developed since the 2012 rule, technology availability, development and application, if it were considered in isolation, is not necessarily a limiting factor in the Administrator's selection of which standards are appropriate."[919] Rather than stopping there, as would be required under the traditional interpretation that EPA purports to apply, EPA goes on to focus exclusively on the costs of compliance—the very considerations that need only be taken up when the necessary technology does not yet exist.

EPA neither acknowledges nor explains this about-face from its long-standing, traditional interpretation of Section 209(b)(1)(C). This alone demonstrates that finalizing the proposed revocation would be unlawful.[920]

2. Confusion of EPA's own making, and conclusory statements, do not support EPA considering costs.

Although EPA expressly concedes that the wide range of technologies already in-use renders technological feasibility a non-issue, in other parts of the proposal EPA seems to suggest that *some* of the technologies may not yet be fully developed.[921]

Nowhere in this discussion, however, does EPA identify the "certain control technology" that "would likely not be fully developed" in time.[922] These wholly conclusory, non-specific statements, which do not cite to any supporting evidence, are not lawful proposed findings and cannot provide a basis for EPA to proceed to analyze lead time and cost. Indeed, it is difficult to see how EPA could analyze lead time and costs for technologies it fails to even identify. Nor may EPA conduct that analysis in its final rule in the first instance.

EPA does point to the analysis it and NHTSA conducted for the *federal* standards.[923] That analysis is fatally flawed, as demonstrated in this comment letter, and cannot support any conclusion to revoke California's waiver. Moreover, that analysis looks at lead time and costs for *all* technologies, including the "majority of these technologies" which are already commercialized and in-use.[924] That does not support EPA's conclusory speculation that certain, unspecified technologies may not develop in time. Put simply, EPA did not apply the legal standard under Section 209(b)(1)(C) that it said it would. That is arbitrary and capricious. It is also arbitrary and capricious to introduce this much confusion into the proposal, making it difficult for the public to understand and comment on the basis for the agency's proposed action.

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[919] *Id.* at 43,229.
[920] *Fox Television*, 556 U.S. at 515 ("[T]he requirement that an agency provide reasoned explanation for its action would ordinarily demand that it display awareness that it *is* changing position. An agency may not, for example, depart from a prior policy *sub silentio*. . . .").
[921] *E.g.*, 83 Fed.Reg. at 43,229 ("The majority of these technologies have already been developed, have been commercialized, and are in-use on vehicles today."); *id.* at 43,252 ("certain control technology would likely not be fully developed in time for deployment in MY 2021 through 2025 motor vehicles"); *id.* at 43,250 ("EPA is proposing to determine that there is inadequate lead time to permit the development of technology necessary to meet those requirements, giving appropriate consideration to cost of compliance within the lead time provided in the 2013 waiver.").
[922] *See id.* at 43,252.
[923] *Id.* at 43,251–52.
[924] *See, e.g.*, 83 Fed.Reg. at 43,006-43,010.

3. EPA's analysis implicitly applies a new interpretation of Section 209(b)(1)(C), and that interpretation is impermissible and unreasonable.

The problems with EPA's Section 209(b)(1)(C) analysis do not end there. EPA's analysis implicitly adopts a new interpretation that is unambiguously prohibited and unreasonable.

EPA's historical interpretation is unambiguously the correct one. Notably, "[n]either the court nor the agency has ever interpreted" Section 209(b)(1)(C)'s cross-reference to Section 202(a) as requiring more than "allow[ing] sufficient lead time to permit manufacturers to develop and apply the necessary technology."[925] This underscores that under EPA's and the courts' interpretation of Section 202(a), by itself, and as cross-referenced in Section 209(b)(1)(C), the first question is one of technological availability.

That interpretation—EPA's historical interpretation—is also grounded in the statutory text and congressional intent. The text of Section 202(a) expressly ties EPA's consideration of compliance costs to the amount of lead time "necessary to permit the development and application of the requisite technology." Given that "lead time" refers to the "time in which the technology will have to be available," it goes without saying that where technology is already available, no additional lead time is necessary.[926] Whether or not one reads Section 202(a) that way when applied to EPA's standards, Section 209(b)(1)(C)'s cross-reference to Section 202(a) must be read this way because to do otherwise would undermine Congress' intent that California have the "'broadest possible discretion'" with its vehicle emissions standards.[927]

EPA's analysis implicitly proposes an entirely different and impermissible interpretation. For example, under EPA's traditional interpretation, "the statute does not permit [the Administrator] to take into account the extent of the burden placed on residents of California or on regulated interests, *unless* the California requirement fails to provide an adequate period of time for compliance."[928] But here EPA proposes to find that California's GHG and ZEV standards fail the Section 209(b)(1)(C) criteria without any discussion of whether, or how much, more lead time is necessary. Put another way, EPA now proposes to take the unprecedented step of revoking an already granted waiver without making the very finding it has traditionally faulted waiver opponents for failing to advance.[929] The interpretation reflected in this analysis is impermissible and unreasonable; it is also entirely implicit and unexplained.

In addition, EPA misapplies *International Harvester* in claiming that the agency may consider "any expected hardship that would be posed to manufacturers if EPA does not

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[925] *Nichols*, 142 F.3d at 463.
[926] *See NRDC v. EPA*, 655 F.2d 318, 329 (D.C. Cir. 1981) (quoting *Portland Cement Ass'n v. Ruckelshaus*, 486 F.2d 375, 391 (D.C. Cir. 1973)).
[927] *Nichols*, 142 F.3d at 453 (quoting H.R. Rep. No. 95-294 at 301–02).
[928] 36 Fed.Reg. at 17,458.
[929] *See id.* at 17,459 (granting waiver after noting that "[m]anufacturers do not contend that the cost of compliance will be significantly reduced by extending lead time"); *see also* 78 Fed.Reg. at 2,142 (granting waiver after noting that opponents "noted general concerns about . . . infrastructure and cost [but] made no claims that inadequate lead time exists").

withdraw CARB's waiver."[930] That case involved review of EPA's standards under an unrelated provision in Section 202 that expressly allowed for a one-year reprieve. It is inapposite here and may not be imported, wholesale and without explanation (or even acknowledgement), into an interpretation of Section 209(b), particularly given long-standing recognition by EPA and the courts that the analysis under the two sections must be different.

The new interpretation implicitly advanced by EPA in this proposal would make EPA the arbiter of the costs of compliance, even when there is no dispute that the technology exists or that the standards provide adequate lead time for technological development and application. That is not EPA's role.[931] EPA has not provided any basis for its new interpretations, or even acknowledged it is applying new interpretations, although they depart from prior practice, precedent, congressional intent, and the statutory text. EPA's consideration of costs and hardships to manufacturers unmoored from availability of the technology and adequacy of lead time is arbitrary and capricious and unlawful.

a. EPA also impermissibly and unreasonably proposes to change its long-standing interpretation of excessive costs in ways that infringe on California's congressionally recognized state interests.

Even if EPA could consider costs of compliance where, as here, the relevant technologies already exist and are being applied, EPA still could not finalize the proposed waiver revocation based on an excessive cost finding. Indeed, EPA's new understanding of excessive costs flies in the face of the statutory text, precedent, agency practice, and congressional intent with respect to EPA's own standard-setting authority under Section 202(a). This new understanding is even more impermissible and unreasonable imported into waiver considerations under Section 209(b)(1)(C).

As courts have long recognized, Congress wanted EPA to reduce motor vehicle emissions, but "also sought to avoid doubling or tripling the cost of motor vehicles."[932] In past decisions, EPA has stated that its consideration of costs under Section 209(b)(1)(C) is "fully consistent with *MEMA I*, which indicates that the cost of compliance must reach a very high level before the EPA can deny a waiver. Therefore, past decisions indicate that the costs must be excessive to find that California's standards are inconsistent with section 202(a)."[933]

These past interpretations are consistent with Congress' understanding that costs would rise with the regulation of air pollution. Congress accepted these costs in establishing the Clean Air Act and, in particular, the waiver provision, which safeguards California's

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[930] 83 Fed.Reg. at 43,252 (citing *NRDC*, 655 F.2d at 330, which discussed *International Harvester*, 478 F.2d 615 (D.C. Cir. 1973)).
[931] *Ford Motor Co.*, 606 F.2d at 1301 ("the statute does not provide for any probing substantive review of the California standards by federal officials").
[932] *MEMA I*, 627 F.2d at 1118.
[933] 74 Fed.Reg. at 32,774 (citing 47 Fed.Reg. 7306, 7309 (Feb. 18, 1982), 43 Fed.Reg. 25,735 (Jun. 14, 1978), and 46 Fed.Reg. 26,371, 26,373 (May 12, 1981)).

authority to push technology forward through more stringent standards.[934] Indeed, Congress expressly intended the Clean Air Act to drive technological development, as EPA has conceded in its proposal.[935] Both Congress and EPA have long understood that technology-driving regulation is necessary to take the state of the art "by the hand and g[i]ve it a good pull."[936] EPA's reinterpretation, under which modest cost increases are deemed excessive, contravenes congressional intent, legislative history, and common sense.

EPA's reinterpretation of excessive costs also flouts Congress' intent that California may make its own policy judgments about reasonable costs. *See* H.R. Rep. No. 95-294, at 301. Put simply, EPA's proposal to decide, for California, that modest cost increases are "excessive" flies in the face of the cooperative federalism structure Congress put in place with the Clean Air Act and, particularly, the waiver provision. Because it ignores California's discretion regarding policy choices, EPA's reinterpretation of excessive costs is unlawful and intrudes on the authority Congress preserved for California.[937]

In its waiver decisions, EPA has long recognized this is so:

> I would feel constrained to approve a California approach to the problem which I might also feel unable to adopt at the federal level in my own capacity as a regulator. The whole approach of the Clean Air Act is to force the development of new types of emission control technology where that is needed by compelling the industry to 'catch up' to some degree with newly promulgated standards. Such an approach . . . may be attended with costs, in the shape of reduced product offering, or price or fuel economy penalties, and by risks that a wide number of vehicle classes may not be able to complete their development work in time. Since a balancing of these risks and costs against the potential benefits from reduced emissions is a central policy decision for any regulatory agency under the statutory scheme . . . I believe I am required to give very substantial deference to California's judgments on this score.
>
> 30 Fed. Reg. at 23,104.

EPA has repeated this understanding of California's authority to decide, for itself and for its own consumers, what costs might be excessive in multiple waiver decisions since 1975.[938]

Thus, without demonstrating that compliance costs would be enormous—something akin to doubling or tripling vehicle prices—EPA cannot revoke a waiver simply on the ground that California's standards might result in somewhat higher costs. This is true

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[934] *See, e.g.*, *MEMA I*, 627 F.2d at 1118.
[935] 83 Fed.Reg. at 43,251.
[936] *Int'l Harvester*, 478 F.2d at 623 (quoting Secretary of Health, Education and Welfare).
[937] *See* 78 Fed.Reg. at 2134; 74 Fed.Reg. at 32,744, 32,775 ("Cost-effectiveness is a policy decision of California that is considered and made when California adopts the regulations, and EPA, historically has deferred to these policy decisions.").
[938] *See, e.g.*, 74 Fed.Reg. at 32,748 (citing 40 Fed.Reg. at 23,103–04).

even where compliance will be challenging, which EPA essentially concedes is not the case here.[939] EPA's express consideration of the reasonableness of costs here and rejection of its prior excessive costs standard is an abrupt and unexplained departure from longstanding practice and, if finalized, would frustrate congressional intent.

Because any cost assessment EPA conducts must be related to the lead-time requirement, EPA also may not decline to issue a waiver unless it determines that the costs it finds excessive will decrease with an extension of lead time.[940] As stated above, EPA has not analyzed lead time at all. And it certainly has proposed no finding that costs of compliance would decrease with additional lead time. Since EPA has not proposed such a finding, it may not rely on a new finding to that effect in its final decision.

Even if EPA could change its legal interpretation here, which it may not, it has not adequately explained its dramatic shift. This is particularly apparent given the longstanding nature of EPA's historical interpretations and California's reliance on them.[941] Here, however, EPA has provided no valid rationale for changing these interpretations.

b. EPA improperly relies on California's "Deemed to Comply" language to justify its unlawful revocation of California's waiver for GHG and ZEV standards.

Contrary to EPA's assertion,[942] the inclusion of the "deemed to comply" provision in California's regulations does not mean that California either does not need or may not receive a waiver. First, any such conclusion by EPA would reflect a change in its legal interpretation of the waiver provision, and that cannot form the basis of a waiver revocation. Second, California may make its own policy judgments that, when the federal standards are substantially similar to California's, including a provision regarding "deemed to comply" is appropriate. This is well within the abundant policy discretion Congress left to California, especially considering California may request and obtain a waiver for standards that are "at least as protective" as federal standards.[943]

Third, EPA's proposal that the "deemed to comply" provision is logically incompatible with a preemption waiver analysis is itself illogical. Under EPA's interpretation, CARB would have to wait until the federal government took some action, for instance, to weaken standards, before CARB could request a waiver to lock in its own standards. Such a requirement would undercut the efficacy of California having its own standards, especially given lead times for waiver decisions and lead time requirements for

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[939] *See* 74 Fed.Reg. at 32,768 ("California must be given substantial deference when adopting motor vehicle emission standards which may require new and/or improved technology to meet challenging levels of compliance.").
[940] *See* 36 Fed.Reg. at 17,459 (granting waiver after noting that "[m]anufacturers do not contend that the cost of compliance will be significantly reduced by extending lead time").
[941] *Fox Television*, 556 U.S. at 515 (an agency's justification for its proposed change of course must be "more detailed than what would suffice for a new policy created on a blank slate" because its "prior policy has engendered serious reliance that must be taken into account"); *see also Encino Motorcars, LLC v. Navarro*, 136 S. Ct. 2117, 2126 (2016).
[942] 83 Fed.Reg. at 43,252 & n.589.
[943] 42 U.S.C. § 7543(b)(1).

standards, thereby frustrating congressional intent and undermining California's and Section 177 States' abilities to protect their residents and resources. Fourth, EPA ignores the fact that "California retains a sovereign interest in being able to enforce its own regulations against automobile manufacturers—just as states have a sovereign interest in enforcing state drug laws *even if they coincide with federal drug laws*."[944] And, finally, there is no credible argument that accepting compliance with EPA's standards, promulgated under Section 202(a), can render California's standards inconsistent with that same section.

