BEFORE THE
CALIFORNIA AIR RESOURCES BOARD

COMMENTS OF THE CONSUMER FEDERATION OF AMERICA ON THE CALIFORNIA AIR RESOURCES BOARD *MID-TERM REVIEW*

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MARCH 24, 2017

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INTRODUCTION AND RECOMMENDATION

The Consumer Federation of America (CFA)

The Consumer Federation of America[1] has participated in dozens, if not hundreds, of efficiency rulemakings, regulatory negotiations, and legislative hearings involving large and small energy using durables, ranging from automobiles to heavy duty trucks, air conditioners, furnaces, water heaters, computers, and light bulbs.[2] CFA and its staff have participated in the regulation of automobile safety, emissions and fuel economy for almost 40 years. We have been intensively involved in the setting of fuel economy and emissions standards since the passage of the Energy Independence and Security Act. For the past decade we have also testified about and worked on the Clean Cars program that implements California standards.[3]

We appreciate the opportunity to share our views on *California's Advanced Clean Cars Mid-term Review* prepared by the California Air Resources Board (CAB). While these comments are brief, we provide two lengthy Attachments, each composed of a number of Appendices that address the most important areas dealt with in the *Mid-Term Review*. Attachment I contains our comments in response to the Environmental Protection Agency's (EPA) *Technical Analysis Review* and *Final Determination* and other past formal comments that directly address key issues we raise herein. Attachment II contains our recent analyses of electric vehicles, since a considerable amount of attention in the[4] *Mid-Term Review* is devoted to this issue.

Recommendation

EPA's *Technology Analysis Report* and *Final Determination* combined with the CARB's *Mid-term Review*, placed atop the massive original analyses in the National Program, constitute one of the most thorough examinations of automotive technology and market conditions ever conducted in a regulatory proceeding in the United States. Both these mid-term reviews arrive at the same conclusion, the current standards for 2022-2025 are technically feasible and economically beneficial. The standards will result in significant reductions in emissions of pollutants, including greenhouse gases and huge consumer savings. We fully support their conclusion.

In determining that the substantive recommendation should be supported, we also recommend that the process by which the nation has arrived at this important moment also deserves our explicit support. The process under the Clean Air Act through which California is authorized to set a standard, which other states can follow, is an example of American Federalism at its best.[5] It allows states to be laboratories of innovation that then inform and improve the overall terrain of U.S. policy and decision making.

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[1] The Consumer Federation of America is an association of more than 250 nonprofit consumer groups that was established in 1968 to advance the consumer interest through research, advocacy, and education.

[2] The CFA website (http://www.consumerfed.org/issues/energy) lists over 100 pieces of legislative testimony and regulatory comments in home energy and motor vehicles, most of which involve energy use and efficiency standards.

[3] The Consumer Federation of America participated in state proceedings in November 2007 in New Mexico and followed up with presentations in Arizona and Florida.

[4] See II.

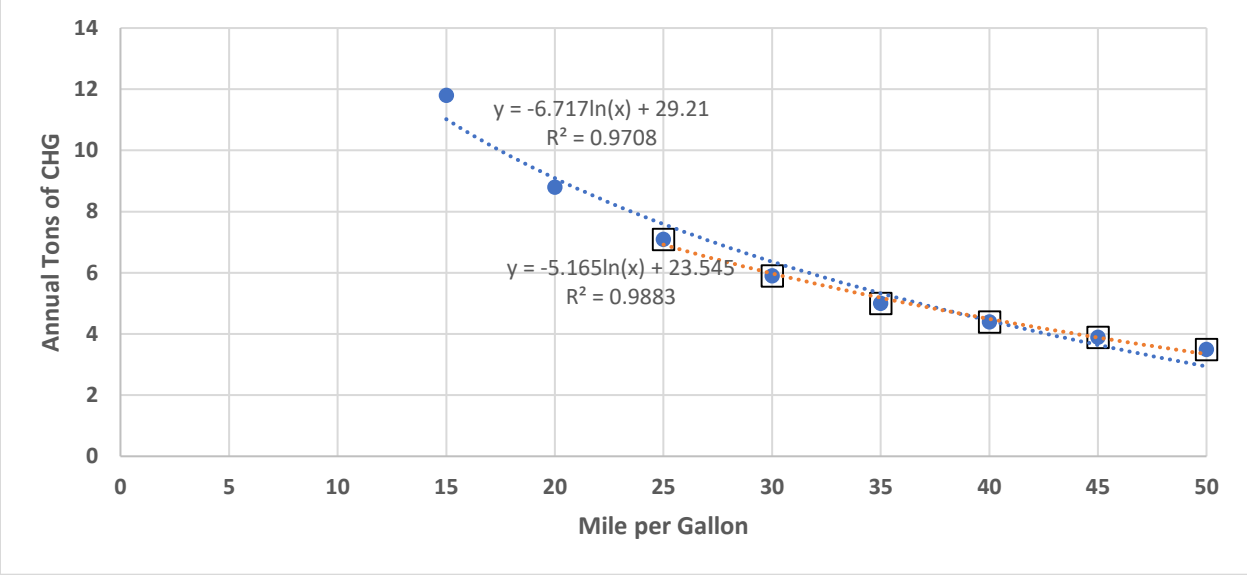
[5] See Attachment I, *American Federalism at its Best.*

The statute only allows two choices. The fact that as many as a dozen states have chosen to adopt the California standard is testimony to the disciplined and responsible process that has developed. This process has been in place for four decades and it has consistently helped consumers and the public. The regulation of emissions from automobiles, which has also delivered massive consumer pocket book benefits, may be its finest hour.

THE ENVIRONMENTAL AND CONSUMER POCKETBOOK BENEFITS OF THE 2012-2025 STANDARDS

As we pointed out long ago in our work on the Clean Cars program,[6] the near perfect correlation between emission of pollutants and consumption of petroleum products in vehicles creates a powerful and inevitable connection between environmental protection and consumer pocketbook savings (See Figure 1). The least cost approach to emission reductions is to improve the efficiency of vehicles by reducing their energy consumption per mile driven. All of the agencies involved in setting standards for automobiles, be they emissions or fuel, economy are required to consider this economic benefit.

Figure 1: The Near Perfect Correlation of Greenhouse Gas Emissions and Fuel Economy



Source: EPA, *Sources of CO_2 Emissions for a Typical Household*, www.fueleconomy.gov/feg/climate.shtml

This physical relationship makes the adoption of pollution reduction unique in writing environmental standards to regulate pollution from vehicles because the avoided cost of energy consumption are direct and immediate pocketbook benefits. It has every attribute that we look for from a consumer point of view.

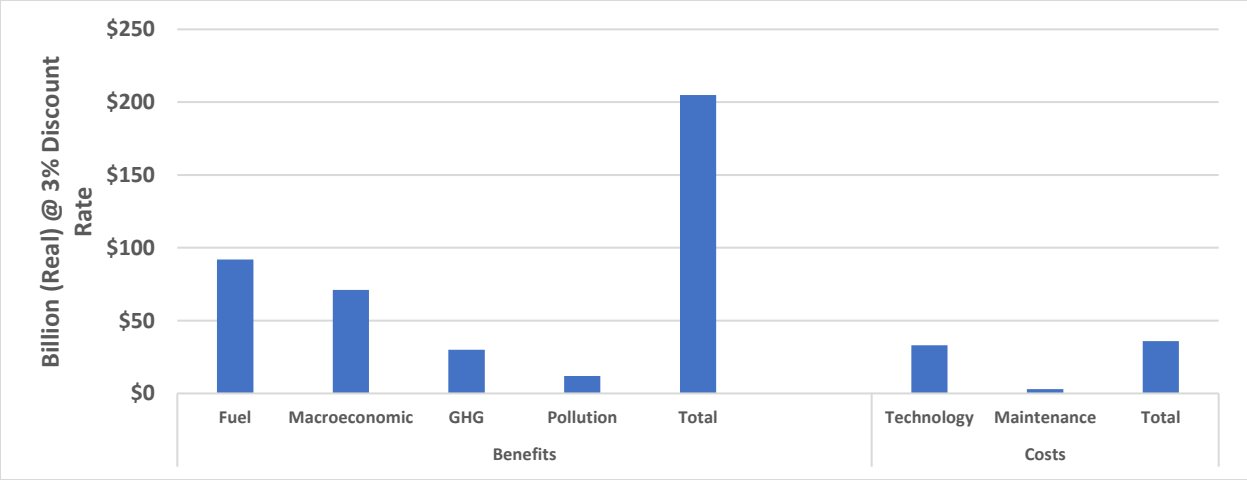
- On average, households save over $1600 over the life of the vehicle.
- Cash flow benefits exceed costs incurred to reduce gasoline consumption early in the asset life (the first year).

[6] At the time of the filing in New Mexico, CFA issued a report entitled, A Consumer Analysis of the Adoption of the California Clean Cars Program in Other States, November 2007.

- The cost per gallon saved is far below the projected cost of gasoline, even in the low cost scenarios.
- Payback is less than half the asset life, so we expect initial purchasers to achieve net benefits.
- There are substantial total savings measured at the consumer and national levels.

The direct consumer pocketbook savings, a complementary and inevitable effect of pollution reduction, are by far the largest economic impact of the rule that has been affirmed by EPA and CARB (see Figure 2).[7] From our uniquely consumer point of view, the finding that the value of fuel savings far exceeds the cost of technology and maintenance to achieve those savings is central. The fact that indirect economic benefits that flow from the reduction in the cost of driving result in a macroeconomic benefits which is the second largest source of benefit strongly reinforces our positive view. Combined, these economic benefits are over four times larger than that cost of the standards. The environmental benefits are also larger than the costs. Total benefits are almost six times the cost. Thus, at the level current standards are set and for the foreseeable future, pollution reduction more than pays for itself in direct consumer pocketbook savings, in indirect macroeconomic benefits, and in environmental benefits of the reduction of emissions of pollutants.

Figure 2: Benefits and Costs of the 2022-2025 Standards



Source: CFA, based on EPA, *Final Determination,* p. ES-6, and Macroeconomic benefits based on

AMERICAN FEDERALISM AT ITS BEST, THE IMPORTANCE OF ALLOWING THE STATES TO SET A SEPARATE STANDARD[8]

The Dynamic Process of American Federalism

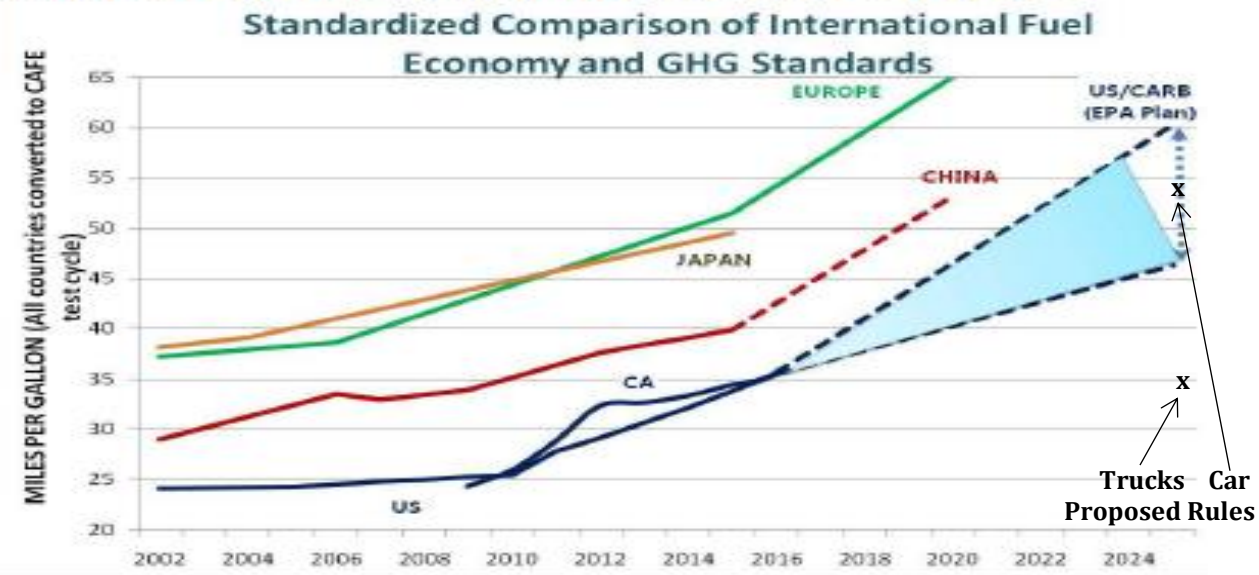
The findings of the EPA and the CARB also reaffirm one of the most important aspects of regulatory implementation in the past four decades. The dynamic policy effect of American federalism at its best has produced a uniquely powerful and beneficial standard setting process.

[7] See Attachment I, *CFA Comments on the Final Determination.*
[8] Consumer Federation of America,

California has the authority under the Clean Air Act to set standards that meet the unique needs of the state. Other states can choose to follow either the California standard or the Federal standard. Over the course of the past decade, over a dozen states have chosen to implement the California standard. Because so many states chose to follow California, the Clean Cars states constituted the fifth or sixth largest auto market in the world.

These states led the way to higher standards nationwide. These standards pulled the Federal standards higher and put the U.S. on a course to approach the levels at which the major auto consuming nations have set their standards, as shown in Figure 3. Automakers simply cannot be competitive in the current auto market if they cannot sell their products globally and they cannot sell those products if they cannot compete on fuel economy. To stop now would be catastrophic for U.S. automakers and consumers. Thus, the dynamic process between the states and the federal levels benefits the environment, consumers and the nation.

Figure 3: Comparison of Proposed Standard with International Standards



Source: CFA, Comments on the National Plan, Technical Appendix, p.33, based on Feng An, Robert Early and Lucia Green-Weiskel, *Global Overview of Fuel Economy and Motor Vehicle Emission Standards: Policy Options and Perspectives for International Cooperation* (The innovations Center for Energy and Transportation, United Nationals Commission on Sustainable Development, May 2011, Background Paper No. 3)

The decision to coordinate in the setting of the 2017-2025 standards formalized this process. However, it would be a huge mistake to short circuit the interactive process between state and Federal policymaking. The potential benefit of the process have not come anywhere near being exhausted. Indeed, a second major benefit of the process is readily observable. When California adopted a low emission vehicle standard, it create the conditions for a new technology to enter the market – hybrids. Today that same process is playing out with electric vehicles, as discussed below.

The initial standards proposed by NHTSA were grossly inadequate. It was California and the Clean Cars states that pulled the federal standards to a level that made them consistent with

the rest of the world. There is no justification to backslide on either the current level of the standards or the process that propelled us to it.

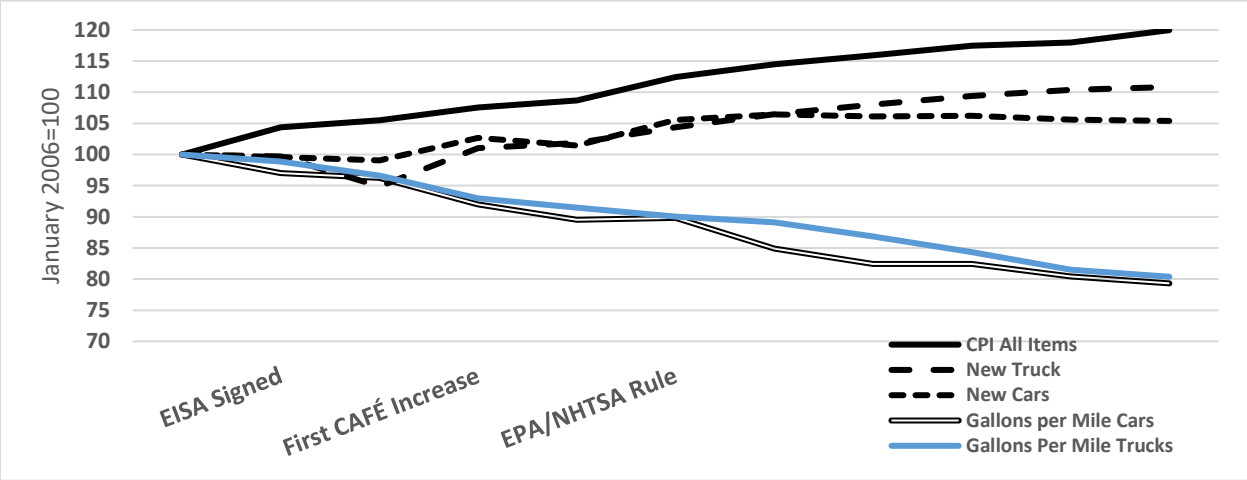
Bringing the Auto Industry into the 21st Century

One of the greatest benefits of American federalism is to have numerous agencies with different perspectives vetting the arguments that are being made by various parties. It helps to have independent viewpoints to rebut the arguments of powerful industries. The analysis by EPA and CARB thoroughly rebut the gloom and doom scenarios laid out by the automakers.

Throughout their involvement in public interest regulation of the industry, the automakers have consistently and repeatedly overestimated costs and underestimated the value of regulation driven improvements in quality.[9] The reduction in technology cost noted by EPA (about 5.7% per year), based on the detailed engineering analysis, fits the historic pattern of self-interested overestimation by the automakers.

More importantly, the claim that efficiency improvements increases prices dramatically is simply not supported by real world data. In our comments we point to extensive analysis in the record that rebuts this claim. Figure 4, which is an extension of the long-term data from the Consumer Expenditure Survey already in the record, reinforces this conclusion.

Figure 4: New Car Prices and Mileage



Source: Bureau of Labor Statistics, *Consumer Expenditure Survey*, new vehicle prices. EPA, *Light Duty Trends Report, 2016*

In the post-EISA period new car prices fell early as the great recession depressed sales. After the first increase in fuel economy mandated by EISA went into effect, they tracked inflation. Recently, car prices have significantly failed to keep up with inflation, while truck prices have moderated slightly. The automakers' predictions in the record of the current proceeding have once again failed to come to pass and they should be dismissed as a self-interest public relations stunt.

[9] See Attachment A, CFA Comments on the TAR.

THE OBLIGATION TO ACHIEVE MAXIMUM FEASIBLE, COST BENEFICIAL, ECONOMICALLY PRACTICABLE REDUCTIONS

The laws of physics and chemistry that are expressed in the close connection between energy consumption and emission of pollution, have been reflected in the laws governing policy.

Under the California statute governing the CARB, it must adopt rules that achieve "the maximum feasible and cost-effective reduction of greenhouse gas (GHG) emissions emitted by passenger vehicles in the state."

Under the Clean Air Act, once the EPA makes an endangerment finding, the EPA must regulate the emission of "the deleterious pollutant from new motor vehicles." Law, past practice and legal rulings dictate that "In establishing such standards, EPA must consider issues of technical feasibility, cost, and available lead time."[10]

Finally, the mandate under which the National Highway Traffic Safety Administration operates requires it to achieve

> the maximum feasible average fuel economy level that it decides the manufacturers can achieve in that model year (49U.S.C. 32902(a)),'' based on the agency's consideration of four statutory factors: Technological feasibility, economic practicability, the effect of other standards of the Government on fuel economy, and the need of the nation to conserve energy

While these legal mandates are not identical, they are similar and point in the same direction. Economics play a key role, as does technological practicability. What is economically practicable or cost effective should include all of the costs and benefits of a technology.

The idea of cooperation is clearly laudable, but it does not override the statutory mandates. Moreover, to the extent that the framework introduced in the 2012 order demands cooperation, two of the three agencies (EPA and CARB) have now affirmed that the standards should not be reduced. If anyone is not "cooperating" it is NHTSA. The only question for NHTSA is "does the 2012 order carried to its conclusion comply with NHTSA's legal mandate?" We believe that the evidence overwhelmingly shows that it does.

ELECTRIC VEHICLES

The CARB staff analysis of electric vehicles speaks for itself. It presents an objective, thorough and realistic picture of a dramatic new technology in the early phase of innovation and diffusion with a sound basis to expect that the product will be successful with careful policies to

[10] Section 202 (a) of the Clean Air Act requires EPA to establish standards for emissions of pollutants from new motor vehicles which emissions cause contribute to air pollution which may reasonably be anticipated to endanger public health or welfare. *See Coalition for Responsible Regulation* v. *EPA*, No. 09–1322 (D.C. Cir. June 26, 2012) slip op. p. 41 (''[i]f EPA makes a finding of endangerment, the Clean Air Act requires the [a]gency to regulate emissions of the deleterious pollutant from new motor vehicles. '* * * Given the non-discretionary duty in Section 202 (a)(1) and the limited flexibility available under Section 202 (a)(2), In establishing such standards, EPA must consider issues of technical feasibility, cost, and available lead time. Standards under section 202 (a) thus take effect only ''after providing such period as the Administrator finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period''

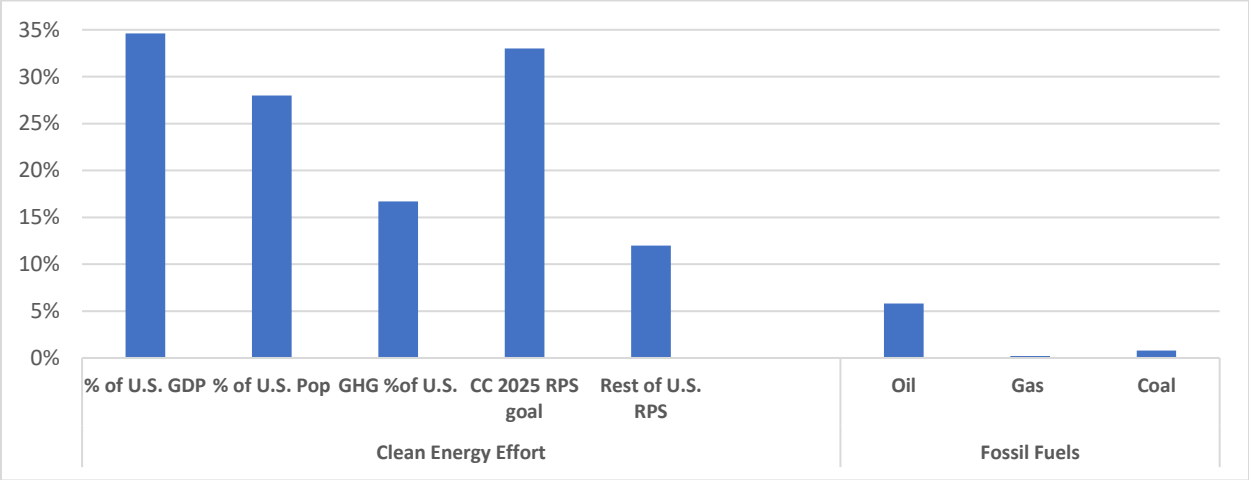
nurture it. The design of the California efforts to create the conditions for the market success of electric vehicles is complementary to and respectful of the standards adopted in the *Final Determination* and supported by the *Mid Term Review*. The California policies are very much complementary policies intended to address market imperfection and early development challenges that a new technologies face.[11]

The penetration of EVs to meet the standards at the national level is assumed to be quite small. The federal standard is not technology forcing. The California efforts (and those of other states) are separate. Both the program costs of increasing penetration and the vehicle costs, fall on the vehicles sold in those states.

The Clean Cars States

It is important to also note that the commitment to the Clean Cars program is part and parcel of a broad commitment of state policy to reducing energy consumption and reliance on high polluting sources of energy, as shown in Figure 5. The ZEV states included in Figure 5 represent five-sixths of the Clean Cars States.

Figure 5: ZEV States, Clean Energy Efforts



Sources: U.S. Bureau of the Census, Population by States; Bureau of Economic Analysis, GDP by State; EIA, Greenhouse Gas Emissions, Energy Production Database; *State Renewable Portfolio Standards And Goals*

While these states represent just over a quarter (28%) of US. population and just over a third (35%) of U.S. GDP, but they account for only one-sixth (17%) of U.S. greenhouse gas emissions. This is a result of state policies. Their renewable portfolio standards are almost three times higher than the rest of the nation. They account for eight of the top ten ranked states policies to promote efficiency through utilities, in building and in transportation.[12]

Their desire to use local, renewable resources and reduce energy consumption reflects the distribution of fossil fuel resources. They have virtually on natural gas or coal production (which are the primary sources of U.S. electricity generation) and little oil production. Thus, these

[11] Consumer Federation of America, *Performance Standards*
[12] ACEEE, *The State Energy Efficiency Scorecard, 2016.*

choices by the ZEV states are clearly in the interest of the consumers in those states and the economic interest of the states.

CFA's Electric Vehicle Analysis

Our analysis of the electric vehicle market, particularly viewed through the lens of the success of hybrids, antedates and is consistent with the CARB analysis. We consider the CARB analysis independent corroboration of our earlier work.

We have appended several of our EV analyses that mirror the CARB staff analysis. Here we make two fundamental points.

First, it is extremely important to recognize where a new product is on the innovation adoption curve. Penetration is naturally low early in the process and adoption is slow as the technology is developed and the infrastructure necessary to support is it deployed. We concluded six years ago that the EV was moving more quickly than hybrids and that continues to be the case. Our innovation/diffusion analysis in 2011 is spot on, as shown in the upper graph of Figure 6. The Lower graph shows that EVs are now moving ahead of the pace set by hybrids. This reflects the rapid proliferation of models as noted by the CARB analysis.

Second, we believe their predictions about failure of electric vehicles in the market will prove to be even wider of the mark than their predictions about costs. As we pointed out in our comments on the TAR, they have misinterpreted (or misrepresented) the results of their survey.[13]

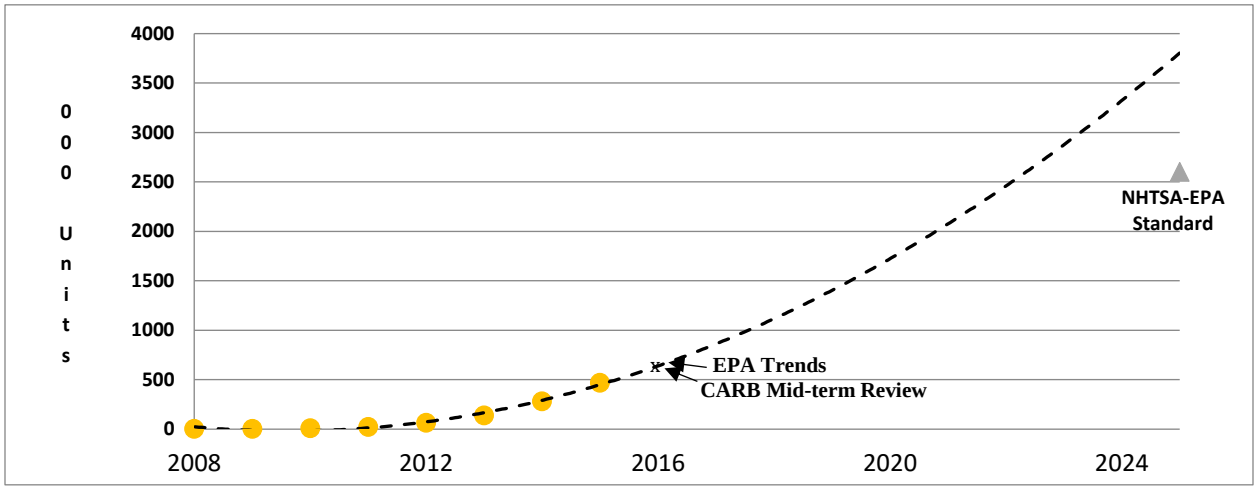
While the automakers claim that all they do with vehicles is "just what consumers want," we showed that their own survey results contradicted that claim. Because we believe this misreading of consumers has been persistent and their erroneous portrayal of consumer attitudes will likely play an important part in the debate over the standard, some of our earlier analysis bears repeating.

The public is not as enamored of gasoline powered muscle cars and trucks as the automakers claim. As shown in Figure 5, the automakers' survey evidence does not support their claims. If an EV and gasoline vehicle were matched on cost and travel length[14], more would prefer the electric vehicles (48% to 43%) and a clear majority (57%) are willing to pay more for an electric vehicle. As Figure 7 shows, the analysis of desirable vehicle attributes shows that consumers want reliable, safe, affordable and low maintenance vehicles.[15] There is no reason to believe that fuel efficient gasoline engines or electric vehicles (EVs) cannot fill the bill and automakers are working hard to achieve that goal.

[13] Attachment I, Comments on Final Determination.
[14] Mitch Bainwol, President and CEO, Alliance of Automobile Manufacturers, *Consumers & Fuel Economy,* CAR Management Briefing Seminars, Traverse City, Michigan, August 2016, p. 9.
[14] Id., p. 10.

