BEFORE THE

DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration — **49 CFR Parts 523, 531, 533, 536 & 537 [NHTSA–2016–0068]**

ENVIRONMENTAL PROTECTION AGENCY — **40 CFR Part 86 [EPA–HQ–OAR–2015–0827; FRL–9966–62– OAR]**

Request for Comment on Reconsideration of the Final Determination of the Mid-Term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022–2025 Light-Duty Vehicles; Request for Comment on Model Year 2021 Greenhouse Gas Emissions Standards

COMMENTS OF THE CONSUMER FEDERATION OF AMERICA

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OCTOBER 5, 2017

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INTRODUCTION

A. The Consumer Federation of America

The Consumer Federation of America[1] appreciates the opportunity to provide comments to the Environmental Protection Agency and the National Highway Transportation Safety Administration on the Reconsideration of the Final Determination of the Mid-Term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022–2025 Light-Duty Vehicles as well as the Model Year 2021 Greenhouse Gas Emissions Standards (Docket ID No. EPA–HQ–OAR–2015–0827).

Throughout its 50 years of existence, CFA has been a vigorous and continuous participant in the process of setting regulations to improve the efficiency of energy-using consumer durables and lower the cost of energy borne by consumers.[2]

In the year since the publication of the Technical Analysis Report (TAR), CFA has filed comments on the fuel consumption of vehicles at the National Highway Traffic Safety Administration (NHTSA),[3] the Environmental Protection Agency (EPA),[4] EPA and NHTSA acting jointly,[5] the Department of Transportation (DOT)[6] and the California Air Resources Board (CARB).[7] In addition we have testified before the Committee on Energy and Commerce on the Midterm Review and an Update on the Corporate Average Fuel Economy Program and Greenhouse Gas Emissions Standards for Motor Vehicles[8] and the CARB.[9]

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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://consumerfed.org/issues/energy/) provides links to 140 pieces of testimony and reports published in the past ten years dealing with the efficiency of energy-using consumer durables divided roughly equally between appliances and vehicles.

[3] Comments of the Consumer Federation of America, Notice of Intent to Prepare an Environmental Impact Statement; Request for Scoping Comments, before the National Highway Transportation Safety Administration, Department of Transportation, Docket No. NHTSA-2017-0069, September 25, 2017 (hereafter, CFA NHTSA EIS Comments).

[4] Comments of the Consumer Federation of America, In the Matter of Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation, before the Environmental Protection Agency, EPA-HQ-OAR-2015-0827, December 30, 2016 (hereafter CFA Determination Comments);

[5] Comments of the Consumer Federation of America, Evaluation Draft Technical Assessment Report for Model Year 2022–2025 Light Duty Vehicle GHG) Department of Transportation Emissions and CAFE Standards, EPA– HQ–OAR–2015–0827; NHTSA–2016 0068; FRL–9949–54–OAR RIN 2060–AS97; RIN 2127–AL76, September 26, 2016 (hereafter CFA TAR Comments).

[6] Comments of the Consumer Federation of America, in the Matter of Transportation Infrastructure: Notice of Review of Policy, Guidance and Regulation, before the Department of Transportation, Docket No. Ost-2017-0057, July 24, 2017 (hereafter, CFA DOT Infrastructure Comments).

[7] Comments of the Consumer Federation of America on the California Air Resources Board *Mid-Term Review*, before the California Air Resources Board, March 24, 2017 (here after, CFA CARB Comments).

[8] Testimony of Dr. Mark Cooper 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 (hereafter, CFA Mid-term Congressional Testimony).

[9] Statement of Jack Gillis, U.S. Environmental Protection Agency on the Reconsideration of the Final Determination of the Mid-term Evaluation of Greenhouse Gas Emissions Standards for Model Years 2022-2025

While this is an unusual amount of regulatory activity, it should come as no surprise for two reasons, as these comments show.

First, transportation fuels, the source of energy most directly affected by NHTSA/EPA regulations, are a major household expenditure, representing over 3 percent of total expenditures, one of the 6 largest subcategories listed in the Consumer Expenditure Survey.[10] Factoring in indirect expenditures on fuels consumed by commercial fleets,[11] which consumers pay for in the price of goods and services, would push transportation fuel consumption above 5% of household expenditures making it the third or fourth largest household expenditure.[12] Thus, transportation fuel costs are one of the largest consumer pocketbook issues policy makers confront.

Second, the National Program for reducing gasoline consumption and emissions of pollutants from vehicles ushered in unprecedented cooperation and coordination between the leading agencies responsible for setting federal (NHTSA, EPA) and state policy (CARB) under the newly enacted Energy Independence and Security Act, signed into law by President Bush in 2007. This legislation, combined with the executive action to urge the agencies to cooperate has yielded the largest improvement in fuel economy in the nation's history, massive consumer pocketbook savings, and improved economic performance, not to mention reductions in the emissions of pollutants that harm the environment and public health, as described below.

B. Outline

The analysis in our comments and testimony since the publication of the TAR provide the basis for our conclusions and recommendations in these comments. They are incorporated into these comments in the following manner.

First we present an overview of our findings and recommendations.

Second, we present a brief answer to each of the issues raised in the Notice about which we have conducted research and analysis. At the end of our responses, we give section and page references to the specific documents, which are provided as attachments. Although many of the documents make similar points (having been filed at different agencies for different regulatory purposes), we attempt to avoid redundancy and provide direct citations to the most recent or complete discussion in the underlying documents.

Light-duty Vehicles, Environmental Protection Public Hearing, Washington DC, September 6, 2017 (hereafter CFA EPA Reconsideration Testimony).

[10] The most recent version available from the Bureau of Labor Statistics covers 2016.

[11] Mark Cooper, *Paying the Freight,* Consumer Federation of America, attached to CFA Comments *Re: Department of Transportation Notice of Intent to Prepare an Environmental Impact Statement for New Medium- and Heavy-duty Vehicle Fuel Economy Standards*— August 8, 2014

[12] https://www.bls.gov/cex/22016/midyear/quintile.pdf. Adding appliance efficiency standards, which are governed by a structure of legal authority and administrative rules similar to that affecting appliances doubles the level of household expenditures and makes regulatory reform one of the largest consumer pocketbook issues for the Trump or any administration.

CONCLUSIONS

Considering the consumer pocketbook impact as a key aspect of the National Program's remarkable success, the determination by EPA and the CARB to continue the National Program as adopted in 2012, was well-founded on policy and legal grounds. The EPA final determination, should not have been pulled back for reconsideration, since the careful analysis done by the three agencies showed that the National Program has overwhelmingly positive benefits.[13]

Although NHTSA was required by statute to conduct an *de novo* rulemaking, the other agencies were not and the evidence developed in the TAR, the final determination and the contemporaneous California analysis,[14] overwhelmingly supported continuation of the program, which they recommended.

Our analysis over the year since the publication of the TAR shows the following:

- The National Program standards have a benefit cost ratio greater than 6-to-1, and
- At a breakeven cost of gasoline of $0.75 per gallon, which means that as long as gasoline stays above $0.75 per gallon, the standards are justified.
- Thus, the record and current economic conditions suggest that, if the agencies want to change the levels, they should be raised, not lowered.

Rolling back the 2021 standards and freezing the 2022-2025 standards would do great harm to consumers, the economy and the nation: A rollback would:

- Rob consumers of net savings of over $4,500 per household,
- Prevent a reduction in operating costs of $150 billion,
- Undermine $150 billion of macroeconomic growth, and
- Forego over $50 billion in environmental, health and other benefits.
- The total of $350 billion of benefits foregone would yield automaker savings of only $50 billion., for a severely negative benefit cost ratio of -6-to-1.

Consistent with the long history of fuel economy standards, automakers' efforts to implement the standards show that the cost of compliance has been below the NHTSA/EPA projections and far below inflated industry estimates.

- The standards are well within the technological frontier of the industry as analyzed not only by NHTSA/EPA/CARB, but also MIT and the National Academy of Sciences.

[13] This summary is drawn from the CFA NHTSA EIS Comments, pp. 2-3.

[14] California Environmental Protection Agency Air Resource Board, California's Advanced Clean Cars Midterm Review: summary Report for the Technology Analysis of the Light Duty Vehicle Standards, January 18, 2017.

- The rate of improvement is consistent with historical periods where standards were implemented.
- The standards are consistent with (or slightly below) other advanced industrial nations.
- Fuel economy pays for itself in a market where it has taken on much greater importance to consumers. As a result, fuel economy sells.
- With a gradual, but steady approach, developing new models to meet the standards and consumer needs has been evident in the marketplace and automakers have not only been complying with the standards, but exceeding them.

Given these two conclusions, i.e. the enormous benefit-cost ratio and the automakers ability to meet the standard, the rollback and/or freeze violate the statutes that charge the agencies with achieving maximum feasible energy savings/pollution reduction and the Executive Branch guidance the requires agencies to adopt rules that comply with the statutes and achieve maximum net benefits, as discussed below.

RECOMMENDATION

Consistent with the massive amount of evidence in the record, the cooperative nature of the overall undertaking, the statutes charging EPA with the task of ensuring maximum reduction in pollutants, and NHTSA with achieving maximum energy conservation, and the law and guidance governing agency action, EPA should affirm its original determination that the standards set by the National Program should remain in place. NHTSA should concur.

We believe that the decision to reconsider the final determination was ill-considered, if not illegal. We believe that the full record of this proceeding, stretching back to 2012, and including the cooperative document issued last September and the final determinations properly issued by two of the three cooperating agencies make it clear that there is no justification for a lowering of the standards.

We reached roughly the same findings and conclusions in our initial comments on the TAR (see Attachment 1). To the extent that further analysis modifies these findings and conclusions, (as outlined in other attachments) they refine, extend and strengthen our initial findings and recommendations for the mid-term review.

ISSUES RAISED IN THE NOTICE

In its requests for comments, the U.S. EPA, the documents 40 CFR 86.1818-12(h) and 40 CFR 86.1818-12(h)(1)(viii), asked for a response to a series of questions. The Consumer Federation of America is providing a brief response and reference to our submission which addresses many of those questions.

In the following discussion, the citations are identified as follows: the Attachments to our comments, followed by the document title, the section title and the page number within the document.

THE AVAILABILITY AND EFFECTIVENESS OF TECHNOLOGY, AND THE APPROPRIATE LEAD TIME FOR INTRODUCTION OF TECHNOLOGY;

Response

The performance of the industry to date shows a clear ability to meet the standards, in large measure because of the reforms in the CAFE program introduced by the Energy Independence and Security Act signed in to law by President Bush, the decision of President Obama to encourage cooperation between federal and state agencies, and the adoption of an effective regulatory model. The performance standards are a good example of "command-but-not-control" regulation that sets a goal and lets market forces drive least cost solutions. They respond to numerous clear market imperfections in a flexible manner. This approach has been applied not only to light duty vehicles, but more broadly to heavy duty trucks.

Because the standards set a moderate path for improvement in fuel economy/emissions, along a path that is technology and product neutral, producers can meet the standards in the manner that best suits their abilities. Because the standards are attribute-based, there is no pressure to build any specific vehicle and the needs of consumers are met in the marketplace.

Automakers have not only met the standards, but they are well ahead of the targets. They have brought low cost, high efficiency technologies into the market that were not considered "on the shelf" just five years ago.

The commitment of resources for research and development of electric vehicles has accelerated rapidly, far beyond the level anticipated by the standards. Automakers are competing vigorously to announce a wide array of electric vehicles to be brought into the market well within the time frame of the National Program. These will be a game changer for meeting standards as they enter the market.

Citations

ATTACHMENT F: CFA TAR Comments, Summary and Findings, at p. 2, Market imperfections, at p. 6;

ATTACHMENT C: CFA DOT Infrastructure Comments, Appendix A, Performance Standards, An Effective "Command-But-Not- Control" Approach, at p. 17

ATTACHMENT F: CFA TAR Comments, Heavy Duty Trucks, at p. 18.