Further, EPA incorrectly asserts that CARB's 2012 feasibility finding "was premised on a finding of reduced compliance costs and flexibility because of the deemed to comply provisions."[945] When EPA evaluated California's request for a waiver in 2012, it first assessed the standards without the deemed to comply language, and then also with the language, and concluded that, with or without that provision, California should receive a waiver.[946] That is unsurprising. As CARB demonstrated in its request for a waiver in 2012, confirmed in its Midterm Review in 2017, and reaffirmed in its current deemed to comply rulemaking, California's standards satisfy the Section 209(b)(1)(C) standard regardless of the deemed to comply provision.[947] In any event, as discussed above, EPA's analysis of costs with respect to the proposed waiver revocation is arbitrary and capricious and unlawful for numerous reasons and cannot support revocation.

4. EPA's proposed finding under Section 209(b)(1)(C) is arbitrary and capricious because it is not based on any proper factual support.

EPA's proposal to revoke California's waiver under Section 209(b)(1)(C) also lacks adequate factual support. After baldly claiming clear and compelling evidence supports revocation under Section 209(b)(1)(C),[948] EPA proceeds to offer no concrete evidence that California's standards are infeasible.[949] EPA cannot lawfully revoke a waiver because its view of the facts has changed, and it certainly may not do so simply by claiming without support that there may be more challenges—for instance, modest costs—to reaching California's standards than CARB projected in 2012. Indeed, given that, as intended by Congress, California's waiver requests typically contain technology forecasts and cost projections years into the future, it begs credulity to assert that EPA can revoke a waiver because it now believes California's forecasts and projections did not pan out as exactly as anticipated.

EPA erroneously relies on the analysis of the federal rules as a proxy, stating that analysis "raises questions" about the feasibility of California's standards and that

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[944] *Chamber of Commerce of U.S. v. EPA*, 642 F.3d 192, 211 (D.C. Cir. 2011) (emphasis added).
[945] 83 Fed.Reg. at 43,252.
[946] 78 Fed.Reg. at 2138–39.
[947] *See* Clean Air Act § 209(b) Waiver Support Document Submitted by the California Air Resources Board 15–16 (May 2012); CARB, Proposed Amendments to the Low-Emission Vehicle III Greenhouse Gas Emission Regulation: Standardized Regulatory Impact Assessment (SRIA) Equivalent Document (June 7, 2018); CARB, California's Advanced Clean Cars Midterm Review (Jan. 18, 2017).
[948] 83 Fed.Reg. at 43,244.
[949] *See id.* at 43,250–53.

therefore California's GHG standards are inconsistent with Section 202(a). This approach suffers from multiple fatal flaws. First, as explained at length above, EPA's analysis of the federal GHG standards is insupportable. EPA has impermissibly relied almost entirely on NHTSA's analysis rather than conducting its own, and the Agencies' modeling approach, inputs, and assumptions are all fundamentally flawed.[950] EPA cannot rely on NHTSA's fundamentally flawed analysis to support its proposal to revoke California's waiver.

Even if EPA's analysis of the feasibility of the federal standards were supportable, the Agency could not rely on a nationwide assessment to conclude that California's standards are infeasible. Instead, EPA must consider a California-specific analysis of technological feasibility before making its determination.[951]

Notably, EPA's attempt to equate the federal and California standards in this way is misleading and misses the point. Similarity in structure or stringency of the California and federal standards does not speak to whether a standard applicable across the entire country could be more or less feasible in California, the fifth largest economy in the world and a State that has long required vehicle technology before it was required in other parts of the country. Electric vehicle infrastructure and electric vehicle sales in California far exceed those elsewhere in the country. In light of both the case law and the statutory structure here, if EPA aims to use the federal analysis as a proxy for California, it must adequately explain why nation-wide and California-specific feasibility assessments are interchangeable. EPA's proposal fails to provide that justification.

EPA's sole reference to concerns that "manufacturers may no longer be willing to commit to investments for a limited market as compared to the broader national market"[952] does not constitute a California-specific analysis. It is unsupported by any evidence and attempts to reconsider a judgment made by Congress—that there can, in fact, be two, and only two, sets of vehicle standards in the United States. It also ignores the reality that California accounts for approximately 50 percent of ZEV and PHEV sales in the country.[953] Given those sales and California's size, it is hardly a "limited" market for which manufacturers should be presumed to be unwilling to commit investments. Indeed, Congress made the opposite assumption when it enacted the waiver provision (and Section 177).

EPA's reliance on CARB's 2012 waiver request submissions in concluding that California's standards are infeasible under Section 209(b)(1)(C) is also improper, particularly when EPA itself purports to rely on a current federal analysis. EPA has no authority to reassess CARB's 2012 request as though it were submitted today. EPA has also unlawfully ignored CARB's 2017 Midterm Review and CARB's more recent projections of feasibility, including the Standardized Regulatory Impact Assessment

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[950] (*See* Sections V and VI of CARB's comment).
[951] *See Ford Motor Co.*, 606 F.2d at 1306 ("The statute provides for no determination at all as to the effect of the California standards on other parts of the country."); *id.* at 1302 (affirming EPA's interpretation that Administrator "grants or denies a waiver without exploring the consequences of nationwide use of the California standards or otherwise stepping beyond the responsibilities delineated by Congress").
[952] 83 Fed.Reg. at 43,252.
[953] California's Advanced Clean Cars Midterm Review: Executive Summary 44. CARB. Jan. 18, 2017.

(SRIA) it conducted in 2018 as part of its rulemaking to clarify the "deemed to comply" provision.

If EPA is going to base its proposed waiver revocation on unavailability of technology, it must demonstrate that none of the technological options will be available, not merely that one option (of many) may not be available.[954] In any event, EPA is correct when it says that the technology exists to comply with California's standards out to model year 2025.[955]

Adding more inconsistencies and further undermining CARB's ability to comment meaningfully, EPA states that its analysis of costs and feasibility under Section 209(b)(1)(C) should be conducted on a standard-by-standard basis,[956] but then analyzes the ZEV and GHG standards together, arguing that they are intertwined (*id.* at 43,250). This inconsistency confuses EPA's analysis and is unexplained, rendering EPA's actual proposed approach impossible to understand. Notably, EPA's contention that it can (or perhaps must) examine these two standards together is unjustified as either a legal or factual matter. In any event, the waiver provision does not permit EPA to analyze California's standards in a manner that risks defying congressional intent through an overbroad intrusion on California's authority.

EPA also inconsistently and impermissibly considers alleged challenges to meeting the ZEV mandates in Section 177 States as support for its conclusion that CARB's ZEV standards are not technologically feasible.[957] Yet, in a footnote, EPA concedes that "EPA's longstanding interpretation of section 209(b) and its relationship with section 177 is that it is not appropriate under section 209(b)(1)(C) to review California regulations, submitted by CARB, through the prism of adopted or potentially adopted regulations by section 177 States."[958] Thus, EPA appears to be proposing a reinterpretation of the statute without acknowledging it is doing so, explaining the new interpretation, or justifying the change in course. In addition, the bases for EPA's proposal is insufficiently clear. In its current form, the proposal's inconsistencies prevent effective comments and raise serious questions about the integrity of any analysis EPA claims to have conducted. Moreover, to the extent EPA is considering Section 177 States' compliance, its analysis is based on false assumptions about the penetration of ZEVs in other States. See Multi-State Comment Letter, Appendix B on ZEV Penetration and Infrastructure Outside of California, for more detail on ZEV penetration and technology in Section 177 States.

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[954] *MEMA v. EPA*, 627 F.2d 1128 (D.C. Cir. 1979) ("*MEMA II*") (determining that denial of a waiver request under § 209(b)(1)(C) would not be appropriate unless EPA finds that an infeasible technology is "one among several technologically infeasible options").
[955] California's Advanced Clean Cars Midterm Review (2018). CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/msprog/acc/mtr/acc_mtr_finalreport_full.pdf; Proposed Amendments to the Low-Emission Vehicle III Greenhouse Gas Emission Regulation: Standardized Regulatory Impact Assessment (SRIA) Equivalent Document (June 7, 2018). CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/regact/2018/leviii2018/appd.pdf; Duleep Report, §§ 2.6, 3.1, 3.4, and 5.
[956] 83 Fed.Reg. at 43,243 ("EPA's evaluation of the technological feasibility of standards is best understood as in effect an evaluation of each standard for each year").
[957] *Id.* at 43,250, 43,252.
[958] *Id.* at 43,242 n.561; *see also* 74 Fed.Reg. at 32,783 (reaffirming that EPA may not "consider the impact of actions or potential actions taken by other states under § 177 of the Act.").

Furthermore, throughout its Section 209(b)(1)(C) analysis, EPA improperly relies on conclusory statements and insufficient justification to conclude that California's standards are infeasible. For instance, EPA claims there is "inadequate lead time"[959] for manufacturers to meet California's standards, but offers no suggestions as to how more time would help alleviate its concerns or how much additional time would be necessary. EPA also baldly asserts that it "expects that the pace of technological developments as it relates to infrastructure for [fuel cell vehicles] will slow down."[960] Yet EPA provides no support whatsoever for this expectation. And, in fact, EPA's proposal, if finalized, would help realize this "expectation." But EPA cannot prematurely use that potential effect of its proposal to justify revoking California's waiver. Doing so would also prejudge the outcome of EPA's own proposal, in violation of well-established principles of administrative law. None of these conclusory statements can support the proposed revocation.

As these inadequacies illustrate, EPA has not presented any proper factual support for its conclusion that California's standards are inconsistent with Section 202(a). The improper analytical approach, internal inconsistencies, conclusory statements, and non-existent evidence demonstrate that EPA's proposal is arbitrary and capricious and unlawful. The proposal's flaws are all the more apparent because, as discussed below, California's GHG and ZEV standards are unquestionably feasible and consistent with Section 202(a).

5. California's GHG and ZEV standards are feasible and, therefore, consistent with Section 202(a).

EPA's failure to conduct an adequate California-specific analysis under Section 209(b)(1)(C) does not and cannot shift the burden to California to conduct such an analysis. Without conceding otherwise, CARB observes that California's standards are demonstrably feasible and consistent with Section 202(a). As noted above, EPA does not really contend to the contrary—rather, it seeks to impermissibly redefine the statutory criteria and then unlawfully apply those criteria to an improper (and in many cases non-existent) factual record.

a. California's GHG standards are consistent with Section 202(a).

There is no doubt that technology exists to meet California's GHG standards. EPA concedes as much throughout the proposed rule.[961] As discussed above, EPA's proposed conclusion that the cost of these standards is "excessive" is unlawful.

Even if EPA were to assess cost of compliance in the regulatory period, both California's GHG and ZEV standards are feasible. EPA's "questions" on this point are based entirely on the Agencies' analysis of the federal standards. That is, of course, impermissible here. In any event, that analysis is also fundamentally flawed in ways that vastly over-state costs.[962] That heavily flawed, national analysis provides no basis to revoke California's waiver.

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[959] 83 Fed.Reg. at 43,250
[960] *Id.* at 43,252.
[961] *See, e.g.*, 83 Fed.Reg. at 43,229.
[962] *See* Section V.C of CARB's comments.

It would be a costly and time consuming process for CARB to conduct an in-depth analysis of feasibility as it did in developing its standards. California should not and cannot be expected to complete such an analysis in response to EPA's *sua sponte* proposal to withdraw California's waiver. And California certainly cannot be expected to complete that analysis within the inadequate 63-day public comment period, during which CARB must also attempt to unpack the complex, unexplained, and faulty modeling and inputs that the Agencies claim support weakening the federal standards.

Nevertheless, CARB submits its Midterm Review as well as its Standardized Regulatory Impact Assessment (SRIA) conducted for its rulemaking to clarify the deemed to comply provision.[963] Both demonstrate that the standards are feasible, including with respect to cost of compliance.[964] Of course, that is California's judgment to make, as discussed above, and it has made that very judgment in the Midterm Review. Moreover, evaluating the impact of removing CARB's deemed to comply language, CARB's SRIA assessed the change in costs associated with flatlining either the federal or California GHG standards at 2021 levels. CARB found that flatlining California GHG standards at 2021 levels would reduce the price per vehicle in California by $303–1042, depending on the applicable model year.[965] But changes in fuel consumption costs and other adverse environmental impacts would more than offset this change in price.[966] As an alternative, flatlining the federal GHG standards at 2021 levels, while retaining California's existing standards, would increase California new vehicle prices by $28–670, depending on the model year.[967] This cost difference also would be more than offset by the changes in fuel consumption costs.

Though not intended to support retention of California's waiver (a case that should not have to be made, and certainly not under these circumstances), these analyses demonstrate that California's GHG standards do not create excessive costs of compliance. And, even applying EPA's erroneous reinterpretation of excessive costs, EPA cannot deem unreasonable a cost difference of up to $670 between a flatlined federal GHG standard (beginning in 2021) and CARB's more stringent GHG standards.

b. California's ZEV standards are consistent with Section 202(a).