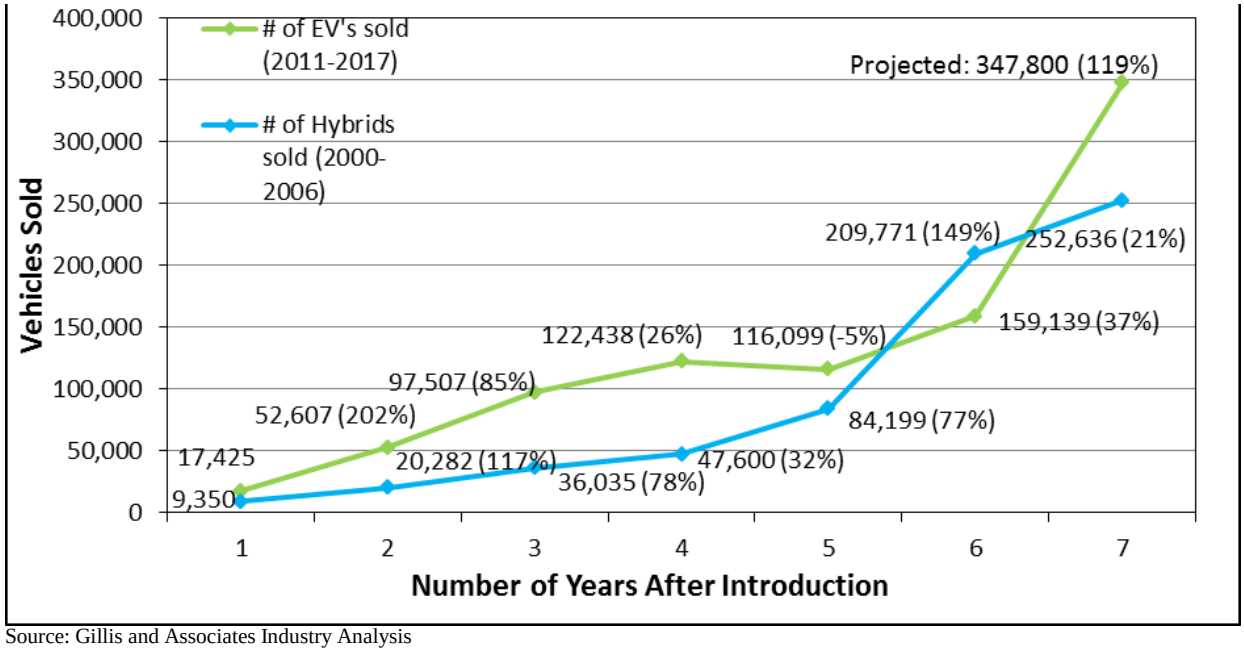
Figure 6: CFA's Analysis of Electric Vehicle Diffusion

CFA's 2011 Diffusion Curve of Projected Cumulative Electric Vehicle Sales



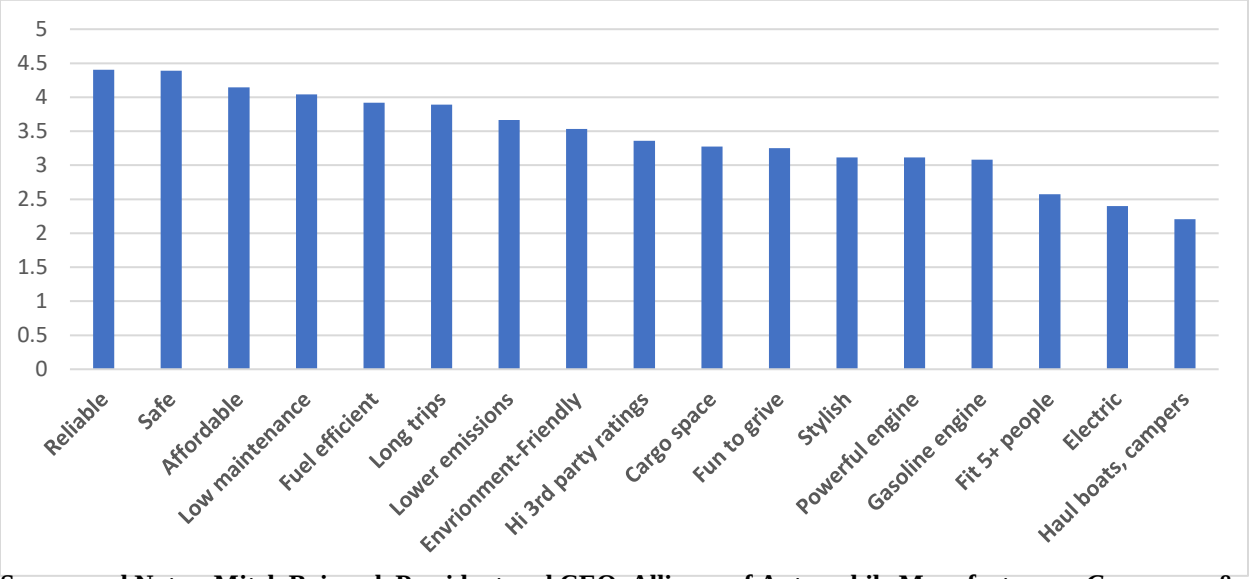
Sources: Consumer Federation of America, Technical Appendix, p. 32, based on Rudi Halbirght, Max Dunn, *Case Study: The Toyota Prius, Lessons in Marketing Eco-Friendly Products*, March3, 2010, http://www.hybridcars.com/hybrid-sales-dashboard/... Various years; J.D. Power, ,Mike Omotoso, *Global Alternative Fuel Light Vehicle Sales Forecast,* April 2010; J.D. Power and Associates - 2, *Despite Rising Fuel Prices, the Outlook for "Green" vehicles Remains Limited for the Foreseeable Future,* April 27, 29011, The Boston consulting Group, *The Comeback of the electric Car? How Real, How Soon, and What Must Happen Next?*, June 2011, Exhibit 5, from the "steady pace Scenario."

EV & PHEV (2011-2017) vs. Hybrid (200-2006) Initial Sales (% Change Year-over-Year)



Source: Gillis and Associates Industry Analysis

Figure 7: Alliance of Automobile Manufacturers, Vehicle Attribute Survey



Source and Notes: Mitch Bainwol, President and CEO, Alliance of Automobile Manufacturers, *Consumers & Fuel Economy,* CAR Management Briefing Seminars, Traverse City, Michigan, August 2016, p. 10. The winter related question, specific to the North East, has been discarded. It would rank 12th of 18, low in California, high in New England).

As Figure 7 shows, after the big four attributes, respondents care as much about fuel efficiency as the ability to take long trips and the automakers are working on that too. Beyond these big six attributes, the valuation of others falls off, but even here the message for EVs is positive. Environmental impacts rank a lot higher (8th and 9th) than powerful engines (13th) or engine type (gasoline power =14th, electricity = 16th). Fitting more than 5 people (15th) or hauling boats and campers don't matter much (ranks dead last).

CONCLUSION

The CARB *Mid-Term Review* attests to the coordination between it and the Federal agencies. The House testimony of EPA and NHTSA also gave strong evidence on the ongoing coordination.[16] At that hearing the agencies noted that their statutes laid out different routes to a final conclusion and the CARB's obligation was different from the other two. There is nothing surprising or nefarious in the three agencies with three different statutory obligation reaching conclusions at different times.

The CARB was required to issue its report by the end of 2016.

EPA had discretion as to when to reach its conclusion. The record was voluminous and complete, so it moved forward with its determination. One can even argue that the underlying statute pushed it in that direction. The lead time automakers claim to need is substantial. By

[16] Mid-term Review and an Update on the Corporate Average Fuel Economy Program and Greenhouse Gas Emissions Standards for Motor Vehicles Before the Committee on Energy and Commerce Subcommittee on Commerce, Manufacturing, and Trade Subcommittee on Energy and Power U.S. House of Representatives September 22, 2016

making its determination a full four years in advance, it was giving most of a redesign cycle, the time that the industry has always demanded. EPA should not have re-opened the review.

NHTSA was required to engage in another rulemaking, which would certainly consumer substantial time. NHTSA will consume (waste) a substantial amount of lead time.

Thus the fact that the three agencies acted on different schedules is not an indication of a failure to coordinate, particularly given the extensive cooperation that went into the preparation of two massive analyses. Given the massive amount of analysis that led two of the three agencies to a conclusion strongly supported by the evidence, NHTSA bears a heavy burden of proof to arrive at a different conclusion.

ATTACHMENT I

Evaluation Draft Technical Assessment Report for Model Year 2022–2025 Light Duty Vehicle GHG Emissions and CAFE Standards	**)** **)** **)** **)**	**EPA–HQ–OAR–2015–0827; NHTSA–2016–0068; FRL–9949–54–OAR** **Department Of Transportation** **RIN 2060–AS97; RIN 2127–AL76**

Comments of the Consumer Federation of America
(Technical Appendix Omitted)
Dr. Mark Cooper
Director of Research

September 26, 2016

THE CONSUMER FEDERATION OF AMERICA

The Consumer Federation of America[17] has participated in dozens, if not hundreds, of efficiency rulemakings, regulatory negotiations, and legislative hearings involving large and small energy using durables, ranging from automobiles to heavy duty trucks, air conditioners, furnaces, water heaters, computers, and light bulbs.[18] We have participated in every round of rulemaking for fuel economy standards since the passage of the Energy Independence and Security Act, which rebooted and reformed the CAFÉ program. We appreciate the opportunity to share our views of the current state and future prospects for the National Program.

Our technical expertise is not in the design and production of these durables, it is in the design and implementation of minimum energy standards. We believe that knowing how to build an effective standard is at least as important to arriving at a successful outcome as knowing how to build a consumer durable. Moreover, we conduct extensive polling of public opinion, review the technical economic studies prepared by others and analyze evidence on the market performance of consumer products to determine whether there are significant potential consumer savings that would result from a higher standard.

In these comments we briefly discuss what we see as the key issues that should be addressed as the agencies move from the Technical Assessment Review (TAR) to the full mid-term evaluation and final rule for light duty vehicles in the model year (MY) 2022-2025 time frame In the Appendices we provide extensive documentation of these main points by

1) showing that we have raised these point throughout our involvement in the proceedings that led up to the TAR and similar proceedings dealing with minimum energy performance standards and

2) updating the extensive literature reviews that we have conducted to establish the validity of the approach we take in these comments.

[17] The Consumer Federation of America is an association of more than 250 nonprofit consumer groups that was established in 1968 to advance the consumer interest through research, advocacy, and education.

[18] The CFA website (http://www.consumerfed.org/issues/energy) lists over 100 pieces of legislative testimony and regulatory comments in home energy and motor vehicles, most of which involve energy use and efficiency standards. The NCLC website (http://www.nclc.org/issues/appliance-efficiency-standards.html) lists a dozen comments, letters and lawsuits involving appliance efficiency standards.

SUMMARY OF FINDINGS

1) Under the base case assumptions, consumers are the big winners, with total benefits (consumer pocketbook, environmental/public health, and macroeconomic stimulus) in the range of three to six times the costs.

- Three-fifths of those benefits are enjoyed as direct pocketbook cost savings resulting from a reduction in the total cost of driving.
- Payback periods are less than half of the life of the vehicles, and\
- Cash flow is positive in the first year of ownership.
- One way to summarize this outcome is to calculate the cost per gallon saved. EPA estimates that over 50 billion gallons of oil will be saved at a cost of $36 billion. That works out to just over $0.70 per gallon. Under NHTSA's base case assumption the cost is $1.30/gallon. Both are far less than even the low cost EIA price projections.

2) Low income consumers benefit more than the average consumer.

- Operating expenses are much more important in their total cost of driving.
- In buying used cars they capture a disproportionate share of the fuel savings embodied in resold cars,
- They tend to live in areas that are most affected by the environmental and public health impacts of driving.
- By the time the MY 2022 standards kick in, the many of the new cars available for resale in the used car market will have higher mileage and lower operating costs than would have been the case without the reboot of CAFÉ.

3) The benefits of the National Program are still very strong, in spite of declining gasoline prices, because the minimum performance standards were extremely well designed. They are what we call a "command but not control" approach to regulation.

- They address numerous market imperfections.
- They do so in a manner that harnesses the power of capitalism and markets to meet the standard in the least cost manner possible.
- The new approach ensures consumers have choices in what to buy and automakers have freedom to select the technologies they know best to meet the standards.

4) Automakers have done an excellent job with the freedom they have.

- The auto market is setting records for sales, even as the fuel economy standard rises.
- Automakers are over-complying.
- Costs are coming down.
- Innovation is roaring.

5) Industry complaints about the standards are the typical handwringing, which has proven to be wrong time and again in the past.

- The attack on the National Program is based on a mixture of self-serving, unsubstantiated assumptions and false choices between efficiency and other attributes of vehicles.
- The current round of complaints uses costs that are between two and seven times, the agency estimates.
- Their analysis misrepresents what consumers want and ignores how much the billions of dollars they spend on advertising influences consumer behavior.
- The auto industry funded think tank attacks on the National Program are equally unconvincing. Six months ago their report identified a dozen things the TAR. The 1200 pages of the TAR make it clear that the agencies have responded and still find a strongly positive outcome.

6) The automakers are also overstating the differences between the agencies and demanding a unified National Program in the hope that this would lower the standards.

- Both agencies find that the National Program is in the public interest under the both of the applicable statutes.
- Many of the differences between the agencies were transitional and will be eliminated before the MY2022 standards kick in.
- Analytic differences are "easy" to resolve. The two agencies (EPA and CARB) that support the current standard (or stronger) have made a better case.

7) The Zero Emission Vehicles (ZEV) standards adopted by nine states under Clean Air Act rules should not be weakened or undermined by the federal agencies.

For forty years the Clean Air Act has allowed California to adopt a different standard that the federal standard to deal with unique pollution problems. The states can choose between the two standards. States that account for about one third of the U.S. auto market have followed California.

- This approach is an example of American federalism at its best, allowing states to exhibit leadership and experiment with more aggressive approaches to national problems, while limiting the number of standards to two.
- The Clean Cars states adopted the Low Emission Vehicle Program (LEV), which was a huge success, in that it was a primary factor in bringing hybrids into the market.
- EPA and NHTSA expect gasoline engines to represent the overwhelming majority of vehicles automakers sell to comply with the standards.
- Automakers have vastly overstated the impact of sale of electric vehicles (EV) under the ZEV program and underestimated the prospects for EV sales.

RECOMMENDATIONS

Our review of the TAR and the reports and critiques that have been made public prior to the filing of formal comments leads us to make the following recommendation.

NHTSA's departure from the base case assumptions has not been well-justified and should be dropped, or treated as a minor sensitivity analysis. This applies to the shift in markup calculation and the dramatic reduction in vehicle miles traveled.

More broadly, NHTSA needs to abandon the artificial constraint it has place on technology in its model with the 3-year payback requirement. That figure was never correct. Consumers are willing to accept a five year payback. More importantly, the marketplace has moved away from short paybacks. It appears that the overwhelming majority of consumers (90% according to an NADA spokesman), finance their vehicles. They do not walk into a dealership and pay cash up front. Leases now run an average of 68 months and vehicles are being held by owners more than five years. A payback constraint on technology, if one can be justified, should be five years.

Both agencies should estimate the indirect macroeconomic benefits of the rule.

Payback periods have been given far too much prominence because they embody and reflect market failures. They should not determine the inclusion of technology directly.

The impact of standards on low income households deserves continuing attention and analysis since it is frequently, and incorrectly, cited as a reason to weaken fuel economy standards.

Specific detailed examples and case studies of the dramatic increase in innovation stimulated by performance standards should developed.

The role of the Clean Cars Program in triggering the development of hybrid technology should be examined both as a backward look at how federalism under the Clean Air Act has worked and as a forward looking framework for the development of electric vehicles.

The agencies should continue to work, as they have in the past, to resolve and reconcile their differences over technologies, program design and costs. The richness of the analysis that comes from multiple agencies using different approaches should be seen not as a source of dissention and difference. The agencies must act to implement a National Program and their statutes afford them the flexibility to resolve their difference by using the highest, not lowest common denominator.

DESCRIPTION OF AND EXPLANATION FOR THE NATIONAL PLAN SUCCESS

1. CONSUMER BENEFITS OF THE STANDARD

As shown in Table 1, the topline results of the launch and early implementation of the National Program are quite simply, a very positive bottom line. Table 1 identifies key measures of the performance of the National Program projected for the MY2022-2025 standards by both EPA and NHTSA from the consumer point of view. EPA and NHTSA focus on the lifecycle

consumer savings, the payback period and total national benefits (in addition to reduction in CO_2 emissions and oil consumption). We add monthly cash flow analysis and cost per gallon saved, as more relevant to consumers.

There are clearly differences between the two agencies in their assessments. As described below, we believe EPA's analysis, which stayed much closer to the original framework, is stronger and NHTSA will have to provide better justification for the changes it proposes to that methodology. We also believe the monthly cash flow analysis is more relevant to consumers and the cost per gallon saved is a simple measure of the consumer impact.

TABLE 1: CONSUMER POCKETBOOK IMPACTS

	Monthly			Cost per	Payback	Lifecycle savings		Total National ($, billion)	
	Cost	first year savings	Net	gallon saved	in years	Consumer	Total	Cost	Benefit
EPA									
Mark-up (ICM)	$16.07	$19.92	$3.85	$0.70	5-5.5	$1,620	$2,365	$36	$130
Retail Price Equivalent (RPE)	18.66	19.93	1.27	0.78	6	1,460	2,131	40	129
NHTSA									
Incremental Cost Mark-up (ICM)	18.00	25.10	6.90	1.18	6	800	1.168	89	175
Retail Price Equivalent (RPE)	20.00	24.79	4.79	1.29	6.5	600	876	79	178

Source: TAR, ES-11, ES-12 for cost/vehicle, total cost, total oil savings. First year cash flow and payback analysis is based on TAR 12-41 – 12-46, in which EPA presents year-by-year data for cash flows in the payback approach. The basic approach is applied to NHTSA first year VMT with direct calculation of savings, TAR 13-11 – 13-14. For the combined fleet, first year VMT is assumed to be 25% higher (increasing the first year net benefit, but in the long term NHTSA projections, survival weighted VMT is 20% lower, decreasing the lifecycle cost savings and increasing the cost per gallon saved..

- Notwithstanding the differences, the bottom line for both agencies is clear. The benefits of the program far exceeds the costs.
- Cash flow benefits exceed costs incurred to reduce gasoline consumption early in the asset life (the first year).
- The cost per gallon saved is far below the projected cost of gasoline, even in the low cost scenarios.
- Payback is less than half the asset life.
- There are substantial total savings measured at the consumer and national levels.

As positive as these evaluation are, CFA believes that a major benefit of the National Program has been omitted from the calculation. Driving is very close to a necessity in our society, given our sparsely populated continental economy and living patterns. Necessities have relatively low price elasticities and modest income elasticities. When the total cost of driving declines, consumers have more to spend on other goods and services.

At one level, the EPA/NHTSA analyses recognize this in the form of a rebound effect. As the cost of driving declines, consumers drive a little more, but they still additional disposable income left over. The gasoline savings calculations are net of the rebound effect at the societal level, but not the individual level. If a consumer chooses to spend the economic savings on more gasoline, that constitutes a net benefit to the consumer in the form of increased utility. The multiplier effect of having more disposable income to spend on other goods and services depends on the nature of the activities that are increased and decreased. The primary area where activity is reduced is the petroleum sector, which has a particularly low multiplier.

Estimating the indirect macroeconomic effect of policy changes using general equilibrium input/output models is a common part of much policy analysis.[19] In 2012 EPA ran such a model to assess the effect of reducing gasoline consumption and increasing expenditure of automotive technology. It found that for every $1 of consumer pocketbook savings, there was an increase in GDP of about $0,80. It also showed a net increase in employment. These benefits could push the total benefits to almost six times the cost, as shown in Table 2.

TABLE 2: BENEFIT-COST RATIOS FOR EACH SOURCE OF BENEFIT

	Base Case Markup		NHTSA High Markup	
	EPA	NHTSA	EPA	NHTSA
Pocketbook	2.5	1.5	2.2	1.4
Environmental/Other	1.1	.7	1	.6
Macroeconomic	2.2	1.2	1.8	1.1
Total	5.8	3.4	5.0	3.1

Source: TAR, pp. ES-12. Macroeconomic based on EPQ,

2. LOW INCOME HOUSEHOLDS

Four years ago we explained why low income households are big winners from fuel economy standards and the EPA has looked at our arguments in the Technical Assessment Report. They found them to be supported by the empirical literature.[20]

Low income households make up a much smaller part of the new vehicle market than their share in the overall population. Therefore, the operating cost of vehicles makes up a much larger part of their total cost of driving than the average household, and fuel economy standards reduce operating costs. In the most recent consumer expenditure survey, low income households spend about one-ninth as much on vehicle ownership as non-low income households but about one half as much of gasoline.[21]

[19] MEMORANDUM TO: Docket EPA-HQ-OAR-2009-0472, SUBJECT: Economy-Wide Impacts of Greenhouse Gas Tailpipe Standards; March 4, 2010 ; The fuel savings and lower world oil prices that result from this rule lead to lower prices economy-wide, even when the impact of higher vehicle costs are factored into this analysis. Lower prices allow for additional purchases of investment goods which, in turn, lead to a larger capital stock. These price reductions also allow higher levels of real government spending while improving U.S. competitiveness thus promoting increased exports relative to the growth driven increase in imports. As a result, GDP is expected to increase as a result of this rule. Appendix H presents our discussion of this issue in the heavy duty truck rule and the performance standards paper.

[20] TAR, pp. 6-16 to 6-22.

[21] Bureau of Labor Statistics, Consumer Expenditure Survey, June 2015.

Second, because low income households buy used cares, they tend to benefit from the fact that the economic value of future fuel savings is only partially reflected in the resale price of used vehicles. Low income households get a disproportionate share of the operating cost reduction.

Third, low income households are likely to be disproportionate beneficiaries of the indirect benefits. Low income households are likely to suffer most from environmental and public health externalities associated with the operation of vehicles. They are likely to suffer most in a weak economy and benefit from policies that strengthen it. Therefore, they are likely to benefit most from reductions in those impacts.

3. WELL-CRAFTED STANDARDS

We approach the setting of standards from a uniquely consumer point of view, always starting from three basic questions:[22]

- Will a standard save consumers money?
- Why is there an efficiency gap that appears to impose unnecessary costs on consumers?
- Why is a standard an appropriate policy?
- How can the standard be best designed to achieve the goal of lowering consumer cost?

Of utmost importance in our framework we find that, "command but not control" performance standards work best when they embody six principles, which are clearly at the core of the National Program. **Long-Term, Product Neutral, Technology-neutral, Responsive to industry needs, Responsive to consumer needs**, **Procompetitive:**

The extensive and intensive analysis of the current standards demonstrates that in the National Program, EPA/NHTSA/CARB have designed an extremely effective performance standard, as the following table shows. As Table 3 shows, the agencies have identified a number of potential market imperfections that the standards address. These follow the imperfections that we identified as important in our earlier analysis. One can argue about which imperfections are most important or most prominent, but there is no doubt that there are many that affect the energy efficiency market.

4. THE INDUSTRY RESPONSE TO WELL-CRAFTED PERFORMANCE STANDARDS

The continuing positive results and the fact that automakers are not only complying with the early standards, but over complying, is driven by the careful design of the standards and the rational response of the automakers.

[22] Appendix A provides examples form recent regulatory proceedings. Appendix B provides an overview of the conceptual framework based on the identification of numerous market imperfection. Appendix C identifies over 200 empirical studies from the past decade and a half that support the vies the energy efficiency and climate change reflect significant market imperfection and market failure problems.

- As we noted and advocated, the original standards were responsible, and did not seek to push fuel economy/pollution reduction to the limit of technology. The original goals were "inframarginal" with respect to the capabilities of the industry.
- The standards remain inframarginal, with many combinations of technologies available to comply.
- While the biggest potential game changer in terms of compliance – electric vehicles – are not necessary to meet the standards, the evidence continues to grow that they could play a much larger part in the vehicle fleet.

TABLE 3: IMPERFECTIONS POTENTIALLY ADDRESSED BY STANDARDS[1]

Societal Failures[2]	Structural Problems[3]	Endemic Flaws	Transaction Costs	Behavioral[4]
Externalities[5]	Scale[6]	Agency[7]	Sunk Costs, Risk[8]	Motivation[9]
Information[10]	Bundling[11]	Asymmetric Information	Risk & Uncertainty[12]	Perception[13]
	Cost Structure[14]	Moral Hazard	Imperfect Information[15]	Calculation[16]
	Product Cycle			Execution[17]
	Availability[18]			
	Produce differentiation[19]			
	Incrementalism[20]			

Source: Framework developed in Comments of the Consumer Federation of America, Proposed Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, Environmental Protection Agency 40 CFR Parts 86 and 600, Department of Transportation 49 CFR Parts 531,633, 537, et al., November 28, 2009. Italicized references are additional factors added by the Technical Assessment Review. Page references are to the TAR

1 The efficiency gap persists, P. 6-5, despite these developments and uptake of energy efficiency technologies, lags behind adoption that might be expected under these circumstances." Quoting the National Academy of Sciences, P. 6-7, [T]here is a good deal of evidence that the market appears to undervalue fuel economy relative to its expected present value."
2 P. 6-7, the nature of technological invention and innovation.
3 P. 6-7, Consumers cannot buy technologies that are not produced; some of the gap in energy efficiency may be explained from the producers' side.
4 P. 6-5, behaviors on the part of consumers and/or firms that appear not be in their own best interest (behavioral anomalies).
5 P. 6-8, dynamic increasing returns. network effects; p.4-35, the potential existence of ancillary benefits of GHG-reducing technologies… These can arise due to major innovation enabling new features and systems that can provide greater comfort, utility, or safety.
6 P. 6-8, the structure of the automobile industry may inefficiently allocate car attributes.
7 P. 6-7, product differentiation carves out corners of the market for different automobile brands.
8 P. 6-6, Consumers may be accounting for uncertainty in future fuel savings
9 P. 6-6, Consumers may... not optimize (instead satisficing).
10 P. 6-5 lack of perfect information.
11 P. 6-6 Fuel-saving technologies may impose hidden costs.
12 P. 6-6, Consumers might be especially averse to short-term loses….relative to long term gains.
13 P. 6-5, Consumers might be "myopic" and hence undervalue future fuel savings; p. 6.6 Consumers may focus on visible attributes... and pay less attention to attributes such as fuel economy that typically do not visibly convey status.
14 P. 6-8, First mover disadvantages, p. 4-33, Thus, instead of the first-mover disadvantage, there is a regulation-driven disincentive to "wait and see."
15 P. 6-6, consumers might lack the information necessary,
16 P. 6-6, consumers might... not have a full understanding of this information.
17 P. 6-6, selecting a vehicle is a complex undertaking... consumers may use simplified decision rules.
18 P. 6-7, the role of business strategies.
19 P. 6-7, separating product into different market segment… may reduce competition.
20 P. 6-8, Automakers are likely to invest in small improvements upon existing technologies

As our historical analysis showed, the industry has responded as market theory and past experience predicts, a process that is observable at both the macro and micro levels.

- The industry has found lower cost ways of complying with the standards than originally thought.
- The mix of technologies likely to be chosen has shifted due to different speeds of development in knowledge and cost.
- There is no evidence that the costs of compliance are disrupting the auto market in any way and consumers are having no difficulty in finding the vehicles that they prefer at prices that are affordable.

5) MISLEADING ANALYSIS FOR THE AUTOMAKERS

The AAM analysis makes a remarkable series of erroneous assumptions and misleading comparisons and claims.[23]

The analysis looks at only the costs of the standards and not the benefits

The first slide (p. 2) claims that "only OEMs have real skin in the game." In fact, since the consumer pocketbook benefits exceed the technology costs by more than three-to-one, consumers have twice as much "skin in the game." As noted above, environmental, public health and macroeconomic benefits should also be included. In other words, consumers and society have as much as six times as much "skin in the game" as the automakers. The claims ignore the fact that the agency analyses show that the total cost of driving declines (p. 35)

Above all, the beneficial effect of a reduction in the total cost of driving is hidden behind cost estimates that are 2 to 10 times higher than the agency estimates and benefits that are under estimated by 50 percent.[24]

The Alliance makes a series of erroneous and misleading comparisons

The Automakers present numerous nonsensical comparisons. For example, on the list of public concerns (p. 7), they note that terrorism, race relations and a weak economy are a greater concern to the public. Improving fuel economy does not detract from policies to address these bigger problems. Indeed, it can be argued that reducing oil consumption and imports helps to undermine the leverage of terrorists, while the resulting macroeconomic growth improves the economy.

Even when they present a bogus choice (p. 7) that assumes the global threat of climate change "requires government regulations… that raised the price on new cars… pricing new cars

[23] Mitch Bainwol, President and CEO, Alliance of Automobile Manufacturers, Consumers & Fuel Economy, CAR Management Briefing Seminars, Traverse City, Michigan, August 2016, The winter related question, specific to the North East, has been discarded. It would rank 12th of 18, low in California, high in New England)

[24] Appendix D provides evidence on the historic tendency of industry and regulators to overestimate the cost of implementing standards because they underestimate the ability of well-designed standards to unleash market forces to lower costs.

out of the reach of many American families," more respondents opt for more regulation (42% to 41%).

Similarly (p. 8), they point out that 69% of respondents want to encourage mobility, vs. 16% that want to discourage mobility. Since the standards lower the cost of driving (and have a rebound effect to increase driving), they obviously encourage mobility.