ATTACHEMENT C: CFA DOT Infrastructure Comments, Appendix B: An Analysis of Consumer Savings and Automaker Progress on the Road to 2025 CAFE Standards, at p. 58

ATTACHMENT A: CFA House Testimony, Market Imperfections and the Need for Standards, at p. 6

THE COST ON THE PRODUCERS OR PURCHASERS OF NEW MOTOR VEHICLES OR NEW MOTOR VEHICLE ENGINES;

Response

Policy analysis must consider costs and benefits. It is overwhelmingly clear in the case of light duty vehicle standards that benefits far exceed costs. Maximum benefits (or pollution savings) are the goal under the statue and maximum net benefit is the overall goal of rulemaking, not just cost minimization.

Moreover, the costs of compliance are declining, which is consistent with the historical pattern of regulatory compliance. The entrepreneurial behaviors and market forces unleashed by "command-but-not-control" regulation has resulted in compliance costs that are a fraction (half to one-third) of the estimates in the regulatory analysis. They are a much smaller fraction of the extremely inflated estimates routinely put forward by the industry. The initial experience under the National Program exhibits this characteristic and projections for the future suggest the process will continue to unfold, so that the final cost of compliance will be at least 30% less than the initial estimate.

Citations

ATTACHMENT C: CFA DOT Infrastructure Comments, Appendix A: III. The Benefit-Cost Analysis of Fuel Standards, at p. 25.

THE FEASIBILITY AND PRACTICABILITY OF THE STANDARDS

Response

The rate of improvement under the National Program has been quicker than at any time in the history of fuel economy standards. Automakers are exceeding the early targets. The technical analysis shows a continuing array of options that can meet the standards going forward. The rapid development and plans for electric vehicles make compliance easier than had been anticipated.

Citations

ATTACHMENT C: CFA DOT Infrastructure Comments, Automaker Response to Higher Standards, at p. 4, Conclusion at p. 6.

ATTACHEMENT A: CFA NHTSA EIS Comments, Declining Cost and Expanding Options Have Led to Easy and Early Supply-Side Compliance, The Proposed Standards are Well Within the Reach of The Industry, at p. 10.

The impact of the standards on reduction of emissions, oil conservation, energy security, and fuel savings by consumers;

Response

The impacts of fuel economy and environmental standards for vehicles have a tightly linked set of benefits that are inextricably and inevitably linked. Fuel savings dominate because they have a direct impact on consumer pocketbooks, which yields additional benefits in the macroeconomy, and national energy security, while also being the least cost approach to reduction of emissions of a variety of pollutants. Simply put, the impact conforms to the laws of physics and economics.

The agencies estimate that the standards will lower consumption, saving billions of gallons of fuel.

Because the value of fuel savings vastly exceeds the cost of the technology needed to reduce consumption, the total cost of driving is reduced. Consumers end up with more disposable income.

Because many of the goods and services they choose to purchase with this increased disposable income have a higher economic multiplier effect than spending it on fuel consumption, the net reduction in driving costs provides an economic stimulus (a multiplier).

The reduction in fuel consumption also lowers the emissions of a variety of pollutants, contributing to reduced environmental damage and improved public health.

The magnitude of these benefits can be monetized and converted to benefit cost ratios for purposes of comparison. The benefit cost ratios (using a 3% discount rate, which we show is the appropriate discount rate for consumers[15]), are as follows:

Direct Pocketbook	2.56
Macroeconomic	1.56
Environmental	1.14
Total	5.26

The total value of benefits is about $200 billion against a cost of $36 billion. Those costs are almost certainly too high. Moreover, the analysis treats the rebound rate incorrectly. The rebound should be added to the consumer pocketbook value of the benefits, since it represents an increase in consumer welfare. Consumers just happen to decide to spend some of their

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pocketbook gains on purchasing more gasoline. Of course, the rebound value should not be added to the national security, macroeconomic, or environmental benefits, since the negative aspects of energy consumption that affect these outcomes are present. Adjusting the estimates for the higher value of pocketbook savings and lower cost of technology, would push total benefits to $240 billion against costs of just under $26 billion for a benefit cost ration of over 9-to-1.

Citations

ATTACHMENT E: CFA Determination Comments, The Bottom Line for Consumers and the Nation, at p. 9.

ATTACHMENT C: CFA DOT Infrastructure Comments, Appendix A: IV. Macroeconomic Benefits, at p. 32; VI. Quantitative Analysis, at p. 44.

THE IMPACT OF THE STANDARDS ON THE AUTOMOBILE INDUSTRY;

Response

As shown above, the standards lower the total cost of driving and that increase in disposable income stimulates economic growth. Both of these factors increase the demand for transportation services, including new vehicles. NHTSA/EPA have reached this conclusion in their long run analyses. This result occurs when reasonable costs of technology, consistent with history and projections of third parties, are used.

Another important factor to consider in assessing the impact of standards on the U.S. auto industry is the global industry. It is no longer possible for automakers to be successful without being competitive in the global industry. They need to be able to sell fuel efficient cars abroad, to spread the cost of technology across a larger volume of sales. They need to be able to compete against imports coming into this nation. The standards are consistent with (slightly lower than) the standards being adopted by other nations. They do not pose a threat to the industry in that regard. On the contrary, they help the industry remain competitive by putting a floor under the fuel economy of the fleet.

In terms of sales, since the 2012 CAFE standards went into effect, auto sales have hit record sales in multiple years, with over 17.5 million vehicles sold in the U.S. last year. Over this same time period, the market share of SUV's, crossovers and light trucks has grown from only 40% of sales to over 50%, helping drive record automaker profits thanks to the higher selling price compared to cars. Thanks, in part to CAFE standards, sales of larger vehicles have increased as their fuel economy has increased. Lastly, automakers have been doing increasingly better at meeting the CAFE standards, with 88% of manufacturers equaling or improving their compliance in 2017 compared to 2015, while at the same time selling 6% more vehicles.

Citations

ATTACHMENT E: CFA Determination Comments, Discount rates and internal rate of return, at p. 10

ATTACHEMENT A: CFA NHTSA EIS Comments, III. Declining Cost and Expanding Options Have Led to Easy and Early Supply-Side Compliance, at p. 10.

ATTACHMENT D: CFA CARB Comments, Attachment II: CFA's Electric Vehicle Analysis, at p. 60.

THE IMPACTS OF THE STANDARDS ON AUTOMOBILE SAFETY;

Automobile safety is a result of a wide variety of factors including driver behavior, differences in vehicle occupant protection, road conditions, automatic crash avoidance features, and the vehicle mix within the fleet (vehicle size, weight, and design characteristics). Because of the unique nature of this particular regulation, namely using vehicle footprints as the driving factor in the requirements for a particular vehicle, there should be little impact on safety. The standard does not force the manufacturers into particular vehicle types or sizes in order to comply with the regulations. This happens to be one of the most elegant aspects of this standard and one of the strongest rationales for keeping it in place. It eliminates the potential of forcing manufacturers into manufacturing smaller, lighter vehicles, which may not fare as well in collisions with larger heavier vehicles. Changes in the vehicle mix will not be driven by the standards, but by the market itself. Furthermore, the industry is rapidly deploying automated crash avoidance technology in all vehicle classes and sizes which will mitigate accidents regardless of the vehicle's fuel efficiency.

The impact of the standards on compliance with other air quality standards;

As shown in the above responses, standards pay for themselves several times over. Each of the major categories of benefits (pocketbook, macroeconomic and environmental/public health) pays for itself on a standalone basis, but the economic benefits are larger and the consumer pocketbook benefits are the largest. This makes the environmental/public health benefits "free." Therefore, reducing energy consumption is almost certainly the least cost way to reduce emissions of pollutants.

Even though they are "free" they are important. Transportation is now the leading source of carbon emissions in the U.S.[16] It is among the leading causes of carbon monoxide, particulate, nitrogen oxides and VOC. Obviously, light duty vehicles are only a part of the total and the emissions of pollutants are complex. All the individual sources add up to the total problem and the only way to "solve" the problem is to reduce emissions from all sources. No one source can address the problem.

The monetization of security benefits receives less attention than the environmental benefits. NHTSA has generally placed a small number on these benefits, but that is beside the point, since these benefits impose no additional cost on society, when either the energy consumption or environmental benefits are captured.

It would be foolish, in the extreme, to not to take the "free" reduction as part of the solution. The most rational approach prefers least-cost approaches to pollution reduction. Given the nexus of economic, security and environmental benefits, the standards have delivered extremely low cost benefits on the environmental and security externalities.

[16] https://www.eia.gov/tools/faqs/faq.php?id=75&t=11

Since the 2012 CAFE went into effect, auto sales have hit record sales in multiple years, with over 17.5 million vehicles sold in the U.S. last year, in the face of reasonable increases in fuel efficiency standards. In addition, the record sales have been accompanied by record increases in CAFE compliance.

The most significant impact of the standards on the industry is related to consumer desire for fuel efficiency. SUVs, pickups and crossovers, whose MPGs (miles per gallon) increased by over 10% between 2011 and 2016, had a 59% increase in sales. On the other hand, those same vehicles with less than a 10% increase in MPGs from 2011 to 2016 only experienced a 41% increase in sales, almost 20% less. The fuel efficiency increases resulting from the standards, helped manufacturers sell more vehicles.

THE EXTENT TO WHICH CONSUMERS VALUE FUEL SAVINGS FROM GREATER EFFICIENCY OF VEHICLES;

Response

Consumers value fuel efficiency and automakers have discovered that fuel economy sells. The industry was slow to recognize this in the 2000s and the great recession found them with acres and acres of gas guzzlers that they could not sell. Slashing prices and profits to move the inefficient metal proved to be an insufficient response for two of the big three automakers.

Our analysis shows that consumers do demand efficiency. They rate it more highly than many of the attributes automakers claim consumers want, even in the automakers own surveys. Our survey results over the last decade have shown overwhelming support for fuel efficiency standards, as well as great concern about fuel costs, and the U.S. dependency on foreign oil. Starting in 2007, consumer support for federal fuel economy standards stood at 55%; by 2013 this had risen to 85% and has stayed roughly steady through our most recent poll in the summer of 2017. Support for the standards, in spite of recent low gas prices, show consumers are cognizant of fluctuations in gasoline prices, and want more fuel efficient vehicles as a buffer against higher gas prices.

Citations

ATTACHMENT C: CFA DOT Infrastructure Comments, E. Public Concern About Policy, Recognition of The Importance Of Increasing Fuel Economy And Support For Fuel Standards, at p. 20; Appendix A, A Comprehensive View of the Benefits of Efficiency Standards, at p. 38;

ATTACHMENT E: CFA Determination Comments, Consumer Support for Fuel Economy Standards, at p. 15.

THE DISTRIBUTIONAL CONSEQUENCES ON HOUSEHOLDS;

Response

Our analysis and other studies in the record show that low income households are the largest beneficiaries of auto standards on a comparative basis.

Low income consumers are unlikely to be in the market for new vehicles, they overwhelmingly buy in the used car market. As more fuel efficient new cars cycle into the used car market, low income households get the benefit of the lower total cost of driving, just as new car owners do. Because they are low income, the cost of driving accounts for a larger share of their household expenditure. Therefore, they benefit disproportionately from the reduction in operating costs.

Of course, they may pay more for the used vehicle with more energy saving technology. If sellers of used cars recover the cost of capital associated with the new energy saving technology, buyers of used cars will receive the remainder of the benefit that the new car owners have foregone in selling it. This will be a larger share of their relatively lower income. To the extent that there are market imperfections and the market undervalues fuel economy, low income households will pay less for these vehicles and get a bigger absolute and relative benefit.