With respect to the ZEV standards, EPA raises concerns about "challenges for the adoption of all ZEV technologies such as lack of required infrastructure and a lower

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[963] Proposed Amendments to the Low-Emission Vehicle III Greenhouse Gas Emission Regulation: Standardized Regulatory Impact Assessment (SRIA) Equivalent Document. CARB. June 7, 2018.; CARB, California's Advanced Clean Cars Midterm Review: Executive Summary. CARB. January 18, 2017.
[964] *See id.*
[965] *Id.* at 17. These costs are evaluated equally over all new vehicles sold per manufacturer, including ZEVs, and those results are averaged to estimate the change in annual incremental price per vehicle that consumers would be expected to pay.
[966] *Id.* The SRIA also analyzed a scenario of more stringent standards for model years 2024 and 2025 in California and concluded that even this alternative was "technically feasible and could provide additional GHG emission benefits at reasonable costs." *Id.* at 40. This more stringent standards scenario resulted in an increase in new vehicle price of $30 in 2024 and $57 in 2025 compared to the existing standards. *See id.* at 17. Therefore, compared to the flatlining in 2021, the more stringent scenario would result in an increase in new vehicle price of $887 in 224 and $1099 in 2025. Neither of these price increases comes anywhere near doubling or tripling the cost of vehicles.
[967] *Id.* at A-1.

level of consumer demand for [fuel cell vehicles] in both California and 177 states."[968] However, EPA has failed to substantiate this alleged uncertainty or these alleged challenges and, most notably, has failed to provide any evidence concerning *California*—the only State it may consider here. EPA has also proposed no supported finding that the standards cannot be met or, if that question could be reached, that they create excessive costs of compliance.

California's existing electric charging infrastructure and planned additional charging stations are more than adequate to fuel the vehicles mandated by ZEV standards through 2025 and beyond. ZEV infrastructure in California is already sufficient to fuel the mandated number of vehicles through at least 2023, and additional planned infrastructure is expected to far exceed the level necessary to meet regulatory mandates through 2025.[969] Currently, the state has over 17,000 electric vehicle public charging ports.[970] As shown below, there has been rapid growth of connectors to keep up with vehicles on the road in California since 2012. These numbers are expected to continue rising. California utilities, phase 1 Electrify America investments, and other local districts have already funded over 20,000 public charging ports. By 2025, CARB expects an additional 80,000 publically funded charging ports.[971]

Manufacturers have been overcomplying with the ZEV mandate each year, and there is no reason (and certainly none EPA has provided) to think that will change in the future.[972] EPA cannot make a finding that the ZEV standards are inconsistent with Section 202(a). In fact, there are over 400,000 battery electric vehicles and plug-in hybrid electric vehicles on the road in California today.[973]

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[968] 83 Fed.Reg. at 43,250.

[969] The U.S. Department of Energy's Electric Vehicle Infrastructure Projection Tool Lite (EVI-Pro Lite) developed by the National Renewable Energy Labs (NREL) demonstrates that California currently has more than adequate levels of public infrastructure to support the current number of vehicles on the road. DOE 2018a "Electric Vehicle Projection Tool (EVI-Pro) Lite: Your Results (400,000 vehicle scenario)". Alternative Fuels Data Center. Accessed on October 24, 2018. https://www.afdc.energy.gov/evi-pro-lite (Scenario run September 6, 2018, using Electric Vehicle Projection Tool (EVI-Pro) Lite).

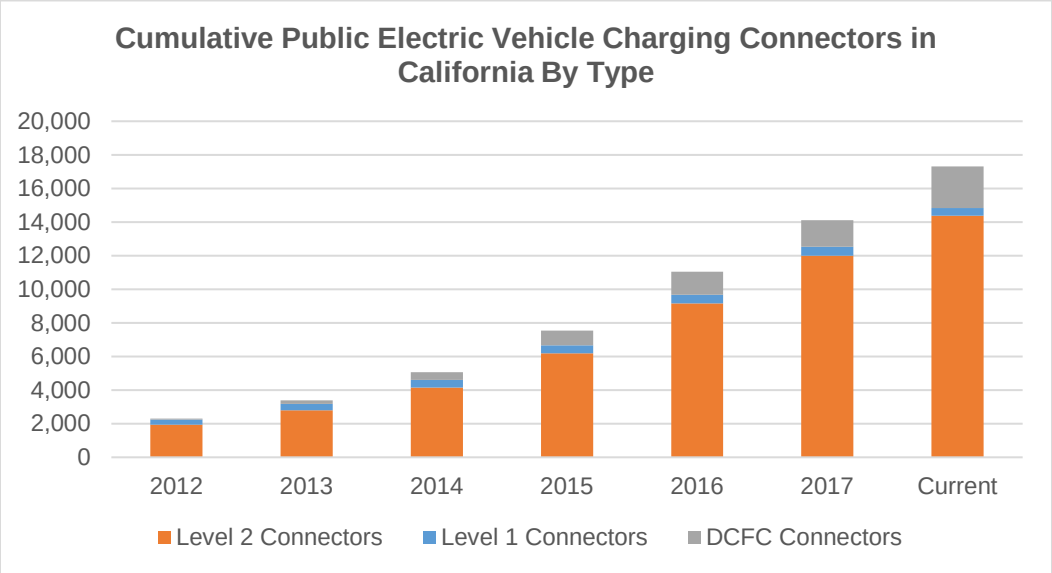
[970] "EVSE_Analysis_AFDC.xlsx" pulled for California on September 6, 2018. Alternative Fuels Data Center. Accessed on October 24, 2018. https://www.afdc.energy.gov/fuels/electricity_locations.html#/find/nearest?fuel=ELEC.

[971] Future funded stations. CARB. 2018.

[972] *See, e.g.*, California's 2017 Climate Change Scoping Plan ES-5 (Nov. 2017). CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017_es.pdf.

[973] Veloz, "6_june_2018_Dashboard_PEV_Sales_veloz.pdf." Hybridcars.com. Accessed on October 24, 2018. http://www.veloz.org/wp-content/uploads/2018/07/6_june_2018_Dashboard_PEV_Sales_veloz.pdf.

Figure X-1

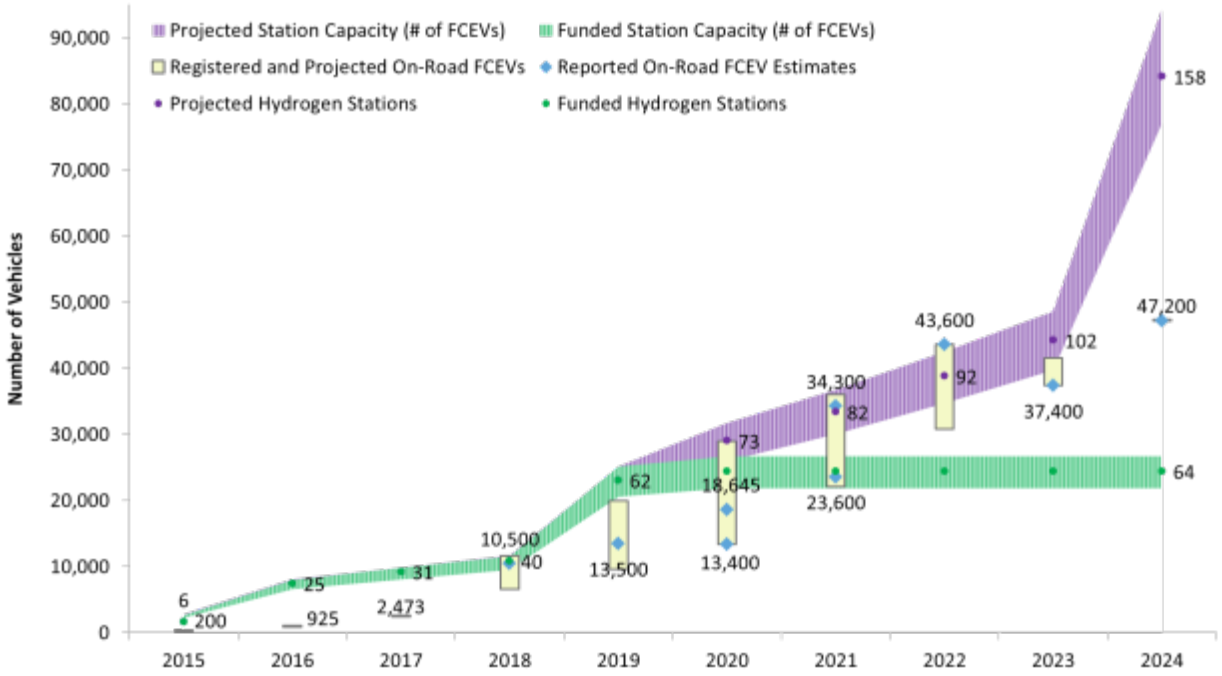


Privately available infrastructure found at many workplaces is not included in the above numbers, but would increase the available connector count by over 3,000. The different connector types refer to voltage: Level 1 Connectors are 120V, Level 2 are 240V, and DCFC are 400V.

Unlike battery electric vehicles and plug-in hybrid electric vehicles, fuel cell electric vehicles depend on public infrastructure. California has over 10,000 fuel cell electric vehicles on the road today. As of September 2018, 39 hydrogen stations open for retail use adequately serve this fuel cell electric vehicle fleet. The chart below depicts additional currently funded hydrogen stations in the planning phase and projections of future stations, as well as projected fuel cell electric vehicle volumes and station capacities. As the chart illustrates, future projections of hydrogen stations confirm more than enough capacity to keep up with demand for these vehicles, which continue to be produced above the levels required by the regulation.[974]

[974] 2018 Annual Evaluation of Fuel Cell Electric Vehicle Deployment and Hydrogen Fuel Station Network Development (June 2018). CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/msprog/zevprog/ab8/ab8_report_2018_print.pdf.

Figure X-2 California Projected Hydrogen Demand and Fueling Capacity



As these data demonstrate, California's infrastructure is and will be more than adequate to fuel the vehicles mandated by ZEV standards through 2025 and beyond. The technologies exist and are being applied in increasing numbers throughout the state. CARB's cost estimates for ZEVs, as detailed in its Midterm Review and EPA's 2016 Proposed Determination, demonstrate that costs, which are not excessive, are decreasing and will continue to do so. For all of these reasons, California's ZEV standards are consistent with Section 202(a), and EPA's proposed findings to the contrary are unsupported and without basis (if they were even legally permissible to make, which they are not).

Finally, EPA's consideration of perceived challenges to ZEV penetration in Section 177 states is meritless. First, as discussed above, EPA may not consider compliance in Section 177 states in analyzing California's waiver. Further, because California's own infrastructure and electric vehicle production and demand far exceed its regulatory mandate, the state need not rely on any ZEV penetration in Section 177 states to meet its standards. And in any case, EPA's perception that "challenges" are preventing ZEV penetration in Section 177 States is misguided, as ZEV penetration is rapidly increasing across those States as well.[975]

I. In sum, EPA may not revoke California's waiver for its GHG and ZEV requirements.

As explained above, EPA lacks any authority to revoke a waiver. Even if EPA had any implicit authority to revoke waivers, that authority must be severely limited and the

[975] *See* Multi-state Comment Letter, Appendix B: ZEV Penetration and Infrastructure Beyond California.

conditions for it do not exist here. Further, none of EPA's grounds for withdrawing California's waiver is lawful, as discussed above. EPA's proposal is unprecedented, unfounded, unlawful, and deleterious to the aims of the Clean Air Act, the basic principles of state sovereignty, and the health and welfare of California's residents.

XI. EPCA preemption is improper.

NHTSA's analysis and proposed finding that California's Advanced Clean Car standards are preempted by the Energy Policy and Conservation Act ("EPCA") is both inappropriate and wrong. As a threshold matter, Congress has not delegated to NHTSA the authority to determine the scope of EPCA preemption, much less determine that any state law is preempted. This is all the more given that California's Advanced Clean Car program has been reviewed by another federal agency and received waivers under a statute—the Clean Air Act—in which NHTSA cannot claim any particular expertise or authority. Furthermore, NHTSA's analysis of both express and conflict preemption is wrong on the law and contradicted by the two federal courts that have directly addressed the issue. Congress intended that California's separate emissions standards would never be preempted by EPCA. Even if EPCA could preempt some hypothetical emissions standards, California's Advanced Clean Car program is not expressly preempted by EPCA nor in conflict with it.

The intent of EPCA's fuel economy program is to promote energy conservation. When enacted, the predominant transportation technology was the internal combustion engine. Now, new technologies are transforming the sector that do not use gasoline, are not inherently limited to non-renewable energy sources, their energy sources come from a variety of renewable and non-renewable sources, and are delivered in a variety of ways. The statute does not evince any text or intent for the Secretary of Transportation to regulate the energy use of such technologies, or to preempt emissions from such technologies. When zero-emission transportation has the potential reduce greenhouse gas emissions millions of metric tons,[976] regulations promoting such technologies to realize these reductions do not "relate to" fuel economy under Section 32919.

A. NHTSA'S discussion of preemption and its proposed regulatory text are ultra vires and unwarranted.

In the preamble to the proposed rule, NHTSA claims "[p]resent circumstances require NHTSA to address the issue of preemption."[977] The "circumstances" NHTSA appears to be referring consist solely of California's GHG standards and ZEV program, which have existed for 9 and 25 years, respectively. In response to these circumstances,

[976] See Bradley, M., Levine, J., Re: Request for Public Input on Potential Alternatives to a Potential Clarification of the "Deemed to Comply" Provision for the LEV III Greenhouse Gas Emission Regulations for Model Years Affected by Pending Federal Rulemakings, May 31, 2018, p. 3.
[977] 83 Fed.Reg. at 43,233.

NHTSA proposes to adopt regulatory text "summarizing" its position.[978] However, on its face, the proposed regulatory text appears not to summarize NHTSA's position, but rather to attempt to make it binding law.[979]

1. Congress has not delegated NHTSA authority to determine whether a state's law is expressly preempted.

As a general matter, agencies lack legal authority to determine the preemptive effect of statutes, absent express delegation from Congress giving them such authority.[980] Accordingly, the rare laws that delegate preemption authority to agencies do so explicitly. For example, the Telecommunications Act of 1996 provides that if the Federal Communications Commission makes a specified determination, after notice and comment, about state laws applicable to providers of telecommunications services, "the Commission shall preempt the enforcement of such [laws] to the extent necessary….."[981]

EPCA does not delegate to NHTSA the authority to determine whether a given state law is preempted, or even whether that state law is "related to fuel economy standards."[982] NHTSA does not, and cannot, assert otherwise. It is no accident that courts confronting the question of whether state laws are expressly preempted under EPCA have ignored NHTSA's statements in prior rulemakings addressing the question.[983]

Because NHTSA has no authority to declare California's standards preempted, and is entitled to no deference in interpreting EPCA's preemption language, it should not finalize its proposed regulations nor purport to interpret the preemption provision of the statute in the preamble to any final rule.