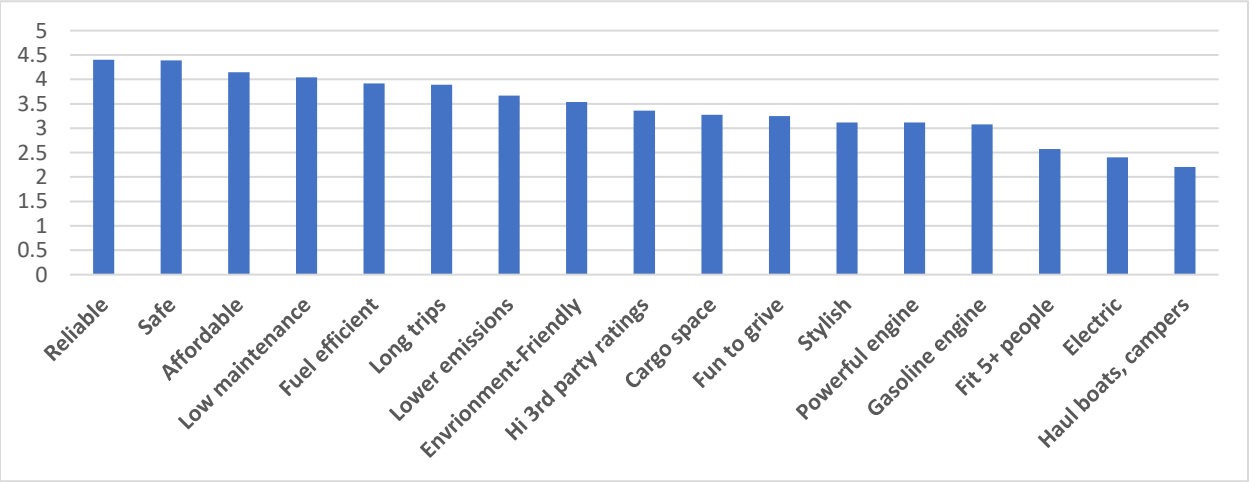
The Alliance asks loaded questions

The key question on regulation reported by the AAM is extremely biased (p. 10). First, the question uses the laboratory standard of 54.5 miles per gallon, while EPA/NHTSA do all their economic analysis at the adjusted, real world mileage of about 42 MPG. Survey respondents live in the real world and 42 MPG would certainly seem more realistic that 54.5. Second, in presenting the choice, they AAM survey present only one side – the automakers' side. "OEMs say that under the new standard, consumers will have to pay more for cars and buy more hybrids and EVs." Remarkably, even with this double barrel bias, while 47% of the respondents said the target of 54.5 was too aggressive, 46% said it was about right or too lenient.

The public is not as enamored of gasoline powered muscle cars and trucks as the automakers claim

If an EV and gasoline vehicle were matched on cost and travel length (p. 9), more would prefer the electric vehicles (48% to 43%) and a clear majority (57%) are willing to pay more for an electric vehicle. As Figure 1 shows, the analysis of desirable vehicle attributes shows that consumers want reliable, safe, affordable and low maintenance vehicles (p. 10). There is no reason to believe that fuel efficient gasoline engines or electric vehicles (EVs) cannot fill the bill and automakers are working hard to achieve that goal.

FIGURE 1: ALLIANCE OF AUTOMOBILE MANUFACTURERS, VEHICLE ATTRIBUTE SURVEY



Source and Notes: Mitch Bainwol, President and CEO, Alliance of Automobile Manufacturers, *Consumers & Fuel Economy,* CAR Management Briefing Seminars, Traverse City, Michigan, August 2016, p. 10. The winter related question, specific to the North East, has been discarded. It would rank 12th of 18, low in California, high in New England)

As Figure 1 shows, after the big four attributes, respondents care as much about fuel efficiency as the ability to take long trips and the automakers are working on that too. Beyond these big six attributes, the valuation of others falls off, but even here the message for EVs is positive. Environmental impacts rank a lot higher (8^{th} and 9^{th}) than powerful engines (13^{th}) or engine type (gasoline power =14^{th}, electricity = 16^{th}). Fitting more than 5 people (15^{th}) or hauling boats and campers (ranks dead last) don't matter much. If you watch the TV ads and go into the show rooms, you would have to conclude that the automakers are pushing the wrong vehicles. More importantly, there is nothing in this data that suggests EVs cannot be a big success. Our survey results, this data and automaker investments can be interpreted to means that EVs are on the early part of the adoption curve and there is a very strong basis to expect success.

While the report from the School of Public and Environmental Affairs of Indiana University, which is supported by the automakers, raises many issues and questions about the Fuel Economy standards. As the Table 4 shows, the report should carry no weight with policymakers on procedural and substantive grounds.

TABLE 4: RECOMMENDATION FROM *RETHINKING AUTO FUEL ECONOMY* COMPARED TO THE EPA/NHTSA DRAFT *TECHNICAL ASSESSMENT REPORT*

Issue/Recommended for Analysis of the National Program	**EPA/NHTSA Action**	**Impact on Evaluation**
Technical		
1. Gas price changes	Use EIA estimates	+
2. Expert Technology Analysis	Integrate NRC/Teardown analysis	+
3. Rebound	Extensive literature Review	+
Consumers		
4. Perceptions	Extensive literature Review	+
5. Capabilities	"Efficiency Gap" analysis	+
6. Sensitivities	Extensive literature Review	+
Economic Impacts		
7. New Vehicle Effects	Extending 2012, little Impact	+
8. Non-vehicle macroeconomic Effects likely to be positive	Mentioned, but not analyzed,	(+)
ZEV		
9. Consider Impact on Market	Small fleet acknowledged	+
10. Modify Standards if Needed	Out of Bounds, EPA/NHTSA lack authority	=
11. Consider Complementary Policies	Discussed	+
12. Risk Assessment	Sensitivity analysis, wide range of plausible scenarios considered	+

Source: Issues/Recommendations from Sanya Carley, et al., *Rethinking Auto Fuel Economy Policy: Technical and Policy Suggestions for the 2016-17 Midterm Reviews,* February, 2016.

There are a dozen specific recommendations embodied in the report. We believe one is out of bounds, in the sense that EPA/NHTSA lack the authority to implement changes in the California ZEV program, although they certainly could discuss changes with the California Air Resources Board. However, we do not think the ZEV program is malfunctioning or in need of repair. Of the remaining eleven recommendations, EPA/NHTSA have addressed 10 and their extensive analysis shows that the National Program is functioning quite well. Prior analysis in the 2012 Technical Support Document suggests that the one recommendation that has not yet been addressed will also support the National Program.

7. ONE NATIONAL PROGRAM

The automakers claim "there is no One National Plan" (ONP, p. 31-33). Although all the three agencies involved in the National Program generally agree that the standards are positive and point generally in the same direction. In fact, two of the three agencies (EPA and CARB) agree quite closely.

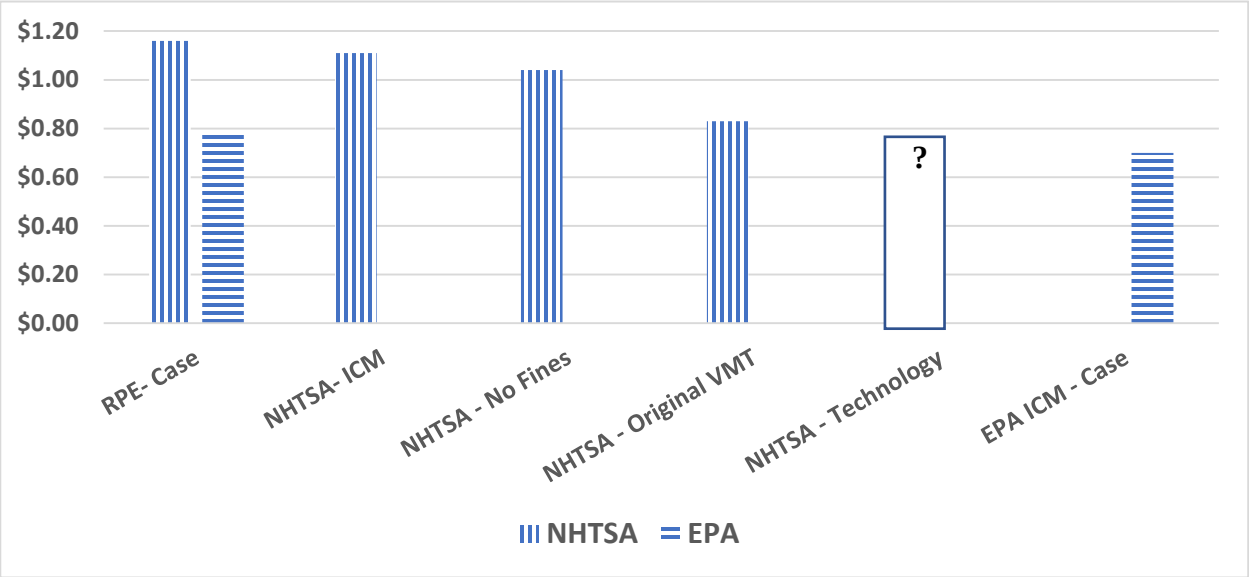
NHTSA has headed in a tangential direction based questionable assumptions. Its analyses are properly treated by EPA as a "sensitivity" case. EPA offers several analyses that allow us to begin to reconcile the differences between agencies, as suggested by Figure 2.

In our view NHTSA has gone off on a tangent from the other two agencies because of erroneous assumptions in its analysis. It increased the estimate of costs by unjustifiably raising the mark-up on fuel efficiency technologies and including fines paid in the cost. If lower cost technologies are available from compliant manufacturers, they will set the market clearing price and neither excessive profits nor fines will be recoverable in the market. It decreased the estimate of benefits by assuming a dramatic reduction of vehicle miles traveled, which it admits could well be a result of the great recession.

It continues to impose the assumption that technologies included in vehicles must have a three year payback.[25] That assumption was never justified, since consumers are willing to accept a five year payback and, when all manufacturers face a similar constraint, there should be no disadvantage in meeting a higher constraint. Not only was the assumption never justified, but the changes in the market since 2012 have moved the market farther from the artificial constraint. Consumers are holding their vehicles longer and the majority of new car buyers are taking loans of five years or more. A five year payback would be more appropriate, if such a constraint is needed, although NHTSA would be better off allowing technologies to enter the model in the order of least cost.

[25] Appendix E explains why concepts like the discount rate and payback periods are market characteristics, reflecting the full array of market imperfections and failures. Therefore, it is a mistake to attribute them solely to consumers and to reify them in the economic analysis, since they embody the market imperfections that the rules are intended to correct.

FIGURE 2: EXPLAINING THE DIFFERENCES BETWEEN THE EPA AND NHTSA BASED ON COST PER GALLON SAVED



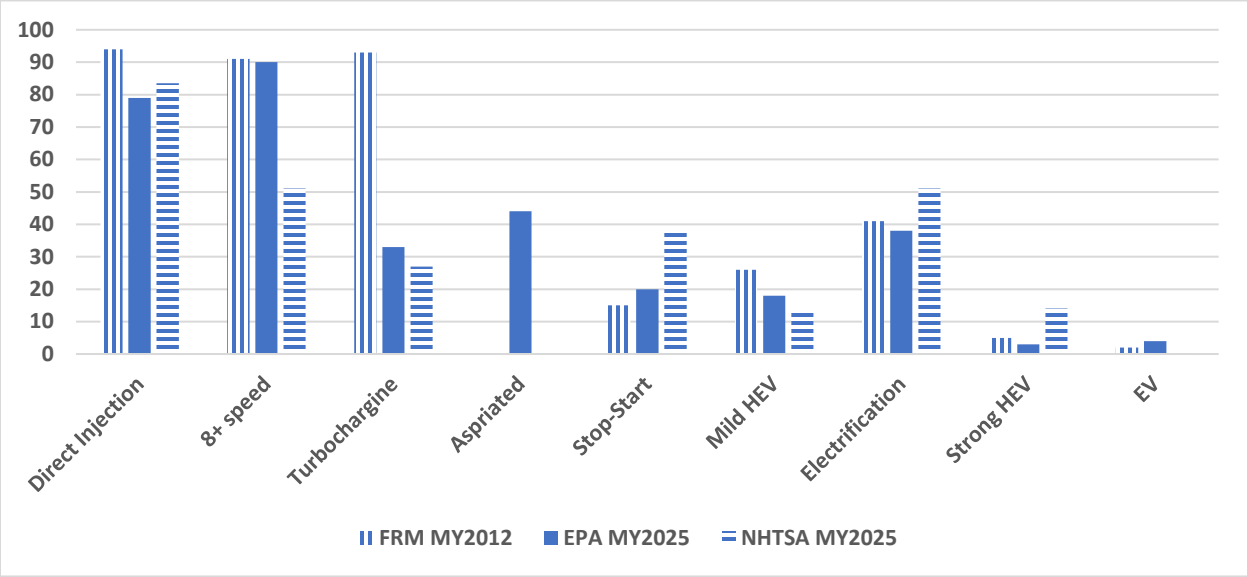
Source: ES-11 for costs, ES-12 for gallons saved and ES-9 for fines as a percent of base case costs. Assumes that fines and ICM are additive, which may overstate the cost reduction, since lower cost might enable some manufacturers to avoid fines.

In one sense we should welcome differences in the penetration of technologies between manufacturers and across the fleet. This should indicate that different automakers are pursuing those technologies that suit them best and there are a lot of alternative pathways available. At the same time, extremely large differences might reflect the assumptions made by the modelers, rather than what is going in in the market. If there we little difference in the cost projections between the agencies this would not be a concern (since they are getting to the same place through different routes).

However, as shown in Figure 3, EPA and NHTSA have come up with different projections on technologies and costs and that immediately raises the question of whether the assumptions about technologies are driving the difference. Three differences stand out, the low level of penetration of 8-speed transmissions and high compression aspirated engines and the high level of penetration of strong hybrids in the NHTSA analysis. The agencies should examine and explain these differences as we move forward. We believe that EPA has presented the more convincing analysis on many of these points. We have also supported the general proposition that EPA is better institutionally and legal better situated to take the lead where differences cannot be resolve.[26]

[26] Appendix F argues that the intersection of the "efficiency gap" and climate change create an urgent need for vigorous policy action. Appendix G outlines our thinking about the legal and institutional factors that affect the agencies' ability to undertake those vigorous actions.

FIGURE 3: PENETRATION OF SPECIFIC TECHNOLOGIES INTO THE FLEET (IN PERCENT)



Source: TAR, pp. 12-35, 13-61-13-72.

The Important Role of the Clean Cars (ZEV) Program

Our analysis shows that the main reason hybrids hit the market as early as they did (if indeed they ever would have) was California's low emission vehicle (LEV) program. The LEV program was designed to address the state's unique air quality problems, and adopted by a dozen other states for a variety of reasons, and incentivized automakers to develop and sell hybrids. Hybrids have now become best in class across a number of vehicle categories.

California's leadership role on emissions and fuel economy is federalism at its best: the state is a test-bed for automotive innovation, and we're seeing the emergence of some of the cleanest vehicles on the planet, at prices comparable to other mass market vehicles. The leadership of states to advance important public policy goals in the form of the Zero Emission Vehicle (ZEV) Program is again being resisted and attacked by the automakers.

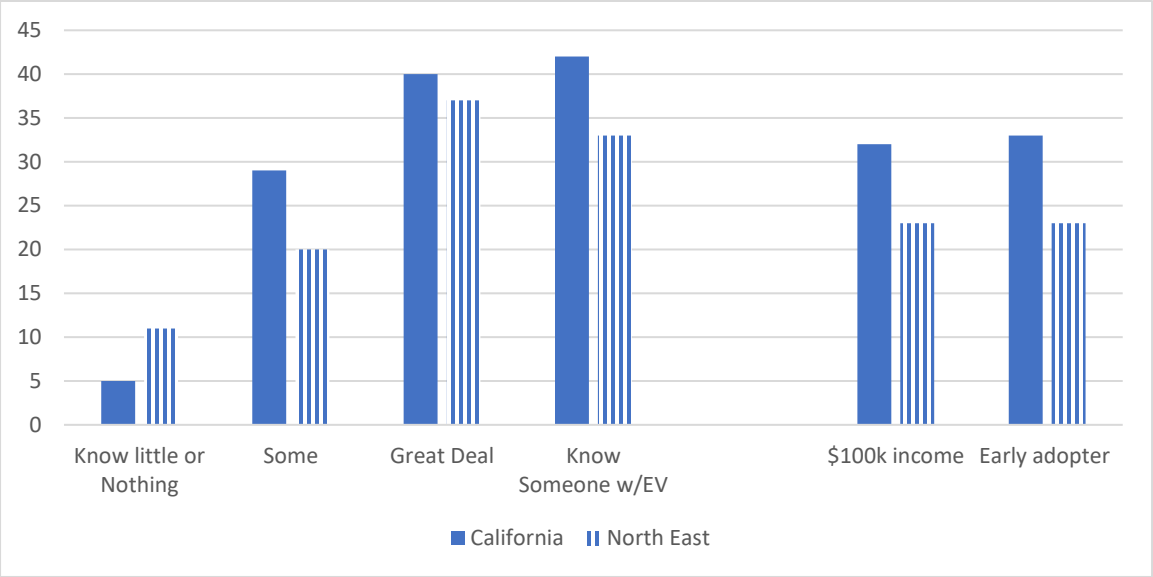
Consumer Federation of America surveys show that consumers – especially young adults—are increasingly interested in buying electric vehicles and the more people know about EVs, the more interested they are. Interest has increased over the past year, despite persistent low gas prices. This year, 13 car companies are offering at least one electric option.

Neither EPA nor NHTSA expect gasoline engines to dominate the compliance strategies of auto makers and both project EVs playing a very small role in the National Program. We have argued that the public opinion response and automaker interest in a new technology that is rapidly evolving toward attributes that will attract consumers is bright (see Appendix I).

Figure 4, taken from the AAM shows the important role of knowledge that we have found in our surveys. Those will little knowledge are unlikely to consider buying an EV, that the willingness to consider EVs grows dramatically with knowledge, to about two fifths. Moreover,

knowledge and some experience (knowing someone with an EV) are equal in impact. We also not that over a quarter of young people and almost a third of those with incomes above $100k express interest. Early adopters express a similar level of interest. In our view, with a new technology at a currently low level of penetration and targets for adoption well below the level of expressed interest, this constitutes an encourage field of interest for automakers to till.

FIGURE 4: LIKELY TO CONSIDER BUYING AN EV IN THE NEXT TWO YEARS



Source and Notes: Mitch Bainwol, President and CEO, Alliance of Automobile Manufacturers, *Consumers & Fuel Economy,* CAR Management Briefing Seminars, Traverse City, Michigan, August 2016, p. 19. The winter related question, specific to the North East, has been discarded. It would rank 12th of 18, low in California, high in New England)

Before the
Environmental Protection Agency

In the Matter of Proposed Determination on the	**)**	
Appropriateness of the Model Year 2022-2025	**)**	**EPA-HQ-OAR-2015-0827**
Light-Duty Vehicle Greenhouse Gas Emissions	**)**	
Standards under the Midterm Evaluation	**)**	

COMMENTS OF THE THE CONSUMER FEDERATION OF AMERICA (Technical Appendix Omitted)

MARK COOPER,
DIRECTOR OF RESEARCH

December 30, 2016

THE CONSUMER FEDERATION OF AMERICA

The Consumer Federation of America[27] has participated in dozens, if not hundreds, of efficiency rulemakings, regulatory negotiations, and legislative hearings involving large and small energy using durables, ranging from automobiles to heavy duty trucks, air conditioners, furnaces, water heaters, computers, and light bulbs.[28] We have participated in every round of the rulemaking for fuel economy standards since the passage of the Energy Independence and Security Act, which rebooted and reformed the CAFE program. We appreciate the opportunity to share our views on the current state and future prospects for the National Program.

Our technical expertise is not in the design and production of these durables, it is in the design and implementation of minimum energy standards. We believe that knowing how to build an effective standard is at least as important to arriving at a successful outcome as knowing how to build a consumer durable. Moreover, we conduct extensive polling of public opinion, review the technical economic studies prepared by others and analyze evidence on the market performance of consumer products to determine whether there are significant potential consumer savings that would result from a higher standard.

$100 BILLION IN LAST MINUTE CONSUMER BENEFITS

The Determination by the Environmental Protection Agency (EPA)[29] that the standards set by the National Program for model years (MY) 2022 – 2025 should remain in place is fully supported by a massive evidentiary record.

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[27] The Consumer Federation of America is an association of more than 250 nonprofit consumer groups that was established in 1968 to advance the consumer interest through research, advocacy, and education.

[28] The CFA website (http://www.consumerfed.org/issues/energy) lists over 100 pieces of legislative testimony and regulatory comments in home energy and motor vehicles, most of which involve energy use and efficiency standards.

[29] Environmental Protection Agency, *Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Greenhouse Gas Emission Standards under the Midterm Evaluation,* EPA, 420-R-16-020, November 2016.

- The hearing record and analysis that originally set the standards fully complies with the legislative mandates laid down in the enabling statutes that govern regulation by EPA (the Clean Air Act) and the National Highway Traffic Safety Administration (NHTSA).[30]
- Subsequent analyses in the Technical Assessment Report (TAR) and in the Determination not only support the same conclusion, they reinforce it.[31]
- Given the new approach to standard setting, the industry is meeting and exceeding the standard, while consumers have the full range of choices of models.[32]

Opponents of economic, public health and safety regulation, including fuel economy standards, have adopted a simple and catchy, but fundamentally misleading approach to criticizing standards – they calculate the cost of the regulation, but not the benefits. They have become particularly vocal in their outrage over so-called "midnight burdens,"[33] claiming that dozens of regulations have created about $50 billion in burdens. The estimate includes the proposed Determination that the fuel economy standards should not be lowered.

These comments show that the analysis of the opponents is fundamentally flawed and wrong. When you do the correct math of cost benefit analysis, you must include both the benefits and the cost. For energy efficiency standards, in particular, which reduce energy consumption and lower energy bills, there are direct, immediate and substantial pocketbook benefits. In the case of the fuel economy standards for MY 2022-2025, careful and complete analysis leads to a very different conclusion than the one put forward by the critics of the fuel economy standards. Far from $50 billion of "midnight burdens" this one proposed rule delivers $100 billion of last minute benefits. The decision to continue the march toward more fuel-efficient vehicles delivers significant net benefits to consumers and the nation.[34]

The benefits of the proposed rule include:

- $134 billion total and almost $100 billion net of costs.
- Two thirds of the total benefits – over $90 billion – are direct pocketbook savings that consumers will enjoy because the cost of new fuel savings technologies is smaller than the value of the fuel saved.

[30] Our initial analysis is contained in: Comments of Consumer Groups on Proposed Rule 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, Docket Nos.EPA-HQ-OAR-2010-0799; FRL-9495-2NHTSA–2010–0131, February 13, 2012.

[31] Our analysis of the TAR is contained in: Comments of the Consumer Federation of America, Evaluation Draft Technical Assessment Report for Model Year, 2022–2025 Light Duty Vehicle GHG, Emissions and CAFE Standards, EPA–HQ–OAR–2015–0827; 0068; FRL–9949–54–OAR, Department Of Transportation NHTSA–2016– RIN 2060–AS97; RIN 2127–AL76, September 26, 2016.

[32] Our extensive review of performance standards can be found in: Energy Efficiency Performance Standards: The Cornerstone of Consumer-Friendly Energy Policy, October 2013. Energy Efficiency Performance Standards: Driving Consumer and Energy Savings in California, Mark Cooper, Director of Research, California Energy Commission's Energy Academy, February 20, 2014,

[33] American Action Forum, based on the sum of two "midnight burden" estimates, December 2 and 12, 2016.

[34] See notes 4 and 5 above.

- For the typical consumer who finances the purchase of a vehicle with a five year auto loan, the investment in more fuel saving technology is cash flow positive from the first month.
- For those who pay cash, the payback period is less than five years and the lifetime fuel savings are valued at almost $1650.
- The benefit cost ratio is more than two to one.
- The return on investment is three times the cost of capital, compared to the return on low risk investments available to consumers, and more than twice the opportunity cost of capital compared to the cost of borrowing.
- Public health and environmental benefits make the total social benefits much larger and those social benefits are ultimately enjoyed by the public, with benefit cost ratios in the range of 3-to1 to 4-to-1.
- When indirect macroeconomic benefits are included, the benefit cost ratio in the EPA analysis would be close to 6-to-1.

THE IMPORTANCE OF RIGOROUS BENEFIT-COST ANALYSIS

That proper cost benefit analysis must include both costs and benefits should be obvious to anyone who has taken Economics 101. In fact, an introductory economics text written by John B. Taylor,[35] who holds prestigious named appointments at Stanford University and the conservative Hoover Institute and served as an Under Secretary of the Treasury in the George W. Bush administration,[36] defines cost benefit analysis as follows:

> Cost-Benefit Analysis: an appraisal of a project based on the costs and benefits from it.[37]

A more advanced text on *The Economics of Regulation and Antitrust,*[38] calls it benefit-cost analysis and explains the obvious need to include costs and benefits as follows:

> From an economic efficiency standpoint, the rationale for a benefit-cost approach seems quite compelling. At a very minimum, it seems reasonable that society should not pursue policies that do not advance our interests. If the benefits of a policy are not in excess of the costs, then clearly it should not be pursued, because such efforts do more harm than good. Ideally, we want to maximize the net gain that policies produce…
>
> The requirement that benefits exceed costs for sound regulatory policies has also given rise to a simple shorthand. The ratio of benefits to costs, or the benefit-cost ratio, must exceed 1.0 for a policy to be potentially attractive. This requirement

[35] Mary and Robert Raymond Professor of Economics at Stanford University, and the George P. Shultz Senior Fellow in Economics at Stanford University's Hoover Institution.

[36] He was a member of the President's Council of Economic Advisors during the George H. W. Bush Administration and Senior Economist at the Council of Economic Advisors during the Ford and Carter Administrations.

[37] John, B. Taylor, *Economics* (Houghton Mifflin, 11998, pp. 410, 896.

[38] W. Kip Viscusi, John M. Vernon and Joseph E. Harrington, Jr., *Economics of Regulation and Antitrust* (MIT, 2001).

> serves as the minimum tests for policy efficacy, as our overall objective should be to maximize the spread between benefits and costs.[39]

MARKET IMPERFECTIONS AND THE NEED FOR STANDARDS

It is possible, in a post-truth, fact-free world, to make the benefits disappear by arguing that the market for energy efficiency works perfectly. Assuming the market outcome is exactly "right," the costs imposed by the inclusion of new technology represent costs without benefits that reduce consumer surplus and waste producer resources. [40]

The empirical evidence in this proceeding shows that this effort to resurrect the faulty argument against the program in this way fails as well. The evidence on the record is overwhelming that there are a host of market failures that lead automakers to underinvest in technologies that reduce the fuel consumption of vehicles. The EPA has carefully reviewed and incorporated this evidence on the market failures. We have documented and discussed these at great length in our earlier comments in this proceeding. We need not repeat them here. Table 1 summarizes the intersection of our broad analysis of imperfections in the market for energy efficiency and the evidence presented in the TAR.

BENEFIT-COST METHODOLOGY

Properly Counting Benefits and Costs

Doing the math of benefits and costs requires several tools to ensure that the analysis yields relevant and useful information. One obvious step is to take inflation into account. Another important step is to take the time value of money into account. Viscusi, et al., describe the process of discounting benefits and costs as follows.

> Even if one ignores the role of inflation, it is important to take the temporal distribution of benefits and costs into account. If one could earn a riskless real rate of interest r on one's own money, then the value of a dollar today is $(1+r)^{10}$ ten years from now. Thus resources have an opportunity cost, and one must take this opportunity cost into account when assessing the value of benefits and cost stream over time…
>
> Although a substantial literature exist on how one should approach the discount rate issue and estimate the appropriate rate of discount, these approaches can be simplified into two schools of thought. One approach relies on the opportunity cost of capital… a simple but not too unreasonable approximation to this measure is simply the real rate of return on federal bonds. The alternative is the social rate of time preference approach under which society's preference for allocating social resources across time may be quite different from the time rate expressed in private markets.[41]

[39] Id., pp. 28-29.

[40] The Mercatus Center offered a similarly misguided response to the analysis underlying the National Program, which CFA rebutted earlier at the time. CFA, 2013, Performance Standards.

[41] Viscusi, et al., 2001, pp. 31-32.

Taylor frames the same concept a little differently. Looking to individuals that are asked to make the investment, he concentrates on alternative uses of funds.

> What discount rate should be used…? A private firm deciding whether to invest in a project would use the interest rate on other alternative investments. If the benefits and costs of a public investment have been measured accurately, then the discount rate on alternative uses of funds for the citizens in the community might be the appropriate discount rate.[42]

TABLE 1:
IMPERFECTIONS POTENTIALLY ADDRESSED BY STANDARDS[1]

Societal Failures[2]	Structural Problems[3]	Endemic Flaws	Transaction Costs	Behavioral[4]
Externalities[5]	Scale[6]	Agency[7]	Sunk Costs, Risk[8]	Motivation[9]
Information[10]	Bundling[11]	Asymmetric Information	Risk & Uncertainty[12]	Perception[13]
	Cost Structure[14]	Moral Hazard	Imperfect Information[15]	Calculation[16]
	Product Cycle			Execution[17]
	Availability[18]			
	Produce differentiation[19]			
	Incrementalism[20]			

Source: Framework developed in Comments of the Consumer Federation of America, Proposed Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, Environmental Protection Agency 40 CFR Parts 86 and 600, Department of Transportation 49 CFR Parts 531,633, 537, et al., November 28, 2009. Italicized references are additional factors added by the Technical Assessment Review. Page references are to the TAR.