Thus, the fuel economy standards do not price many low income households out of the new vehicle market because very few of them are in that market. On a year-to-year basis, the increase in cost for fuel economy is small, so the number of low income households priced out of the market is a small fraction of a small fraction.

Low income households are also likely to be disproportionately affected by the negative environmental and public health effects of pollution emissions from light duty vehicles because they live in neighborhoods that suffer more pollution and are less able to respond in ways to reduce exposure or obtain treatment. Therefore, they are likely to be receive disproportionately large benefits.

Citation

ATTACHMENT E: CFA Determination Comments, Low Income Consumers, at p. 34.

THE AVAILABILITY OF REALISTIC TECHNOLOGICAL CONCEPTS FOR IMPROVING EFFICIENCY IN AUTOMOBILES THAT CONSUMERS DEMAND, AS WELL AS ANY INDIRECT IMPACTS ON EMISSIONS;

Response

The responses to the other issues make it clear that technologies to meet the standards are available to meet the standards. The targets set by the National Program are inframarginal and leave numerous options for producers. The market processes unleashed by the "command-but-not-control" approach of the standards has allowed automakers to move ahead with new technologies for gasoline (aspirating engines) and electric vehicles (33 new models announced by GM and Ford and foreign manufacturers committed to complete conversion to electric vehicles) that go beyond the wide array of options that NHTSA/EPA considered in developing the National Program.

As electric vehicles expand, the indirect impact on emissions will be determined by the development of the electricity sector. Using the "fuel economy" of electric vehicles in the National Program, electric vehicles currently emit between one-half and one-third of the pollutants that gasoline does. As electricity generation transition to low polluting resources, a strong national and global trend, the reduction in emissions of pollutants will be even greater.

Citations

THE IMPACT OF THE STANDARDS ON CONSUMER BEHAVIOR, INCLUDING BUT NOT LIMITED TO CONSUMER PURCHASING BEHAVIOR AND CONSUMER AUTOMOBILE USAGE BEHAVIOR (E.G. IMPACTS ON REBOUND, FLEET TURNOVER, CONSUMER WELFARE EFFECTS, ETC.); *AND*

Response

Response

The responses to the above issues make it clear that consumers have been positively affected by the improvement in fuel economy as a result of the standards adopted by the federal agencies. Consumers express a desire to have more fuel-efficient vehicles and strong support for fuel economy standards. Fuel economy costs have been a small part of the overall increase in vehicle costs. Occurring as they do in small, steady increments, the increase in income has been much greater than the fuel economy driven increase in vehicle costs. Consumers now clearly favor more fuel-efficient vehicles.

When consumers have more disposable income as a result of the decline in the cost of driving, they spend a small part of it on more driving. That expenditure (the rebound effect) has been declining as the marginal value of driving declines. Nevertheless, the rebound effect constitutes an increase in consumer welfare, since they choose to spend that money on driving, rather than other things.

Willingness to pay studies, which suggest that consumers are unwilling to pay for fuel efficiency are highly suspect. Studies based on market behaviors reflect the preferences of consumers in the context of what is available in the market, rather than their simple preferences. Automakers push specific types of vehicles in advertising, in what they put on their showroom floors, and what they put in the lots. When real world costs of fuel efficiency are taken into account, it represents a small part of the total increase in vehicle costs over the years. What the automakers want to sell clashes with what the consumers want to buy.

Generally, the industry "manages" costs and financing to fit income. The only time in the past couple of decades that there was a significant fall in demand, consumers zipped up their pocketbooks and refused to buy gas guzzlers.

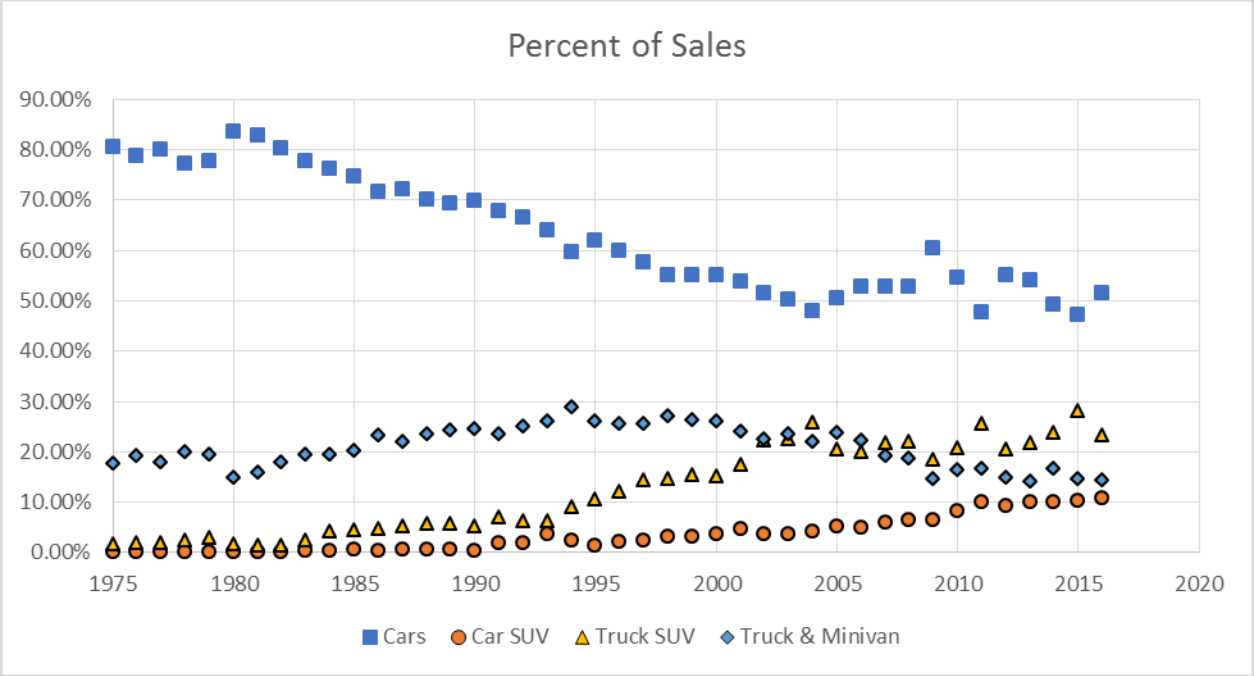
There are complex dynamic forces operating on the auto market. We have documented consumer interest in fuel efficiency and automaker slowness to respond. Our recent analysis of sales since the start of the National Program shows that fuel economy sells when new models are introduced. A look at longer term trends supports that finding, as the following Figure shows.

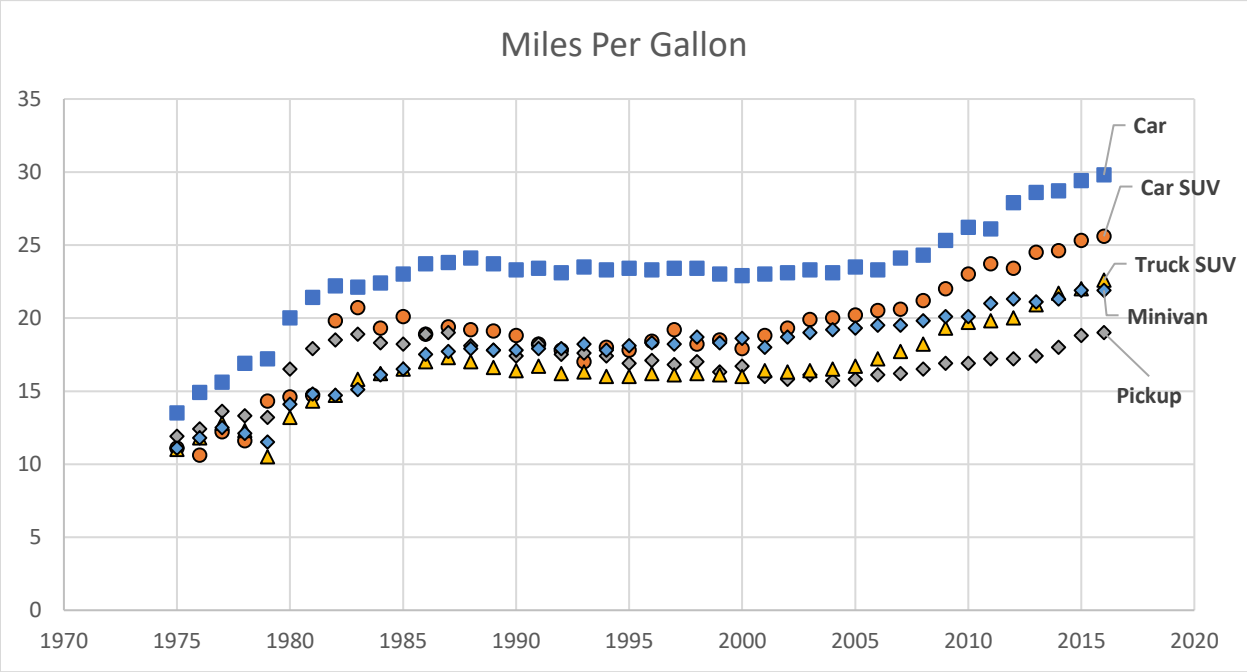
Consumers love their SUVs and they love the fact that they get better mileage than they used to. According to the EPA trends report, in the past two decades, the primary shift in consumer purchases has been an increase in SUVs (first truck SUVs until 2004, then car SUVs since 2004). Since 2004, when car sales ended a two-decade long decline in market share, car sales have been flat, while sales of pickups and minivans have dropped.

The two categories of vehicles that show the largest declines in sales are the least fuel efficient and show the lowest improvement in fuel economy. Vans (14%) and pickup (21%)

have the lowest rate of improvement, while Truck SUVs have the highest (37%), with car SUVs are in the middle (28%), just slightly below cars (29%).

Trends in Sales and Fuel Economy for Light Duty Vehicles





Source: Environmental Protection Agency, Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2016, November 2016, Tables 3.1 and 3.2.

Citations

ATTACHMENT C: DOT Infrastructure Comments, Discount Rates

ATTACHMENT F: CFA TAR Comments,
Appendix B: Conceptual Specification of Market Imperfections, at p. 24
Appendix C: Empirical Evidence Supporting the Market Imperfection and Policy Analysis, at p. 34
Appendix E, Discount Rates and Payback Periods as Market Outcomes, at p. 57
Appendix F, The Intersection of Market Failure and Massive Externalities, at p. 61.

ANY RELEVANT INFORMATION IN LIGHT OF NEWLY AVAILABLE INFORMATION.

Response

Embedded within those comments are excerpts from our earlier analysis of the fuel economy program going back to the initial proposal in the National Program and, in some instances, to the initial rulemakings triggered by the Energy Independence and Security Act of 2007. That Act, signed by President Bush, was a milestone in the U.S. history of fuel economy, not only because it "rebooted" an extremely important program that had been dormant for two decades, but also because it "reformed" the program in ways that substantially improved it and brought it into compliance with the Bush Administration's guidance on rulemaking (OMB Circular 4-A).

As we show in the attached comments, the National Program is the result of a vigorous bipartisan effort over four decades to develop an economically sound approach to rulemaking. There is nothing in law or administrative practice that supports its abandonment.

Citations

ATTACHMENT C: CFA DOT Infrastructure Comments, The Legal Context of Regulatory Reform of Fuel economy standards, at p. 11.

ATTACHEMENT A: CFA NHTSA EIS Comments, I. The Legal and Analytic Terrain of Fuel Economy Rulemaking, at p. 4; II. Based on the Empirical Record: A Freeze or Rollback of the Standards for Model Years 2021-2025 Is Not Justified, Current Standards are Well-Short of Maximum Net Benefits, at p. 6.