2. NHTSA's Proposed Finding of Conflict Preemption is Premature, Cursory, Outside the Agency's Expertise and Erroneous.

NHTSA's proposed finding and regulatory text regarding conflict preemption are similarly misplaced. Even a serious attempt to analyze conflict preemption would be

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[978] *Id*. at 43,329.
[979] *Id.* at 43,486, 43,489 (to be codified at 49 C.F.R. §§ 531.7, 531 App. B, 533.7, 533 Appx. B) (purporting to declare preemption). This effort is ultra vires, and should be abandoned.
[980] *Am. Tort Reform Ass'n v. Occupational Safety & Health Admin.*, 738 F.3d 387 (D.C. Cir. 2013); *Wyeth v. Levine*, 555 U.S. 555, 577 (2009) (Agencies "have no special authority to pronounce on preemption absent delegation from Congress.").
[981] 47 U.S.C. § 253(d).
[982] 49 U.S.C § 32919(a).
[983] *See Green Mountain Chrysler Plymouth Dodge Jeep v. Crombie*, 508 F.Supp.2d 295 (D. Vt. 2007); *Cent. Valley Chrysler-Jeep, Inc. v. Goldstene,* 529 F.Supp.2d 1151 (E.D. Cal. 2007), *Ophir v. City of Boston* 647 F.Supp.2d 86 (D. Mass. 2009); *cf*. *Metro. Taxicab Bd. of Trade v. City of New York*, No. 08CIV7837(PAC), 2008 WL 4866021, at *10 (S.D.N.Y. Oct. 31, 2008) (rejecting use of "out of context" quote from passage "summariz[ing] NHTSA's view that not all emissions standards should be preempted under the EPCA").

premature at this point because there is no final NHTSA CAFE regulation to analyze.[984] Conflict preemption is a fact-specific inquiry.[985] NHTSA appears to concede that at least some hypothetical state greenhouse gas emissions standards may be able to coexist with NHTSA's CAFE regulations.[986] Therefore, it cannot claim that particular state standards conflict with federal regulations in the absence of final federal regulations and a factual record demonstrating a conflict.[987] Auto industry trade associations have made this same basic point to the Supreme Court, arguing that the question of whether state greenhouse gas emission standards are conflict preempted under EPCA "is an issue that can only be decided on the merits in the pending [district court cases addressing the question], where the interplay between the specific state regulations and the federal fuel economy program can be determined on a full record."[988] NHTSA has not attempted the type of analysis that would be required to support a conflict preemption argument; it cannot lawfully do so for the first time in its final rule.

NHTSA's discussion of preemption is gratuitous for another reason: EPCA's preemption provision does not apply to emissions standards for which California has obtained a valid waiver under the Clean Air Act—like those at issue here. As both federal courts to consider the issue have recognized, and as described in more detail below, California's emissions standards are outside the scope of what Congress intended EPCA to preempt.[989]

NHTSA should withdraw its proposed findings on conflict preemption for the further reason that, in any future litigation, NHTSA's conclusions in this rulemaking would not merit any deference by the courts. Even in cases that might merit deference to an agency's understanding of the impacts state laws may have on the operation of federal law, courts "have not deferred to an agency conclusion that state law is preempted" as a result of that conflict.[990]

Moreover, this is not a case in which deference would be appropriate even for NHTSA's analysis of any alleged conflict. Such deference is appropriate only when agencies are

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[984] NHTSA's proposed rule introduces new assumptions, modeling, and analyses, all of which are contrary to a recent 2016 technical record and are the subject of extensive public comment. In other words, if NHTSA has an open mind in this rulemaking, the outcome should not be certain enough for the Agency to conduct a conflict analysis.
[985] *Alascom, Inc. v. FCC*, 727 F.2d 1212, 1220 (D.C. Cir. 1984) ("[W]hether a state regulation unavoidably conflicts with national interests is an issue incapable of resolution in the abstract.").
[986] *see* 83 Fed.Reg. 43,234-235.
[987] *California Coastal Comm'n v. Granite Rock Co.*, 480 U.S. 572, 588 (1987) ("Congress' treatment of environmental regulation and land use planning as generally distinguishable calls for this Court to treat them as distinct, until an actual overlap between the two is demonstrated in a particular case.").
[988] *Massachusetts v. EPA*, U.S. Sup. Ct. No. 05-1120, Br. of Resp'ts Alliance of Auto. Mfrs. et al., p. 15 (October 24, 2006).
[989] *Green Mountain*, 508 F.Supp.2d at 354; *Cent. Valley,* 529 F.Supp.2d at 1175.
[990] *Wyeth*, 555 U.S. at 576 (emphasis in original); *see also id*. at 588 (Thomas, J., concurring) ("Congressional and agency musings, however, do not satisfy the Article I, § 7, requirements for enactment of federal law and, therefore, do not pre-empt state law under the Supremacy Clause.").

"uniquely qualified to comprehend the likely impact of state requirements."[991] Moreover, "[t]he weight we accord the agency's explanation of state law's impact on the federal scheme depends on its thoroughness, consistency, and persuasiveness."[992]

First, NHTSA is not entitled to any deference for its determination that the operation of the Clean Air Act conflicts with the congressional objectives set forth in EPCA. In a similar context, the Supreme Court recently noted that "[a]n agency eager to advance its statutory mission, but without any particular interest in or expertise with a second statute, might (as here) seek to diminish the second statute's scope in favor of a more expansive interpretation of its own—effectively "bootstrap[ping] itself into an area in which it has no jurisdiction."[993] Similarly, NHTSA has no "interest in or expertise with" Section 209 of the Clean Air Act. That statutory provision establishes California and EPA as co-regulators of the California and federal vehicle emissions control programs, respectively.[994] And the Supreme Court has recognized that EPA's capacity and obligation to set national emissions standards under the Clean Air Act is independent of NHTSA's obligation to regulate fuel economy under EPCA.[995]

Second, NHTSA's analysis of conflict preemption lacks "thoroughness, consistency, and persuasiveness."[996] To obtain its waiver under Section 209, California has conducted extensive analyses on the feasibility of its emissions standards and their consistency with Section 202 of the Clean Air Act. By contrast, NHTSA has dedicated approximately one page of the Federal Register to its claim that the operation of the Clean Air Act, a statute NHTSA does not administer, stands as an obstacle to NHTSA's administration of EPCA.

For all of these reasons, NHTSA should refrain from finalizing its preemption regulations or otherwise taking a position on preemption in any final rule.

B. EPCA does not expressly preempt California's standards.

NHTSA's discussion of express preemption is not only unwarranted, it is also wrong: California's Advanced Clean Car standards are not expressly preempted by EPCA. As discussed below, EPCA's preemption provision does not apply to emissions standards for which California has obtained a waiver. And even if it could do so in some hypothetical scenario, it does not preempt California's Advanced Clean Car standards under any reasonable interpretation.

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[991] *Geier v. Am. Honda*, 529 U.S. 861, 883 (2000) (internal quotation omitted).
[992] *Wyeth*, 555 U.S. at 577.
[993] *Epic Sys. Corp. v. Lewis*, 138 S. Ct. 1612, 1629, (2018).
[994] [*See* Sections III and X of CARB's comments.].
[995] *Massachusetts v. EPA,* 549 U.S. 497, 532 (2007).
[996] *See Wyeth*, 555 U.S. at 577.

1. EPCA does not preempt standards for which California has obtained a waiver under Section 209 of the Clean Air Act.

Rather than preempting California's emissions standards, EPCA represents a continuation of Congress's long history of preserving and recognizing California's authority to regulate vehicle emissions, including vehicle greenhouse gas emissions. NHTSA's reading of EPCA's preemption provision is contrary to that history, other provisions of EPCA, the presumption against implied repeal, and federalism canons of statutory construction.

a. Congress has repeatedly preserved California's ability to regulate motor vehicle emissions.

"[T]he purpose of Congress is the ultimate touchstone in every pre-emption case."[997] Congress has continually expressed its intent not to preempt, but to instead preserve California's authority to implement its separate motor vehicle emission control program and associated emission standards for new motor vehicles.

i. The Air Quality Act of 1967 and the Clean Air Act of 1970.

When California regulates air pollution from new vehicles sold in the state, it does so pursuant to its historic police power, which encompasses the protection of the health and welfare of its citizens.[998] State police powers also clearly extend to the protection of the environment.[999] "Legislation designed to free from pollution the very air that people breathe clearly falls within the exercise of even the most traditional concept of what is compendiously known as the police power."[1000]

This historic power has been repeatedly and explicitly preserved by Congress, first in the Air Quality Act of 1967, and again in the Clean Air Act of 1970, recognizing California's historical exercise of that authority and the importance of California continuing to exercise that authority.[1001]

The statutory regime established a presumption that California is entitled to continue exercising its traditional role and authority with respect to controlling vehicle emissions. The original language entitled California to a waiver unless EPA found that California

> *does not require standards more stringent than applicable federal standards to meet compelling and extraordinary conditions or that such State standards and accompanying enforcement procedures are not consistent with section 202(a) of this title.*

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[997] *Medtronic, Inc. v. Lohr*, 518 U.S. 470, 485 (1996) (internal quotation marks omitted).
[998] *Id*. at 475.
[999] *Huron Portland Cement Co. v. City of Detroit*, 362 U.S. 440, (1960).
[1000] *Id*. at 442.
[1001] *See Motor & Equip. Mfrs. Ass'n, Inc. v. EPA*, 627 F.2d 1095, 1110 (D.C. Cir. 1979) ("*MEMA I*").

> Pub. L. 90-148, § 208(b), 81 Stat. 485, 501; see also Pub. L. 91-604, § 8(a), 84 Stat. 1676, 1694 (redesignating Section 208 of the Air Quality Act as Section 209 of the Clean Air Act).

Thus, Congress provided that in order to preempt California from exercising its historic police power, opponents of California's emissions standards must carry a heavy evidentiary burden and demonstrate circumstances that could overcome the presumption that the waiver should be granted.[1002]

ii. EPCA

Having thus preserved California's authority to set vehicle emissions standards, Congress accounted for the effects those emissions standards would have on fuel economy when it enacted EPCA in 1975. The legislative history of the statute is replete with discussion of the relationship between California vehicle emission standards and fuel economy, including the potential positive and negative impacts the former might have on the latter.[1003] Not only did Congress consider that relationship when setting the initial CAFE standards contained in the statute, but, as described in more detail below, it also provided that individual manufacturers could request and obtain exemptions from those initial fuel economy standards if it they could show California's emissions standards would make compliance too difficult.[1004] In other words, in the event that Congress underestimated the effect of California's emissions standards on fuel economy, Congress specified that CAFE standards—and not California's emissions standards—would give way.[1005] When Congress later recodified EPCA, it similarly directed NHTSA to consider "other motor vehicle standards" when it set standards for later years. As described below, that phrase encompassed California's emission standards.

iii. The Clean Air Act Amendments of 1977.

Two years after EPCA's promulgation, Congress amended the Clean Air Act "'to ratify and strengthen the California waiver provision and to affirm the underlying intent of that provision, i.e., to afford California the broadest possible discretion in selecting the best means to protect the health of its citizens and the public welfare.'"[1006] Recognizing that other states also had substantial sovereign interests in controlling vehicle emissions, Congress added Section 177 to allow other States to adopt California's waiver standards, under specified conditions.[1007] In expanding and strengthening its preservation of state authority, Congress made no mention of EPCA or its preemption

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[1002] MEMA I, 627 F.2d at 1121-1122.
[1003] *See*, e.g., H. Rep. No. 94–340, at 86–87, 89-91; H. Rep. No. 95–294, p. 245–46, 249.
[1004] Pub. L 94-163, 89 Stat. 871, § 502(d)(3)(D)(i).
[1005] H.R. Rep. 94-340, 90, reprinted in 1975 U.S.C.C.A.N. 1762, 1852 ("In order to take account of the possibility that more stringent emission standards would result in an even greater reduction in average fuel economy, the Committee provided a mechanism for adjusting downward the average fuel economy standards for passenger automobiles.").
[1006] *MEMA I*, 627 F.2d at 1110 (quoting H.R.Rep. No. 95-294, 301-02 (1977), reprinted in 1977 U.S.C.C.A.N. p. 1380).
[1007] Pub. L. 95-95, § 129(b).

provision, even though it was well aware of the relationship between California's emissions standards and fuel economy.

iv. The Energy Independence and Security Act of 2007.

Finally, in 2007, Congress specifically embraced California's ability to establish greenhouse gas emissions standards for vehicles. In the Energy Independence and Security Act ("EISA"), Congress amended federal agency vehicle acquisition rules to establish a general rule that federal agencies acquire only "low greenhouse gas emitting vehicles."[1008] Congress simultaneously required EPA to determine which vehicles qualify as "low greenhouse gas emitting vehicles" by taking into account "the most stringent standards for vehicle greenhouse gas emissions applicable to and enforceable against motor vehicle manufacturers for vehicles sold anywhere in the United States."[1009] Through its use of the phrase "anywhere in the United States," Congress envisioned greenhouse gas emissions standards set by authorities other than EPA. And the only other authority that can set vehicle emissions standards is California, under Section 209(b) of the Clean Air Act. Indeed, in 2007, California had already adopted such standards for greenhouse gas emissions while the federal government had not. If Congress had meant EPA to only consider federal standards to be set by EPA it could easily have said so. Nor would there have been any need to refer to the "most stringent" standards if Congress meant only EPA's standards.