1 The efficiency gap persists, P. 6-5, despite these developments and uptake of energy efficiency technologies, lags behind adoption that might be expected under these circumstances." Quoting the National Academy of Sciences, P. 6-7, [T]here is a good deal of evidence that the market appears to undervalue fuel economy relative to its expected present value."
2 P. 6-7, the nature of technological invention and innovation.
3 P. 6-7, Consumers cannot buy technologies that are not produced; some of the gap in energy efficiency may be explained from the producers' side.
4 P. 6-5, behaviors on the part of consumers and/or firms that appear not be in their own best interest (behavioral anomalies).
5 P. 6-8, dynamic increasing returns. network effects; p.4-35, the potential existence of ancillary benefits of GHG-reducing technologies… These can arise due to major innovation enabling new features and systems that can provide greater comfort, utility, or safety.
6 P. 6-8, the structure of the automobile industry may inefficiently allocate car attributes.
7 P. 6-7, product differentiation carves out corners of the market for different automobile brands.
8 P. 6-6, Consumers may be accounting for uncertainty in future fuel savings
9 P. 6-6, Consumers may... not optimize (instead satisficing).
10 P. 6-5 lack of perfect information.
11 P. 6-6 Fuel-saving technologies may impose hidden costs.
12 P. 6-6, Consumers might be especially averse to short-term loses….relative to long term gains.
13 P. 6-5, Consumers might be "myopic" and hence undervalue future fuel savings; p. 6.6 Consumers may focus on visible attributes... and pay less attention to attributes such as fuel economy that typically do not visibly convey status.
14 P. 6-8, First mover disadvantages, p. 4-33, Thus, instead of the first-mover disadvantage, there is a regulation-driven disincentive to "wait and see."
15 P. 6-6, consumers might lack the information necessary,
16 P. 6-6, consumers might... not have a full understanding of this information.
17 P. 6-6, selecting a vehicle is a complex undertaking... consumers may use simplified decision rules.
18 P. 6-7, the role of business strategies.
19 P. 6-7, separating product into different market segment… may reduce competition.
20 P. 6-8, Automakers are likely to invest in small improvements upon existing technologies

Attributes of Effective Standards

Viscusi, et al., go on to describe a number of attributes of regulation that improve its efficacy, including "performance-oriented regulation," "give firms some discretion in terms of

[42] Taylor, 1998, p. 412.

the means of their compliance," "utilization of unbiased estimates of benefits and costs," and "avoid… regulation of prices and production."[43]

In our earlier analysis CFA explained why the National Program has the key attributes of an effective performance standard.[44] In our testimony on the TAR, we describe the National Program as a good example of "command but not control" regulation, as shown in Table 2. These standards work best when they embody six principles,[45] which are clearly at the core of the National Program.

In our House testimony, we pointed to the positive results for consumers and the fact that automakers are not only complying with the early standards, but over-complying, as indicators of the success of the National Program. We attribute this success to the fact that it is driven by the careful design of the standards and the rational response of the automakers. [46]

- As we noted and advocated, the original standards were responsible, and did not seek to push fuel economy/pollution reduction to the limit of technology. The original goals were "inframarginal" with respect to the capabilities of the industry.
- The standards remain inframarginal, with many combinations of technologies available to omply.
- While the biggest potential game changer in terms of compliance – electric vehicles – are not necessary to meet the standards, the evidence continues to grow that they could play a much larger part in the vehicle fleet.[47]

[43] Viscusi, et al., 2001, pp. 35-37.

[44] CFA, 2012, National Program Comments, Technical Appendix, pp. 28-31.

[45] Mark Cooper, "Energy Efficiency Performance Standards: Driving Consumer and Energy Savings in California, February 20, 2014), slide 22.

[46] See CFA analyses of success of the standards and the ability of the industry to comply: Dr. Mark Cooper, Director of Research, Jack Gillis, Director of Public Affairs, Consumer Federation of America, A Key Step to Ending America's Oil Addiction: Policymakers, Consumers and Automakers are Shifting, New Vehicles to Higher Fuel Economy, July 2012; Statement of Dr. Mark Cooper, Director of Research. Consumer Federation of America, "Will They or Won't They? Consumer Adoption of High Fuel Economy Vehicles, 1999-2012, and the Role of the 2025 Standards in Speeding Diffusion of Advanced Technology, Panel on Consumer Acceptance of Advanced Technology Vehicles Mobile Sources Technical Review Subcommittee, December 13, 2012; Jack Gillis, Mark Cooper, On the Road to 54.5 Mpg: A Progress Report on Achievability, April; 29, 2013; For First Time Over 50 Percent of Current Year Models Get More Than 23 MPG; Over 11 Percent Get 30 MPG, Carmakers are on the road to 54.5 by 2025, April 29, 2014; 2015 Cars Gain MPGSs. CAFE Goals In Reach If Gains Continue: However, New Data Shows Some Companies Are Backsliding, May 19. 2015; Dr. Mark Cooper, Staying on the Road to 54.5 Mpg by 2025: Riding the Gasoline Roller Coaster, February 15, 2015.

[47] We have monitored the development of the EV market. Knowledge Affects Consumer Interest in EVs, New EVs Guide to Address Info Gap: New Survey Shows Nearly One-Third Are Willing to Consider Buying an EV for their Next Car, October 29, 2015**;** New Data Shows Consumer Interest in Electric Vehicles Is Growing: Prices Are Down; Number of Models Is Up; Free New Guide to EVs Available as Year over Year Sales Increase, September 19, 2016**.**

TABLE 2:

ATTRIBUTES OF EFFECTIVE, COMMAND BUT NOT CONTROL PERFORMANCE STANDARDS

- **Long-Term:** Setting an increasingly rigorous standard over a number of years that covers several redesign periods fosters and supports a long-term perspective. The long term view lowers the risk and allows producers to retool their plants and provides time to re-educate the consumer.
- **Product Neutral:** Attribute based standards accommodate consumer preferences and allow producers flexibility in meeting the overall standard.
- **Technology-neutral:** Taking a technology neutral approach to the long term standard unleashes competition around the standard that ensures that consumers get a wide range of choices at that lowest cost possible, given the level of the standard.
- **Responsive to industry needs:** The standards must recognize the need to keep the target levels in touch with reality. The goals should be progressive and moderately aggressive, set at a level that is clearly beneficial and achievable.
- **Responsive to consumer needs:** The approach to standards should be consumer-friendly and facilitate compliance. The attribute-based approach ensures that the standards do not require radical changes in the available products or the product features that will be available to consumers.
- **Procompetitive:** All of the above characteristics make the standards pro-competitive. Producers have strong incentives to compete around the standard to achieve them in the least cost manner, while targeting the market segments they prefer to serve.

Sources: Testimony of Dr. Mark Cooper, Director of Research, Consumer Federation of America, on "Midterm Review and an Update on the Corporate Average Fuel Economy Program and Greenhouse Gas Emissions Standards for Motor Vehicles," Before the *Committee on Energy and Commerce Subcommittee on Commerce, Manufacturing, and Trade Subcommittee on Energy and Power,* U.S. House of Representatives, September 22, 2016.

As our historical analysis showed, the industry has responded as market theory and past experience predicts, a process that is observable at both the macro and micro levels.

- The industry has found lower cost ways of complying with the standards than originally thought.
- The mix of technologies likely to be chosen has shifted due to different speeds of development in knowledge and cost.
- One of the most popular approaches to meeting the standards, the Atkinson-2 engine was not even considered in the initial analysis and would never have been applied widely, but for the standards.
- There is no evidence that the costs of compliance are disrupting the auto market in any way and consumers are having no difficulty in finding the vehicles that they prefer at prices that are affordable.

THE BOTTOM LINE FOR CONSUMERS AND THE NATION

Is correcting the pervasive imperfections in the market for fuel economy a good use of consumer's money? Positive cost benefit ratios, rapid paybacks and significant life cycle cost savings suggest that it is. Table 3 presents several economic measures of the effect of the fuel economy program.

The Long-Term Performance of Fuel Economy Standards

David Greene, a leading analyst of automotive fuel economy has prepared and placed in the record a groundbreaking study of the effect of fuel economy since the beginning of the CAFE program.[48] It is based on data from the Consumer Expenditure Survey conducted by the Bureau of Labor Statistics. It involves reported expenditures on gasoline and automobiles combined with estimates of national fuel prices and estimates of the cost of energy saving technology. The analysis is adjusted for inflation (results are stated in real, 2015 dollars), but it does not discount.

The top line of the Table 3 presents the results of that comprehensive evaluation of fuel economy improvements over the period from 1980 to 2014. To render the results of the backward -looking analysis comparable to the forward-looking analysis, we state all dollar amounts in 2015 dollars. We also estimate the implicit rate of return on the investment, i.e. we calculate the return on the average cost of technology yielded by the average savings over the life of the vehicle.

We then show at the bottom of the table a variety of estimates of the opportunity cost of consumer capital. Here we show current estimates for how much consumers earn on relatively low risk investments, and how much they pay to borrow money. We include borrowing as an alternative use of consumer credit. These capture the essence of the idea of the discount rate by proving metrics for the "alternative investments".

It is clear that figure is in the range of 1-3%. While federal agencies are required to consider 3% and 7%, this data shows that the 3% figure is a far better (perhaps even to high) proxy for the opportunity cost of consumer capital. Reflecting this analysis, we have always focused on the agency analyses based on the 3% discount rate. The table reflects the 3% discount rate for the agency analyses.

We also show the mid-point estimates (preferred or reference cases) for the agency analyses. Greene and Welch did not provide a mid-point. The range we show is for their estimated high and low cost of technology. They did caution that even the low cost attributed to technology they derived from the literature is probably too high.

Greene's backward looking analyses of the impact of fuel economy standards over three and a half decades of its existence, which is almost its entire operating life, is extremely important in the context of the current Determination. It provides a grounding for the forward looking analyses. It shows that the forward looking analyses are consistent with the past performance of the fuel economy standards, particularly when one focuses on the high end of the results, which Greene and Welch think is the estimate that better describes the standards in the past. Their best case scenario is for average annual benefits of just over $400 per year for 35 years. The worst case scenario is for benefits of just over $200 per year.

[48] David Greene and Jilleah G. Welch, *The Impact of Increased Fuel Economy for Light-Duty Vehicles on the Distribution of Income in the United States*, Oak Ridge National Laboratory and the Energy Foundation, September 2016.

TABLE 3:
ECONOMIC METRICS FOR EVALUATING THE PERFORMANCE OF FUEL ECONOMY STANDARDS

Program/Type of Benefit/Period		Source	Benefit/Cost Ratio	Internal Rate of Return %, Undiscounted
Direct Pocketbook (Fuel Savings				
CAFE Program (MY 1980-2014)		Greene[49]	2.7 - 4.2	3.3 - 4.9
Forward Looking				
National Program (MY 2017-2025)[50]		EPA	3.2	6.9
		NHTSA	2.3	5.7
TAR, MY 2022-2025[51]		EPA	2.5	6.1
		NHTSA	1.3	3.9
Determination (MY 2022-2025)[52]		EPA	2.4	6.0
Total Benefits (Pocketbook + Individual + Social)				
National Program (MY 2017-2025)		EPA	4.0	8.0
		NHTSA	4.3	8.0
TAR, MY 2022-2025		EPA	3.1	6.9
		NHTSA	2.0	5.2
Determination (MY 2022-2025)		EPA	3.8	7.5
Opportunity Cost of Consumer Capital[53]				
Savings/	Bank Account			1
Investing	5-year Interest rates	CD		2
	Home value	1996-2016		3.2
		2006-2016		-1.9
	Municipal Bonds	1-year		1
		2-year		1.2
		5-year		1.8
		10-year		2.4
		30-year		3.2
	Inflation Protected Treasury	5-year		0
	(TIPS)	10-year		0.5
		20-year		0.7
		30-year		1
Borrowing	5-year Interest rates	New Car		2.4
		Used Car		2.7
	15-year fixed Refi	Home		2.9

Estimated Economics of the National Program

The middle of the table reflects the forward looking analysis of the National Program prepared by the agencies. We find that the forward looking analyses of the program indicate it is beneficial both from the consumer pocket book and the national points of view. The benefit cost

[49] David Greene and Jilleah G. Welch, *The Impact of Increased Fuel Economy for Light-Duty Vehicles on the Distribution of Income in the United States*, Oak Ridge National Laboratory and the Energy Foundation, September 2016.

[50] Derived from National Program, Federal Register Notice, 62663,63119,

[51] Derived from TAR, Executive Summary, Chapter 12, Chapter 13.

[52] Derived from Determination, p. 44,

[53] Auto loans: Bankrate.com boot screen, Rate of return, homes, Stocks, Bonds: http://money.cnn.com/calculator/pf/home-rate-of-return/, Saving account: http://www.money-rates.com/savings.htm, 5-7ear CD http://www.interest.com/cd-rates/news/5-year-cd-rates/

ratio is substantially greater than one. At the pocketbook level, it is in the range of 2-to-1 to 3-to-1. From the societal point of view, the benefit cost ratio is even more positive, in the range of 3-to-1 to 4-to-1. We also find that the rate of return is generally 3 to 4 times higher than the amount consumers can earn on their money and twice what they pay to borrow money.

For the typical household that purchases a vehicle with a 5-year auto loan and holds the vehicle for 10 years, the average annual savings is close to $300, discounted at 3%.

A household that pays cash for the vehicle would realize almost $1650 of net savings.

Another way to look at the cost effectiveness of the program is to calculate how much it costs to save a gallon of gasoline by including more fuel saving technology in vehicles. EPA estimates that over 50 billion gallons of oil will be saved at a cost of $36 billion. That works out to just over $0.70 per gallon. Under NHTSA's base case assumption the cost is close to $1.30/gallon. Both are far less than even the low cost EIA price projections.

Table 4 shows that there were differences between EPA and NHTSA in the estimates of costs and benefits. However, the topline results of the launch and early implementation of the National Program are quite simply, a very positive bottom line. Table 4 identifies key measures of the performance of the National Program projected for the MY2022-2025 standards by both EPA and NHTSA from the consumer point of view. EPA and NHTSA focus on the lifecycle consumer savings, the payback period and total national benefits (in addition to reduction in CO2 emissions and oil consumption). We add monthly cash flow analysis and cost per gallon saved as they are as more relevant to consumers.

While there are differences between the two agencies in their assessments as described below, we believe EPA's analysis, which stayed much closer to the original framework, is stronger and NHTSA will have to provide better justification for the changes it proposes to that methodology. We also believe the monthly cash flow analysis is more relevant to consumers and the cost per gallon saved is a simple measure of the consumer impact.

- Notwithstanding the differences, the bottom line for both agencies is clear. The benefits of the program far exceeds the costs.
- Cash flow benefits exceed costs incurred to reduce gasoline consumption early in the asset life (the first year).
- The cost per gallon saved is far below the projected cost of gasoline, even in the low cost scenarios.
- Payback is less than half the asset life.
- There are substantial total savings measured at the consumer and national levels.
- Macroeconomic Benefits
- The bottom line findings are strikingly clear. Since its inception, the fuel economy standards program has yielded substantial consumer pocketbook savings. The level adopted by the National Program and affirmed in the Proposed

Determination is consistent with that track record and will extend consumer savings far into the future. Environmental and public health benefits increase the total benefits by 50%.

TABLE 4:

CONSUMER POCKETBOOK IMPACTS

	Monthly			Cost per	Payback	Lifecycle savings		Total National ($, billion)	
	Cost	first year savings	Net	gallon saved	in years	Consumer	Total	Cost	Benefit
EPA									
Mark-up (ICM)	$16.07	$19.92	$3.85	$0.70	5-5.5	$1,620	$2,365	$36	$130
Retail Price Equivalent (RPE)	18.66	19.93	1.27	0.78	6	1,460	2,131	40	129
NHTSA									
Incremental Cost Mark-up (ICM)	18.00	25.10	6.90	1.18	6	800	1.168	89	175
Retail Price Equivalent (RPE)	20.00	24.79	4.79	1.29	6.5	600	876	79	178

Source: TAR, ES-11, ES-12 for cost/vehicle, total cost, total oil savings. First year cash flow and payback analysis is based on TAR 12-41 – 12-46, in which EPA presents year-by-year data for cash flows in the payback approach. The basic approach is applied to NHTSA first year VMT with direct calculation of savings, TAR 13-11 – 13-14. For the combined fleet, first year VMT is assumed to be 25% higher (increasing the first year net benefit, but in the long term NHTSA projections, survival weighted VMT is 20% lower, decreasing the lifecycle cost savings and increasing the cost per gallon saved).

However, there is an even larger benefit that these analyses do not take into account.

As the cost of driving declines, consumers drive a little more, but they still have a great deal of additional disposable income left over.[54] The gasoline savings calculations are net of the rebound effect at the societal level, but not the individual level. If a consumer chooses to spend the economic savings on more gasoline, that constitutes a net benefit to the consumer in the form of increased utility and increases the economic output of the economy, as shown in Table 5.

The multiplier effect of having more disposable income to spend on other goods and services depends on the nature of the activities that are increased and decreased. The primary area where activity is reduced is the petroleum sector, which has a particularly low multiplier. Estimating the indirect macroeconomic effect of policy changes using general equilibrium input/output models is a common part of much policy analysis.[55]

[54] The literature is huge and the idea has become "common sense," evidenced by publications from institutions like the IEA (*Capturing the Multiple Benefits of Energy Efficiency*, 2014) and NREL (Suzanne Tegen, Marshall Goldberg and Michael Milligan,, *User –Friendly Tool to Calculate Economic Impacts from Coal, Natural Gas and Wind: The Expanded Jobs and Economic Development Impact Moden,* June 2006), and Lawrence Berkeley Labs, (<ax Wei, Shana Patadia and Daniel M. Kammen, "Putting renewables and energy efficiency to work: How many jobs can the clean energy industry generate in the US?" *Energy Policy* 38 (2010); and the U.S. Chamber of Commerce (*Increasing America's Energy Efficiency, Institute for 21st Century Energy,* Spring 2010).

[55] MEMORANDUM TO: Docket EPA-HQ-OAR-2009-0472, SUBJECT: Economy-Wide Impacts of Greenhouse Gas Tailpipe Standards; March 4, 2010; The fuel savings and lower world oil prices that result from this rule lead to lower prices economy-wide, even when the impact of higher vehicle costs are factored into this analysis. Lower prices allow for additional purchases of investment goods which, in turn, lead to a larger capital stock. These price reductions also allow higher levels of real government spending while improving U.S. competitiveness thus promoting increased exports relative to the growth driven increase in imports. As a result, GDP is expected to increase as a result of this rule.

TABLE 5:

BENEFIT-COST RATIOS FOR EACH SOURCE OF BENEFIT

	Base Case Markup		NHTSA High Markup	
	EPA	NHTSA	EPA	NHTSA
Pocketbook	2.5	1.5	2.2	1.4
Environmental/Other	1.1	.7	1	.6
Macroeconomic	2.2	1.2	1.8	1.1
Total	5.8	3.4	5.0	3.1

Source: TAR, pp. ES-12. Macroeconomic based on MEMORANDUM TO: Docket EPA-HQ-OAR-2009-0472

In 2012 EPA ran such a model to assess the effect of reducing gasoline consumption and increasing expenditure of automotive technology. It found that for every $1 of consumer pocketbook savings, there was an increase in GDP of about $0, 80. It also showed a net increase in employment. These benefits could push the total benefits to almost six times the cost, as shown in Table 6.

The above pocketbook analysis helps to explain one of the major findings of our survey research. In a dozen public opinion polls over the past decade, we consistently find substantial support for the standards. Generally, about three quarters of the respondents express support. As shown in Figure 1, in our post-election poll in 2016, we found a similar high level of support. The support is not only broad, it is bipartisan. Two-thirds of those who voted for Donald Trump support the standards. Two-thirds of Republicans and Independents who lean Republican support the program. Support is stronger among Democrats, Independent leaning Democrats and those who voted for Hillary Clinton, with over four fifths supporting the program.

CONSUMER SUPPORT FOR FUEL ECONOMY STANDARDS

Support for Standards Post-2016 Presidential Election

Over the course of a decade CFA has examined public opinion about regulatory policy to increase the fuel economy of the light duty vehicle fleet. The questions have been varied to deal with the policy issue of the moment, but the responses have all supported greater fuel economy through regulation. Before the Energy Independence and Security Act (EISA) rebooted and reformed the Corporate Average Fuel Economy (CAFE) program, we focused on the general proposition that fuel economy should be increased.

Long Term Support for Fuel Economy Standards

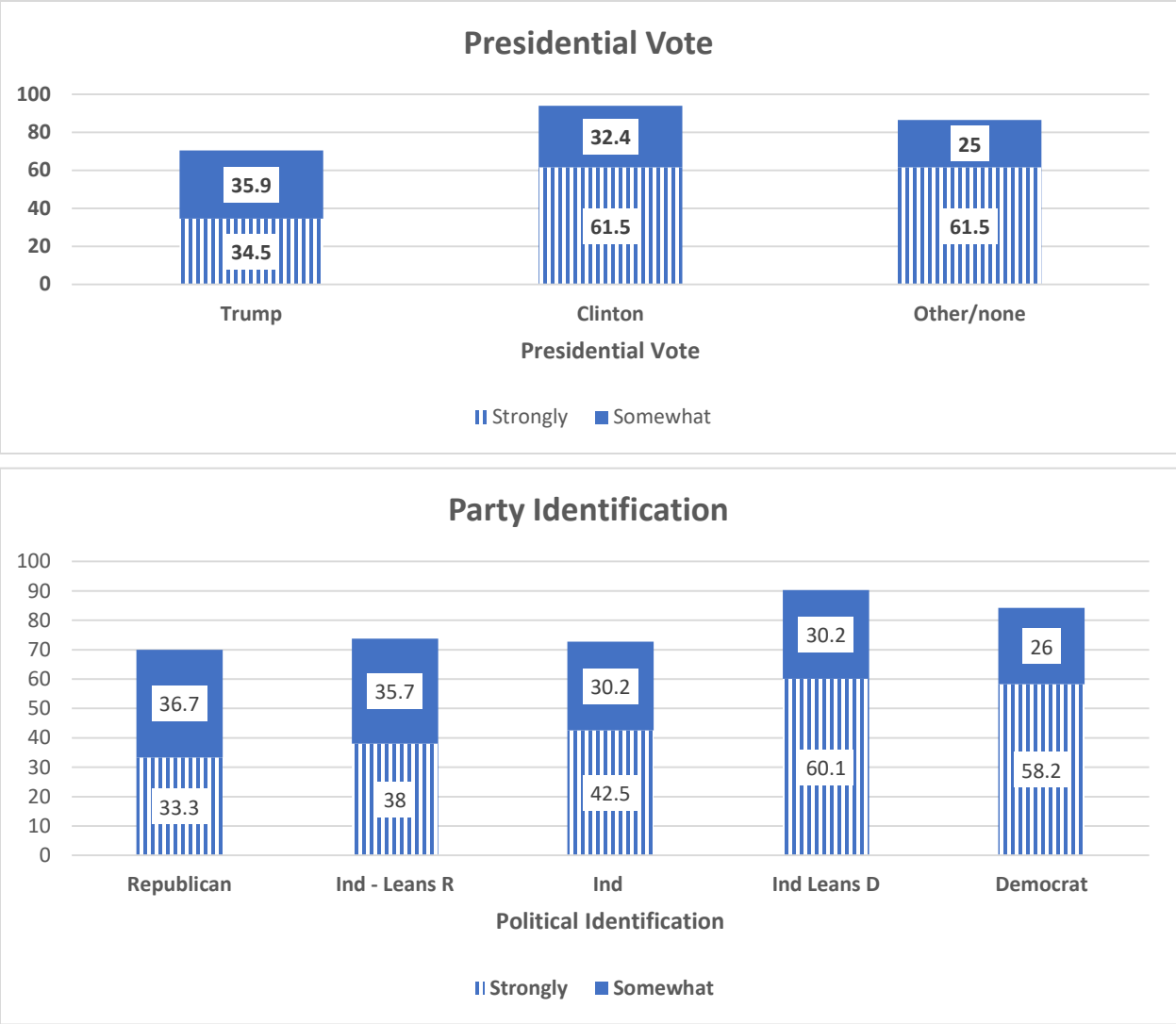
In April 2007 we asked about legislation "that would require auto manufacturers to increase their new car fuel mileage by about one mile per gallon a year for ten years.[56]

[56] All of the surveys were conducted for the Consumer Federation by ORC, based on a national random sample of 1,000 households with a margin of error of + 3

- Support for the increase stood at 81%.

We followed that up with a question that pointed out that the cost of vehicles would go up, but be completely offset by lower costs for less gasoline consumption (although we could have stated that there would be substantial net savings).

FIGURE 1:
PUBLIC SUPPORT FOR FUEL ECONOMY STANDARDS ACROSS THE POLITICAL SPECTRUM POST-2016 ELECTION



Source: CFA commissioned public opinion poll conducted by ORC, December 8-11, 2016.

- Support for the increases stood at 73%.

In September 2007, we asked about support for the broad goals of EISA in a question that began with fuel economy but also mentioned greater reliance on renewables and ethanol.

- Support for the legislation stood at 84%.

We followed that up with a question that laid out the arguments for passage (lower consumer spending on energy, dependence on imports, and global warming emissions) and against (rising prices and lost jobs).

- Support for the legislation stood at 75%.

After the passage of EISA we shifted our questioning to the level of standards being considered in rulemakings.

In March 2008, we asked consumers about the U.S. oil situation (share of global reserves and level of consumption) and split the sample. We noted that regulations were being considered to increase fuel economy from 25 mpg to 35 mpg by 2016 and asked about support for raising that target to 50 mpg by 2025. Among those who gave correct answers to the questions on the U.S. oil situation,

- Support for the increase stood at 73%.

Among those who did not give correct answers, without being provided the correct information,

- Support for the increase was 65%.

After correct information was provided,

- support for the increase rose to 69%.

In September 2010, we asked about a much larger increase, in addition to going from 25 mpg to 35 mpg by 2016, we asked about going to 60 mpg by 2025.

- Support for the increase stood at 59%.

In May 2012, we shifted to evaluating the standard that had been adopted for 2025, with the lab test goal of approximately 55 mpg.

- Support for the standard stood at 74%.

In April 2013, we repeated the survey question.

- Support for the standard stood at 85%.

In June 2014, we again surveyed on the proposed standard.

- Support for the standard stood at 83%.

The previous surveys relied on the laboratory miles per gallon estimates used in the regulatory documents, but the economic analysis of the CAFE standards and the EPA stickers on vehicles have always relied on the estimated on-road mileage that consumers are likely to see.

As the mpg increases, the difference between the lab tests and on-road mpg grows. In our recent surveys we have shifted to using the on road numbers, since that is more familiar to consumers.

In our April, 2016 survey we shifted to the projected on-road mileage of about 42 mpg.

- Support for the standard stood at 81%.

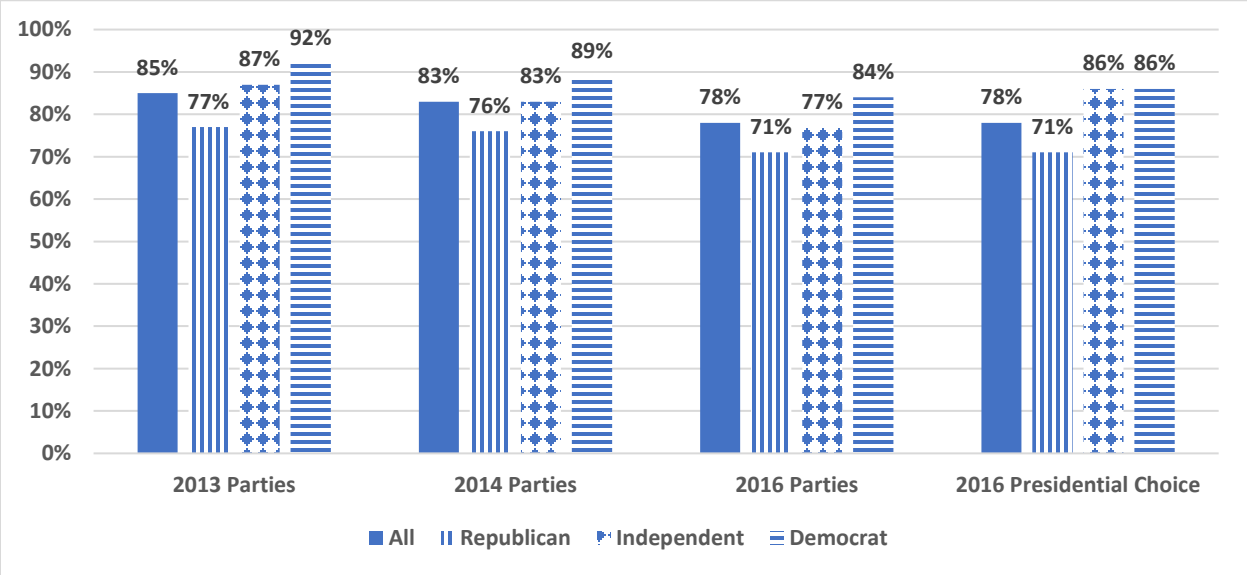
The December 2016 survey analyzed above also reflects this change.