ATTACHMENT A: CFA House Testimony, Misleading Analysis from the Automakers, at p. 8.

ATTACHMENT F: CFA TAR Comments, Appendix G: Reconciling the Institutional and Legal Differences of a Complex Economic and Environmental Challenge, at p. 66.

ATTACHMENT D: CFA CARB Comments, American Federalism at its Best, p. 58

Consumer Federation of America's

Submission to the Environmental Protection Agency

Docket No. EPA-HQ-OAR-2015-0827

Attachment A

Comments of the Consumer Federation of America: Notice of Intent to Prepare an Environmental Impact Statement, Request for Scoping Comments No. NHTSA-2017-0069

September 25, 2017

BEFORE THE NATIONAL HIGHWAY TRANSPORTATION SAFETY ADMINISTRATION, DEPARTMENT OF TRANSPORTATION

NOTICE OF INTENT TO PREPARE AN ENVIRONMENTAL IMPACT STATEMENT; REQUEST FOR SCOPING COMMENTS) **DOCKET NO. NHTSA-2017-0069**

COMMENTS OF THE CONSUMER FEDERATION OF AMERICA

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September 25, 2017

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INTRODUCTION

THE CONSUMER FEDERATION OF AMERICA: EXPERTISE AND INTEREST

The Consumer Federation of America[1] appreciates the opportunity to provide the National Highway Safety Administration (NHTSA) of the Department of Transportation (DOT) with guidance in its efforts to scope out the Environmental Impact Statement (EIS) that must accompany its proposed fuel economy standards for model years 2022-2025 and any reconsideration it undertakes for earlier year standards. Throughout its 50 years of existence, CFA has been a vigorous and continuous participant in the process of setting regulations to improve the efficiency of energy-using consumer durables and lower the cost of energy borne by consumers.[2] Transportation fuels, the source of energy most directly affected by DOT regulations, are a major household expenditure, representing over 3 percent of total expenditures, one of the 6 largest subcategories listed in the consumer expenditure survey. Factoring in indirect expenditures on fuels consumed by commercial fleets,[3] which consumers pay for in the price of goods and services, would push transportation fuel consumption above 5%, making it the third or fourth largest household expenditure. [4]

To guide the DOT, these comments identify a number of principles that should inform its EIS and demonstrates them with specific examples from evidence before the agency. The empirical examples presented in these comments are drawn from materials previously filed in relevant proceedings. Each section begins with an excerpt from comments filed in fuel economy proceedings,[5] which are then followed by more recent analyses that show the original conclusions are supported by real world trends. [6]

While the EIS scoping intent seeks broad framing guidance, this Notice of Intent contains several references that go to the substance of the issues. The notice for the EIS scoping document notes the decision to "reconsider" the final determination of the Environmental Protection Agency (EPA) and the California Air Resources Board (CARB). It also newly lays on the table the reconsideration of the 2021 model-year standards. Although NHTSA must conduct a new proceeding to write standards for 2022-2025, it did participate in the proceedings underlying the 2021 standard and in drawing up the Technical Analysis Report that underlies the EPA and CARB determinations. In essence, it proposes to reverse more than half of the rules of

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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://consumerfed.org/issues/energy/) provides links to 140 pieces of testimony and reports published in the past ten years dealing with the efficiency of energy-using consumer durables divided roughly equally between appliances and vehicles.

[3] Mark Cooper, *Paying the Freight,* Consumer Federation of America, attached to CFA Comments *Re: Department of Transportation Notice of Intent to Prepare an Environmental Impact Statement for New Medium- and Heavy-duty Vehicle Fuel Economy Standards*— August 8, 2014

[4] https://www.bls.gov/cex/22016/midyear/quintile.pdf. Adding appliance efficiency standards, which are governed by a structure of legal authority and administrative rules similar to that affecting appliances doubles the level of household expenditures and makes regulatory reform one of the largest consumer pocketbook issues for the Trump or any administration.

[5] Comments of the Consumer Federation of America, Proposed Rulemaking to Establish Emission Standards and Corporate Average Fuel Economy Standards Environmental Protection Agency Light-Duty Vehicle Greenhouse Gas) 40 CFR Parts 86 and 600; Department of Transportation 49 CFR Parts 531,633, 537, et al., November 27, 2009; Comments of Consumer Groups: Docket Nos. EPA-HQ-OAR-2010-0799; FRL-9495-2, NHTSA–2010–0131, February 13, 2012.

[6] Mark Cooper, 2017, *Pocketbook Savings, Macroeconomic Growth and Other Public Benefits of Energy Efficiency Appliance Standards: Benefit-Cost Analysis of Four Decades of Rules Shows they have Delivered Trillions of Dollars of Economic Value to Consumer and the Nation*; Jack Gillis and Richard Eckman, *An Analysis of Consumer Savings and Automaker Progress on the Road to 2025 CAFE Standards*, attached to Comments of the Consumer Federation of America, in the Matter of Transportation Infrastructure: Notice of Review of Policy, Guidance and Regulation, Before the Department of Transportation Docket No. OST-2017-0057, July 24, 2017.

the National Program adopted just five years ago. The empirical record is substantial and, in many respects complete. Therefore, we believe it is important to draw conclusions based on that record in outlining the considerations that should be included in the EIS.

FINDINGS AND RECOMMENDATIONS

The congressionally mandated goal of the law governing the Corporate Average Fuel Economy Program is maximum feasible fuel economy standards as embodied in the Energy Policy and Conservation Act of 1975 (EPCA). That goal was reaffirmed and strengthened less than ten years ago in the Energy Independence and Security Act (EISA). The guidance offered by executive orders and OMB circulars for the past twenty years have emphasized maximum net benefits. The principles and methods were described in detail in the Bush Administration.

While these clear goals are balanced by other concerns, such as technical feasibility and economic practicability, the extensive evidence in the record shows that the standards in place are quite moderate, well-within the bounds of feasibility and practicability. Thus, based on the extensive record established at the agencies since EISA reformed and rebooted the CAFE program, these comments show that there is no justification to roll back the 2021 fuel economy or carbon emission standards for light duty vehicles, or modify the 2022-2025 standards. The current standards comply with the laws setting goals and faithfully implement the controlling executive branch guidance.

These comments are divided into four sections.

Section I discusses the laws governing agency action which require maximum energy savings and greenhouse gas reductions, Executive Orders and OMB circulars that still guide agency actions advocating maximum net benefits to society. The laws and guidance recognize that there are economic, technological and social balancing factors that should be considered in setting standards. The Administrative Procedure Act requires that agency actions are not arbitrary and capricious, do not lack justification or run counter to critical evidence in the record, particularly when the agency is changing its mind. A freeze or rollback in the standards would be contrary to current law and practice.

Section II begins with a review of the economic analysis on which the standards proposed in the National Program were based. It shows that the standards adopted by the National Program took the balancing factors into account and proposed standards that fell far short of either maximum feasible or maximum net benefit levels. An empirical discussion of the benefit cost analysis shows:

- the National Program standards have a benefit cost ratio greater than 6-to 1 and
- a breakeven cost of gasoline of $0.75 per gallon, which means that as long as gasoline stays above $0.75 per gallon, the standards are justified.

Thus, the record and current economic conditions suggest that, if the agencies want to change the levels, they should be raised, not lowered. Rolling back the 2021 standards and freezing the 2022-2025 standards would:

- Rob consumers of net savings of over $4,500 per household,

- Prevent a reduction in operating costs of $150 billion,
- Undermine $150 billion of macroeconomic growth, and
- Forego over $50 billion in environmental, health and other benefits.
- The total of $350 billion of benefits foregone would yield automaker savings of only $50 billion., for a benefit cost ratio of -6 to 1.

Section III examines several aspects of the proposed standards from the producer point of view. The empirical evidence shows that the standards are readily achievable for a variety of reasons.

- Consistent with the long history of fuel economy standards, automakers' efforts to implement the standards show that the cost of compliance has been below the NHTSA/EPA projections and far below inflated industry estimates.
- The standards are well within the technological frontier of the industry as analyzed not only by NHTSA/EPA, but also MIT and the National Academy of Sciences.
- The rate of improvement is consistent with historical periods where standards were implemented.
- The standards are consistent with (or slightly below) other advanced industrial nations.
- Fuel economy pays for itself in a market where it has taken on much greater importance to consumers. As a result, fuel economy sells.
- With a gradual, but steady approach, developing new models to meet the standards and consumer needs has been evident in the marketplace and automakers have been complying with the standards.

Section IV presents brief observations on the reasons that the reboot of CAFE signed into law by President Bush and implemented through the National Program has worked well, while coordinating the approach to improving fuel economy and the reduction of carbon emissions between EPA, NHTSA and the California Resources Board (CARB). The National Program is a perfect example of "command-but-not control" regulation that has been evolving under Executive Orders and OMB guidance written by Republican and Democratic presidents over almost four decades. The CAFE standards set by the National Program are long-term, product neutral, technology-neutral, responsive to industry needs, responsive to consumer needs, and procompetitive.

We have also shown that it is a good example of American Federalism at its best, with California leading over a dozen other states in pursuit of more effective standards.[7]

[7] Statement of Dr. Mark Cooper on American Federalism At Its Best: Why The Environmental Protection Agency Should Grant A Clean Air Act Waiver To The Clean Cars Program, to the Environmental Protection Agency, Pubic Hearing, September 19, 2012

I. The Legal and Analytic Terrain of Fuel Economy Rulemaking

Laws Governing Agency Action

As we pointed out in our earlier comments to the Department of Transportation with regard to its request for information in relation to its infrastructure policy implementation, federal agencies cannot change or repeal three sets of laws: the laws of policy, physics and economics. That observation is even more relevant with respect to the setting of fuel economy standards because NHTSA must write an environmental impact statement and this process has included cooperating with the EPA and the CARB.

The laws of policy are set by Congress to state the goals and identify the considerations that agencies must take into account in working toward those goals. Congress generally recognizes the complexity of writing regulations in the modern economy, so it leaves discretion to the expert agency, giving guidance about what is to be considered.

Of course, Congress can change the goals and guidance (with the agreement of the executive branch), but, like the agency, it cannot repeal or change the laws of physics or economics. As we pointed out in our earlier comments, the laws of physics dictate that rules governing fuel economy are, necessarily and inevitably, environmental rules that govern emissions of pollutants. It is the case that the reduction in the use of fuel is linked directly to a reduction in emissions.

The laws of economics come into play in two respects.

First, energy efficiency, in general, and improving fuel economy, in particular, tend to be very low cost (frequently the least cost) ways to lower emissions. To the extent that congressional or the executive branch guidance mandates least-cost, maximum net benefit approaches to lowering fuel consumption, it also mandates least-cost, maximum net benefit approaches to environmental protection.

Second, when fuel economy standards yield a net benefit to consumers by lowering operating costs more than the increase in technology costs, it increases the disposable income in consumer pocketbooks. Consumers spend that disposable income on other goods and services. This "respending" has a multiplier effect, causing the economy to grow. The macroeconomic benefits are an inevitable result of fuel economy standards.

Over the past forty years, guidance from OMB has tried to help the agencies navigate the complex terrain of rulemaking. President Reagan's order defined the overall structure of the analysis. Presidents Clinton, Bush and Obama refined that approach. OMB guidance and recent notices from the agencies recognize that the previous executive orders are still in force, as are the agency specific statutes that dictate goals and considerations.

The Complex Terrain of Fuel Economy Standards Setting

As acknowledged in the EIS scoping notice, NHTSA faces two sources of complexity in setting a standard. The law governing the fuel economy standards is focused on "maximum feasible" average fuel economy. In amending the underlying statute (EPCA) with EISA, the

Congress emphasized the energy saving goal by referring to energy independence and security. Because of the need to consider environmental impacts, take other regulations into account and the agreement to cooperate with EPA, a second set of goals and considerations come into play, the Clean Air Act, see Table 1.