At the time of EISA's passage, the Supreme Court had made clear in *Massachusetts v. EPA* that EPA could set standards for greenhouse gas emissions from new motor vehicles, meaning that California, in turn, could obtain a waiver for greenhouse gas emissions standards provided the statutory criteria of Section 209(b) were satisfied. Further, two federal district courts had held that EPCA does not preempt California from adopting GHG emissions standards for vehicles. Those decisions, and the existence of California's greenhouse gas emission standards, were "a part of the contemporary legal context in which Congress legislated."[1010] Congress chose not to disturb that context, enacting a savings clause in EISA that expressly preserved existing state authority to regulate greenhouse gas emissions.[1011] And the legislative history indicates that Congress was fully aware of the legal context and interpreted the savings clause as protecting California's ability to regulate tailpipe greenhouse gas emissions pursuant to a waiver from EPA under Section 209(b).[1012]

In sum, Congress has repeatedly and carefully preserved California's ability to regulate emissions, including greenhouse gas emissions, from new motor vehicles. This history

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[1008] 42 U.S.C. § 13212(f)(2)(A).
[1009] *Id*. § 13212(f)(3)(B).
[1010] *Merrill Lynch, Pierce, Fenner & Smith, Inc. v. Curran*, 456 U.S. 353, 381 (1982).
[1011] 42 U.S.C. § 7545(o)(12).
[1012] *See* Section III.F.2 of CARB's comments.

is fundamentally at odds with NHTSA's assertion that Congress has preempted California from regulating those very emissions.

b. NHTSA's proposed interpretation is foreclosed by EPCA.

As mentioned above, EPCA's initial fuel economy standards, for Model Years 1978-1980 were set by Congress.[1013] Those standards were set after significant discussion of the effect California's emissions standards would have on manufacturers' ability to meet fuel economy standards. At the same time Congress set fuel economy standards for those model years, it also provided individual manufacturers the ability to apply to the Secretary of Transportation for a modification of the fuel economy standards applicable to the manufacturer for those model years.[1014] To obtain such a modification, a manufacturer would need to show that other "federal" standards for those model years would make compliance with fuel economy standards impossible. Those federal standards expressly included both EPA-set emissions standards under Section 202 of the Clean Air Act "and emissions standards applicable by reason of Section 209(b) of such Act."[1015]

NHTSA makes two contentions in an effort to downplay the significance of this provision. Neither is credible. First, NHTSA claims "the listing of federal standards never had any application outside that subsection."[1016] In other words, NHTSA is saying that Congress directed the agency to consider California's standards in one part of the statute while preempting them in another. This interpretation "makes no logical sense."[1017]

Second, NHTSA claims whatever interpretive light that provision might have shone on the rest of the statute "ceased to have significance when the subsection became obsolete."[1018] But while this subsection may have become obsolete along with the fuel economy standards for those Model Years, it is still an express manifestation of Congress' intent with respect to NHTSA's treatment of California's vehicle emissions standards. There is no reason to think that Congress intended the scope of the preemption provision to expand after Model Year 1980. And NHTSA has offered no reason to think that its mandate to consider "other motor vehicle standards of the Government" when setting standards refers to anything other than the same standards that NHTSA had previously been required to consider when reviewing applications for modifications of standards applicable to individual manufacturers. Nor has NHTSA explained why Congress would have intended for the agency to ignore, when setting standards, the impacts—positive or negative—of California emissions standards, nor, if

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[1013] Pub. L 94-163, 89 Stat. 871, § 502(a)(1).
[1014] *Id*. § 502(d).
[1015] *Id*. § 502(d)(3)(D)(1); *See* also S.Rep. No. 94–516, at 156 (1975).
[1016] 83 Fed.Reg. at 43,237.
[1017] *Cent. Valley*, 529 F.Supp.2d at 1175.
[1018] 83 Fed.Reg. at 43,237.

Congress had intended that, why it would have left the word "federal" out of the phrase "other motor vehicle standards of the Government." Indeed, prior to this rulemaking, NHTSA has consistently interpreted that phrase to include California's emission standards.[1019] And both courts to consider the issue have agreed.[1020, 1021]

Although NHTSA points to some limited legislative history in arguing that Congress only meant to require NHTSA to consider the California smog standards that existed at the time of EPCA's enactment[1022] the text of the statute is not so limited. To the contrary, in 1975 it was entirely predictable that California might still seek a new waiver for model years four years in the future. And NHTSA has not articulated any reason Congress would have cared only about the fuel economy impact of some California waiver standards but not others.

NHTSA also fails to meaningfully contend with the enactment of EISA in 2007. Although NHTSA argues that EISA's savings provision "does not purport expand pre-existing authority," NHTSA does not address the fact that Congress enacted that provision against the backdrop of two recent federal court rulings explicitly holding that EPCA did not limit California's authority to adopt greenhouse gas emissions standards. Nor does NHTSA explain why, if EPCA preempted greenhouse gas standards other than those set by EPA, Congress directed EPA to identify "low greenhouse gas emitting vehicles" by looking at "the most stringent standards for vehicle greenhouse gas emissions applicable to and enforceable against motor vehicle manufacturers for vehicles sold anywhere in the United States."[1023]

Finally, in the preamble to the proposed rule, NHTSA claims Congress understood CO_2 *emissions* were related to fuel economy standards, because, in a different provision governing compliance testing, Congress accepted measurement of CO_2 emissions as a means of determining compliance with the initial CAFE standards.[1024] NHTSA appears to be arguing that the details of the compliance testing provision can expand the scope of EPCA's preemption provision, overriding the rest of the statute and Section 209 of the Clean Air Act insofar as it applies to one of the pollutants used in compliance testing. This makes little sense, and flies in the face of Justice Scalia's warning that "Congress ... does not alter the fundamental details of a regulatory scheme in vague terms or ancillary provisions—it does not ... hide elephants in mouseholes."[1025]

[1019] *See*, *e.g.*, 71 Fed.Reg. 17,566, 17643 (Apr. 6, 2006).
[1020] *Green Mountain*, 508 F.Supp.2d at 347 ("It seems beyond serious dispute therefore that once EPA issues a waiver for a California emissions standard, it becomes a motor vehicle standard of the government…."); *Cent. Valley*, 529 F.Supp.2d at 1173 ("[T]here is nothing in statute or in case law to support the proposition that a regulation promulgated by California and granted waiver of preemption under § 209 is anything other than a "law of the Government" whose effect on fuel economy must be considered by NHTSA in setting fuel economy standards.").
[1021] The automaker plaintiffs in the *Central Valley* even conceded this point at oral argument. *Cent. Valley Chrysler-Jeep, Inc. v. Goldstene*, 529 F. Supp. 2d 1151, 1172 (E.D. Cal. 2007), as corrected (Mar. 26, 2008).
[1022] *See* 83 Fed.Reg. at 43,237.
[1023] *Id.* § 13212(f)(2)(A) & (3)(B).
[1024] *Id*. at 43,234.
[1025] *Whitman v. Am. Trucking Ass'ns*, 531 U.S. 457, 468 (2001).

Moreover, as NHTSA acknowledges, CO_2 emissions were only one part of the compliance testing regime Congress approved. That regime also included testing for hydrocarbons, emissions for which California already had standards that Congress clearly did not intend to preempt, as described above.

c. NHTSA's proposed interpretation would partially implicitly repeal Section 209(b) of the Clean Air Act.

NHTSA also does not and cannot contend with the need to harmonize EPCA and the Clean Air Act, asserting instead an interpretation of EPCA that violates the "strong presumption" against implied repeal.[1026] But one statute may be read to implicitly repeal another only in the rare circumstances when the two statutes cannot be harmonized.[1027] If possible, the two statutes must be read in a way that gives meaning and effect to both.

The Clean Air Act and EPCA can be reconciled in a way that gives effect to both. NHTSA appears to recognize the need for such a reconciliation, as it struggles in vain to articulate a reason for preempting California's greenhouse gas emissions standards while preserving California's authority for other emissions standards. As described below, NHTSA fails to articulate a coherent or workable distinction between standards for greenhouse gases and those for other pollutants, let alone one that gives effect to Congress's intention in the Clean Air Act. Fortunately, a much simpler way to give effect to both two statutes is available: interpreting EPCA's preemption provision so as not to apply to emissions standards for which California has obtained a waiver. This reading is the best—and only—way to give effect to both statutes. The Clean Air Act will continue to authorize California emissions standards, including those for greenhouse gases, while EPCA's preemption provision will continue to apply to other state laws.[1028]

NHTSA's purported attempt to reconcile EPCA with the Clean Air Act does not give effect to the Clean Air Act. Rather, NHTSA claims that Section 209(b) of the Clean Air Act "operates only to relieve 'application of this section'—the preemption provision of the Clean Air Act," and therefore has no bearing on whether Congress meant for EPCA to preempt California's emissions standards.[1029] But "this section" is the law that addresses—in highly specific terms—California's authority to set emissions standards. Its effect is to give California the ability—subject to EPA's narrow and deferential review—to set emission standards, including standards for greenhouse gases. Indeed, when Congress enacted EPCA, it described Section 209(b) as having the effect of

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[1026] *Epic Sys. Corp. v. Lewis*, 138 S. Ct. 1612, 1624 (2018).
[1027] *Morton v. Mancari*, 417 U.S. 535, 550 (1974).
[1028] *See Stewart v. Smith*, 673 F.2d 485, 492 (D.C. Cir. 1982) ("When one statute speaks in general terms while the other is specific, conflicting provisions may be reconciled by carving out an exception from the more general enactment for the more specific statute.").
[1029] 83 Fed.Reg. at 43,235 (quoting 42 U.S.C. 7543(b)).

authorizing California emissions standards, without any reference to EPCA's preemption provision.[1030]

By failing to give effect to the Section 209(b) of the Clean Air Act, NHTSA's proposed interpretation implicitly repeals Section 209(b) to the extent it included standards for greenhouse gases tailpipe emissions.[1031] To wit, NHTSA says EPCA's preemption provision renders California's tailpipe GHG and ZEV standards void *ab initio*. Meanwhile, EPA says that, as a result, it cannot grant a waiver those standards. The combined effect of those positions would be that Section 209(b) would not have even the limited effect NHTSA claims, of saving California's standards preemption under Section 209(a). And even if EPA can grant a waiver for standards that are void *ab initio*, that waiver would be effectively meaningless. In either case, NHTSA's reads EPCA in a way that fails to give any meaningful effect to Section 209(b), at least with respect to tailpipe greenhouse gas emissions.

Congress can of course limit Section 209(b)'s effect if it wants. But it has to do so explicitly, or otherwise leave no room for doubt.[1032]

The canon against implied repeal applies with particular force in this case, given that EPCA explicitly recognized that Section 209(b) would be effective, both with respect to standards already approved and with respect to those yet to be proposed, and that EISA appears to have recognized the validity of California's greenhouse gas emissions standards adopted pursuant to Section 209(b). In addition, Congress should not be read as having implicitly repealed part of the effect of Section 209(b) in 1975 only to have expanded its effect two years later, when it heightened the burden for waiver opponents and allowed Section 177 States to adopt California standards. As the House Report accompanying those 1977 Amendments said, Congress did not intend to exempt certain pollutants from "the comprehensive protections afforded by the Clean Air Act."[1033]

d. NHTSA's proposed interpretation would violate principles of federalism.

Even in a vacuum, EPCA could not plausibly be interpreted as preempting California emission standards made effective "by reason of" Section 209 of the Clean Air Act. And EPCA does not exist in a vacuum. Rather, it must be read in light of presumptions against statutory interpretations that interfere with federalism. These include the

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[1030] Pub. L 94-163, 89 Stat. 871, § 502(d)(3)(D)(1) (referring to "emissions standards *applicable by reason of § 209(b)*") (emphasis added).
[1031] *See Agri Processor Co. v. N.L.R.B.*, 514 F.3d 1, 4 (D.C. Cir. 2008) (rejecting implied repeal of National Labor Relations Act's definition of employee, "to the extent that it includes undocumented aliens").
[1032] *Epic Sys*, 138 S. Ct. at 1627 ("It's more than a little doubtful that Congress would have tucked into the mousehole of Section 7's catchall term an elephant that tramples the work done by these other laws … and seats the Board as supreme superintendent of claims arising under a statute it doesn't even administer.").
[1033] H.R.Rep. No. 95–294, at 42–43.

presumption against preemption of historic state police powers and the requirement of a plain statement of congressional intent to alter the federal-state balance. NHTSA's interpretation runs afoul of both.

"[B]ecause the States are independent sovereigns in our federal system," preemption analysis must begin "with the assumption that the historic police powers of the States were not to be superseded by the Federal Act unless that was the clear and manifest purpose of Congress."[1034] California's regulation of air pollution from motor vehicles fits squarely within its historic police powers. Absent a clear indication of congressional intent to the contrary, statutes—even those with express preemption provisions—must not be interpreted to preempt such police powers.[1035] Moreover, when "coordinate state and federal efforts exist within a complementary administrative framework, and in the pursuit of common purposes, the case for federal pre-emption becomes a less persuasive one."[1036] This rule of federalism is longstanding; Congress was well aware of it when it enacted EPCA in 1975. NHTSA, however, fails to address this presumption or the significance of California's police power authority, and cannot explain how its interpretation can overcome the presumption.

California's authority to regulate motor vehicle emissions carries even more weight here. As described above, that authority has been carefully preserved and reinforced by Congress over the course of more than 50 years. Congressional action has cemented California's authority within "the usual constitutional balance between the States and the Federal Government."[1037] That balance is presumed not to be altered without a plain statement by Congress.[1038] "This plain statement rule is nothing more than an acknowledgment that the States retain substantial sovereign powers under our constitutional scheme, powers with which Congress does not readily interfere."[1039] NHTSA's proposed interpretation would interfere with those sovereign powers, altering the federal-state balance inherent in our system of federalism and as expressly struck by Congress.[1040] Again, NHTSA fails to address the significance of this balance or the requirement of a plain statement to alter it.