Support for the standard stands at 76%.

We have occasionally analyzed the issue of support across the political spectrum. The results were similar in the past few years. A large majority supports the standards across the political spectrum with a slight decline in support in recent years, as shown in Figure 2.

FIGURE 2:

SUPPORT FOR THE CURRENT STANDARD



Source: CFA commissioned public opinion polls conducted by ORC.

CONSUMER ATTITUDES V. AUTOMAKER CLAIMS

These findings that the program has delivered substantial consumer savings and enjoys substantial public support touches on several of the important issues of the recent election campaign. One of the major themes is the consumer pocket impact of policies. While much of the debate focused on big macro policies, like taxes and wage rates, it is important to recognize that many discrete micro policies, like the fuel economy of vehicles, are important as well.

One of the major macro level issues of the recent campaign was a debate about regulation and deregulation. While the general sentiment that we need less regulation tends to gain

majority support, when asked about specific pocketbook and public health and safety regulations, we frequently find strong support.[57] Fuel economy standards are a good example of this.

Automaker Effort to Roll Back the Standards

The automakers were quick to seize on the election outcome to demand a rollback in the standards – sending the President-elect a letter barely 48 hours after the winner was declared.[58] This rush by the industry to catch the ear of the President-elect clearly was intended to influence any decision about the future of the standards and establishes the context in which the rigorous analysis of the National Program should be evaluated.

Given the broad public support for fuel economy standards, juxtaposed by the rapid push by the automakers for a rollback of the program, we thought it would be instructive to test public opinion about the automakers demands. Very much in the style of election year survey instruments, we tested how knowledge about the automaker actions would affect opinions about policy.

We stated two facts about the current situation in our survey and asked consumers how this would affect their attitude toward the standard. The question sequence is presented in Table 6.[59]

TABLE 6

SEQUENCE OF QUESTIONS ON AUTOMAKER EFFORTS TO ROLL BACK STANDARDS

Federal and state standards now require automobile manufacturers to increase the fuel economy of the new cars they sell to an on-road average of 42 miles per gallon by 2025. What is your view of this increase in fuel economy standards? Would you say you…
(READ ENTIRE LIST BEFORE RECORDING ONE ANSWER)

01	Support strongly
02	Support somewhat
03	Oppose somewhat
04	Or, oppose strongly
99	DON'T KNOW

In the past several years, automobile manufacturers have made good progress increasing the fuel economy of their vehicles and are on schedule to meet the 42 miles per gallon requirement, which varies by type of vehicle. But now some auto manufacturers are objecting to the standard and are asking the new administration in Washington to scale it back.

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[57] As an example, the Glover Park Group, 2016, *GPG/Morning Consult Poll: Trump voters show support for federal spending in break with traditional conservative cuts*, December 16. Automotive regulation is deemed to be just right or too lenient by almost two thirds of the respondents; three-quarters supported requiring manufacturers to make appliances more efficient, and 61% support requiring U.S. companies to reduce carbon emissions. Similarly, The Pew Research Center provides similar results. In a mid-2015 poll (Beyond Distrust: How Americans View Their Government) they found only 19% agreeing with the proposition that government should be trusted always or most of the time, three-quarters of the respondents said it should have a major role in protecting the environment and strengthening the economy, with majorities saying it was doing a good job.

[58] 7 Reasons Why the Trump Administration Won't Put the Brakes on Fuel Economy Standards, November 14, 2016

[59] Source: CFA commissioned public opinion poll conducted by ORC, December 8-11, 2016.

Knowing this, are you more likely to support or oppose the federal and state standards that require automobile manufacturers to increase the fuel economy of the new cars they sell to an on-road average of 42 miles per gallon by 2025? Would you say you are…
(READ ENTIRE LIST BEFORE RECORDING ONE ANSWER)

01 Much more likely to support
02 Somewhat more likely to support
03 Somewhat more likely to oppose
04 Much more likely to oppose
05 Or, does it make no difference
99 DON'T KNOW

Figure 3 shows the responses to this question. It indicates that, when presented with the two salient and somewhat contradictory facts – that the automakers are currently meeting the standard and they want to roll them back – respondents are more likely to support the standard. Respondents were three times as likely to support the program (57%), compared to a small minority (17%) who said it would make them oppose the program. About one quarter said it did not matter. The shift in attitude was even greater when we consider strong changes, with 35% more strongly supporting v. 9% more strongly opposing.

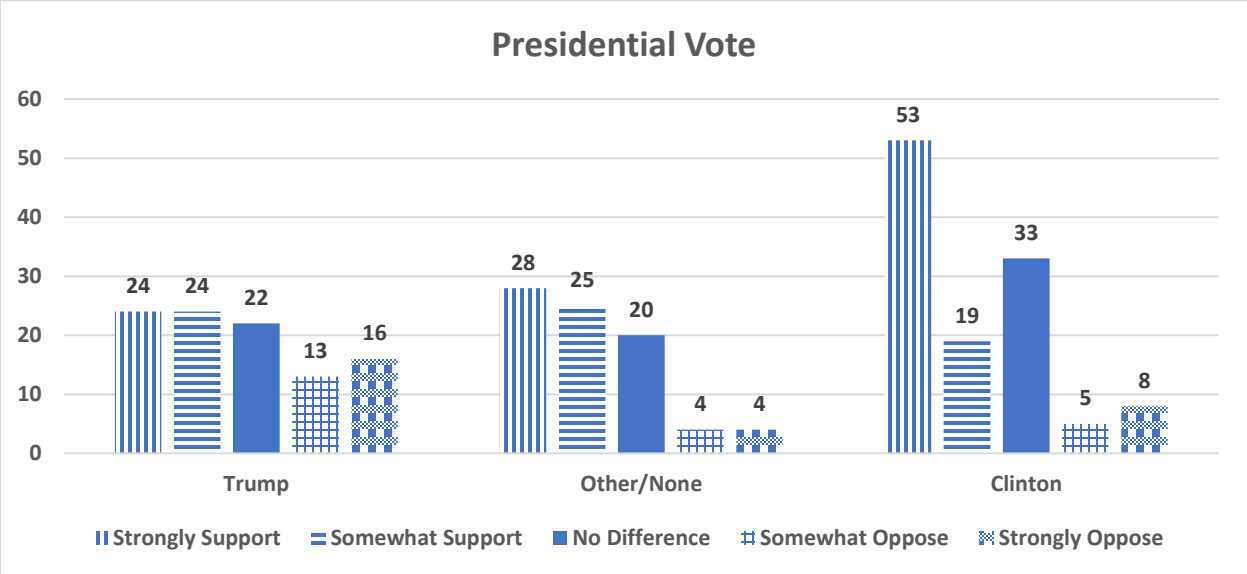
All across the political spectrum, those who were more likely to support the standard, given the two facts, outnumber those who were more likely to oppose it by a wide market. There were differences between the groups, as shown in Figure 3. The biggest increase in support was among those who voted for Clinton, the smallest among those who voted for Trump. The remainder of respondents fell between these two extremes. The results across party identification are almost identical to the results across presidential-voting.

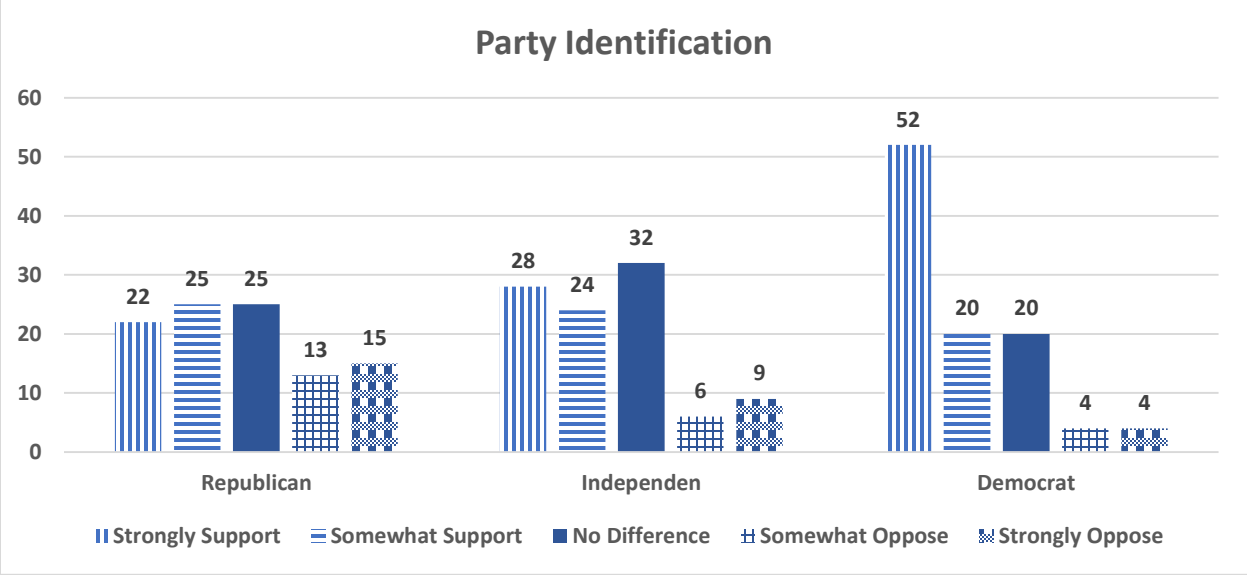
The introduction of this information can shift attitudes significantly. Among those who expressed strong support for the standard, 6 percent indicated the information "weakened" their support. Among those who strongly opposed the standard, two-and-a-half times as many (15%) indicated the information "weakened" their opposition. The results are similar in the middle. Among those who reported moderate (somewhat) support or opposition, 47% demonstrated the information shifted their view in a direction that was favorable to the standard (more support), whereas less than half as many (21%) shifted their view toward less support.

Conflict between Consumer Needs and Automaker Wants

These survey results put the automakers' efforts to roll back the standards at odds with public opinion. In our comments in response to the Technical Analysis Report we showed that the automakers are out of step with consumers in another way. While the automakers claim that what they want to do with vehicles is "just what consumers want," we showed that their own survey results contradicted that claim. Because we believe this misreading of consumers has been persistent and their erroneous portrayal of consumer attitudes will likely play an important part of the debate over the standard, some of our earlier analysis bears repeating.

FIGURE 3:
LIKELIHOOD OF SUPPORT FOR STANDARDS WITH INFORMATION ON AUTOMAKERS





Source: CFA commission public opinion poll conducted by ORC, December 8-11, 2016.

The AAM analysis makes a remarkable series of erroneous assumptions and misleading comparisons and claims.[60]

The first slide claims that "only OEMs have real skin in the game."[61] In fact, since the consumer pocketbook benefits exceed the technology costs by a substantial amount, consumers have a great deal of "skin in the game." As noted above, environmental, public

[60] Mitch Bainwol, President and CEO, Alliance of Automobile Manufacturers, Consumers & Fuel Economy, CAR Management Briefing Seminars, Traverse City, Michigan, August 2016, The winter related question, specific to the North East, has been discarded. It would rank 12th of 18, low in California, high in New England)

[61] Id., p. 2.

health and macroeconomic benefits should also be included. In other words, consumers and society have as much as four to six times as much "skin in the game" as the automakers.[62] The claims ignore the fact that the agency analyses show that the total cost of driving declines.

The automakers present numerous nonsensical comparisons. For example, on the list of public concerns they note that terrorism, race relations and a weak economy are a greater concern to the public.[63] Improving fuel economy does not detract from policies to address these bigger problems. Indeed, it can be argued that reducing oil consumption and imports helps to undermine the leverage of terrorists, while the resulting macroeconomic growth improves the economy.

Even when they present bogus choices, their arguments do not work. They state that the global threat of climate change "requires government regulations…[64] that raise the price on new cars… pricing new cars out of the reach of many American families." In spite of this introduction, more respondents opt for more regulation (42% to 41%).

Similarly they point out that 69% of respondents want to encourage mobility, vs. 16% that want to discourage mobility.[65] Since the standards lower the cost of driving (and have a rebound effect to increase driving), they obviously encourage mobility.

The key question on regulation reported by the AAM is extremely biased.[66] First, the question uses the laboratory standard of 54.5 miles per gallon, while EPA/NHTSA do all their economic analysis at the adjusted, real world mileage of about 42 MPG. Survey respondents live in the real world and 42 MPG would certainly seem more realistic than 54.5. Second, in presenting the choice, the AAM survey presents only one side – the automakers' side. "OEMs say that under the new standard, consumers will have to pay more for cars and buy more hybrids and EVs." Remarkably, even with this double barreled bias, while 47% of the respondents said the target of 54.5 was too aggressive, 46% said it was about right or too lenient.

The public is not as enamored of gasoline powered muscle cars and trucks as the automakers claim.

The automaker spend a great deal of time complaining about policies to promote electric vehicles (EVs), claiming they will drive up the cost of the National Program. We have shown that the EV program will have little impact on the cost of compliance for three reasons.

First, electric vehicles are projected to make up a very small part of the fleet in the targeted compliance period.

Second, the cost of electric vehicles is plummeting, with a number of cost-competitive, consumer-friendly vehicles planned for the market long before the compliance period.

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[62] Id., p. 35.
[63] Id., p. 7.
[64] Id., p. 7.
[65] Id., p. 8.
[66] Id., p. 10.

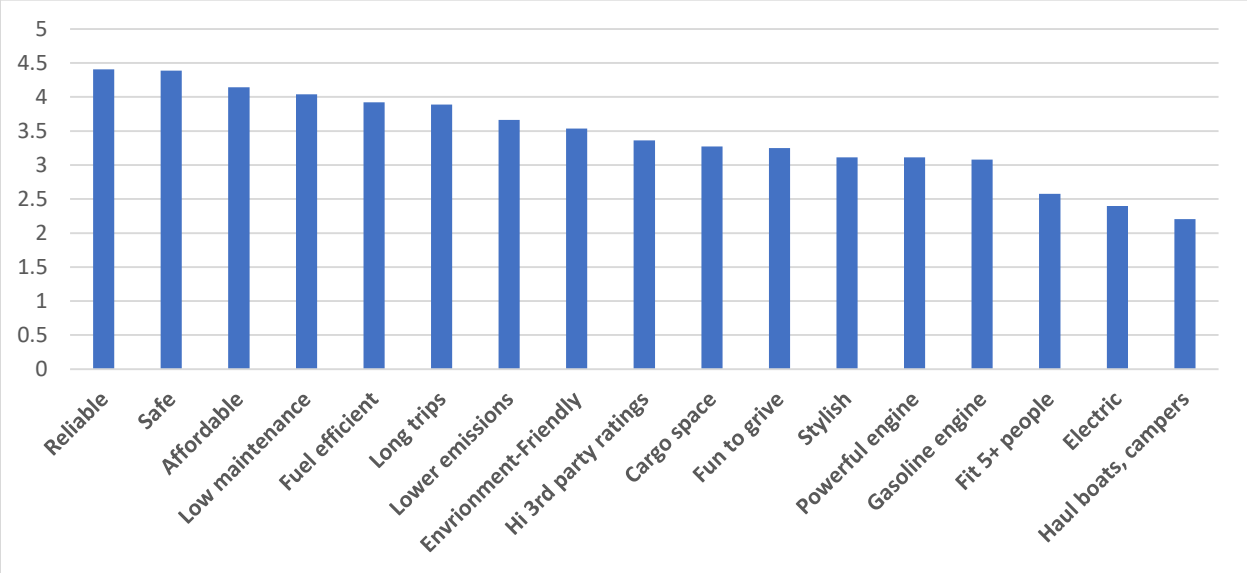
Third, as frequently happens in efficiency programs, the cost of compliance declines as producers learn and volumes rise. This is the powerful intersection of "command but not control" regulation and the market forces on which it relies.

As we pointed out during the House hearing, this was the experience with hybrid vehicles. California's leadership in the LEV program created the global market for those vehicles. With respect to EV's, the global market is rapidly emerging. In this case, California's leadership will help to ensure that the U.S. automakers are not left behind.

Moreover, the automakers' survey evidence does not support their claim. If an EV and gasoline vehicle were matched on cost and travel length[67], more would prefer the electric vehicles (48% to 43%) and a clear majority (57%) are willing to pay more for an electric vehicle. As Figure 4 shows, the analysis of desirable vehicle attributes shows that consumers want reliable, safe, affordable and low maintenance vehicles.[68]. There is no reason to believe that fuel efficient gasoline engines or electric vehicles (EVs) cannot fill the bill and automakers are working hard to achieve that goal.

FIGURE 4:

ALLIANCE OF AUTOMOBILE MANUFACTURERS, VEHICLE ATTRIBUTE SURVEY



Source and Notes: Mitch Bainwol, President and CEO, Alliance of Automobile Manufacturers, *Consumers & Fuel Economy*, CAR Management Briefing Seminars, Traverse City, Michigan, August 2016, p. 10. The winter related question, specific to the North East, has been discarded. It would rank 12th of 18, low in California, high in New England).

As Figure 4 shows, after the big four attributes, respondents care as much about fuel efficiency as the ability to take long trips and the automakers are working on that too. Beyond these big six attributes, the valuation of others falls off, but even here the message for EVs is

[67] Id., p. 9.
[40] Id., p. 10.

positive. Environmental impacts rank a lot higher (8th and 9th) than powerful engines (13th) or engine type (gasoline power =14th, electricity = 16th). Fitting more than 5 people (15th) or hauling boats and campers don't matter much (ranks dead last).

If you watch the TV ads and go into the showrooms, you would have to conclude that the automakers are pushing the wrong vehicles. More importantly, there is nothing in this data that suggests EVs cannot be a big success. Our survey results, this data and automaker investments can be interpreted to mean that EVs are on the early part of the adoption curve and there is a very strong basis to expect success.

Additional Evidence on Automaker Misunderstanding of Consumers and Misrepresentation of the Impact of Standards

Although our primary focus has been on analyzing the standards, rather than arguing with the industry, over the years, we have asked questions that reinforce the evidence of the automaker misunderstanding of consumers. We find that consumers have consistently expressed a desire for vehicles that get about 20% high fuel economy than the sales weighted average of new vehicles sold. Until recently, when the standards changed automaker behavior, the show rooms did not have vehicles to meet consumer efficiency demands.

In 2006, when automakers were having difficulties, long before the financial meltdown and the bankruptcy of two of the Big Three U.S. automakers, we asked consumers what role fuel economy might be playing: "Both Ford and General Motors are having well-publicized financial problems. To what extent do you think these problems have resulted from their emphasis on producing and marketing SUVs and pick-up trucks with relatively low miles per gallon?" Two-thirds said that it was playing a part.

OVERESTIMATION OF COSTS IN REGULATORY PROCEEDINGS

While CFA has not made it a practice of arguing with the automakers, there have been other moments when their actions have raised our concerns. Of particular concern to us is the tendency of the automakers to vastly overstate the costs meeting the standards. In June 2011, we thoroughly rebutted a fundamentally flawed analysis from the Center for Automotive Research that claimed the new standards would do severe harm to the industry.[69] The real world experience since then shows how far off the mark they were. The historical analysis shows that such dire predictions are unfounded. Unfortunately, the industry is at it again with gloom and doom projections that policymakers should reject.

In the automaker analysis discussed above, the beneficial effect of a reduction in the total cost of driving is hidden behind cost estimates that are 2 to 10 times higher than the agency estimates and benefits that are underestimated by 50 percent.

[69] *Setting the Record Straight on Increases in Fuel Economy Standards: Higher Fuel Economy Standards Will Lower the Cost of Driving, Increase Auto Sector Employment, Keep U.S. Car Companies Competitive, and Reduce Our Dependence on Foreign Oil,* June 2011.

One of the most important areas in which the automakers have erred in the past and are likely to err in the present is the estimation of costs. This becomes a key point of conflict in the regulatory debate.

Policies to reduce the efficiency gap, like performance standards, will improve market performance. By overcoming barriers and imperfections, well-designed performance standards will stimulate investment and innovation in new energy efficient technologies. A natural outcome of this process will be to lower not only the level of energy consumption, but also the cost of doing so. The efficiency gap literature addresses the question of how "learning curves" will affect the costs of new technologies as they are deployed. There are processes in which producers learn by experience to lower the cost of new technologies dramatically. The strong focus on the supply-side and innovation underlies the observation above that aggressive policies to stimulate innovation and direct technological change can speed the transition and lower the ultimate costs.

In the efficiency gap area, the issue of declining costs driven by technological change has received significant examination as a natural extension of the effort to project technology costs. One of the strongest findings of the empirical literature is to support the theoretical expectation that technological innovation will drive down the cost of improving energy efficiency and reducing greenhouse gas emissions. A comprehensive review of *Technology Learning in the Energy Sector* found that energy efficiency technologies are particularly sensitive to learning effects and policy.

> For demand-side technologies the experience curve approach also seems applicable to measure autonomous energy efficiency improvements. Interestingly, we do find strong indications that in this case, policy can bend down (at least temporarily) the experience curve and increase the speed with which energy efficiency improvements are implemented.
>
> 1. For the past several decades, the retail price of appliances has been steadily falling while efficiency has been increasing.
> 2. Past retail price predictions made by the DOE analysis of efficiency standards, assuming constant price over time, have tended to overestimate retail prices.
> 3. The average incremental price to increase appliance efficiency has declined over time. DOE technical support documents have typically overestimated the incremental price and retail prices.
> 4. Changes in retail markups and economies of scale in production of more efficient appliances may have contributed to declines in prices of efficiency appliances.[70]

The findings on learning curve analysis are extremely important because decisions to implement policies that promote efficiency and induce technological change are subject to intensive, ex ante cost-benefit analysis. Analyses that fail to take into account the powerful process of technological innovation that lowers costs will overestimate costs, undervalue innovation, and perpetuate the market failure. Detailed analysis of major consumer durables

[70] Larry Dale, et al., "Retrospective Evaluation of Appliance Price Trends," *Energy Policy* 37, 2009. p. 1.

including vehicles, air conditioners, and refrigerators find that technological change and pricing strategies of producers lowers the cost of increasing efficiency in response to standards.

> The more specific point here is that, while regulatory compliance costs have been substantial and influential, they have not played a significant role in the pricing of vehicles. Vehicle prices have steadily increased over time, far exceeding the costs of emission control and safety equipment…
> These cost increases, to the extent they are substantial, are dealt with in the short run by a variety of pricing and marketing strategies and by allocating R&D costs further into the future and over more future models. As with any new products or technologies, with time and experience, engineers learn to design the products to use less space, operate more efficiently, use less material, and facilitate manufacturing. They also learn to build factories in ways that reduce manufacturing cost. This has been the experience with semiconductors, computers, cellphones, DVD players, microwave ovens – and also catalytic converters.
>
> Experience curves, sometimes referred to as "learning curves," are a useful analytical construct for understanding the magnitude of these improvements. Analysts have long observed that products show a consistent pattern of cost reduction with increases in cumulative production volume. …
>
> In the case of emissions, learning improvements have been so substantial, as indicated earlier, that emission control costs per vehicle (for gasoline internal combustion engine vehicles) are no greater, and possibly less, than they were in the early 1980s, when emission reductions were far less.[71]

A comparative study of European, Japanese and American automakers prepared in 2006, before the recent reform and reinvigoration of the U.S. fuel economy program, found that standards had an effect on technological innovation. The U.S. had lagged because of the long period of dormancy of the U.S. standards program and the fact that the U.S. automakers did not compete in the world market for sales, (i.e. they did not export vehicles to Europe or Japan).

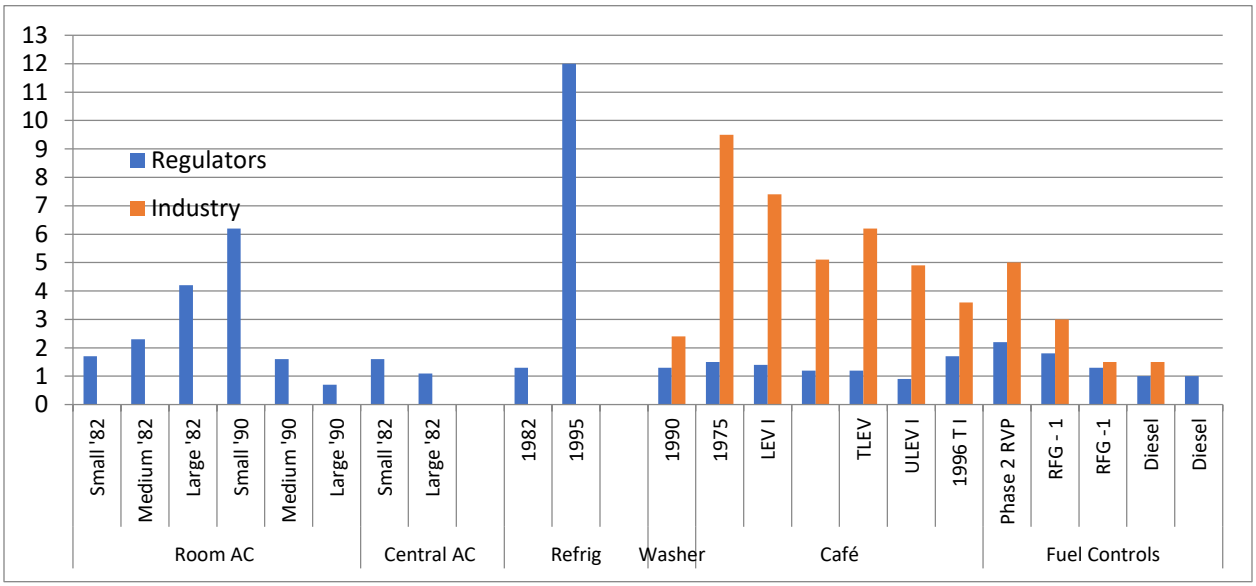
> The European car industry is highly dynamic and innovative. Its R&D expenditures are well above average in Europe's manufacturing sector. Among the most important drivers of innovation are consumer demand (for comfort, safety and fuel economy), international competition, and environmental objectives and regulations… One element of success of technology forcing is to build on one or more existing technologies that have not yet been proven (commercially) in the area of application. For improvements in the fuel economy of cars, many technological options are potentially available…
> With respect to innovation, the EU and Japanese policy instruments perform better than the US CAFE program. This is not surprising, given the large gap between the stringency of fuel-efficiency standards in Europe and Japan on the one hand and the US on the other…

[71] Sperling, Dan et al., 2004, Analysis of Auto Industry and Consumer Responses to Regulation and Technological Change and Customization of Consumer Response Models in Support of AB 1493 Rulemaking, Institute of Transportation Studies, UC Davis, June 14, pp. 10-15.

One of the reasons for the persistence of this difference is that the US is not a significant exporter of cars to the European and Japanese markets.[72]

Figure 5 shows the systematic overestimation by regulators of the cost of efficiency improving regulations in consumer durables. The cost for household appliance regulations was overestimated by over 100% and the costs for automobiles were overestimated by about 50 percent. The estimates of the cost from industry were even farther off the mark, running three times higher for auto technologies.[73] Broader studies of the cost of environmental regulation find a similar phenomenon, with overestimates of cost outnumbering underestimates by almost five to one with industry numbers being a "serious overestimate."[74]

FIGURE 5:
THE PROJECTED COSTS OF REGULATION EXCEED THE ACTUAL COSTS: RATIO OF ESTIMATED COST TO ACTUAL COST BY SOURCE



Sources: Winston Harrington, Richard Morgenstern and Peter Nelson, "On the Accuracy of Regulatory Cost Estimates," *Journal of Policy Analysis and Management* 19(2) 2000, *How Accurate Are Regulatory Costs Estimates?*, Resources for the Future, March 5, 2010; Winston Harrington, *Grading Estimates of the Benefits and Costs of Federal Regulation: A Review of Reviews*, Resources for the Future, 2006; Roland Hwang and Matt Peak, *Innovation and Regulation in the Automobile Sector: Lessons Learned and Implications for California's CO_2 Standard*, Natural Resources Defense Council, April 2006; Larry Dale, et al., "Retrospective Evaluation of Appliance Price Trends," *Energy Policy*, 37, 2009.

While the very high estimates of compliance costs offered by the auto manufacturers can be readily dismissed as self-interested political efforts to avoid regulation, they can also be seen as a worst case scenario in which the manufacturers take the most irrational approach to

[72] Kuok, On, *Environmental Innovation Dynamics in* the *Automotive Industry:* Project Assessing Innovation Dynamics Induced by Environmental Policy, November 3, 2006.
[73] Roland Hwang and Matt Peak, Innovation and Regulation in the Automobile Sector: Lessons Learned and Implications for California's CO_2 Standard, Natural Resources Defense Council, April 2006.
[74] Winston Harrington, Grading Estimates of the Benefits and Costs of Federal Regulation: A Review of Reviews, Resources for the Future, 2006; p. 3.