TABLE 1: PRIMARY GOALS AND BALANCING FACTORS IN FUEL ECONOMY STANDARD SETTING

GOALS AND CONSIDERATIONS	NHTSA (EPCA, EISA)	NATIONAL PROGRAM
OVERARCHING GOAL	Maximum feasible average fuel economy Need to conserve petroleum addressing energy independence and security by reducing U.S. reliance on foreign oil	Maximum feasible energy savings and reduction in emissions
BALANCING FACTOR		
	Technological feasibility	feasible
	Economic practicability	practicable
	Consider other standards	cost-effective

As we noted in our 2009 comments,[8] EPA's goals are expressed in terms of maximum reduction in emissions to protect the public health and welfare. The other considerations that EPA must take into account in terms of technology and economic analysis are less constraining. Nevertheless, the goals are very similar, particularly given the environmental and economic convergence (identicality) of the physical relationship between fuel use and emissions. The California Air Resources Board, which joined in the cooperative effort, is charged with maximum feasible reduction in emissions that are cost-effective.[9] The National Program effectively harmonized the different goals into a consensus within the legal constraints, a harmonization that enjoyed widespread support.

IDENTIFYING THE RANGE OF OPTIONS

In the scoping EIS notice, NHTSA identified a series of options that would bracket the possible levels it could choose within the confines of the law. Table 2 shows three potential approaches to standard setting defined by language in the law and guidance. For each we offer a "formal" economic definition in terms of the benefit cost ratio it would reflect. This is consistent with the more detailed Bush administration guidance in OMB Circular A-4. It is also consistent with the NHTSA/EPA analysis of the National Program, where multiple scenarios were analyzed.

[8] Comments of the Consumer Federation of America, Proposed Rulemaking to Establish Emission Standards and Corporate Average Fuel Economy Standards Environmental Protection Agency Light-Duty Vehicle Greenhouse Gas) 40 CFR Parts 86 and 600; Department of Transportation 49 CFR Parts 531,633, 537, et al., November 27, 2009, pp. 2-3.

[9] Environmental Protection Agency, California Air Resources Board, National Highway Traffic Safety Administration, *Draft Technical Assessment Report: Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025,* July 2016, p. 1-3.

TABLE 2: EXPRESSING STANDARDS IN TERMS OF MARGINAL AND TOTAL COST BENEFIT PRINCIPLES

OBJECTIVE	STANDARD	COST CHARACTERISTICS: Move standards to the point where
Baseline	No Action	
Emphasize Economic Practicability	Maximum Net Benefit	Marginal Benefit = Marginal Cost
	Maximum Benefit @ zero cost	Total Benefit = Total Cost
Identify Limit of Technology limit	Incur costs to achieve maximum goal	Marginal benefit = 0 All technologies, regardless of cost

The starting point for the rulemaking must be the vast body of evidence compiled in the half decade collaboration of NHTSA, EPA and CARB. The fact that a mid-term review has been called for does not diminish the importance of the record that already exists before the agency. Indeed, the fact that the three agencies collaborated fully on the Technical Assessment Report attests to the productive nature of the collaboration. The fact that only two of the three agencies reached a final determination, while the third was legally obligated to conduct a *de novo* proceeding does not detract from the weight of that evidence or its interpretation.

The evidentiary record continues to strongly support the Final Determination reached by EPA and CARB. If anything, the record supports a strengthening, not weakening of the standards for both benefit and cost (demand and supply side) reasons. Because that record is still operative and we have made these points throughout the proceedings that fall under the rubric of the "National Program," we begin these comments by bringing forward our initial discussions of these key points. Our recent analyses show that these arguments were not only correct when first presented but economics, technology and the industry have moved in a direction that fully supports and strengthens those initial analyses.

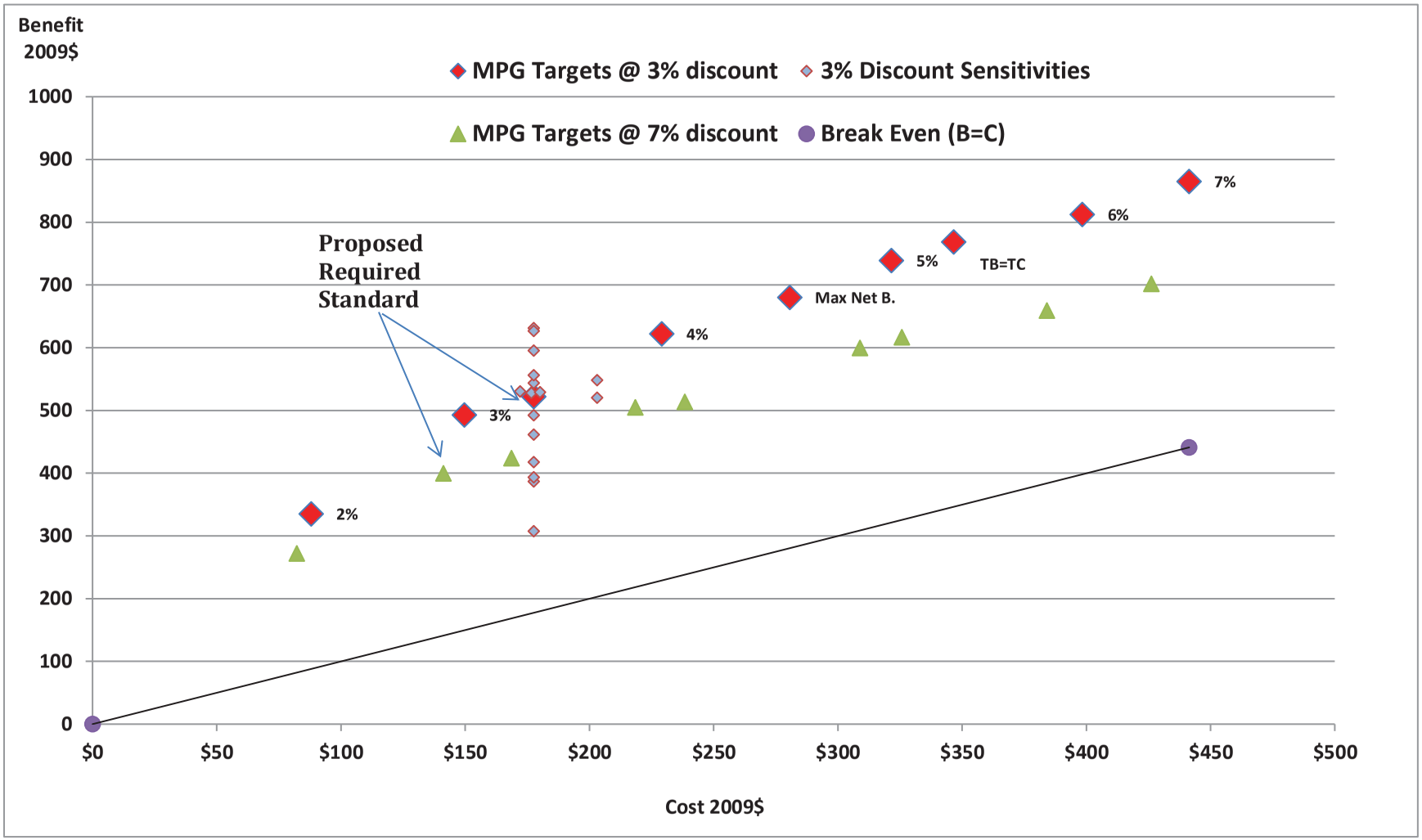
II. BASED ON THE EMPIRICAL RECORD: A FREEZE OR ROLLBACK OF THE STANDARDS FOR MODEL YEARS 2021-2025 IS NOT JUSTIFIED[10]

CURRENT STANDARDS ARE WELL-SHORT OF MAXIMUM NET BENEFITS

Figure 1 presents the full range of cases and scenarios considered by the agencies in setting the standards under the National Program. It shows each target level evaluated at discount rates of 3% and 7%. It plots the costs (on the x-axis) and the benefits (on the y-axis) for the eight different target levels and the results of the sensitivity analyses. It also shows the analyses that were conducted at the 3% discount rate. In all, there are 28 cases/scenarios shown. The figure also includes a break even line. If a case/scenario falls above the line, the benefits exceed the costs.

[10] Excerpt from Comments of Consumer Groups: Docket Nos. EPA-HQ-OAR-2010-0799; FRL-9495-2, NHTSA–2010–0131, February 13, 2012

FIGURE 1: NHTSA NATIONAL COST BENEFIT ANALYSIS SHOWS THE 2025 STANDARD IS A MODERATE, MID-RANGE TARGET



Source: Office of Regulatory Analysis and Evaluation National Center for Statistics and Analysis, *Preliminary Regulatory Impact Analysis Corporate Average Fuel Economy for MY 2017-MY 2025, Passenger Cars and Light Trucks,* November 2011, Table 2 and Table X-12c.

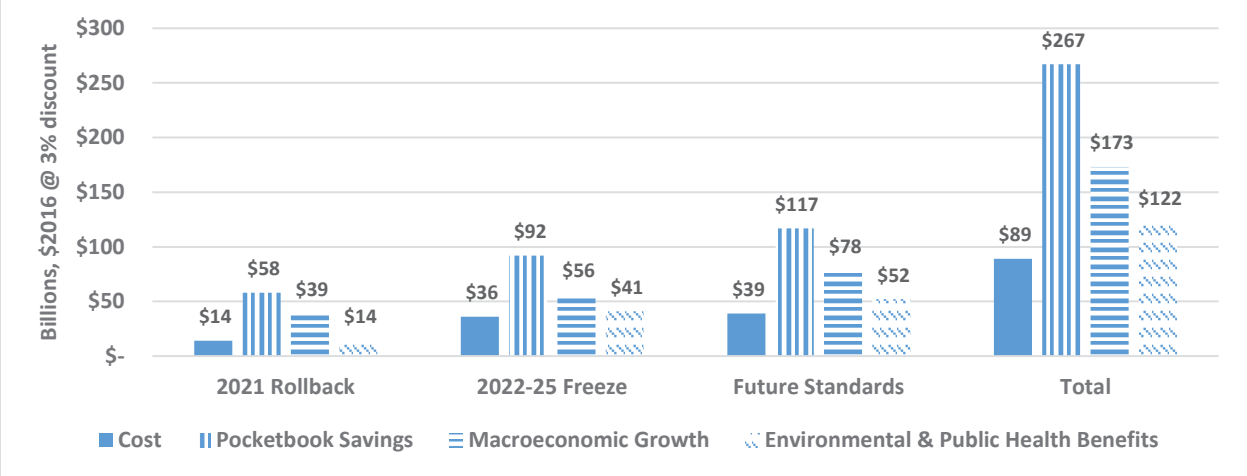
Figure 1 makes it clear that the benefits are likely to exceed the costs by a wide margin. Even under the most extreme assumption – i.e. that consumer pocketbook savings are only one-quarter of the base case calculation, the benefits are almost twice as large as the costs at the 3% discount rate.[11] The standards are well below the maximum net benefit level.

The agencies presented over two dozen cases and scenarios to assess the level of confidence that policymakers can have in the conclusion of the base case cost benefit analysis. In traditional agency fashion, they present a Monte Carlo simulation of expected outcomes under the full array of alternative assumptions. They conclude that there is a high probability that the outcome of the policy will be positive. The probability that net benefits will exceed zero between now and the mid-term review, is 95 percent or more for cars and at least 99 percent for trucks.