Because NHTSA's proposed interpretation is inconsistent with the principles of federalism, it should be abandoned.

[1034] *Medtronic, Inc. v. Lohr*, 518 U.S. 470, 486 (1996) (quoting *Rice v. Santa Fe Elevator Corp.*, 331 U.S. 218, 230 (1947)).
[1035] *BNSF Ry. Co. v. Cal. Dep't of Tax & Fee Admin.*, 904 F.3d 755, 765-66 (9th Cir. 2018); *Shuker v. Smith & Nephew, PLC*, 885 F.3d 760, 771 (3d Cir. 2018).
[1036] *N.Y. State Dep't. of Soc. Servs. v. Dublino*, 413 U.S. 405, 421 (1973).
[1037] *Gregory v. Ashydrocarbonroft*, 501 U.S. 452, 461 (1991).
[1038] *Id*.
[1039] *Id*.
[1040] *See Oregon v. Ashydrocarbonroft*, 368 F.3d 1118, 1124 (9th Cir. 2004), aff'd sub nom. *Gonzales v. Oregon*, 546 U.S. 243 (2006) (balance altered by federal "interfer[ence] with Oregon's authority to regulate medical care within its borders").

i. Even if some waiver standards could be preempted as "related to fuel economy standards," California's Advanced Clean Car standards are not.

As discussed above, emissions standards for which California has obtained a waiver under Section 209 are always outside the scope of EPCA's preemption provision. But even if EPCA's preemption provision *could* apply to some waiver standards, applying it to California's GHG and ZEV standards, as NHTSA proposes here, would contravene congressional intent.

e. EPCA's preemption provision must be read narrowly in light of congressional intent.

In any inquiry into the scope of a preemption provision, "[t]he purpose of Congress is the ultimate touchstone."[1041] In analyzing provisions using "related to" language, courts "simply must go beyond the unhelpful text and the frustrating difficulty of defining its key term, and look instead to the objectives of the [] statute as a guide to the scope of the state law that Congress understood would survive."[1042] For the reasons discussed above, if there were any apparent ambiguity in congressional intent, it would have to be resolved in favor of interpretations that preserve historic state police powers over air pollution control and give the fullest possible effect to other congressional actions.

Travelers Insurance is particularly instructive. There, the Supreme Court rejected a broad reading of ERISA's "relate to" preemption provision—a reading that would have resulted in barring state regulation of hospital costs because of the effect that regulation would have on ERISA plans. The Court said such a reading would be "unsettling" and "startling," given that—at the time of ERISA's adoption—states were already regulating hospital charges, "and yet there is not so much as a hint in ERISA's legislative history or anywhere else that Congress intended to squelch these state efforts."[1043] Moreover, the Court noted that, subsequent to ERISA, Congress enacted a law providing for the funding of state demonstration projects regulating hospital rates without explicitly exempting those projects from ERISA preemption.[1044] The Court refused to read ERISA's "relate to" preemption provision as rendering Congress's subsequent action "utterly nugatory," by preempting the state efforts Congress sought to encourage.[1045]

Similarly, in *California Division of Labor Standards Enforcement v. Dillingham Construction, N.A., Inc.*, the Court refused to interpret ERISA's preemption provision as applying to state statutes that Congress "previously sought to foster."[1046]

[1041] *Medtronic*, 518 U.S. at 485 (quotation omitted).
[1042] *N.Y. State Conference of Blue Cross & Blue Shield Plans v. Travelers Ins. Co.*, 514 U.S. 645, 656 (1995).
[1043] 514 U.S. at 665.
[1044] *Id*. at 667.
[1045] *Id*.
[1046] 519 U.S. 316, 332 n.7 (1997).

EPCA's preemption provision likewise must be read consistent with action Congress took before and after EPCA, as well as in EPCA itself. As described above, Congress has repeatedly taken action to preserve California's authority to adopt emissions standards for new motor vehicles, beginning in the Air Quality Act of 1967, and continuing through the Clean Air Act of 1970, EPCA itself, the 1977 Amendments to the Clean Air Act, and the Energy Independence and Security Act of 2007. NHTSA's overbroad interpretation of EPCA's preemption provision disregards these actions and thus fails like the overbroad readings in *Travelers Insurance* and *Dillingham Construction*.

Further, while taking these actions, Congress has consistently recognized that California's emissions standards might have substantial impacts on fuel economy. In enacting EPCA, Congress acknowledged both a 13.8 percent *increase* in fuel economy due to the proliferation of catalytic converters required by California and (later) federal emissions standards, and the possibility of a 5.7 percent *decrease* in fuel economy due to certain California emission standards.[1047] These impacts were, in fact, part of the reason Congress established the process, described above, by which an individual manufacturer could seek a modification of the fuel economy standards applicable to it, based not only on those standards in place at the time but also those that had yet to be proposed.

And in expanding the waiver provision in the 1977 Amendments, Congress "remained well aware of a potential conflict between tighter air pollution control standards and improved fuel economy."[1048] Congress also recognized that the emissions standards it was intending to foster could also result in *improved* fuel economy.[1049]

Finally, in adopting the Energy Independence and Security Act of 2007, Congress adopted a savings provision that explicitly preserved California's existing authority to regulate greenhouse gas emissions, including under Clean Air Act section 209(b). Congress also leveraged California's authority to set GHG emissions standards for new motor vehicles—enacting a provision to drive reductions in greenhouse gas emissions from federally owned vehicles by directing agencies to purchase low-emitting vehicles from a list to be determined in part by reference to California's GHG standards. In other words, Congress clearly believed California had the authority to control GHG emissions from new motor vehicles in 2007.

Congress has thus repeatedly recognized and protected California's ability to regulate emissions, including greenhouse gas emissions, from new motor vehicles. Accordingly, Congress should not be understood as having preempted that ability through the use of

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[1047] H.R. Rep. No. 94-340, at 86-87, 89-91 (1975), reprinted in 1975 U.S.C.C.A.N. 1762, 1848-49, 1851-53; *see also* 40 Fed.Reg. 23102, 23105/1 (May 28, 1975) (noting manufacturers' claim that California waiver standards would depress fuel economy by up to 24 percent).
[1048] *Green Mountain*, 508 F. Supp. 2d at 346.
[1049] *Id*.

the vague phrase "related to fuel economy standards," particularly given that several re-affirmations of California's authority post-date Congress's use of that phrase.

f. NHTSA has failed to propose an interpretation of the phrase "related to fuel economy standards" consistent with clear congressional intent.

i. NHTSA has failed to provide adequate notice of the interpretation it is proposing to adopt.

Ignoring the history of congressional action, NHTSA points to a couple of snippets of EPCA's legislative history to repeatedly describe the scope of EPCA's preemption provision as "broad."[1050] The agency's attempted support for this interpretation of congressional intent is limited to the fact that earlier House and Senate versions of the bill that emerged from conference did not use the phrase "related to fuel economy standards" to describe types of laws that would be preempted. NHTSA argues that the "related to" language in the final is broader than the language in those earlier bills, and, thus, Congress meant the statute to preempt broadly. Notably, there is nothing in the legislative history that supports NHTSA's inference of congressional intent. Indeed, the absence of any discussion of this change suggests the opposite—that Congress did not view it as a substantial change.

In any event, even if the final version of EPCA's preemption provision were read as broader than the earlier versions, NHTSA does not explain why that means it should be read so broadly as to preempt California's authority to regulate greenhouse gas emissions from new motor vehicles. Nor can it, given that Congress repeatedly recognized that authority and even built a federal procurement requirement around the exercise of that authority.

NHTSA claims that EPCA's preemption provision has an "unambiguous plain meaning,"[1051] In doing so, NHTSA ignores Supreme Court precedent rejecting the notion that other preemption provisions using the phrase "related to" or similar language have an unambiguous plain meaning.[1052] As Justice Scalia wrote in *Dillingham Construction*:

> [*A]pplying the "relate to" provision according to its terms was a project doomed to failure, since, as many a curbstone philosopher has observed, everything is related to everything else. The statutory text provides an illusory test, unless the Court is willing to decree a degree of pre-emption that no sensible person could have intended-which it is not.*[1053]

[1050] E.g., 83 Fed.Reg. at 43,233, 43,234.
[1051] 83 Fed.Reg. at 43,234.
[1052] *See Travelers Insurance*, 514 U.S. at 656.
[1053] 519 U.S. at 335-36 (Scalia, J., concurring).

The agency also ignores a variety of possible readings of the "related to fuel economy standards" phrase suggested by the courts. For example, the *Central Valley* court interpreted it as preempting "only those state regulations that are explicitly aimed at the establishment of fuel economy standards, or that are the de facto equivalent of mileage regulation."[1054] And Justice Scalia has suggested that "related to" preemption provisions should be read as merely codifying normal principles of implied preemption.[1055]

In the face of those entirely plausible readings, NHTSA remains silent as to what it thinks the "unambiguous plain meaning" of EPCA's preemption provision actually is. Despite NHTSA's claim that the statute is unambiguous, it seeks comment on the appropriate test to apply to determine whether state laws are "related to fuel economy standards" within the meaning of that provision. The agency does not make clear what test it itself is applying to reach the conclusion that California's tailpipe GHG standards and ZEV mandates are preempted by EPCA. While the agency alludes to case law applying other preemption provisions using language similar to "related to,"[1056] it makes no attempt to analogize to or distinguish that case law. Rather, at various points, NHTSA claims preemption is appropriate for a host of different reasons, including because California's standards:

- are "mathematically linked to fuel economy."[1057]
- are "inextricably linked" to "fuel consumption," given currently available technologies.[1058]
- have more than a "merely incidental impact on fuel economy,"[1059] and
- in the case of the ZEV mandate, have "the purpose … to affect fuel economy."[1060]

None of NHTSA's formulations refer to a relationship between California's standards and fuel economy *standards*, which is the key phrase in the statute. Indeed, NHTSA repeatedly misstates the statute as preempting state regulations that are related to "fuel economy," rather than "fuel economy standards."[1061] This distinction matters. A law may be "linked to," have an "impact" on, or "affect" fuel economy without having the same relationship with fuel economy standards. For example, lowering speed limits or prohibiting idling or various safety laws may significantly improve "fuel economy" or reduce "fuel consumption." Their effect on fuel economy *standards*, if any, is

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[1054] *Central Valley*, 529 F. Supp. 2d at 1175.
[1055] *Dillingham Construction*, 519 U.S. at 336 (Scalia, J., concurring) ("I think it accurately describes our current ERISA jurisprudence to say that we apply ordinary field pre-emption, and, of course, ordinary conflict pre-emption."); *see also Egelhoff v. Egelhoff ex rel. Breiner*, 532 U.S. 141, 153 (2001) (Scalia, J., concurring).
[1056] 83 Fed.Reg. at 43,233.
[1057] *Id.* 43,234.
[1058] *Id*. 43,234.
[1059] *Id*. 43,235.
[1060] *Id*. 43,238.
[1061] *Id*. At 42,999, 43,234, 43,235, 43,486 (proposed Part 531 Appx. B (a)(3)).

significantly more attenuated. Likewise, laws increasing the adoption of electric and fuel-cell vehicles may affect constructive average fuel economy, given that EPCA allows manufacturers to effectively claim extra credit for those vehicles,[1062] but cannot legally affect fuel economy *standards*, as NHTSA is barred from considering them in setting standards.[1063] NHTSA's failure to discuss, let alone describe, the relationship between the standards it claims are preempted and its fuel economy *standards* disregards the plain text of the statute and renders its proposal unlawful.

NHTSA's formulations of various tests for preemption are also vague and inconsistent with each other, making NHTSA's proposed interpretation of the statute impossible to divine. It is unclear, for example, whether NHTSA's interprets the statute to preempt all laws that are "mathematically linked" to fuel economy or only those that are "inextricably linked," and what exactly NHTSA means by the latter term. Nor is it clear what determines, in NHTSA's view, what would make an impact "merely incidental," whether it refers to the size of the impact, the mechanism that causes it, or something else. Indeed, NHTSA never says what impact it expects California's GHG or ZEV standards to have on fuel economy, nor what makes those impacts more than "incidental." Nor is it clear why NHTSA considers the (alleged) purpose of the state law to be relevant in the case of the ZEV mandate but not in the case of tailpipe emissions standards. (And, of course, as discussed below, NHTSA offers no support for its assertion that the purpose of the ZEV mandate is to affect fuel economy rather than to reduce emissions.)

Accordingly, NHTSA has not provided notice of, or a fair opportunity to comment on, its interpretation of EPCA's preemption provision. And the agency cannot issue a final rule purporting to interpret the provision without first remedying that flaw.

ii. NHTSA's proposed reasons for finding California's standards preempted are contrary to congressional intent, unreasonable and arbitrary.

Separate and apart from NHTSA's failure to clearly articulate its position, none of the various proposed reasons it offers for asserting that California's standards are preempted stand up to examination. To the extent those reasons are interpretations of the statute, they are unambiguously prohibited and unreasonable.

2. Tailpipe GHG standards are not "related to fuel economy standards."

As an initial matter, NHTSA's proposed justifications for preemption of tailpipe GHG standards are overbroad, and would sweep in laws that NHTSA appears to agree are not preempted. For example, as noted above, speed limits are "mathematically linked to fuel economy," as are laws that restrict vehicle idling. The same goes for many California waiver standards, as improvements in fuel economy generally reduce criteria pollutants, and technological changes to reduce criteria pollutants generally affect fuel

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[1062] *See* 49 U.S.C. §§ 32904(a)(2), 32905.
[1063] 83 Fed.Reg. at 43,212 (citing 49 U.S.C. § 32902(h)).

economy positively or negatively. As described above, those impacts can be quite significant; to take one example from the time of EPCA's passage, manufacturers predicted California's standards for model year 1977 would reduce fuel economy by up to 24 percent. 40 Fed. Reg. at 23105. Some past waiver standards have even depended upon improvements in fuel combustion efficiency to achieve targeted reductions of criteria pollutants.[1064]

In addition, NHTSA's proposed justifications are factually inaccurate. For example, important parts of California's Advanced Clean Cars program are fuel-neutral, making them independent of—and not mathematically linked to—fuel economy standards. This includes not just the program's coverage of emissions from air conditioning, which NHTSA appears to acknowledge is not preempted, but also its accounting for alternative fuel vehicles, neither of which NHTSA can consider when setting CAFE standards.