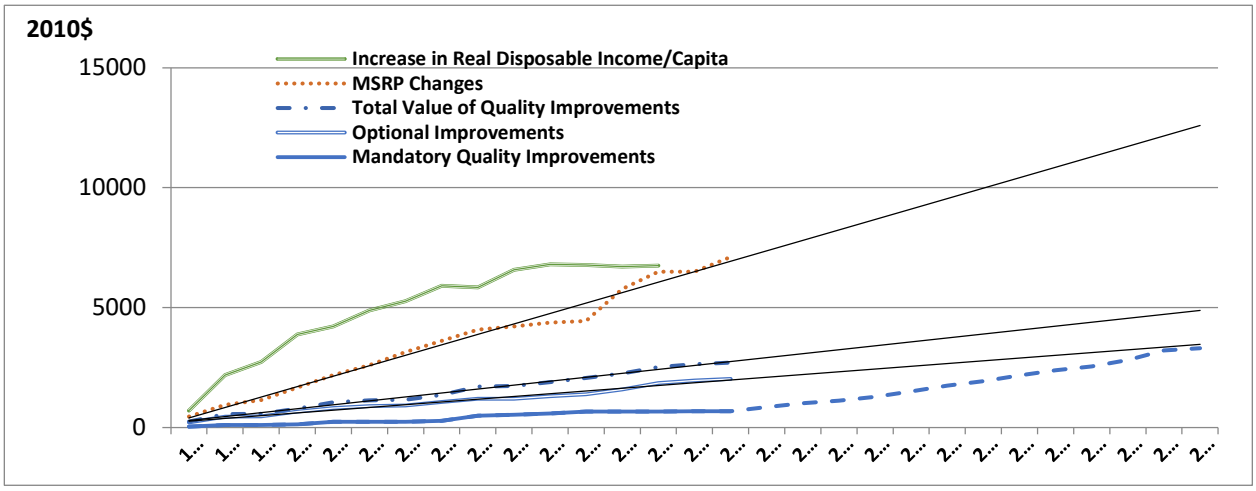
compliance under an assumption that there is no possibility of technological progress or strategic response. A simulation of the cost of the 2008 increase in fuel economy standards found that a technologically static response was 3 times more costly than a technologically astute response.

> We perform counterfactual simulation of firms' pricing and medium-run design responses to the reformed CAFE regulation. Results indicate that compliant firms rely primarily on changes to vehicle design to meet the CAFE standards, with a smaller contribution coming from pricing strategies designed to shift demand toward more fuel-efficient vehicles... Importantly, estimated costs to producers of complying with the regulation are three times larger when we fail to account for tradeoffs between fuel economy and other vehicle attributes.[75]

There may be a number of factors that produce this result, beyond an upward bias in the original estimate and learning in the implementation, including pricing and marketing strategies. Sperling et al, 2004, emphasized the adaptation of producers in the analysis of auto fuel economy standards.

As shown in Figure 6, in comments on the light duty truck and auto standards, CFA presented a historical analysis of cost increases associated with mandates that reflects the ability and strategy of producers to keep cost increases within the broad limits of industry practices. We used an estimate of the cost of technology (25%) of the total increase that is quite close to the "preferred estimate of Green and Welch (27%, which they believe is a little high).

FIGURE 6:
GRADUAL IMPROVEMENT IN FUEL ECONOMY CAUSES A SLOW AND STEADY PRICE INCREASE WHILE THE INDUSTRY HAS HANDLED QUALITY IMPROVEMENT WITH MUCH GREATER COSTS



Source: Bureau of Labor Statistics, Quality Changes for Motor Vehicles, various years; Consumer Price Index database; Sources: Office of Regulatory Analysis and Evaluation, *Regulatory Impact Analysis, Corporate Average Fuel Economy*, 2011, 2012-2016, 2017-2025.

[75]Whitefoot, Kate, Meredith Fowler and Steven Skerlos, 2012, Product Design Response to Industrial Policy: Evaluating Fuel Economy Standards Using an Engineering Model of Endogenous Product Design, Energy Institute at Haas, May, pp. 1…5.

Many of the factors that are cited as causes of the declining cost, such as learning, standardization and homogenization of components, competitive outsourcing of components, and technological improvements in broader socio-economic environment) represent market factors or externalities that are difficult for individual firms to control or profit from (appropriate), so they constitute externalities that policy must address, if the externalities are to be internalized in transactions. At the same time, performance standards simply shift the baseline of competition to a higher level of energy efficiency. To the extent that markets are competitive, normal competitive processes drive down the costs of innovation such as competition driven technological change, declining markups, and economies of scale.

Even more fundamentally, there is evidence that the decision to increase energy efficiency can stimulate broader innovation and productivity growth.

> The case-study review suggests that energy efficiency investments can provide a significant boost to overall productivity within industry. If this relationship holds, the description of energy-efficient technologies as opportunities for larger productivity improvements has significant implications for conventional economic assessments…This examination shows that including productivity benefits explicitly in the modeling parameters would double the cost-effective potential for energy efficiency improvement, compared to an analysis excluding those benefits.[76]

We noted above that the implementation of the standards in the early years already exhibit clear signs of this process.

LOW INCOME CONSUMERS

CFA's Seminal Analysis

Automakers, dealers and flawed think tank analyses frequently claim that increases in fuel economy driven by performance standards drive lower income households out of the market. We responded to the claims that higher fuel economy standards will harm low income households, which were emphasized by the National Association of Auto Dealers.[77] This rebuttal was part of the record and the object of the extensive analysis offered by Greene in the TAR proceeding.

We have argued that, since low income households are generally not in the new car market and operating costs are a much larger share of their cost of driving, the standards do not harm them. The TAR recognized this argument, reviewed the literature and concluded that the evidence supported our point of view.[78] The study by Greene and Welch discussed above looks at this issue in greater detail than any previous study and strongly supports our conclusion.

Since the issue receives such attention from the opponents of standards, it merits a reexamination. Our argument can be summarized in three points. These are demonstrated in

[76] Worrell, Ernst, et al., 2003, "Productivity Benefits of Industrial Energy Efficiency measures," *Energy*, 28(11).p. 1081.

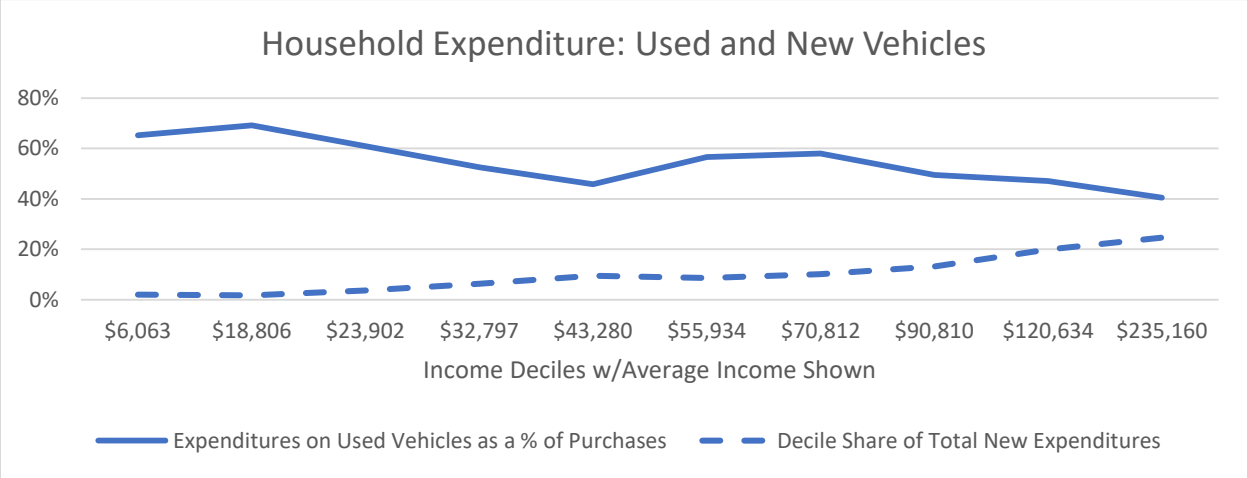
[77] CFA responded to these claims in *Top 10 Reasons Consumers Want 54.5 MPG by 2025,* May 22, 2012, as well as in comments on the proposed Rule, 2012.

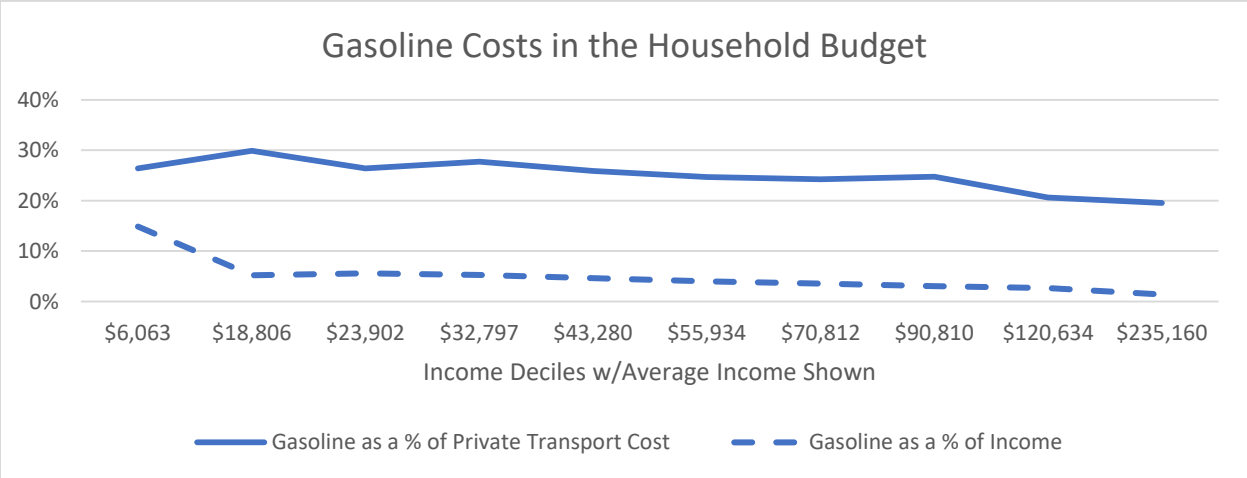
[78] TAR, pp. 6-16 to 6-22.

Figure 7 with data from the Consumer Expenditure Survey of 2015 broken down by deciles of income.

First, low income households make up a much smaller part of the new vehicle market than their share in the overall population. The upper graph of Figure 7 shows that the two lowest income categories –bottom 20% of households -- account for less than 4% of the expenditures on new vehicles. The share of low income households in expenditures on used vehicles is above the national average. The percentage of used vehicle costs in total ownership costs declines steadily as income rises. Therefore, as shown in the lower graph, the operating cost of vehicles makes up a much larger part of their total cost of driving than the average household, and fuel economy standards reduce operating costs. The operating cost share of private transportation costs and household income decline steadily as income rises.

FIGURE 7:
OWNERSHIP AND OPERATING COSTS ACROSS INCOME DECILES





Source: Bureau of Labor Statistics, Consumer Expenditure Survey, 2015.

Second, because low income households buy used cars, they tend to benefit from the fact that the economic value of future fuel savings is only partially reflected in the resale price of

used vehicles. Low income households get a disproportionate share of the operating cost reduction.

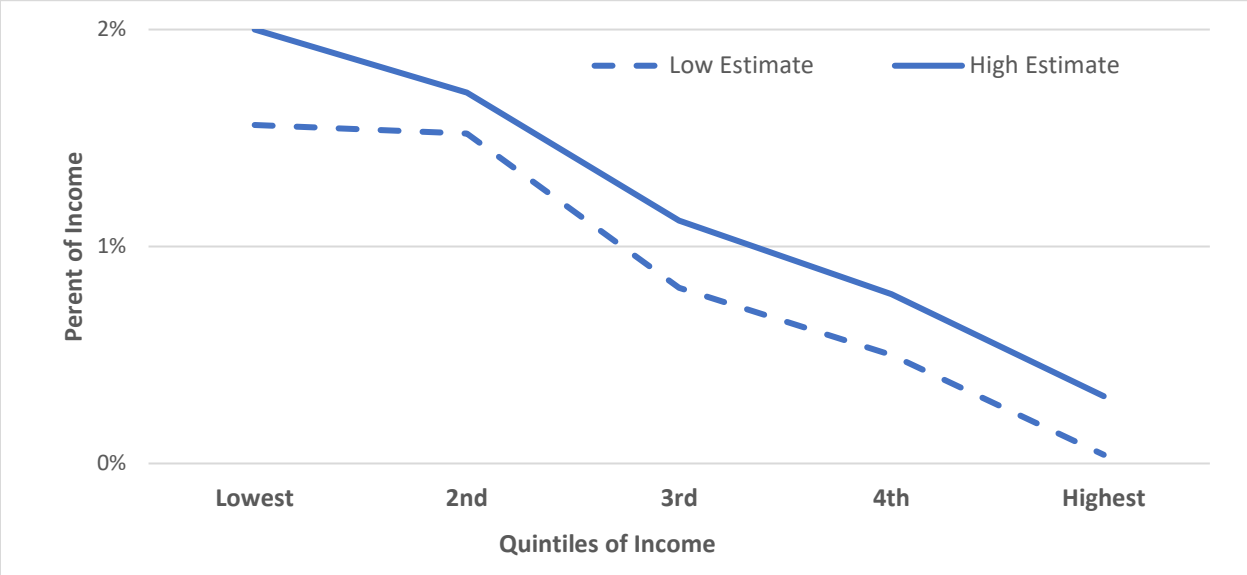
Third, low income households are likely to be disproportionate beneficiaries of the indirect benefits. Low income households are likely to suffer most from environmental and public health externalities associated with the operation of vehicles. They are likely to suffer most in a weak economy and benefit from policies that strengthen it. Therefore, they are likely to benefit most from reductions in those impacts.

Confirmation of the Key CFA Argument

The Greene and Welch study strongly supports our view, as shown in Figure 8. Using the Consumer Expenditure Survey, the study can directly measure many of the key elements in our argument. Low income households are much less likely to buy new automobiles, so ownership costs are relatively less important than operating (primarily fuel costs). As more fuel efficient vehicles pass through the used car market into the hands of lower income households, their operating cost expenditures decline. One of the big questions is "how much of the value of fuel savings is captured in the price of the used vehicle?" Based on a review of the literature and examination of the CES data, Greene and Welch find that about four-fifths of the value of fuel economy is passed on to low income purchasers of used vehicles. This finding is consistent with our conclusion that the auto market is imperfect with respect to fuel economy. Many of the imperfections that afflict the new car market would also affect the used car market.

FIGURE 8:

PERCENTAGE OF INCOME SAVED IN DUE TO FUEL ECONOMY IMPROVEMENTS 1980-2014



Source: David Greene and Jilleah G. Welch, *The Impact of Increased Fuel Economy for Light-Duty Vehicles on the Distribution of Income in the United States*, Oak Ridge National Laboratory and the Energy Foundation, September 2016, **p. 56.**

The fact that lower income households receive a disproportionate share of the fuel savings interacts with the fact that operating costs are a larger part of their private transportation

costs and the fact that they have lower income produce a powerful progressive effect of the program, as shown in Figure 8.

The two lowest quartiles (bottom 40%) enjoyed a reduction in household expenditures of 1.5% to 2% of income. The two middle income quartiles enjoyed a reduction in the range of 0.5% to 1%. The upper income quartile had the smallest net saving (0% to .3%).

CONCLUSION

In the scheme of things, given the strong track record and current projections of significant consumer pocketbook savings combined with clear public support for the program across the political spectrum, the fuel economy standards program is one set of consumer-friendly regulations that should be allowed to proceed on the course that was set in 2012. It is strongly supported by the volumes of evidence in the record. If rigorous analysis and facts matter in policy choices, as they should, the decision of the EPA to maintain the level of standards passes the public interest test with flying colors.

AMERICAN FEDERALISM AT ITS BEST:
WHY THE ENVIRONMENTAL PROTECTION AGENCY SHOULD GRANT A CLEAN AIR ACT WAIVER TO
CALIFORNIA FOR ITS ADVANCED CLEAN CARS PROGRAM

Statement of Dr. Mark N. Cooper
Director of Research, Consumer Federation of America (CFA)
to the Environmental Protection Agency, Pubic Hearing,

September 19, 2012

The Consumer Federation of America strongly supports California's Advanced Clean Cars Program and urges the Environmental Protection Agency to grant California's waiver request as submitted.

The Clean Air Act allows California to exercise independent authority to adopt more stringent emissions standards because of the state's unique air pollution. Other states have followed California's lead in the past and will do so in the future. California's Clean Cars Program has helped to set us on a path that will improve the performance of light duty vehicles (cars and trucks) by a greater amount in a shorter time period than ever accomplished in U.S. history. CFA believes that the direction set by California and the states that follow its lead is a wonderful example of American federalism at its best.

The California Clean Cars Program enjoys widespread support from consumers, automakers and suppliers, business groups, national defense experts, public health advocates and environmentalists.

CFA and many of its members, like Consumers Union (CU) and Consumer Action, support the Advanced Clean Cars program because consumers agree that California and other states should be able to lead as shown in our 2011 national public opinion survey. To examine the responses across state different types of state we doubled the sample size and identified four categories of states. California, the other Clean Cars states, automotive states (Ohio, Michigan, Indiana) and the other states. The continued involvement of the states is supported by about two-thirds of the respondents, with the strongest support coming from the automotive states.

The very concrete and significant benefits associated with reducing emissions from vehicles are obvious, as are the corresponding improvements to fuel economy that come when emissions are reduced. Our analysis of the national standard, which mirrors California's greenhouse gas emissions standard through the year 2025, yields the following estimates of the economic benefits:

- consumer pocketbook savings of thousands of dollars per vehicle,
- reduced oil imports of billions of barrels of oil,
- increased gross domestic product of $150 billion, and
- over 100,000 additional auto sector jobs.

We emphasize the plural, "Clean Cars states," for a simple reason. While it is true that the statutory language gave California the lead in developing a state-based alternative to federal standards, we believe that the adoption of the California standard by 13 states plus the District of Columbia was instrumental and irreplaceable in the process the during 2009 waiver process.

- Combined the "Clean Car" states represented the fifth or sixth largest auto market in the world.

- The collective wisdom of so many states gave the California standard a great deal of credibility; the size of the market gave it economic clout.

One of the great benefits of American federalism is to allow the individual states to act as laboratories to discover better ways of accomplishing shared goals. The more eyeballs looking at a problem, the more likely it is that a good solution will be found. By allowing the largest economy in the nation to develop a set of standards independently of the federal standards and allowing the states to adopt either the Federal or the California standard, the Clean Air Act prevents fragmentation into fifty standards, but preserves the dynamic of state-based innovation.

By adding a layer of cooperation between federal and state agencies, the executive order issued by the Obama administration increased the smoothed the process and increased the benefits of Federalism in this policy area that is important to the environment, public health and safety, the economy and national defense.

That cooperation produced an immediate acceleration of emissions standards that will save consumers over $35 billion in the 2012-2015 period alone, and it has now created the first long-term plan for fuel economy and clean air standards in the history of the nation that will yield the massive benefits identified above.

The proposed standards for which California has requested an EPA waiver, already supported by several states, continue to play exactly that role. In the early 2000s, when the California standard pointed the auto market toward hybrid technologies, the automakers said it could not be done. Today, there are over 150 hybrid and electric models in auto showrooms. The current proposed standard continues to nudge the market in that direction, while the technologies used to meet the California standards help automakers meet the national standard.

We applaud California's leadership and the benefits it has provided the nation in improving air quality and increasing fuel economy and urge the EPA to grant the waiver.

ATTACHMENT II:
CFA'S ELECTRIC VEHICLE ANALYSIS

(Excerpt from Comments of the Consumer Federation of America, On the Proposed National Program, Technical Appendix, pp. 31-32)

The Benefit of Technology Neutral, Product Neutral Long-Term Standards

The current approach to standard setting, which is technology neutral, product neutral and long-term, transforms standards into consumer friendly, procompetitive instruments of public policy.

Long-Term: Setting a high standard for the next fifteen years is intended to foster and support a long-term perspective for automakers and the public, by reducing the marketplace risk of investing in new technologies. The long-term view gives the automakers time to re-orient their thinking, retool their plants and help re-educate the consumer. The industry spends massive amounts on advertising and expends prodigious efforts to influence consumers when they walk into the show room. By adopting a high standard, auto makers will have to expend those efforts toward explaining why higher fuel economy is in the consumer interests. Consumers need time to become comfortable with the new technologies.

Product Neutral: The new approach to standards accommodates consumer preferences; it does not try to negate them. The new approach to standards is based on the footprint (size) of the vehicles and recognizes that SUVs cannot get the same mileage as compacts. Standards for larger vehicles will be more lenient, but every vehicle class will be required to improve at a fast pace. This levels the playing field between auto makers and removes any pressure to push consumers into smaller vehicles.

Technology-neutral: Taking a technology neutral approach to the long term standard unleashes competition around the standard that ensures that consumers get a wide range of choice at that lowest cost possible, given the level of the standard. There will soon be hundreds of models of electric and hybrid vehicles using four different approaches to electric powertrains (hybrid, plug-in, hybrid plug-in, and extended range EVs), offered across the full range of vehicles driven by American consumers (compact, mid-size family sedans, large cars, SUVs, pickups), by half a dozen mass market oriented automakers. At the same time, the fuel economy of the petroleum powered engines can be dramatically improved at consumer friendly costs and it will continue to be the primary power source in the light duty fleet for decades.

Today, automakers offer 30 models of electric vehicles. All of the major, mass market automakers are offering electrics using different approaches to power including hybrid, plug ins, hybrid plug in and extended range plug in, and they sell hundreds of thousands of units in the U.S. They are offering vehicles across the full range of models that consumers drive – compacts, sedans, large cars, SUVs and pickups. J.D. Powers and Associates project that there will be 159 models by 2016 and that electric vehicles will account for almost 10% of the market.[79]

[79] J.D. Power and Associates, Despite Rising Fuel Prices, the Outlook for "Green" vehicles Remains Limited for the Foreseeable Future, April 27, 29011.

ON THE ROAD TO 54 MPG:
A PROGRESS REPORT ON ACHIEVABILITY

JACK GILLIS
MARK COOPER
APRIL 2013

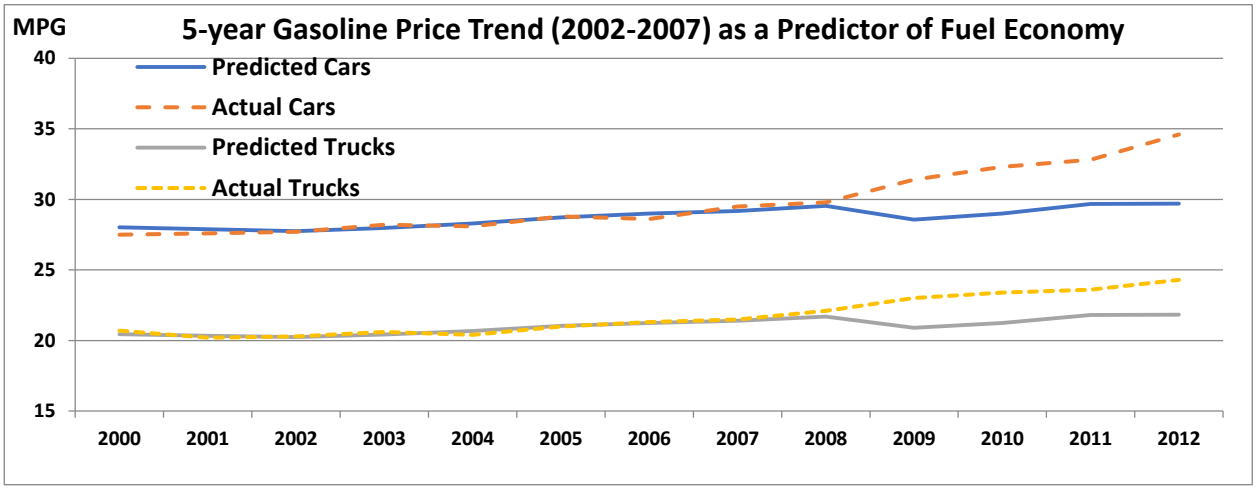
III. A DEEPER DIVE INTO THE NEW FUEL ECONOMY STANDARDS AND THE AUTO MARKET RESPONSE

It is already clear that the market is dynamically adapting to the new standards on both the supply and the demand side. Automakers are delivering products that consumers want, and consumers are purchasing them in increasing numbers. The important role of the standards in triggering this market adaptation is also clear. This section examines several issues that inevitably arise with the acceptance and demand for more fuel efficient vehicles. The following is an in-depth look at 3 key factors on the road to increased fuel efficiency: the role of gasoline prices, electric vehicles and four-cylinder engines.

GASOLINE PRICES

It is strikingly clear that the shift in fuel economy behavior coincided with the Congressional decision to reform and reinvigorate the fuel economy standards discussed in the previous section, as shown in Exhibit 6 above. However, there is an obvious question that will inevitably be raised: "Are not gasoline prices the actual cause of the change in behavior?" Comparing Exhibit 15 to Exhibit 6 shows that while there is a correlation between gas prices and miles per gallon, standards have a strong correlation. Using the price of gasoline as the predictor of fuel economy, we find that prices dramatically under-predict fuel economy in 2008 and later years. Therefore, other factors must be at work.

EXHIBIT 15: MILEAGE PREDICTED BY REAL GASOLINE PRICES V. ACTUAL MILEAGE



Sources: Environmental Protection Agency, *Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2012,* March 2012; Energy Information Administration, Petroleum Price Database.

The above analysis supports the hypothesis that the adoption of future standards played a

larger role than gas prices. In fact, a statistical model that includes both the announcement of standards and gasoline prices accounts for over four-fifths of the variance in fuel economy and shows that standards have a statistically much larger effect.[i]

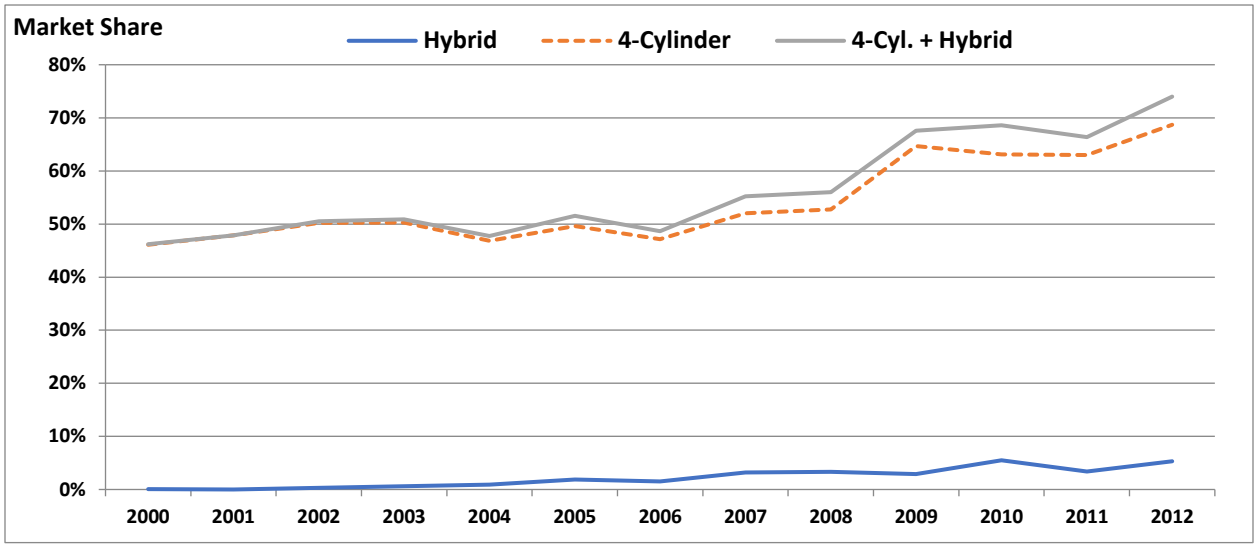
FOUR-CYLINDER ENGINES: EFFICIENT, POPULAR

Analyzing sales of vehicles with four-cylinder engines also support this view of the market. As shown in Exhibit 16, the increase began in 2004, but showed a dramatic jump in 2008. One thing that is particularly noteworthy about this chart is that the increase in popularity of four-cylinder engines came after a significant decline in the popularity of 4-cylinder engines from 1987-2004. During that period, manufacturers offered more and more six and eight-cylinder engines focusing on the perceived need for power and speed.