A FREEZE AND ROLLBACK WILL ROB CONSUMERS AND THE NATION OF HUNDREDS OF BILLIONS OF DOLLARS IN POCKETBOOK SAVINGS, ECONOMIC GROWTH AND OTHER BENEFITS[12]

Our analysis (summarized in Figure 2) shows that a rollback of the 2021 standards and a freeze of the 2022-2025 standards that are being contemplated by NHTSA/EPA would be disastrous. A rollback and freeze would:

FIGURE 2: BENEFIT COST ANALYSIS OF ROLLBACK AND FREEZE OF FUEL ECONOMY STANDARD: MODEL YEARS 2021-2025



Mark Cooper, 2017, Pocketbook Savings, Macroeconomic Growth and Other Public Benefits of Energy Efficiency Appliance Standards: Benefit-Cost Analysis of Four Decades of Rules Shows They Have Delivered Trillions of Dollars of Economic Value to Consumer and the Nation, Consumer Federation of America, July 2017, described the methodology. These are 2016 dollars discounted at 3%. Macroeconomic multiplier =1 x net pocketbook benefits.

- rob consumers of about $150 billion in savings;
- deny the economy almost $100 billion in economic growth;

[11] While OMB recommends the use of discount rates of 3% and 7%, it portrays the 3% rate as the consumer oriented rate. Moreover, OMB guidance recognizes that a lower discount rate may be more appropriate for standards that involve long term (intergenerational) impacts. The OMB guidance suggest discount rates as low as 1%. Fuel economy standards have this long term impact, being one of the largest sources of greenhouse gas emissions. A 3% discount rate is a middle rate in the regulatory analysis. NHTSA should use three discount rates, 1%, 3% and 7%.

[12] Excerpt from Mark Cooper, 2017, Pocketbook Savings, Macroeconomic Growth and Other Public Benefits of Energy Efficiency Appliance Standards: Benefit-Cost Analysis of Four Decades of Rules Shows They Have Delivered Trillions of Dollars of Economic Value to Consumer and the Nation.

- forego over $50 billion of environmental, public health and other benefits, while
- saving automakers only $50 billion.
- In other words, a rollback and freeze have a negative benefit cost ratio with foregone benefits six times cost savings.

EPA estimates the savings at $1620 per vehicle, over the life of the vehicle. Since the average number of vehicles per household, among households that own at least one vehicle, is just over two,[13] the savings per household would be $3240. However, EPA excludes the consumer welfare benefits of increased fuel consumption (the rebound effect) in its estimate of pocketbook benefits. We have argued that, while this is correct from the point of view of counting energy consumption or emissions reductions, it is incorrect from the point of view of consumer economic welfare. The decision to spend some of the pocketbook savings on fuel represents a net increase in consumer welfare. The calculation of consumer pocketbook savings also does not take into account the declining cost of improving fuel economy.

- Thus a conservative estimate of household pocketbook savings lost as a result of a freeze of standards at the 2021 level is well above $3,500.
- The consumer pocketbook harm would be about $4,500 if the 2021 level is rolled back to 2020.[14]

Future savings that would be undermined or jeopardized by a freeze and rollback would:

- push the total benefits foregone to well over $500 billion,
- while saving automakers less than $90 billion.[15]

Even though we find "willingness to pay" studies conceptually and empirically flawed, our review of the most recent willingness to pay analysis of fuel economy shows that the current levels of standards are cost justified on the basis of consumer pocketbook savings alone, which means that over $300 billion of true externalities – macroeconomic growth, environmental, health, and other public benefits are essentially "free."

- Our "breakeven" analysis shows that, the current levels of standards are justified as long as the price of gasoline stays above $0.75 per gallon.

Similar threats to reconsider fuel economy standards for heavy duty trucks are equally problematic from the consumer point of view because, as we have shown, consumers pay for energy consumption of commercial/industrial vehicles in the costs of goods and services that must use transportation services. Undermining these standards would:

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[13] U.S. Department of Transportation, Bureau of Transportation Equipment, *Household, Individual, and Vehicle Characteristics*

[14] This estimate is based on the physical quantity of oil saved by the MY 2021 standard compared to the total oil saved by the MY 2022-2025 standards.

[15] These are the far future benefits as described in Mark Cooper, 2017, *Pocketbook Savings, Macroeconomic Growth and Other Public Benefits of Energy Efficiency Appliance Standards: Benefit-Cost Analysis of Four Decades of Rules Shows They Have Delivered Trillions of Dollars of Economic Value to Consumer and the Nation,* July 2017. Per the methodology described therein, these are 2016 dollars discounted at 3%. Macroeconomic multiplier =1 x net pocketbook benefits.

- rob consumers of another $500 billion,
- while saving truck manufacturers $50 billion.
- Because the benefit cost ratio is so high for heavy duty vehicles, the price of diesel necessary to justify the current standards (i.e. the breakeven level) would be only $0.33 per gallon.

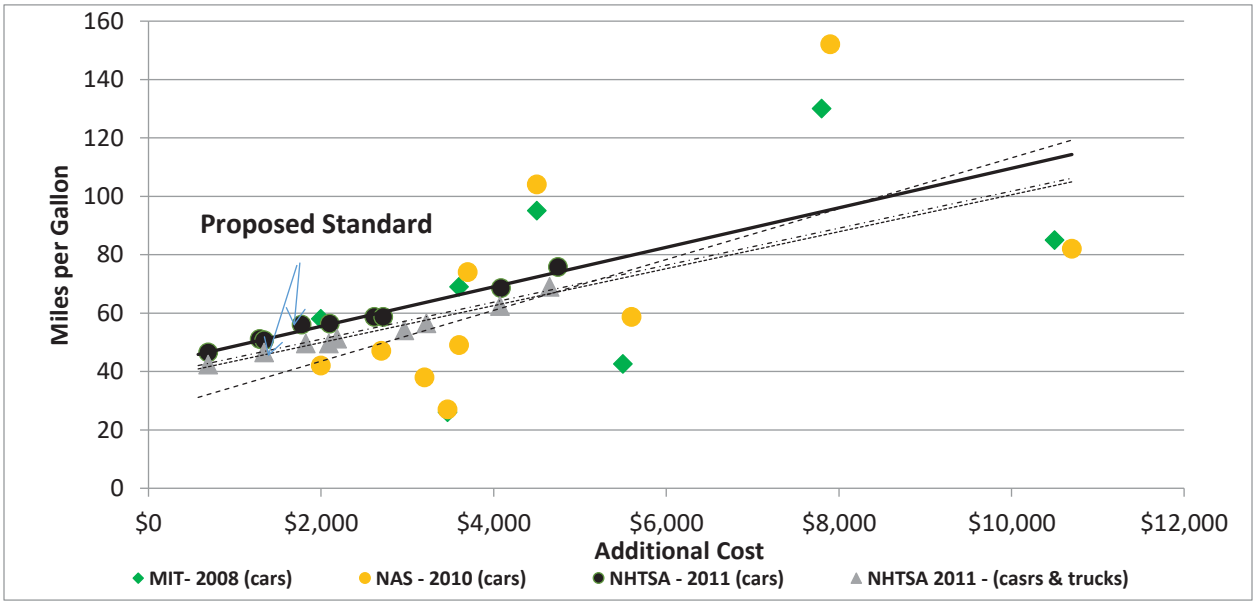
Taken together, the freeze and roll back of fuel economy standards for all vehicles administered by NHTSA would jeopardize $1 trillion dollars of benefits, a sum that is almost seven times as large as the savings vehicle manufacturers would realize. Half of those savings would come out of consumer pocketbooks directly through household expenditures on gasoline, while the other half is borne indirectly through an increase in the cost of goods and services that utilize commercial vehicles.

III. Declining Cost and Expanding Options Have Led to Easy and Early Supply-Side Compliance

The Proposed Standards are Well Within the Reach of The Industry

Figure 3 shows that the proposed standards are moderate from other points of view. It plots the cost and mileage from a number of studies. It shows that the proposed standards are moderate from two points of view.

Figure 3: The 2025 Standard is Well Within The Technology Frontier

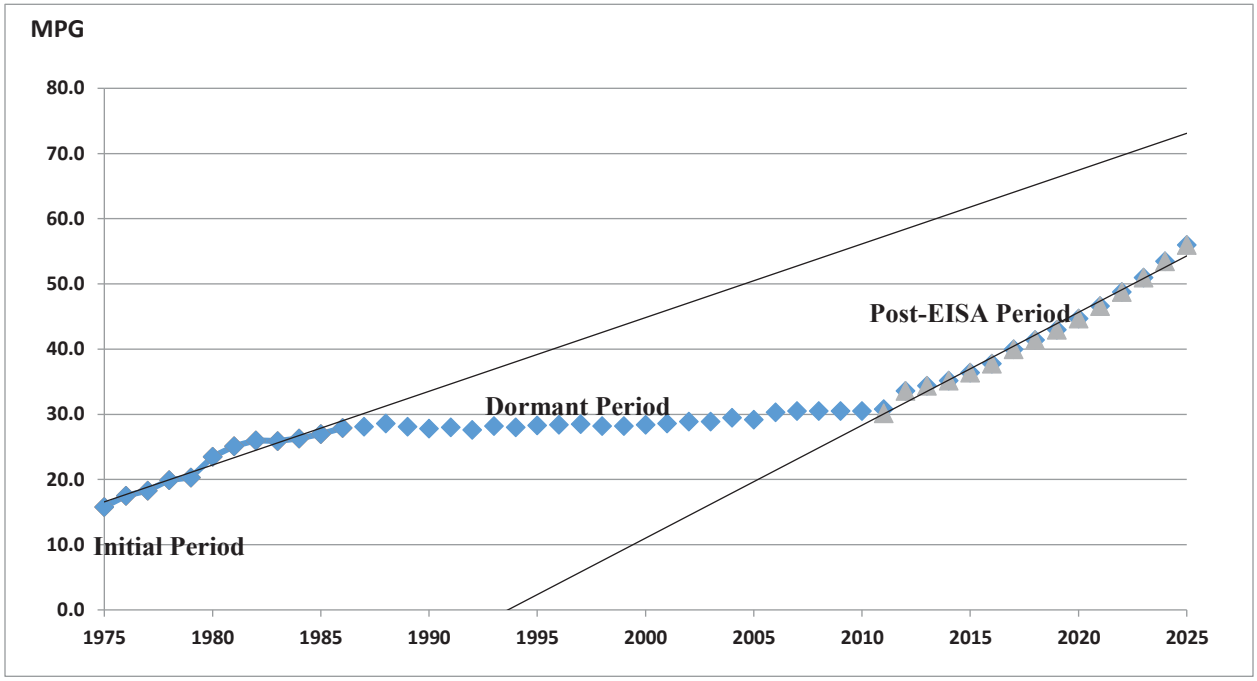


Sources: MIT, 2008; Laboratory of Energy and the Environment, On the Road in 2035: Reducing Transportation's Petroleum Consumption and GHG Emissions Cambridge: July, 2008), Tables 7 and 8; NAS -2010, National Research Council of the National Academy of Science, America's Energy Future (Washington, D.C.: 2009), Tables 4.3, 4.4; NHTSA-EPA 2011;Office of Regulatory Analysis and Evaluation National Center for Statistics and Analysis, *Preliminary Regulatory Impact Analysis, Corporate Average Fuel Economy for MY 2017-MY 2025 , Passenger Cars and Light Trucks,* November 2011, Table 2 and Tables 3, 5.

First, the costs curves are consistent with the level of cost estimated by others with similar levels of fuel savings. Second, there are much higher levels of fuel savings possible, at higher costs. The proposed standards are in the middle of the pack in the lower end of the range.

There are two historical perspectives that also suggest the proposed standards are moderate and achievable. As shown in Figure 4, the current proposal not only restarted the process just about as quickly as the law allowed, but it sets the U.S. on a path to doubling the fuel economy of new vehicles that is consistent with what was accomplished in the first decade of the program.