NHTSA is also incorrect that foreseeable future technologies for reducing greenhouse gas emissions consist solely of technologies to improve fuel economy. To take just one example, adoption of electric and fuel cell vehicles continues to increase, especially in California, and those vehicles will become more and more integral to reducing greenhouse gas (and other) emissions from motor vehicles in the future.[1065] In any case, NHTSA should not interpret EPCA's preemption provision, let alone codify that interpretation, based on current technology or adoption rates.

Moreover, the Supreme Court foreclosed NHTSA's interpretation in *Massachusetts v. EPA*, holding that regulation of CO_2 emissions and regulation of fuel consumption were "wholly independent" statutory obligations.[1066] Likewise, in EISA, Congress clearly treated greenhouse gas emissions as separate from fuel economy, establishing labeling requirements that included separate information about fuel economy and greenhouse gas emissions,[1067] and simultaneously setting fuel economy standards and directing federal agencies to buy low greenhouse gas emitting vehicles based on greenhouse gas standards,[1068] That history also puts the lie to NHTSA claim that the fact that CO_2 emissions are used to measure fuel economy indicates Congress thought regulation of greenhouse gas emissions was preempted by EPCA's "related to" language. And in

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[1064] Staff Report: Low-Emission Vehicle and Zero-Emission Vehicle Program Review, 5-8 (1996). CARB. Accessed on October 25, 2018. https://www.arb.ca.gov/msprog/levprog/levsr3.pdf; Preliminary Draft Staff Report: Proposed Amendments to California Exhaust, Evaporative and Refueling Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles—"LEV II." CARB. Accessed on October 25, 2018. https://www.arb.ca.gov/msprog/levprog/levii/pstfrpt.pdf. p. 38-39.

[1065] "[The new vehicle fleet [in California] will need to be primarily composed of advanced technology vehicles … by 2035" in order to meet the State's 2050 GHG goal. Staff Report: Initial Statement of Reasons Advanced Clean Cars 2012 Proposed Amendments to the California Zero Emission Vehicle Program Regulations (Dec. 7, 2011) ("ZEV ISOR"). CARB. Accessed on October 25, 2018. https://www.arb.ca.gov/regact/2012/zev2012/zevisor.pdf. p. ES-5.

[1066] 549 U.S. at 532.

[1067] Pub. L. 110-140, 121 Stat 1492, § 105 (codified at 49 U.S.C. § 32908(g)).

[1068] *Compare id.* § 102 (codified at 49 U.S.C. § 32902) (setting fuel economy standards), *with id.* § 141, codified at 42 U.S.C. § 13212.

any case, the fact that two regulations might share a common measurement does not suffice to make one impermissibly "related to" the other.

3. ZEV mandates are not "related to fuel economy standards."

NHTSA is simply incorrect when it states, without support, that "the purpose of the ZEV program is to affect fuel economy."[1069] As NHTSA acknowledges, California adopted the ZEV mandate in 1990 to encourage innovation in ZEV technology and infrastructure to support deployment of ZEVs.[1070] ("California initially launched its ZEV mandate in 1990 to force the development and deployment of ZEVs to reduce smog-forming emissions."). CARB continues to rely on the ZEV program to pursue those goals, which are necessary to achieve needed long-term reductions in both GHG and criteria pollutant emissions; the purpose of the ZEV mandate was, and continues to be, to lay a foundation for a future with truly low emissions of both criteria pollutants and GHGs.[1071]

To that end, California has incorporated its ZEV mandate into its State Implementation Plan to attain National Ambient Air Quality Standards for ozone and fine particulate matter. "Approval and Promulgation of Implementation Plans; California; California Mobile Source Regulations,"[1072] EPA's approval of that plan gives it "the force and effect of federal law."[1073] Accordingly, it is not subject to federal preemption, and must be harmonized with federal law.[1074]

Moreover, ZEVs are expressly outside EPCA's definition of fuel economy.[1075] In NHTSA's words, "[i]mproving fuel economy means getting the vehicle to go farther on a gallon of gas."[1076] ZEVs, of course, do not run on gas, and NHTSA cannot even consider the availability of ZEVs when it determines the level of fuel economy that is maximum feasible.[1077] And while NHTSA points to the fact that tailpipe GHG emissions are largely measured the same way as fuel economy[1078] eligibility for California's ZEV

[1069] 83 Fed.Reg. at 43,238.
[1070] *Id*.
[1071] *Id.* at 2 ("Only by reducing criteria pollutant and greenhouse gas emissions to near zero can we achieve California's long-term air quality and climate change goals.").
[1072] 81 FR 39,424 (June 16, 2016).
[1073] *Safe Air for Everyone v. EPA*, 488 F.3d 1088, 1091 (9th Cir. 2007) (internal quotations omitted).
[1074] *See Ass'n of Am. R.R. v. S. Coast Air Qual. Mgmt. Dist.*, 622 F.3d 1094, 1098 (9th Cir. 2010).
[1075] 49 U.S.C. § 32901(11) ("'[F]uel economy' means the average number of miles traveled by an automobile for each gallon of gasoline (or equivalent amount of other fuel) used...."); *see also id.* § 32901(11) ("'[F]uel' means gasoline; diesel oil; or other liquid or gaseous fuel that the Secretary decides by regulation to include in this definition as consistent with the need of the United States to conserve energy.")
[1076] 83 Fed.Reg. at 42,999.
[1077] 42 U.S.C. § 32902(h)(1); *See* also 83 Fed.Reg. at 43,212 ("NHTSA also cannot consider the use of alternative fuels by dual-fueld vehicles nor the availability of dedicated alternative fuel vehicles in any model year.").
[1078] 83 Fed.Reg. at 43,234.

program is not.[1079] Accordingly, ZEV mandates have no "connection to" fuel economy standards, and cannot be "related to fuel economy standards."[1080]

Undeterred, NHTSA appears to go so far as to suggest that EPCA preempts state regulation of anything that might involve the use of fossil fuels and is even indirectly "associated with the vehicle performing its work of traveling down the road."[1081] But this impossibly broad interpretation goes well beyond the concerns Congress addressed in EPCA; it would go so far as to preempt efforts to decarbonize the electric grid, on the grounds that some emissions from the electricity sector can be attributable to ZEVs. NHTSA may not redefine the purpose of the statute (or the meaning of "fuel economy") in order to preempt state law.

NHTSA also fails to acknowledge or explain the apparent change in its position from 2012. Nor does NHTSA justify its sudden need to take a position on ZEV mandates after remaining silent on them for nearly three decades. The agency points to the increasing stringency of ZEV mandates, but that merely underscores that the purpose of those mandates is to increase the uptake of ZEV technology.

a. California's Advanced Clean Car Program is not conflict-preempted.

For many of the same reasons described above, California's Advanced Clean Car program is not conflict-preempted. As noted above, conflict preemption is a fact-specific inquiry that NHTSA has not bothered to conduct. Nor would it be appropriate to conduct such an inquiry at this point, given the uncertainty of potential changes to the federal program as well as technological and economic considerations underlying NHTSA's assertion of a conflict.

[1079] *Compare* 49 U.S.C. § 32904(c) ("[T]he Administrator shall use the same procedures for passenger automobiles the Administrator used for model year 1975 (weighted 55 percent urban cycle and 45 percent highway cycle), or procedures that give comparable results."), *with* Cal. Code. Regs., tit. 13, § 1962.2(a) ("The Executive Officer shall certify … as ZEVs, vehicles that produce zero exhaust emissions of any criteria pollutant (or precursor pollutant) or greenhouse gas, excluding emissions from air conditioning systems, under any possible operational modes or conditions.").

[1080] NHTSA requests comment on "the extent to which the zero-tailpipe-emissions vehicles compelled to be sold by California's ZEV program reduce temperatures in the parts of California which are in non-attainment for ozone and which contain dense populations of allergy sufferers." 83 Fed.Reg. at 43,235 n.508. NHTSA does not say what the density of allergy sufferers in particular non-attainment areas has to do with the legal question of how to interpret the phrase "related to fuel economy standards," nor how it applies to the ZEV program.

To the extent NHTSA is attempting to cast doubt on the ZEV program's purpose of addressing criteria pollution, it entirely fails to do. EPA, the federal agency responsible for administering the Clean Air Act, has already approved California's state implementation plan—including the ZEV program—"necessary or appropriate to meet the applicable requirements of" § 110 of the Clean Air Act, governing state implementation plans for attainment of National Ambient Air Quality Standards. 42 U.S.C. § 7410(a)(2)(A). As described above, the ZEV program aims to encourage innovation and investment to drive long-term reductions of both criteria pollution and GHG emissions; its purpose should not be judged merely by the precise GHG reductions achieved by those cars "compelled to be sold" now. Even if it were viewed through that lens, "small incremental steps" are perfectly valid ways for states to address climate change. *Massachusetts v. EPA*, 549 U.S. 497, 524 (2007). The problem need not be resolved in "one fell regulatory swoop." *Id*.

[1081] 83 Fed.Reg. at 43,234.

Moreover, as an initial matter, conflict preemption does not apply, because Congress has decided to tolerate any tension that exists between federal regulation of fuel economy and joint federal-state regulation of motor vehicle emissions, including emissions of greenhouse gases.[1082] While fuel economy regulation and vehicle emissions regulation "may overlap," "there is no reason to think" they cannot coexist.[1083]

In addition, NHTSA does not and cannot articulate any conflict between California's standards and the objectives of EPCA.[1084] NHTSA has not so much as suggested that California's Advanced Clean Cars program conflicts with what the agency acknowledges is EPCA's "overarching purpose" of "energy conservation." Rather, NHTSA bases it case for conflict preemption on other purported objectives of EPCA. For example, NHTSA claims a conflict based on alleged interference with its ability "to balance and achieve Congress's competing goals."[1085] But the federal government already tried a virtually identical argument in *Massachusetts v. EPA*, arguing that EPA should not set GHG standards because doing so would conflict with NHTSA's role under EPCA.[1086] The Supreme Court rejected this argument with respect to federal standards, noting that federal vehicle emissions standards are "wholly independent" of, and do not pose an obstacle to, NHTSA's statutory obligations under EPCA.[1087] State vehicle emission standards are similarly "independent," and affect far less of the fleet than do federal standards.

In its conflict preemption analysis, NHTSA repeatedly confuses California emission standards for fuel economy standards. For example, NHTSA says state standards would interfere with EPCA's goal to "establish a single national program to regulate vehicle fuel economy."[1088] It likewise suggests California tailpipe GHG standards represent "a state-specific determination for how much energy should be conserved (in the same way that the CAFE program conserves energy)," which necessarily frustrates NHTSA's efforts to make that determination for the country as a whole."[1089] Of course, California's standards do not establish a "program to regulate vehicle fuel economy," and NHTSA does not directly claim they do. Nor do they represent "a state-specific determination for how much energy should be conserved," as opposed to how much greenhouse gases should be reduced.

NHTSA also claims that California's standards conflict with EPCA's purported goals of "avoiding serious economic effects on manufacturers" and "maintaining a reasonable amount of consumer choice among a broad variety of vehicles." The adverse economic

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[1082] *See Silkwood v. Kerr-McGee Corp.*, 464 U.S. 238, 256 (1984) ("Congress intended to stand by both concepts and to tolerate whatever tension there was between them. We can do no less.").
[1083] *Massachusetts v. E.P.A.*, 549 U.S. 497, 532 (2007).
[1084] *Green Mountain*, 508 F.Supp.2d at 392 (rejecting claims of conflict preemption); *Cent. Valley*, 529 F.Supp.2d at 1179 (same).
[1085] 83 Fed.Reg. at 43,238.
[1086] *Massachusetts v. EPA*, U.S. Sup. Ct. No. 05-1120, Br. for the Fed. Resp'ts, et al., p. 24-25 (Oct. 24, 2006).
[1087] 549 U.S. at 532.
[1088] 83 Fed.Reg. at 43,238.
[1089] 83 Fed.Reg. at 43,237.

effects EPCA was concerned about were not limited to manufacturers. But even if they were, NHTSA makes no attempt to explain how California's standards would interfere with such goals. And the agency appears to have done no analysis of any adverse economic or consumer choice effects that would be attributable to any California-specific standards, let alone one that appropriately values the economic and consumer-choice benefits of pollution control and innovation.

As for ZEV mandates, NHTSA claims they are conflict-preempted because "manufacturers are likely to spread the costs of the ZEV mandate to non-ZEV vehicles."[1090] But NHTSA's speculative statement regarding simple cost-sharing cannot be the basis for preemption under EPCA, especially since it is beyond the control of the State. If NHTSA were correct, EPCA could preempt any state law—e.g. a price floor on steel—that results in increased production costs for some vehicles being spread among other vehicles. Moreover, one of EPCA's purposes is and has long been to encourage the adoption of ZEVs.[1091]

Finally, NHTSA suggests the conflict between California's standards and EPCA's objective is underscored by the ability of Section 177 States to adopt California's standards.[1092] But the very same proposal elsewhere claims Section 177 states cannot adopt California's standard.[1093] NHTSA cannot ignore this inconsistency, nor purport to act on its interpretation of Section 177 absent further explanation.

b. Conclusion

For all of the above reasons, California's Advanced Clean Cars Program is not preempted by EPCA, and NHTSA should not finalize any regulatory text or other discussion to the contrary.