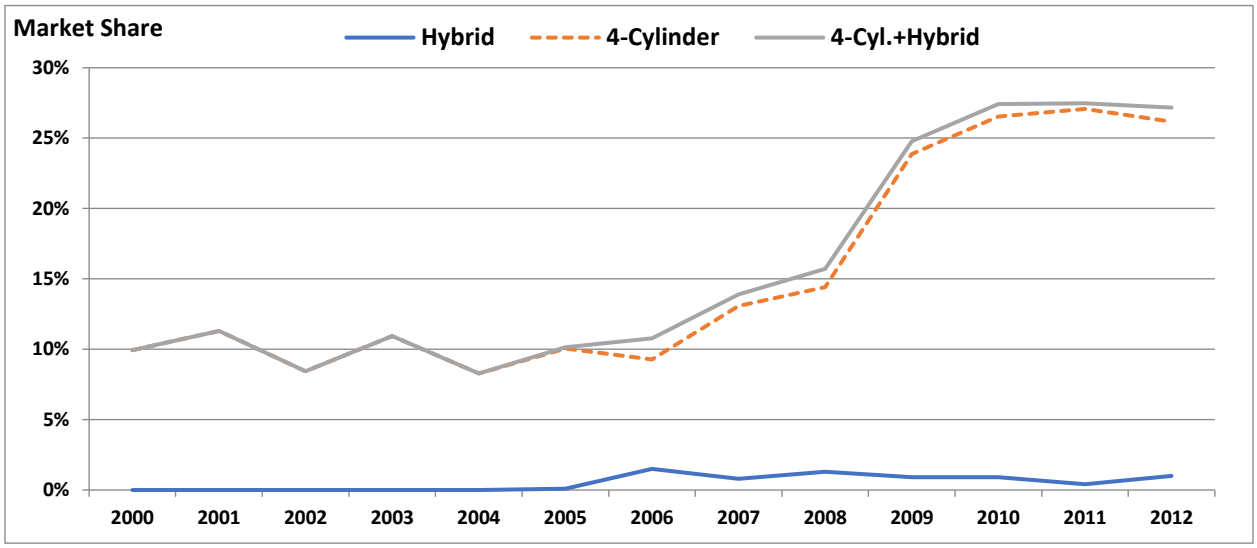
The recent increase in popularity of four-cylinder engines is due to manufacturers building more power into smaller, more efficient engines. As shown in Exhibit 17, the improving performance of four-cylinder engines was an important factor in increasing their market share. Four-cylinder engines get much higher gasoline mileage than engines with more cylinders, but in recent years they have been delivering high fuel economy with more horsepower. In contrast to four cylinder engines, six cylinder engines have been increasing their horsepower, while holding fuel economy steady. These trends reflect the efforts of the auto industry to keep options available for consumers while increasing overall fuel economy. They also reflect the fact that one of the major reforms enacted by Congress was to require future standards be attribute based. NHTSA chose the size (footprint) of the vehicle, which means larger vehicles have lower standards. Therefore, a wider range of vehicles that meet the vehicle-specific standard is available in the market.

EXHIBIT 16: 4-CYLINDER ENGINES AND HYBRID VEHICLES AS A PERCENT OF CARS SOLD

Cars

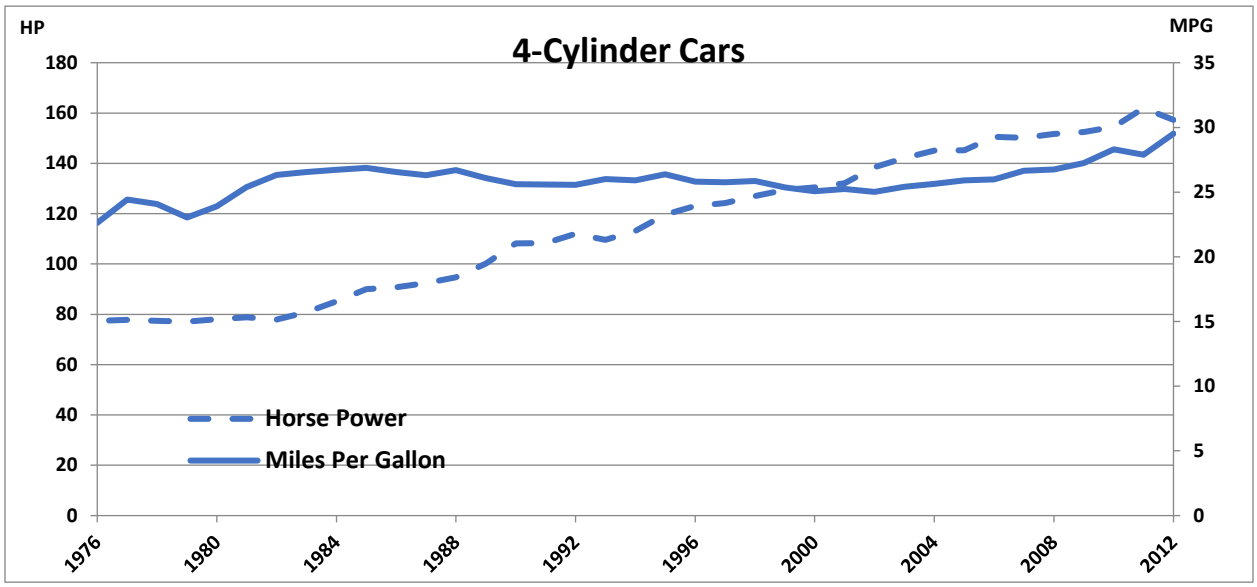


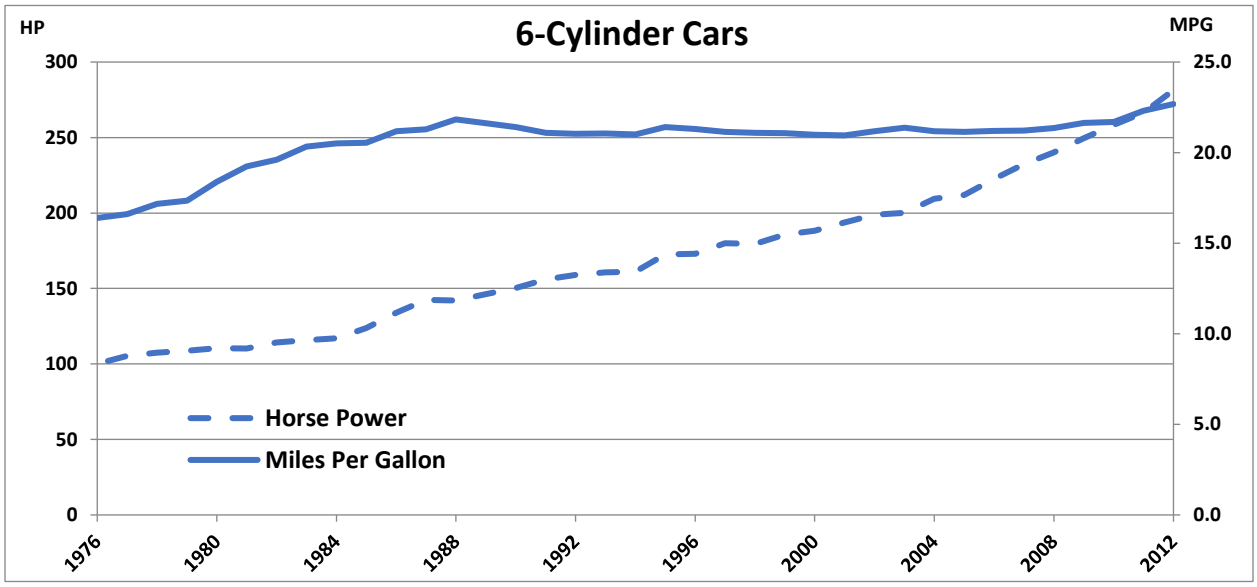
Trucks and SUVs



Sources: Environmental Protection Agency, *Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2012,* March 2012.

EXHIBIT 17: CYLINDERS, HORSE POWER AND MILEAGE FOR CARS





Sources: Environmental Protection Agency, *Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2012,* March 2012.

THE ZERO EMISSIONS VEHICLE PROGRAM
CALIFORNIA AND THE CLEAN CARS STATES LEADING PROGRESS

OCTOBER 24, 2013

The Consumer Federation of America supports the Zero Emission Vehicle (ZEV) program and applauds the states that have decided to participate in it because they are a leadere in advancing a product that is vitally necessary to meet the needs of households for personal transportation in the 21st century.

Our recent analysis of the diffusion of energy efficiency technologies provides strong reasons for our support of the Clean Cars ZEV program.[80]

- First, the innovation diffusion literature highlights the important role that supply-side leadership plays in moving new technologies into the market (see Exhibit 1).
- Second, the efficiency gap literature demonstrates that performance standards can play a key role in creating a market for efficiency technologies.
- Third, the approach of the ZEV program has the key attribute that make performance standard successful.[81]

The ZEV program stands at the intersection of these two findings. There is an even more direct and important reason to believe that the ZEV program will play a leading role in creating an important market for new vehicles – the dramatic success of the Low Emission Vehicle (LEV) program, the immediate predecessor of the ZEV program.

A decade ago, when California launched the LEV program, which jump-started the hybrid market, many predicted it would be a costly failure, but the LEV standard helped to stimulate the hybrid market. Today, hybrids are a hugely successful and profitable product, with millions sold. Many of the most popular automakers offering hybrids in the broad range of vehicles that consumers are most likely to buy.

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[80] Mark Cooper, *Energy Efficiency Performance Standards: The Cornerstone of Consumer-Friendly Energy Policy* (Consumer Federation of America, October 2013)

[81] Id., p. 46, **Long-Term:** Setting an increasingly rigorous standard over a number of years that covers several redesign periods fosters and supports a long-term perspective. The long term view lowers the risk and allows producers to retool their plants and provides time to re-educate the consumer. **Product Neutral:** Attribute based standards accommodate consumer preferences and allow producers flexibility in meeting the overall standard. **Technology-neutral:** Taking a technology neutral approach to the long term standard unleashes competition around the standard that ensures that consumers get a wide range of choices at that lowest cost possible, given the level of the standard. **Responsive to industry needs:** The standards must recognize the need to keep the target levels in touch with reality. The goals should be progressive and moderately aggressive, set at a level that is clearly beneficial and achievable. **Responsive to consumer needs:** The approach to standards should be consumer-friendly and facilitate compliance. The attribute-based approach ensures that the standards do not require radical changes in the available products or the product features that will be available to consumers. **Procompetitive:** All of the above characteristics make the standards pro-competitive. Producers have strong incentives to compete around the standard to achieve them in the least cost manner, while targeting the market segments they prefer to serve.

Given the success of the LEV program and its impact on the clean cars market, it is not surprising to find that, depending on the measuring stick one uses, **today's electric vehicles are on par with or ahead of where hybrids were at a similar stage of their development.**

- Electric vehicle sales certainly match those of hybrids in their early years on the market (see Exhibit 2).
- Moreover, the number of makes and models available today is larger than the number of hybrid makes and models that were available in the early years of the hybrid experience (see Exhibit 3).

Based on the historical experience of the hybrid, the targets set for the ZEV program are certainly achievable, but it would be a mistake to forget that the hybrid success was aided by the forward looking regulation of the LEV states.

The decision of the executive branch agencies of the Clean Cars states to embrace the ZEV program represents a leadership decision that is not only consistent with the extensive research literature and the experience in the LEV program, it is consistent with broad popular support for policies to promote greater energy efficiency of vehicles and state level action to reduce auto emissions.[82]

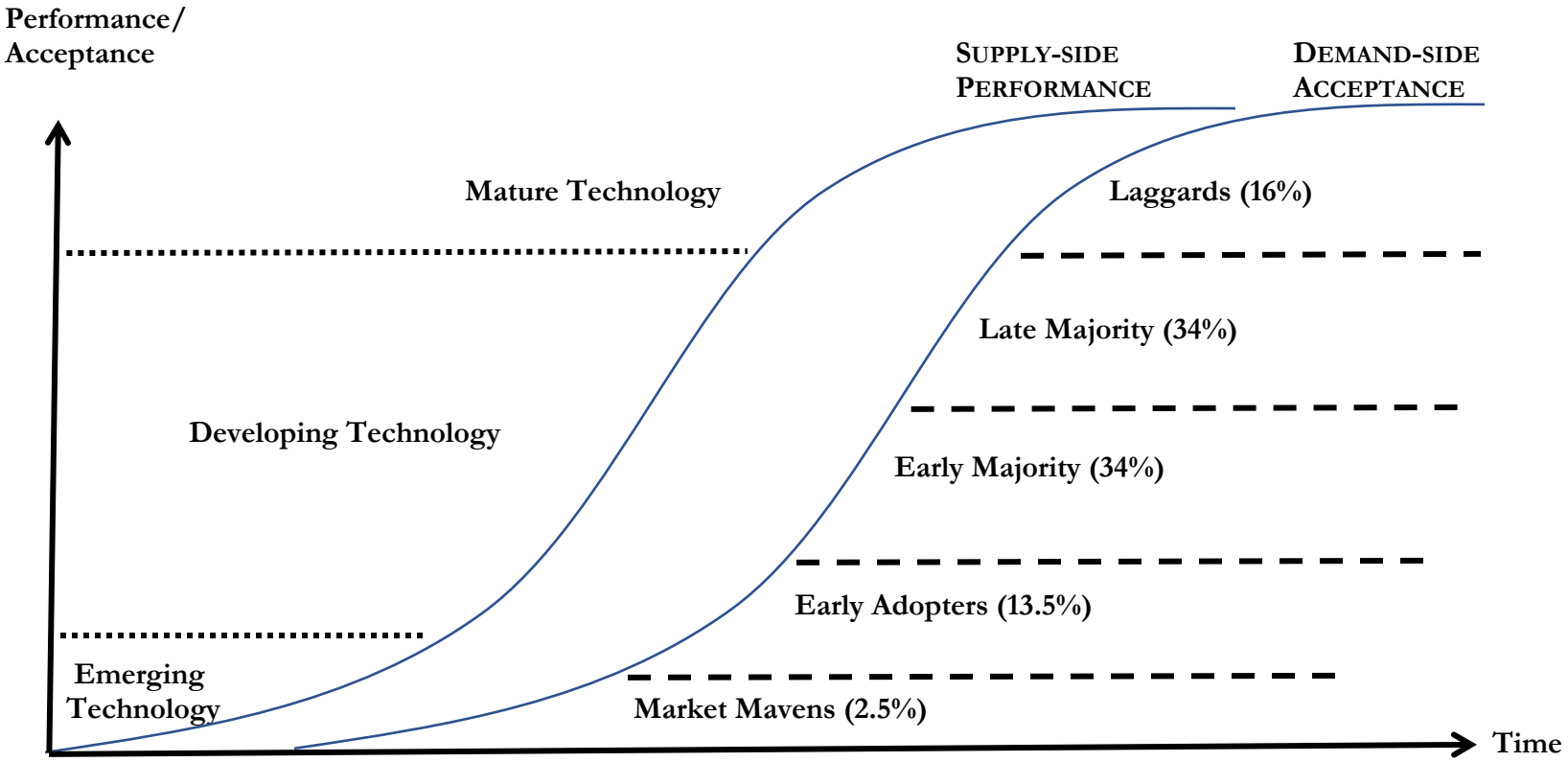
Eight states representing a quarter of the U.S. auto-buying market are joining forces to push for more zero-emission vehicles (ZEVs). Their goal: to get 3.3 million of these clean vehicles on the road by 2025. Governors from California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island and Vermont are pledging to take specific steps to promote the use of electric cars and trucks, plug-in hybrids, and hydrogen-powered vehicles. The governors have pledged to include these vehicles in their public fleets, and to create new incentives to promote ZEVs. They have promised to promote lower electricity rates for home vehicle-charging systems, develop common standards for roadway signs and charging networks, and harmonize building codes to make it easier to build new electric-car charging stations.

These actions, taken in the eight states across the country, will help accelerate the growth of the national market for the latest clean and efficient cars. It's clear that more and more Americans want to do exactly that. Moreover, the commitment to accelerate the sales of electric vehicle is exactly what U.S. automakers need to get an edge in the 21st century auto market.

U.S. automakers were in the rear guard of the hybrid revolution and the failure of the industry to recognize the need to innovate proved to be catastrophic. A failure to recognize the importance of electric vehicles could again be disastrous. **Analysts project that the global plug in electric market will grow over ten times as quickly as the total light duty market over the next decade.**[83] **U.S. automakers need to be in the vanguard of the electric vehicle market to be competitive in the global auto market and the ZEV program is a proven way to ensure that they are..**

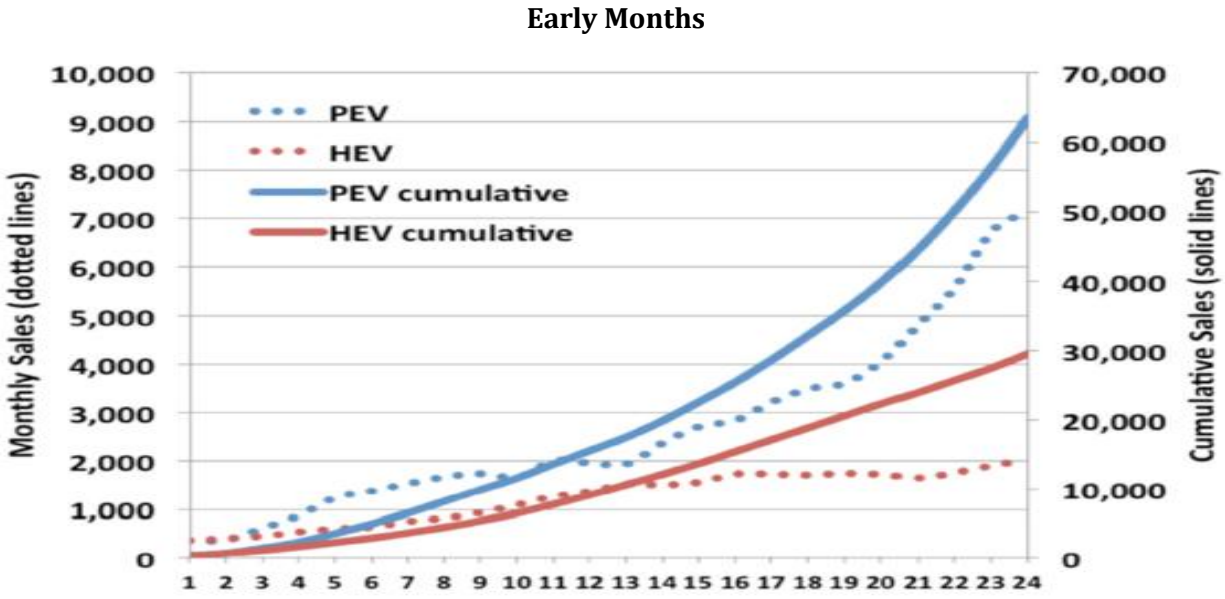
[82] Mark Cooper, *Rising Gasoline Prices And Record Household Expenditures: Will Policymakers Get Serious About Ending Our "Addiction To Oil" By Supporting A 60 Mile Per Gallon Standard?* (Consumer Federation of America, May 16, 2011).
[83] Dave Hurst and John Gartner, *Electric Vehicle Market Forecasts* (Navigant, 2013).

EXHIBIT 1: THE INTERACTION OF SUPPLY AND DEMAND IN THE CREATION/DIFFUSION OF INNOVATIVE TECHNOLOGIES

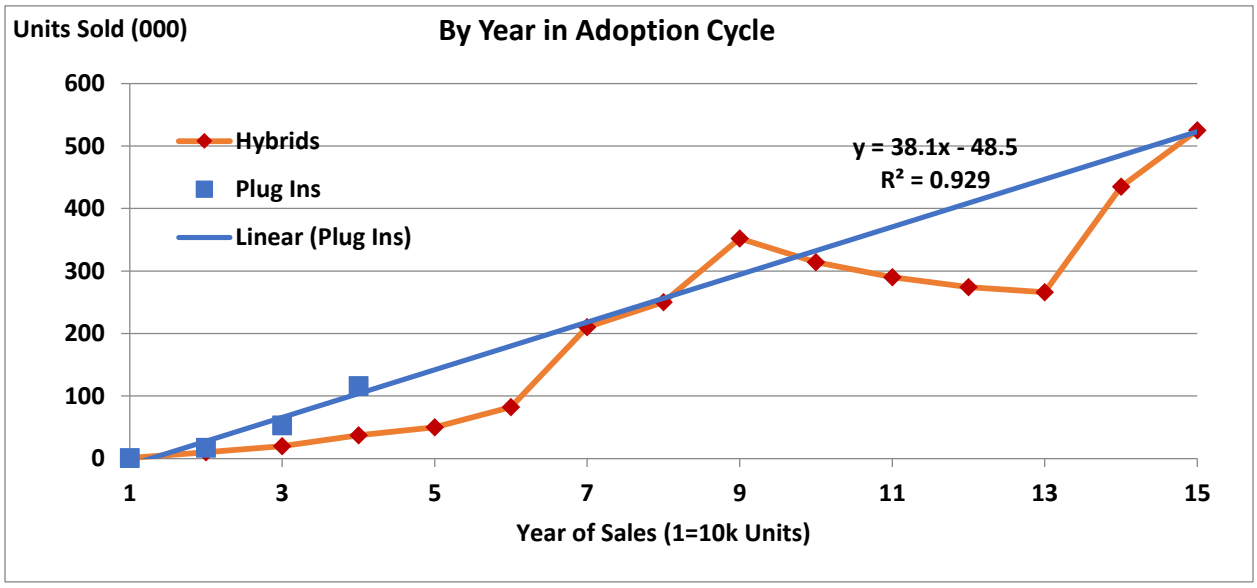


Sources: Mark Cooper, *Energy Efficiency Performance Standards: The Cornerstone of Consumer-Friendly Energy Policy* (Consumer Federation of America, October 2013, p. 50)derived from Mahajan, Vijay, Eitan Muller and Frank M. Bass,1990, "New Product Diffusion Models in Marketing: A Review and Directions of Research," *Journal of Marketing,* 54; Rick Brown, "Managing the "S" Curve of Innovation," 1992, *Journal of Consumer Marketing;* Fenn, Jackie, 1995, *When to Leap on the Hype Cycle,* Gartner Group; Paul Gilder and Gerard J. Tellis, 1997, "Will it Ever Fly? Modeling the Takeoff of Really New Consumer Durables," *Marketing Science,* 16: 3, "Growing, Growing Gone: Cascades, Diffusion, and Turning Points in the Product Life Cycle," *Marketing Science,* 23: 2 (2004); Kohli, Rajeev Donald R. Lehman and Jae Pae, 1999,"Extent and Impact of Incubation Time in New Product Diffusion, *Journal of Product Innovation Management,* 16; Osawa, Yshitaka and Kumiko Miazaki, 2006, "An Empirical Analysis of the Valley of Death: Large Scale R&D Project Performance in a Japanese Diversified Company," *Asian Journal of Technology Innovation,* 14:2; Sood, Ashish, et al., 2012, "Predicting the Path of Technological Innovation: SAW vs. Moore, Bass, Gompertz and Jryder," *Marketing Science,* 31: 6; Gartner, 2013, *Interpreting Technology Hype.*

EXHIBIT 2: HYBRID ADOPTION COMPARED TO PLUG IN ELECTRIC VEHICLE ADOPTION

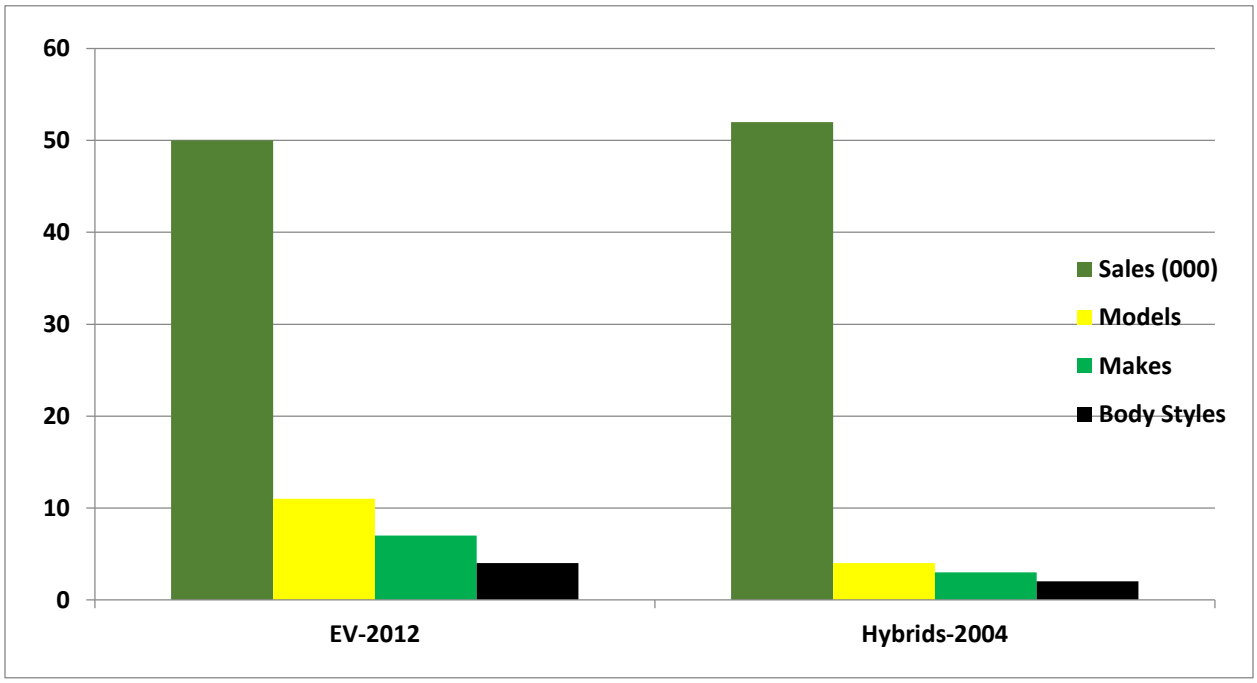


http://en.wikipedia.org/wiki/File:DoE_EV_Everywhere_Blueprint_p5.png



Source: Updated from Jack Gillis and Mark Cooper, *The Fuel Economy of 2013 Vehicles: A Fast Start toward the Goal of 54.5mpg in 2025* (Consumer Federation of America, April 2013). Based on Rudi Halbirght, Max Dunn, *Case Study: The Toyota Prius, Lessons in Marketing Eco-Friendly Products*, March3, 2010; http://www.hybridcars.com/hybrid-sales-dashboard/... Various years; J.D. Power, ,Mike Omotoso, *Global Alternative Fuel Light Vehicle Sales Forecast,* April 2010; J.D. Power and Associates - 2, *Despite Rising Fuel Prices, the Outlook for "Green" vehicles Remains Limited for the Foreseeable Future,* April 27, 29011, The Boston consulting Group, *The Comeback of the electric Car? How Real, How Soon, and What Must Happen Next?,* June 2011, Exhibit 5, from the "steady pace Scenario;" Electric drive vehicle sales figures (U.S. Market) - EV sales, http://www.electricdrive.org/index.php?ht=d/sp/i/20952/pid/20952.

FIGURE 3: EARLY DEVELOPMENT, MODELS, MAKES AND BODY TYPES: HYBRIDS V. NON-HYBRID ELECTRIC VEHICLES



Source: Updated from Jack Gillis and Mark Cooper, *The Fuel Economy of 2013 Vehicles: A Fast Start toward the Goal of 54.5mpg in 2025* (Consumer Federation of America, April 2013). Based on Rudi Halbirght, Max Dunn, *Case Study: The Toyota Prius, Lessons in Marketing Eco-Friendly Products*, March3, 2010; http://www.hybridcars.com/hybrid-sales-dashboard/... Various years; J.D. Power, ,Mike Omotoso, *Global Alternative Fuel Light Vehicle Sales Forecast,* April 2010; J.D. Power and Associates - 2, *Despite Rising Fuel Prices, the Outlook for "Green" vehicles Remains Limited for the Foreseeable Future,* April 27, 29011, The Boston consulting Group, *The Comeback of the electric Car? How Real, How Soon, and What Must Happen Next?,* June 2011, Exhibit 5, from the "steady pace Scenario;" Electric drive vehicle sales figures (U.S. Market) - EV sales, http://www.electricdrive.org/index.php?ht=d/sp/i/20952/pid/20952.

Knowledge Affects Consumer Interest in EVs, New EVs Guide to Address Info Gap

New Survey Shows Nearly One-Third Are Willing to Consider Buying an EV for their Next Car

October 29, 2015 | Press Release

Washington, D.C.—In a survey released today by the Consumer Federation of America (CFA), most Americans (54 percent) have a positive view of electric vehicles (EVs). While 33 percent of the respondents had no opinion, only 13 percent had a negative view of EVs. More significantly, almost one-third (31 percent) say they will consider buying an EV in their next car purchase even though, at this early stage, only one percent of vehicles sold are EVs. "While the current market penetration of EVs is small, there are currently 12 automakers currently offering a wide variety of EVs, so these consumers already have choices," said Jack Gillis, CFA's Director of Public Affairs and author of **The Car Book** and the new *Snapshot Guide to Electric Vehicles*.