FIGURE 4: U.S. MPG HISTORICAL AND PROPOSED: THE RATE OF INCREASE IS STEADY AND CONSISTENT WITH PAST EFFORTS TO IMPROVE FUEL ECONOMY



Sources: EIA, Light Duty Automotive Technology, Carbon dioxide Emissions, and Fuel Economy Trends: 1975 Through 2009, November 2009,Table; Office of Regulatory Analysis and Evaluation, Regulatory Impact Analysis, Corporate Average Fuel Economy,2011, 2012-2016, 2017-2025.

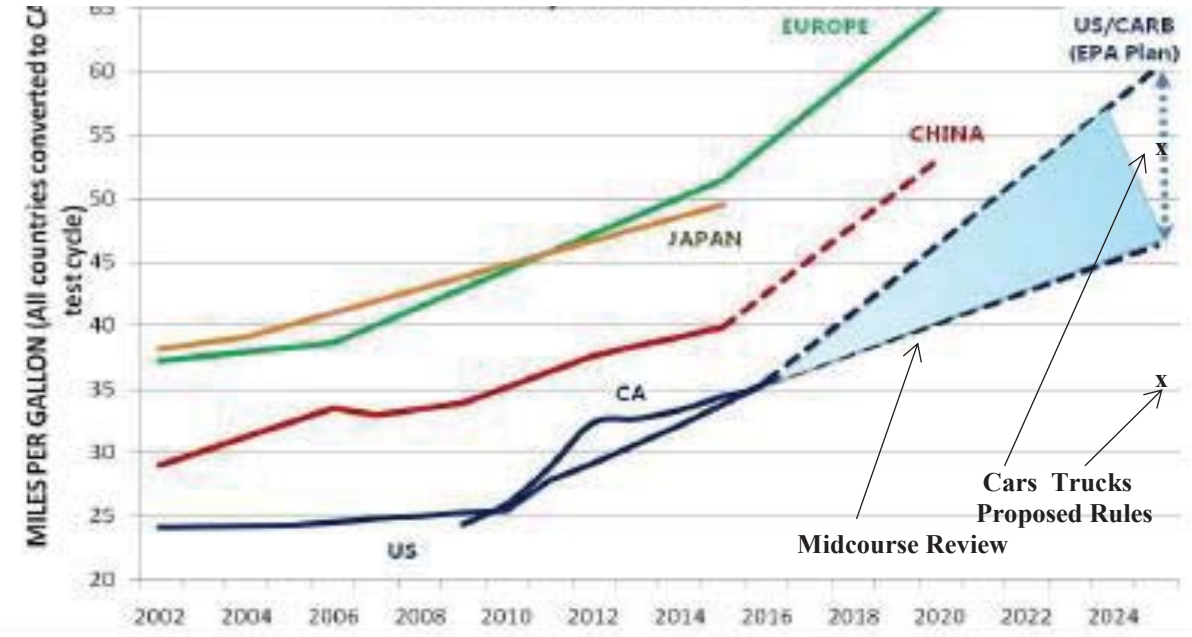
Globalization of the auto industry means it is no longer possible to be a successful automaker without being able to compete globally. Figure 5 shows the proposed standards in relation to the standards in place in other automobile producing and consuming nations. The proposed standard brings U.S. standards up to international levels.

The standards also reduce the supply-side risk of introducing new fuel savings technologies and triggers competition around fuel economy. Automakers know they can sell quality. As shown in Figure 6, according to statistics compiled by the Bureau of Labor Statistics, which is responsible for the Producer Price Index,

- over the past fifteen years, automakers have added three times as much value (and cost) with optional improvements in quality than with mandatory (safety and environmental) improvements.

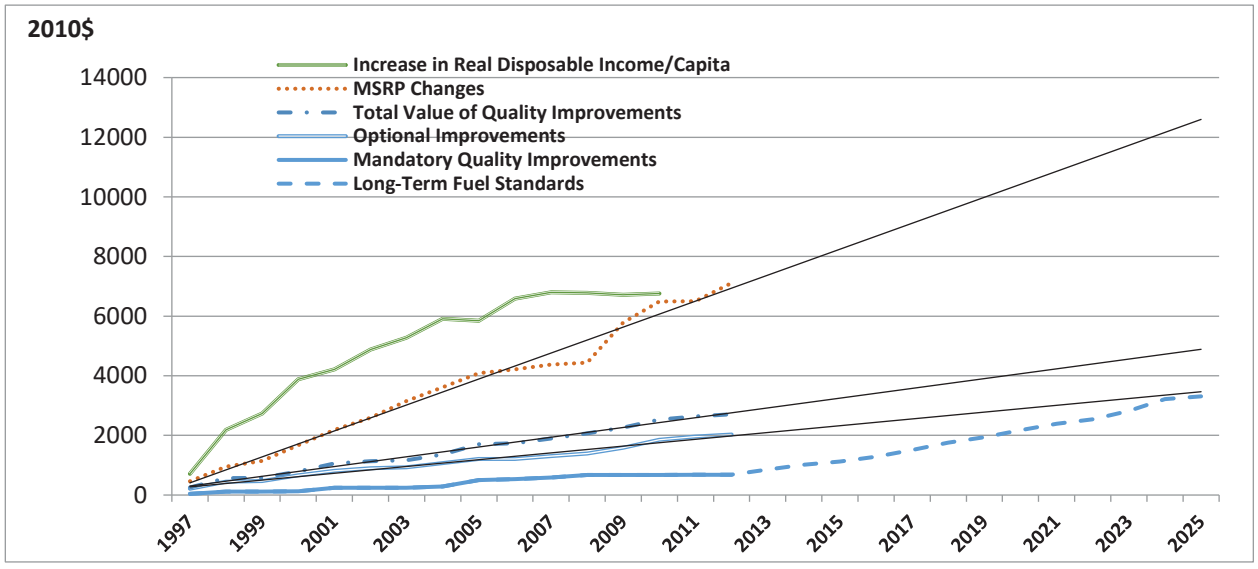
- The overall increase in MSRP tends to track closely to the increase in real disposable income.

FIGURE 5: COMPARISON OF PROPOSED U.S. AND INTERNATIONAL STANDARDS



Source: 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 Nations Commission on Sustainable Development, May 2011, Background Paper No. 3).

FIGURE 6: THE INDUSTRY ROUTINELY MAKES COSTLY QUALITY IMPROVEMENTS (Bureau of Labor Statistics Analysis of Quality Changes for Vehicles)



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

- The cost increases that the long-term standards will require over the next 15 years are well below the cost of quality improvements over the past 15 years.
- Unlike most other quality additions, fuel economy improvements deliver pocketbook savings to consumers.
- In today's market, fuel economy is a major determinant of vehicle quality that the market can easily absorb.
- Automakers adjust MSRP and discounts and auto financing in response to much larger changes in affordability.

RECENT EVIDENCE ON AUTOMAKER COMPLIANCE

Our most recent analysis of new models introduced since the start of the National Program confirms these earlier findings. For this analysis, we compared the cost and fuel economy of 19 of the 27 "all-new" 2017 models which had a 2011 version, the year before the current standard was put in place.[16] Comparing "new" models is particularly revealing because it shows what automakers can do with advance notice and steady, long-term increases in the standards. These 19 models included 79 different EPA designated engine/drive train/transmission/MPG configurations (or what are called "trims").

Improving Fuel Economy Pays for Itself by Lowering the Total Cost of Driving

As shown in Table 3, when we compared the cost difference between the "all-new" 2017 models and their 2011 version, after factoring in inflation, 21 or 27% actually went down in price, yet every one of these vehicles saw a 1 to 10 MPG increase.

Annual vehicle price increases (less inflation) cover many different improvements such as new safety technology, convenience items, design changes, as well as upgraded fuel economy technology. By separating out the cost of fuel economy improvements from these other costs, we were able to get a more accurate look at the impact of the standards on consumer pocketbooks. Overall, for 74 of the 79 vehicles (94%), the added cost of new fuel efficient technology was far exceeded by the resulting fuel cost savings over the first 5 years of ownership.

Fuel Economy Sells

SUVs, pickups and crossovers, whose miles per gallon increased by over 10% between 2011 to 2016, had a 59% increase in sales. On the other hand, those same vehicle types with less than a 10% increase in MPGs from 2011 to 2016 experienced only a 41% increase in sales, almost 20% less. (Table 4) This analysis completely debunks automaker claims that consumers don't value good gas mileage. Clearly, the more improvement in MPG, the better the sales.

[16] There were 27 all new vehicles introduced in 2017, 19 of them had a previous version available in 2011. These 19 vehicles were the ones we included in this analysis.

TABLE 3: 2011 VS. 2017 "ALL-NEW" PRICE COMPARISON (ACCOUNTING FOR INFLATION)		
	"All-New" Trims[123]	**Percent of "All-New Trims"**
Total "All-New" Vehicles with 2011 Counterpart	79	100%
2011 Vehicles Which Were LESS Expensive in 2017 Dollars and Had Higher MPG	21	27%
2011 Vehicles Which Were MORE Expensive in 2017, Whose Fuel[4] Savings Offset the Entire Price Increase	12	15%
2011 Vehicles Which Were MORE Expensive in 2017, Whose Fuel[4] Savings Offset the $100/MPG Cost of Fuel Economy Technology[5]	41	52%
2011 Vehicles Which Were MORE Expensive in 2017, Whose Fuel Economy Stayed the Same or Decreased	5	6%

Mileage figures from EPA and Sales from Auto News, [1]Inflation was calculated using BLS average inflation numbers from 2011-2016; [2]Average "All-New" Vehicle Price from the New Car Cost Guide; [3]Fuel Economy of "All-New" Vehicles based on EPA combined estimate;. [4] Gas costs from AAA $2.27 (7/19/17) and driving an average of 14,000 miles per year; [5] CFA bases its estimate of the cost of fuel economy on a review of the literature including historical, market-based and engineering studies, as described in Appendix B: Jack Gillis and Richard Eckman, An Analysis of Consumer Savings and Automaker Progress on the Road to 2025 CAFE Standards, attached to Comments of the Consumer Federation of America, in the Matter of Transportation Infrastructure: Notice of Review of Policy, Guidance and Regulation, before the Department of Transportation Docket No. OST-2017-0057, July 24, 2017.

TABLE 4: SUVS, CROSSOVERS, LIGHT TRUCKS - 2011-2016					
Percent Increase in MPG 2011 - 2016	**Number of Vehicles**	**2011 Average Sales Per Model**	**2016 Average Sales Per Model**	**Average Change in Sales (Units)**	**2011 - 2016 Average % Change in Sales**
10% or More	29	95,143	150,828	55,685	59%
Under 10%	37	63,423	89,696	26,273	41%
Mileage figures from EPA and Sales from Auto News					

Automakers are Readily Complying with the Standards

In comparing the CAFE compliance of "all-new" models introduced in 2015, 2016 and 2017, there was a significantly higher percentage of CAFE-compliant vehicles in 2017. In fact, 70 percent of the "all-new" 2017 vehicles had a CAFE-compliant trim, compared to 41 percent of the "all-new" 2015 vehicles (Table 5). Particularly noteworthy was the fact that 78% of the

"all-new" light duty trucks had a CAFE compliant trim for 2017. Interestingly, percentage-wise, trucks beat cars for CAFE compliance in 2017.