XII. NHTSA has not met its obligations under the National Environmental Policy Act.

The statutory mandate of the National Environmental Policy Act (NEPA) requires NHTSA to prepare a DEIS that takes a "hard and honest look" at the environmental impacts of the joint proposed rule, including NHTSA's preferred alternative of rolling back the model year (MY) 2021-26 adopted or existing standards to MY 2020 levels. NEPA also requires that NHTSA adequately inform the public and the decision makers of "the reasonable alternatives" and mitigation measures which would avoid or minimize the impacts of the rollback. NHTSA's DEIS fails to meet any of these requirements, and

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[1090] 83 Fed.Reg. at 42,239.
[1091] *See* 83 Fed.Reg. at 43,212. ("EPCA encourages the production of alternative fuel vehicles."); *see* also 49 U.S.C. § 32904(a)(2).
[1092] 83 Fed.Reg. at 43,237-38.
[1093] *Id*. at 43,253.

instead presents a description of alternatives and environmental impacts that is manipulated to affirm a predetermined agency preference.

As explained more fully in the accompanying comments on the Draft Environmental Impact Statement for the SAFE Vehicles proposal, NHTSA's NEPA review is procedurally deficient in two respects. *First*, NHTSA has provided limited time for review and public comment, about a quarter of which lapsed before NHTSA published in the Federal Register the 515-page proposed rule and released its 1,600-page preliminary regulatory impact analysis on which the DEIS relies in many respects. As explained in greater detail in the accompanying comments, additional time is warranted because many stakeholders have reasonably requested it (including the Alliance of Automobile Manufacturers). Additional time is also warranted because, as outlined in the CARB request for information dated September 11, 2018, significant technical studies and data that underlie analyses in both the DEIS and the Proposed Rollback are not available as of the date of this submission. For example, the DEIS concedes that the economic assumptions embedded in the CAFE Model "play a significant role in determining the impacts on fuel consumption, changes in emissions of criteria and toxic air pollutants and GHGs, and resulting economic costs and benefits of alternative standards." (DEIS, 2-15). Partly by necessity, but mostly due to NHTSA's design choices, the analysis presented in the DEIS is complex. It involves cross modeling of many societal, economic, safety, and scientific factors. To evaluate the validity and accuracy of NHTSA's analysis requires substantially more time than NHTSA has allowed. See also States' Letter to Heidi King, Deputy Administrator, NHTSA, dated August 27, 2018 (submitted to NHTSA's DEIS docket).

Second, and relatedly, NHTSA has not released a myriad of significant technical studies and data that underlie both the DEIS and the joint proposed rule.[1094] Either of these two deficiencies, standing alone, renders the DEIS legally inadequate.

Beyond these procedural deficiencies, the DEIS violates NEPA in many other respects, including by using novel and inaccurate modelling inputs, by failing to consider a reasonable range of alternatives, and by attempting to improperly minimize the environmental significance of NHTSA's proposal by burying it within a doomsday reference scenario that assumes catastrophic climate change is essentially unavoidable. Please see the accompanying comments on the DEIS for in-depth discussion regarding the legal deficiencies in the DEIS.

XIII. NHTSA and EPA failed to meet multiple attendant obligations.

The federal Agencies have not met their obligations under a variety of other federal statutes and laws, owing to the wide-ranging implications of the rollback.

[1094] *See*, *e.g.*, Letter from Ellen Peter, Chief Counsel, California Air Resources Board, to Heidi King, Deputy Administrator, NHTSA, dated September 11, 2018 (submitted to NHTSA's DEIS docket).

A. The Agencies failed to consult under the Endangered Species Act.

The Endangered Species Act's section 7,[1095] requires federal agencies to consult with the Secretary of the Interior to ensure their activities are "not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat of such species."[1096] As the Fish and Wildlife Service and many independent scientists have concluded, air pollution and climate change contribute substantially to biodiversity risk. NHTSA and EPA must consult with the Interior Secretary prior to finalizing the rollback.

B. The rollback is not consistent with California's programs to protect its coast against the effects of climate change.

The Coastal Zone Management Act[1097] requires federal programs that affect any land or water use or natural resource of the coastal zone to be carried out in a manner that is consistent, to the maximum extent practicable, with the enforceable policies of the State's program managing the coastal zone. California's coast is vulnerable to sea level rise from climate change, and the rollback will exacerbate that threat. This violates California's policies and obligations in its management program to preserve, protect, and enhance its coastline.

C. NHTSA and EPA failed to consult under the National Historic Preservation Act.

The National Historic Preservation Act requires that the "head of any Federal agency" embarking on a project, to "prior to the approval of the expenditure of any federal funds on the undertaking or prior to the issuance of any license, shall take into account the effect of the undertaking on any historic property."[1098] Climate change and air pollution imperil historic properties throughout the country via direct degradation, sea level rise, fire, flood, and other forms of harm. If NHTSA conducts an undertaking that may further imperil these resources, it must properly consult with the relevant federal and state authorities and fully disclose any impacts.

D. NHTSA and EPA have arbitrarily dismissed the environmental justice impacts of the rollback.

[1095] 16 U.S.C. § 1536.
[1096] 16 U.S.C. § 1536(a)(2).
[1097] 16 U.S.C. § 1451 *et seq*.
[1098] 54 U.S.C. § 306108.

The needs of minority and low-income communities must also be accorded great weight. Per Executive Order 12898, as well as Title VI of the Civil Rights Act, NHTSA must also consider how the impacts of weakened CAFE and greenhouse gas emissions standards impacts will be especially burdensome to disadvantaged communities.[1099] As discussed above, these communities are disproportionately located near highways and other sources of vehicle pollution. They are also disproportionately disadvantaged by high fuel costs, as such costs consume a higher portion of their incomes. More efficient and lower-polluting vehicles are critical to the health and well-being of these communities. The federal Agencies have failed to recognize the benefits of the existing standards. The federal Agencies have also concluded that the Proposed Rule will benefit disadvantaged communities without providing an underlying analysis and thereby failed to meet the requirements of Executive Order 12898.

E. NHTSA and EPA failed to consult Native Tribes.

The federal Agencies have not consulted and coordinated with Native American Tribal Governments, as required by Executive Order 13175.[1100] The rule undermines Tribal sovereignty by weakening their power to improve air quality and reduce GHG emissions on Tribal lands and will increase air pollution and its accompanying health problems for Tribes. Contrary to the federal Agencies' conclusory and unsupported assertions,[1101] as shown above, this proposal will impact native peoples. It will hurt tribal health and accelerate climate change. All tribal communities suffer higher rates of health effects from air pollution. Tribes are seeing the effects of climate change through increased storm surge, erosion, flooding, prolonged droughts, wildfires, and insect pest outbreaks in their forests. Tribal peoples' cultures are rooted in the natural environment and closely integrated into the ecosystem. Tribal members hunt and fish, use native flora and fauna for medicinal and spiritual purposes, and associate their identities and histories closely with the land and water. They suffer disproportionately from the effects of climate change on wildlife, fish, and native plants, which they depend on for subsistence and maintaining traditional cultural practices. Native peoples do drive motor vehicles, and thus will incur increased costs for fuel from this proposal. And they, too, are disproportionately disadvantaged by high fuel costs, as such costs make up a higher proportion of demands upon their incomes. This proposal will, in fact, have disproportionately high, adverse impacts, including on native tribes and indigenous populations.

[1099] *See*, e.g., Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations, Exec. Order No. 12898, 59 Fed.Reg. 7629 (Feb. 11, 1994), as amended, 60 Fed.Reg. 6381 (January 30, 1995).
[1100] 65 Fed.Reg. 67,249 (Nov. 9, 2000).
[1101] 83 Fed.Reg. at 43,477.

F. The rollback will exacerbate floods, impair wetlands, and adversely impact wildlife, fish, and migratory birds.

The rollback's significant impacts from air pollution and climate change will lead to increased flooding, inundation of wetlands, and harm wildlife, fish, and migratory birds. This action is contrary to multiple statutes and requirements, including:

- The Fish and Wildlife Conservation Act
- Floodplain Management Executive Order 11988 and DOT Order 5650.2
- Wetlands Preservation Executive Order 11990 and DOT Order 5660.1a
- The Migratory Bird Treaty Act.[1102]

G. EPA violated the Environmental Research Development Demonstration Act.

The Environmental Research Development Demonstration Authorization Act[1103] requires EPA to share proposed regulations and related supporting information with the Science Advisory Board (SAB) when it provides the regulation to any other agency for formal review. EPA did not meet this requirement.

The SAB has voted to review EPA's decision to withdraw and revise the Final Determination on the midterm evaluation of the greenhouse gas emissions standards. It is interested in the several issues, including the barriers to greater consumer acceptance of advanced technology vehicles, and estimates of fleet turnover due to more stringent standards.[1104] It stands to reason that the SAB is interested in this action as well, and the failure to consult the SAB is prejudicial.

The proposed rollback is a wrong at every turn. It must be withdrawn.

XIV. The rollback proposal is wrong on the facts, wrong on the law, offends our constitutional structure, and must be withdrawn.

The Agencies' proposal offends the science, the law, and the evidence. It disrupts a major industry, puts the public at risk, and reverses critical action needed to protect air quality and reduce climate change impacts. It also marks a stark departure from basic principles of governance, as the executive agencies ignore state sovereignty, Congressional direction, their own statutes, and their own experts to serve the whims of the President. The proposal fundamentally fails basic responsibilities of government.

California is committed to resisting this proposal, but our interest ultimately is in protecting the public. CARB remains open to discussions that will achieve positive

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[1102] 16 U.S.C. § 703 *et seq*.
[1103] 42 U.S.C. § 4365(c)(1).
[1104] *See* Letter from Dr. Michael Honeycutt (SAB Chairman) to Administrator Scott Pruitt (June 21, 2018), EPA-SAB-18-002, p. 2.

public purposes after this proposal is withdrawn. Since 2012, California and the nation have benefited from a single national program for controlling greenhouse gas emissions from passenger cars and light trucks. This program has met California's needs to reduce emissions and develop advanced technologies. It has met the industry's needs for certainty. California remains committed to a program that meets these goals. On September 28, 2018, the CARB's Board reiterated its direction to CARB's Executive Officer and its staff to continue to explore options for a unified national program that is consistent with California's climate and public health goals and needs.[1105]

We have met with you and your staff repeatedly, but have yet to be given the opportunity to discuss the substantive technical issues that the emissions standards, and the harmonized fuel economy standards, present for the public and the industry. We understand from a statement by Mr. Wheeler, on Thursday, October 11, 2018, in Escalon, California, that EPA is waiting for a proposal from California.[1106] We reiterate that from all that we have reviewed, including much of EPA's own work, that the existing standards remain appropriate. There is nothing to "propose" without a substantive basis; public health is not a bargaining chip for "deals" reached for nothing more than their own sake.

We remain ready to discuss the substantive merits of the emissions standards at your convenience. As an agency dedicated to scientific inquiry and technological advancement, we understand there are times when the capabilities of human understanding have not met a schedule. If there are legitimate, substantiated adjustments to the standards that are necessary, we invite you, and the industry, to discuss them with us. You may contact me at (916) 322-7077 or richard.corey@arb.ca.gov to discuss any of these issues.

XV. Expert Reports Attached

CARB submits the attached expert reports in support of its comments. By separate cover, CARB submits additional documents, data, and references cited and relied on for its comments, if not protected by copyright.

1. Ackerman, F. Synapse Energy Economics, *Assessment of Macroeconomic Impacts from Federal SAFE Proposal.* October 22, 2018.
2. Auffhammer, M. *The Use of the Social Cost of Carbon in the Federal Proposal "Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks. [83 Fed.Reg. 42,986 (Aug. 24, 2018)].* October 24, 2018.
3. Bunch, D. *An Evaluation of NHTSA's Economics-based Modeling and Implications for Benefit-Cost Analysis in the NHTSA/EPA August 24, 2018 Notice*

[1105] Reso. 18-35. CARB. Accessed on October 24, 2018. https://www.arb.ca.gov/regact/2018/leviii2018/finalres18-35.pdf. pp. 8 & 11.
[1106] D. Kahn, *Wheeler disowns Facebook post, is open to clean car talks.* ClimateWire. E&E News. Oct. 12, 2018.

of Proposed Rulemaking (NPRM) ["The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks"]. October 24, 2018.
4. Duleep, G., H-D Systems. *Review of the Technology Costs and Benefits Utilized in the Proposed SAFE Rule.* September 2018.
5. Gillingham, K. *The Rebound Effect of Fuel Economy Standards: Comment on the Safer Affordable Fuel-Efficient (SAFE) Vehicles Proposed Rule for Model Years 2021-2026 Passenger Cars and Light Trucks*, Yale University. October 19, 2018.
6. Gillingham, K. *How Fuel Economy Standards Affect Fleet Turnover and Used Vehicle Scrappage: Comment on the Safer Affordable Fuel-Efficient (SAFE) Vehicles Proposed Rule for Model Years 2021-2026 Passenger Cars and Light Trucks*. Yale University. October 25, 2018.
7. Greene, D. *How Consumers Value Fuel Economy and Implications for Sales of New Vehicles and Scrappage of Used Vehicles*. October 21, 2018.
8. Handy, S. *Potential Federal Actions to Reduce Vehicle Travel*. October 2018.
9. Ragland, D.R., Grembeck, O., Chen, K., Medury, A., & Cooper, J.F. *Safety Impacts of Potential Rollback of Vehicle Efficiency Standards and Policies/Countermeasures to Increase Safety*. University of California Berkeley. October 23, 2018.
10. Rogers, G. *Technical Review of: The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks, Final Report*. Roush Industries. October 25, 2018.
11. Stanton, E. *Review of August 2018 NHTSA/EPA Proposed Rulemaking Reducing the Stringency of CAFE and CO2 Standards*. Applied Economics Clinic. October 24, 2018.
12. Van Auken, R.M. *Comments on the Preliminary Regulatory Impact Analysis of the Proposed Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Year 2021-2026 Passenger Cars and Light Trucks*. DRI-TR-18-07. October 25, 2018.