Not surprisingly, the survey revealed that the more Americans know about EVs, the more likely they are to consider this purchase. However, only a little over a quarter of respondents say they know a great deal (6 percent) or a fair amount (21 percent) about EVs at this early stage of EV marketing and sales. "Clearly, there is a tremendous opportunity for EV sellers to take advantage of this interest as long as they engage in the same effective marketing that has moved millions of gas powered vehicles," said Mark Cooper, CFA's Director of Research.

"Our research shows a clear, statistically significant, correlation between knowledge about EVs and positive attitudes towards EVs. The more one knows about EVs, the more positively one feels about these vehicles," said Cooper.

"Furthermore, there is a statistically significant correlation between positive attitudes about EVs and a willingness to purchase them—those who feel positively about EVs are more likely to consider purchasing one," said Cooper.

About the EV Guide

"As the auto and tech industries pour millions and millions into the refinement of EVs, the American consumer is poised to bring those EVs home and plug them in," said Gillis. Research demonstrates not only a strong general interest in EVs, but a correlation of that interest with EV knowledge. In order to improve consumer understanding of EVs, CFA's Jack Gillis, author of **The Car Book**, is releasing *The Car Book's Snapshot Guide to Electric Vehicles*.

"Our goal is to expose the public to the options available and thereby increase interest in learning more about these vehicles. With battery prices coming down, disruptive innovators like Tesla and Apple entering the EV market, and consumers looking for ways to reduce their dependence on the gas pump, there is no question that EVs are poised to become the next big thing in the automotive marketplace," said Gillis. **The Snapshot Guide to Electric Vehicles** provides an overview of the key features of the 2016 model EVs allowing

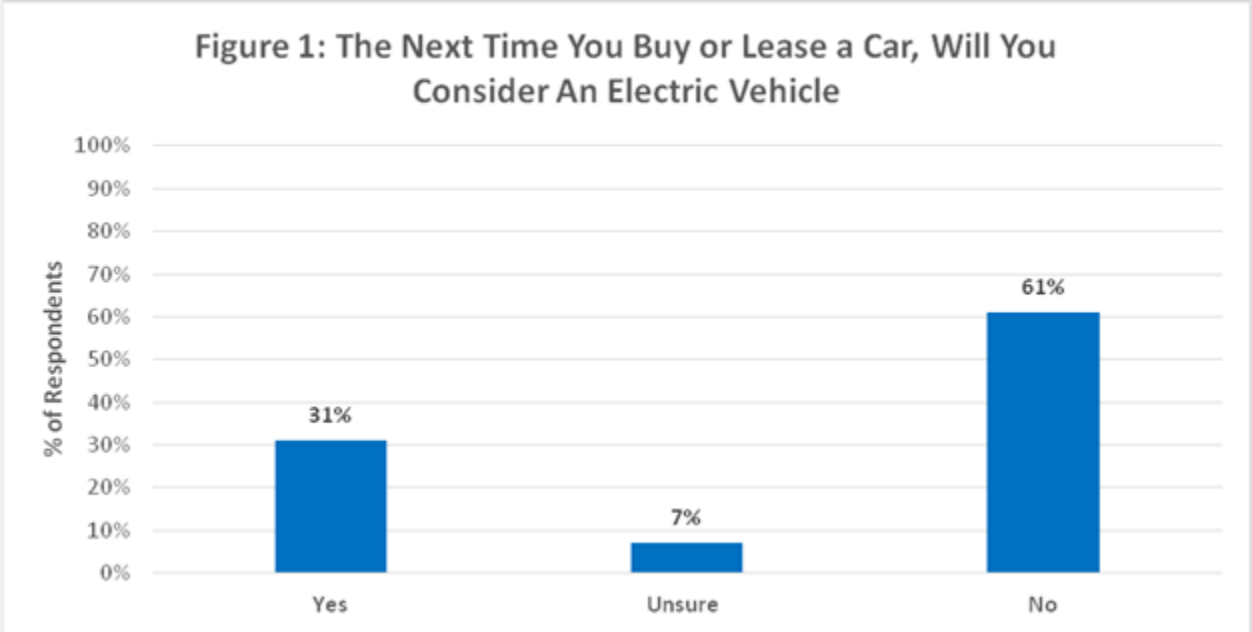
consumers to readily compare the mileage, range, and charging types available among the new models. The guide is designed to improve consumer knowledge and understanding of EVs as well as provide a comparative road map to the choices available for 2016. The guide is available here.

In addition to the main findings of the survey, the data shows that wealthier respondents and those with more education said they knew more about EVs and were more likely to express an intention to purchase. Males state more knowledge, and older respondents and males were more likely to express the intent to purchase. "These demographic correlations are typical of new product adoption and portend a positive future for the EV market," said Cooper.

The following charts depict the major findings in the CFA survey. The survey was conducted for CFA by ORC International by cell phone and landline on August 20-23, 2015, using a representative sample of 1009 adult Americans. The survey's margin of error is plus or minus three percentage points.

Overall Interest in Purchasing an EV

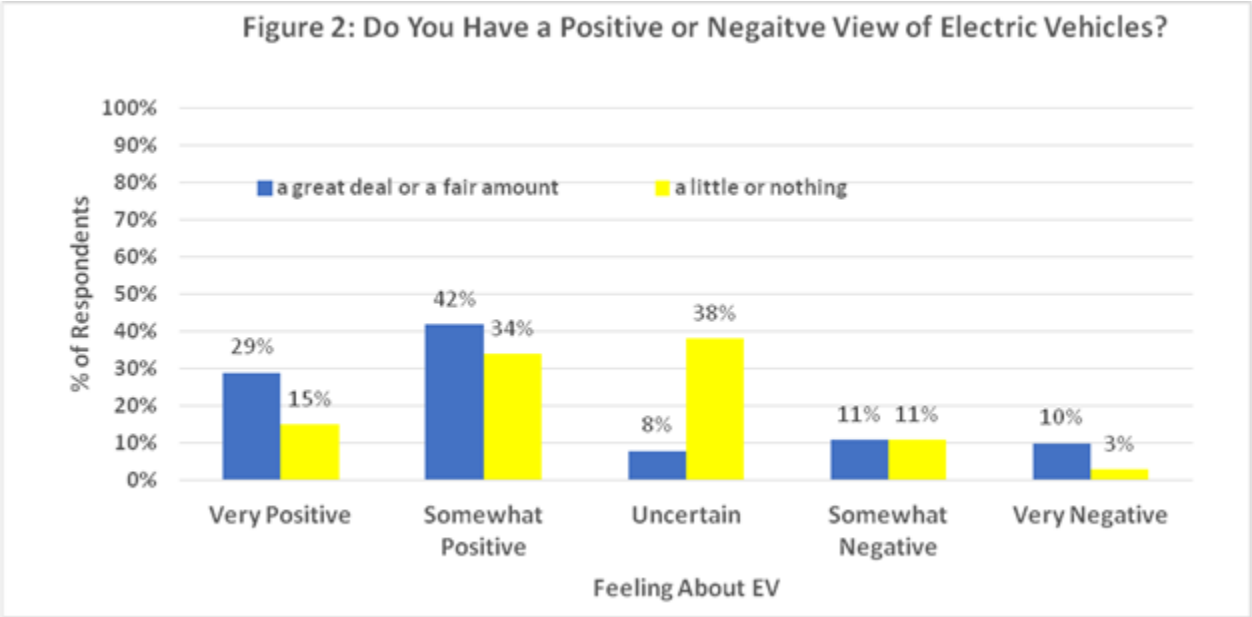
Overall, a surprising percentage of respondents are interested in purchasing an EV. This interest provides a catalyst for manufacturers to aggressively promote EVs and improve their designs.



How Does Knowledge about EVs Affect Attitudes Towards Them?

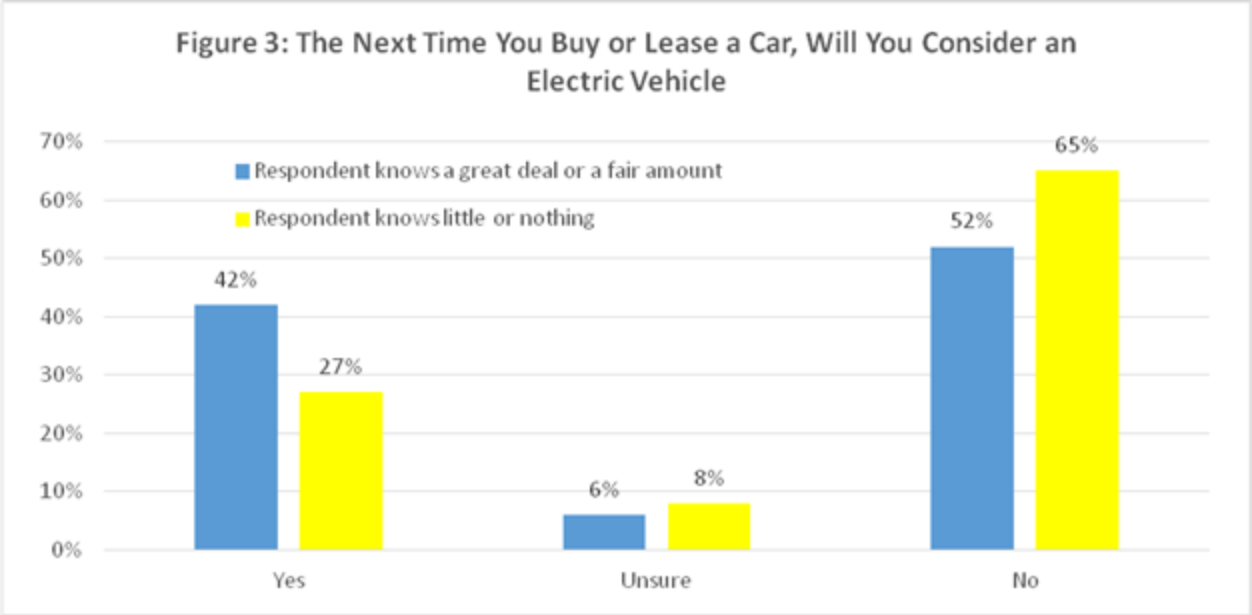
As Figure 2 shows, there is a correlation between consumer knowledge about EVs and their attitude towards them. While 71 percent of those that know about EVs have a "Very Positive" or "Positive" attitude about EVs, it is important to note that there is a remarkably high "Very Positive" or "Positive" attitude (49 percent) among respondents who indicated that they knew

little or nothing about EVs. While knowledgeable consumers have a more positive attitude towards EVs, there is a general attractiveness of EVs among consumers regardless of their EV knowledge.



The Impact of EV Knowledge on Potential Purchase Behavior

In further analyzing consumers' overall interest in buying an EV, we compared purchase desire between respondents more and less knowledgeable about EVs. We found a significant correlation between consumer understanding of EVs and their potential to purchase one. For consumers who understand "a great deal" or a "fair amount" about EVs, intention to purchase was much higher. This is strong evidence of the benefits for manufacturers who invest in promoting their EVs. Automakers are among the largest advertisers in the country; directing some of this investment towards EVs will clearly pay off in increased consumer purchases. Clearly, there is a benefit to consumers learning more about EVs.

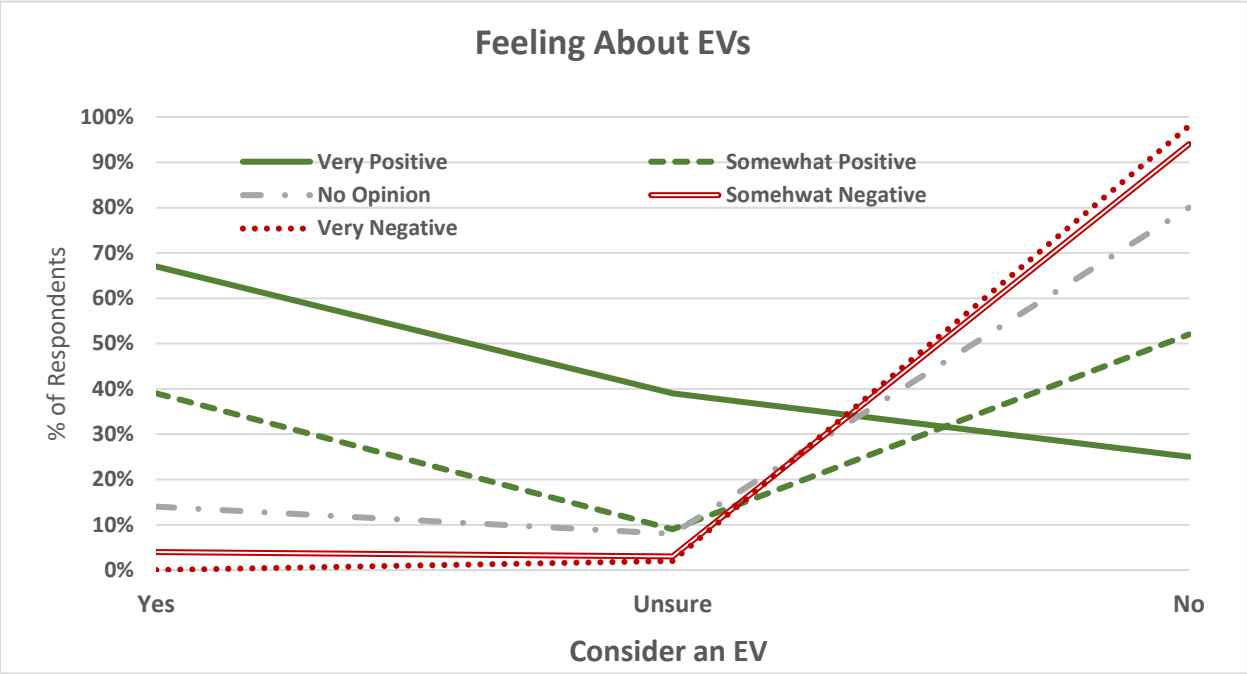


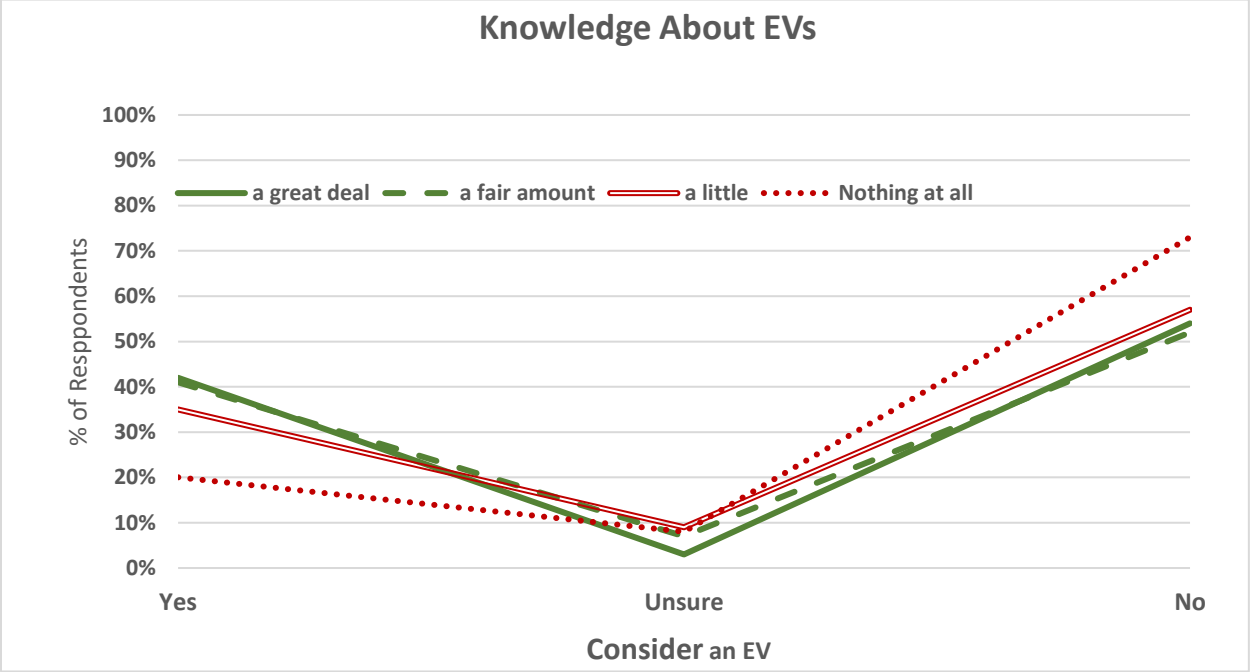
"Our research shows a clear, statistically significant, correlation between knowledge about EVs and positive feelings about EVs. Furthermore, there is a statistically significant correlation between positive feelings about EVs and a willingness to purchase these vehicles—those who feel positively about EVs are more likely to consider purchasing one of these vehicles," said Cooper (see Figure 4).

In addition to the main findings of the survey, the data show that wealthier respondents and those with more education said they knew more about EVs and were more likely to express an intention to purchase. Males state more knowledge and older respondents and males were more likely to express the intent to purchase. "These demographic correlations are typical of new product adoption and portend a positive future for the EV market," said Cooper.

The Consumer Federation of America is a national organization of more than 250 nonprofit consumer groups that was founded in 1968 to advance the consumer interest through research, advocacy, and education.

FIGURE 4: WILLINGNESS TO CONSIDER PURCHASING AN ELECTRONIC VEHICLE





Source: Consumer Federation of America survey conducted by ORC International by cell phone and landline on August 20-23, 2015.

New Data Shows Consumer Interest in Electric Vehicles Is Growing

Prices Are Down; Number of Models Is Up; Free New Guide to EVs Available as Year over Year Sales Increase

September 19, 2016 | Press Release

Washington, D.C. – Consumer interest in purchasing an electric vehicle (EVs) has increased in the past year, and this interest is greatest among young adults. That's according to the Consumer Federation of America's second annual survey on EVs. CFA also found that the number of EV choices on the market is increasing, while electric vehicle prices are becoming competitive with gas-powered vehicles. Overall, sales of EVs have significantly outpaced the sales of hybrids in their first years on the market. Currently, 2016 sales of EVs are on track to outpace 2015.

"Consumer interest in buying electric vehicles is growing at the same time these vehicles are becoming more available and more attractive," said Jack Gillis, CFA Director of Public Affairs and author of **The Car Book**. "It does not surprise us that electric vehicle sales have grown more rapidly in their first four years than did those of hybrid vehicles," he added.

For the second year, CFA commissioned ORC International to conduct a national survey on consumer attitudes toward EVs. A representative sample of 1,007 adult Americans was surveyed by cell phone and landline in late August. The survey's margin of error is plus or minus three percentage points.

The survey revealed growing interest in purchasing an electric vehicle, rising from 31 percent in 2015 to 36 percent in 2016. Among different age groups, young adults (18-34) are most interested, with a full 50 percent saying they would consider buying an electric vehicle.

The more consumers say they know about EVs, the greater their interest in purchasing one. Among survey respondents who consider themselves very knowledgeable about electric vehicles, 55 percent are interested in buying an EV. Among those who say they have no knowledge of EVs, only 22 percent are interested in buying one.

The survey also asked consumers, "**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?**" In response to this question, 57 percent said they would be interested in purchasing this EV. For those who say they know a lot about EVs, the figure was 62 percent. And for young adults, the figure was 70 percent.

"As the younger buyers enter the market, more attractive EVs are made available, and consumers learn more about these vehicles, interest in purchasing them is likely to grow significantly," said CFA's Gillis.

This survey question approximates the kind of vehicle that is expected to be available for consumer purchase in the very near future. The upcoming Chevrolet Bolt ($30,000)[1] and Tesla Model 3 ($27,500)[2] are expected to arrive on the market in 2017, and will match the criteria outlined in the question, with charging estimates via DC Fast Charge of one to two hours.

Consumer Guide to EVs Updated

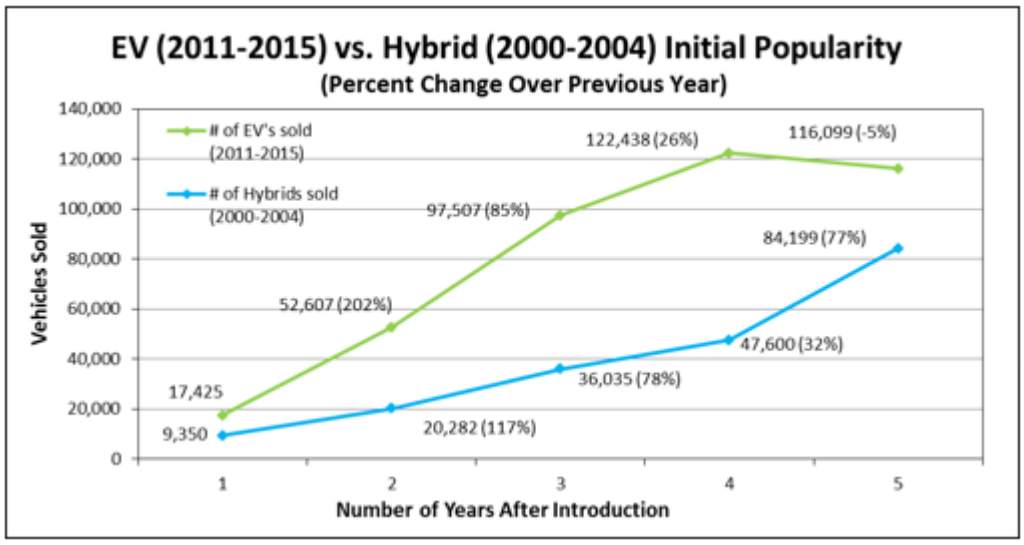
Because research demonstrates a correlation of interest in EVs with knowledge of EVs, CFA has updated its EV guide in order to improve consumer understanding of EVs. **The Car Book's Snapshot Guide to Electric Vehicles** is available for free on the ConsumerFed.org website.

"Our goal is to expose the public to the options available, and thereby increase interest in learning more about electric vehicles. With batteries becoming more efficient, an increasing number of choices entering the market, and prices becoming more affordable, there is no question that EVs are poised to disrupt the automotive marketplace," said Gillis.

The Snapshot Guide to Electric Vehicles provides an overview of the key features of 2017 model EVs, allowing consumers to readily compare the mileage, range, and charging types available among new models. The guide is designed to improve consumer knowledge and understanding of EVs, while providing a comparative road map to the choices available for 2016.

Electric Vehicles Are Off to a Faster Start than Hybrids

Introduced in 2000, the sales of hybrid vehicles (vehicles with dual power sources, typically electric and gas) have increased significantly since their introduction. Today, every manufacturer except Mazda offers a number of hybrid options in a variety of vehicle sizes. As the chart below shows, during their first four years, sales of EVs have outpaced the now popular hybrids.



“Consumers understand that low gas prices will not last forever, and these early adoption numbers for electric vehicles signal significant future growth in the market,” said Dr. Mark Cooper, CFA’s Director of Research.

Number of Electric Models Keeps Increasing

While lower gas prices may have dampened EV sales a bit in 2015, carmakers have increased their efforts to offer new, longer-range, and lower-priced EVs. This year, 13 car companies offer at least one electric option. Volkswagen is offering four models, while Ford, BMW, and Mercedes-Benz each offer three models. Of the major automakers, only Honda, Subaru, and Mazda do not currently offer an EV option.

As both carmakers and their suppliers make large investments in battery technology, there will be a record number of new models introduced in 2017. Table 1 shows a near steady increase in the number of EVs being offered over the past 6 years. Just six years ago there were only three EVs on the market. By 2016, there were 25 models on the market. Based on manufacturer projections, 33 different models should be available in 2017. Between BMW, Chevrolet, Hyundai, Mercedes-Benz, Tesla, and Volvo, six all-new EVs will be added including the much-anticipated Tesla Model 3, which already has over 400,000 pre-orders. The number of pre-orders for the new Tesla is higher than for any other car ever introduced.

Table 1: Number of Electric Vehicles Available by Year

Year	Plug-in Hybrids	Battery Operated EV's	Total Electric Vehicles
2011	1	2	3
2012	4	4	8
2013	8	8	16
2014	10	8	18
2015	8	8	16
2016	12	13	25
2017*	15	16	31

*Projected

“We doubt that automakers would be spending billions of dollars on EVs if they did not think they could sell them to consumers,” said Cooper.*Projected

EV Ranges Are Matching Household Driving Patterns

“Range anxiety” is a term that describes consumer concern about the possibility of an EV running out of electricity at a bad time. The good news is that – according to a study conducted by Consumers Union and the Union of Concerned Scientists in 2015 – about 70 percent of Americans drive less than 60 miles a day, which is within the range of most EVs. As Table 2 below indicates, 13 of the 25 2016 models – that is,

52 percent – have a range of over 60 miles. Four models – or 16 percent – get over 100 miles on a single charge; these include the BMW i3, Nissan Leaf SV/SL, Tesla Model S, and Tesla Model X. (Note: Table 2 considers vehicles' range using battery power only. Plug-in hybrids will have a longer range under gasoline power.)

Table 2: The Range of Electric Vehicles Among 2016 Models Using Battery Only

Range in Miles	2016
0-30	11
31-60	1
61-100	9
101-150	2
151-200	0
201+	2
Total	25

EVs Are Increasingly Price Competitive

In 2016, it is expected that Americans will buy over 17.1 million cars and light trucks, [3] with an average price of $33,560[4]. Today's EVs have become price competitive. While EVs do vary widely in price – from $23,000 for a Mitsubishi i-MiEV to over $136,000 for a BMW i8 – there are a number of vehicles whose prices are similar to those of the gas-powered version of the cars (see Table 3).

In looking at the typical cost of an electric vehicle, we conducted a one-to-one comparison for those EVs with a gas-powered version of the same vehicle. While some manufacturers, including Fiat and Kia, do charge significantly more for their EVs, others – including Ford, Smart and Volkswagen – have priced electric and gas-powered versions of the same model similarly.

To compare the costs between EVs and their gas powered counterparts, we considered the $7,500 federal tax credit currently offered, added the estimated cost of purchasing a Level 2 connection device and a 240 volt circuit for home charging. The connection charges are estimates, and could be mitigated by rebates from local utility companies or local tax credits. For example, Gulf Power in Pensacola, Florida, offers a $750 credit toward the costs of upgrading a home to accept a level 2 charger. Austin (TX) Energy will rebate 50 percent of the cost up to $1500 and many states offer tax credits. If longer charge times are acceptable, then Level 1 charging equipment comes free with the vehicle and simply plugs in to a regular electric outlet, requiring no additional investment.

"While the economics of EVs are becoming attractive to consumers, their 'high-tech' nature will also be an important factor in future purchase decisions," said Gillis.

Table 3: Cost Comparison of EV's to Their Gas Powered Counterpart			
Manufacturer	**Vehicle**	**Price (MSRP)[5] [6]**	**Annual Cost for Fuel[7] [8]**
Fiat	500 Lounge HB (Gas)	$19,856	$1,340
	500e (Electric)	$25,126	$522
	Difference	**$5,270**	**-$818**
Ford	Focus Titanium HB (Gas)	$22,073	$1,090
	Focus Electric (Electric)	$23,050	$576
	Difference	**$977**	**-$514**
Kia	Soul + (Gas)	$18,195	$1,257
	Soul EV (Electric)	$25,577	$576
	Difference	**$7,382**	**-$681**
Smart	ForTwo Proxy (Gas)	$18,480	$1,116
	ForTwo ED (Electric)	$18,500	$576
	Difference	**$20**	**-$540**
Volkswagen	Golf SE HB (Gas)	$24,217	$1,127
	e-Golf (Electric)	$21,685	$522
	Difference	**-$2,532**	**-$605**

[1] Includes $7,500 tax credit.

[2] Includes $7,500 tax credit. Currently, the tax credit only applies to the first 200,000 vehicle models. If the credit is not changed and these pre-orders hold, then have of these people will not get the $7500 tax credit.

[3] J.D. Power and LMC Automotive

[4] Kelley Blue Book

[5] Prices from the New Car Cost Guide

[6] Electric price includes $7,500 federal tax credit, typical level 2 power connector price of $600, and an estimated $750 for home installation of a 240 Volt receptacle.

[7]Based on typical driving of 15,000 miles per year.

[8] Cost of fuel for electrics is based on a national average of $0.12 kWh (according to EIA), and cost for gas is based on national $2.18 for regular and $2.68 for premium (according to AAA)

[i] A two variable regression model explains four-fifths or more of the variance, with all the coefficients significant and no problem of co-linearity. In a multiple regression model, the coefficient on standards is much larger and more highly significant. This is the case whether we use a short period of price history (five years of rising prices from 2002-2007) or a long period (21 years of prices 1986-2007). Regressions were also run with lags on the gasoline price variable of two and three years. There results were similar, with the gasoline price effect weaker.

CARS					TRUCKS				
21-year	β Coff.	Sig.	β Coeff.	Sig.	21-year	β Coff.	Sig.	β Coeff.	Sig.
Standard	.8958	****	.6284	****	Standard	.8932	****	.7017	****
Price	na		.3500	***	Price	na		.2507	***
R^2	.79		.85		R^2	.73		.82	
5-year					5-year				
Standard	.8483	****	.6510	****	Standard	.8985	****	.7001	****
Price	na		.3900	*	Price	na		.3116	**
R^2	.72		.78		R^2	.81		.86	

Sig. Levels: **** <.0001, *** <.001, ** <.01, <.1