TABLE 5: PERCENTAGE OF CAFE COMPLIANT VEHICLES AMONG "ALL-NEW" MODELS 2015-2017			
	2015	**2016**	**2017**
Total "All-New" Vehicles	34	32	27
Total CAFE Compliant	14 (41%)	19 (60%)	19 (70%)
Percentage of CAFE Compliant Vehicles Among "All-New" Model Cars			**2015-2017**
	2015	**2016**	**2017**
Total "All-New" Cars	19	19	18
Total CAFE Compliant	8 (42%)	15 (80%)	12 (67%)
Percentage of CAFE Compliant Vehicles Among "All-New" Model Trucks			**2015-2017**
	2015	**2016**	**2017**
Total "All-New" Trucks	15	13	9
Total CAFE Compliant	6 (40%)	5 (40%)	7 (78%)

In reviewing the "all-new" vehicles, we also determined how many years into the future each model would comply with the *gradual increase* in CAFE requirements. Current vehicles that meet CAFE requirements for future years indicate that manufacturers are actually "ahead of the game" in terms of compliance.

Table 6 shows that 70% (19) of the 27 "all-new" vehicles for 2017 had models which met, at the minimum, the 2017 CAFE standard. In fact, from 2015-2017, the majority of these compliant cars actually exceeded the minimums required for that year. The figure also shows that 6 of the 2017 vehicles are already CAFE compliant with the 2025 standard—a record number.

TABLE 6: AMONG THE "ALL-NEW" VEHICLES–HOW MANY WILL CONTINUE THEIR CAFE COMPLIANCE UNTIL:											
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
2015	14	10 (71%)	8 (57%)	6 (43%)	5 (36%)	3 (21%)	3 (21%)	2 (14%)	0	0	0
2016	-	19	18 (95%)	18 (95%)	15 (79%)	14 (74%)	11 (58%)	7 (37%)	6 (32%)	4 (21%)	2 (11%)
2017	-	-	19	14 (74%)	11 (58%)	10 (53%)	8 (42%)	8 (42%)	7 (37%)	6 (32%)	6 (32%)

IV. CONCLUSION

The substantial empirical record before the agencies supports continuing the National Program at the levels established in the 2012 final rule. If anything, the evidence suggests a strengthening, not weakening of the standards. A rollback and freeze are illegal and uneconomic, likely costing the nation $500 billion dollars. The damage done to the process of standard setting would double the losses.

The National Program has been extremely successful because it implements the changes enacted in EISA in a manner that harnesses market forces to yield consumer pocketbook savings, macroeconomic growth and other public benefits. This is exactly the way the executive branch orders and OMB circulars have guided federal agencies. It takes a "command-but-not-control" approach to build a performance standards that embodies six principles, which we have identified in earlier analysis, as summarized in Table 7.

TABLE 7: 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, 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.

The proposed standards recognize the need to keep in touch with reality in several important ways. The standards do not require dramatic shifts in power train technologies or reductions in weight and offer flexibility and incentives for new technologies, and include a midterm review, which was properly completed by two of the three coordinating agencies. The setting of a coordinated national standard that lays out a steady rate of increase over a long time period gives consumers and the industry certainty and time to adapt to change.

The approach to setting standards which has been undertaken is consumer-friendly and facilitates automaker compliance. The attribute-based approach ensures that the standards do not require radical changes in the types or size of vehicles consumers drive; so, the full range of choices will be available to consumers.

In testimony before the U.S. House of Representatives,[17] we pointed to that 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[18].

- 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.
- They 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.[19]

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

[17] *Testimony of Dr. Mark Cooper 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

[18] See CFA has analyzed the ability of the industry to achieve the standards. Mark Cooper and Jack Gillis, *A Key Step to Ending America's Oil Addiction: Policymakers, Consumers and Automakers are Shifting, New Vehicles to Higher Fuel Economy*, July 2012; S*tatement 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, 2013, *On the Road to 54 Mpg: A Progress Report on Achievability*, April; *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; Mark Cooper, 2015, *Staying on the Road to 54.5 Mpg by 2025: Riding the Gasoline Roller Coaster*.

[19] We have monitored the development of the EV market. See: *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**.**

prices that are affordable.

In closing, a rollback of the MY 2021 fuel economy standard and/or a freeze of the MY 2022-2025 standards is simply not justified. The voluminous record has already established that the benefits far outweigh the costs; consumers and the economy would be greatly harmed if the standards were to be pulled back. Consumers value fuel economy and the automakers have shown they can meet the standards.

Consumer Federation of America's

Submission to the Environmental Protection Agency

Docket No. EPA-HQ-OAR-2015-0827

Attachment B

Testimony of Jack Gillis: Reconsideration of the Final Determination of the Mid-term Evaluation of Greenhouse Gas Emissions Standards for Model Years 2022-2025 Light-duty Vehicles

September 6, 2017

Consumer Federation of America

Statement of
Jack Gillis, Director of Public Affairs
Consumer Federation of America
Author, The Car Book
Before the
U.S. Environmental Protection Agency
on the
Reconsideration of the Final Determination of the Mid-term Evaluation
of Greenhouse Gas Emissions Standards for Model Years 2022-2025 Light-duty Vehicles
Public Hearing, Washington DC
September 6, 2017

My name is Jack Gillis. I am the Director of Public Affairs for the Consumer Federation of America (CFA)[1] and author of *The Car Book*. The Consumer Federation of America appreciates the opportunity to provide the Environmental Protection Agency (EPA) with our views on the Final Determination of the Mid-term Evaluation by the EPA and the California Air Resources Board (CARB) which support the standards adopted in National Program for model-years 2022-2025.

Throughout its 50 years of existence, CFA has been a vigorous and continuous participant in the process of setting regulations to improve the efficiency of energy-using consumer durables and lower the cost of energy borne by consumers.[2] Transportation fuels, the source of energy most directly affected by EPA as well as DOT regulations, are a major household expenditure, representing over 3 percent of total expenditures, one of the 6 largest subcategories listed in the consumer expenditure survey. Factoring in indirect expenditures on fuels consumed by commercial fleets,[3] which consumers pay for in the price of goods and services, would push transportation fuel consumption above 5%, making it the third or fourth largest household expenditure. [4]

We believe the Final Determination by EPA and CARB was correct legally, analytically and empirically. It is faithful to and effectively harmonized the statutory obligations of the three agencies that collaborated in the National Program and embodied a fine example of American federalism at its best.

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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://consumerfed.org/issues/energy/) provides links to 140 pieces of testimony and reports published in the past ten years dealing with the efficiency of energy-using consumer durables divided roughly equally between appliances and vehicles.

[3] Mark Cooper, *Paying the Freight,* Consumer Federation of America, attached to CFA Comments *Re: Department of Transportation Notice of Intent to Prepare an Environmental Impact Statement for New Medium- and Heavy-duty Vehicle Fuel Economy Standards*— August 8, 2014

[4] https://www.bls.gov/cex/22016/midyear/quintile.pdf. Adding appliance efficiency standards, which are governed by a structure of legal authority and administrative rules similar to that affecting appliances doubles the level of household expenditures and makes regulatory reform one of the largest consumer pocketbook issues for the Trump or any administration.

The analytic framework did exactly what twenty-years of executive branch guidance on rulemaking directed agencies to do.

The empirical basis for the standards is overwhelming. They deliver massive benefits to consumers and the nation. Hundreds of billions of dollars are split between pocketbook savings (50%), macroeconomic growth stimulus (30%) and environmental, health and other public benefits (20%).

Over the next month, there will be opportunities to make our case before both federal agencies considering future standards, so today I will briefly outline the conclusion we have reached based on our analyses filed in the proceedings that led to the National Program[5] and several more recent analyses we have conducted which reinforce those early conclusions.[6] To put our conclusion simply and clearly – the final determination of the EPA was administratively sound and reached the correct conclusion. Reconsideration is not necessary. The direct implication of that conclusion is that a freeze or rollback of the standards for MY 2021-2025 are not economically justified and contrary to law and administrative practice.

FINDINGS

The congressionally mandated goal of the law governing the Corporate Average Fuel Economy Program is maximum feasible fuel economy standards as embodied in the Energy Policy and Conservation Act of 1975 (EPCA). That goal was reaffirmed and strengthened less than ten years ago in the Energy Independence and Security Act (EISA). The guidance offered by executive orders and OMB circulars for the past twenty years have emphasized maximum net benefits. The principles and methods were described in detail by the Bush Administration.

While these clear goals are balanced by other concerns, such as technical feasibility and economic practicability, the extensive evidence in the record shows that the standards in place are quite moderate, well within the bounds of feasibility. Thus, based on the extensive record established at the agencies since EISA reformed and rebooted the CAFE program, these comments show that there is no justification to roll back the 2021 fuel economy or carbon emission standards for light duty vehicles, or modify the 2022-2025 standards. The current standards comply with the laws setting goals and faithfully implement the controlling executive branch guidance.

The laws governing agency action which require maximum energy savings and greenhouse gas reductions, executive orders and OMB circulars that still guide agency actions advocate maximum net benefits to society. The laws and guidance recognize that there are economic, technological and social balancing factors that should be considered in setting standards. The Administrative Procedure Act requires that agency actions are not arbitrary and

[5] Comments of the Consumer Federation of America, Proposed Rulemaking to Establish Emission Standards and Corporate Average Fuel Economy Standards Environmental Protection Agency Light-Duty Vehicle Greenhouse Gas) 40 CFR Parts 86 and 600; Department of Transportation 49 CFR Parts 531,633, 537, et al., November 27, 2009; Comments of Consumer Groups: Docket Nos. EPA-HQ-OAR-2010-0799; FRL-9495-2, NHTSA–2010–0131, February 13, 2012.

[6] Mark Cooper, 2017, *Pocketbook Savings, Macroeconomic Growth and Other Public Benefits of Energy Efficiency Appliance Standards: Benefit-Cost Analysis of Four Decades of Rules Shows they have Delivered Trillions of Dollars of Economic Value to Consumer and the Nation*; Jack Gillis and Richard Eckman, *An Analysis of Consumer Savings and Automaker Progress on the Road to 2025 CAFE Standards*, attached to Comments of the Consumer Federation of America, in the Matter of Transportation Infrastructure: Notice of Review of Policy, Guidance and Regulation, Before the Department of Transportation Docket No. OST-2017-0057, July 24, 2017.

capricious, do not lack justification or run counter to critical evidence in the record, particularly when the agency is reconsidering prior action. A freeze or rollback in the standards would be contrary to current law and practice.

A review of the economic analysis on which the standards proposed in the National Program were based shows that the standards adopted by the National Program took the balancing factors into account and proposed standards that fell far short of either maximum feasible or maximum net benefit levels. An empirical discussion of the benefit cost analysis shows:

- The National Program standards have a benefit cost ratio greater than 6-to 1, and
- a breakeven cost of gasoline of $0.75 per gallon, which means that as long as gasoline stays above $0.75 per gallon, the standards are justified.

Thus, the record and current economic conditions suggest that, if the agencies want to change the levels, they should be raised, not lowered.

Rolling back the 2021 standards and freezing the 2022-2025 standards would:

- Rob consumers of net savings of over $4,500 per household,
- Prevent a reduction in operating costs of $150 billion,
- Undermine $150 billion of macroeconomic growth, and
- Forego over $50 billion in environmental, health and other benefits.
- The total of $350 billion of benefits foregone would yield automaker savings only $50 billion.

Many aspects of the proposed standards from the producer point of view. The empirical evidence shows that the standards are readily achievable for a variety of reasons.

- Consistent with the long history of fuel economy standards, automakers' efforts to implement the standards show that the cost of compliance has been below the NHTSA/EPA projections and far below inflated industry estimates.
- The standards are well within the technological frontier of the industry as analyzed not only by NHTSA/EPA, but also MIT and the National Academy of Sciences.
- The rate of improvement is consistent with historical periods where standards were implemented.
- The standards are consistent with (or slightly below) other advanced industrial nations.
- Fuel economy pays for itself in a market where it has taken on much greater importance to consumers. As a result, fuel economy sells.
- With a gradual, but steady approach, developing new models to meet the standards and consumer needs has been evident in the marketplace and automakers have been complying with the standards.

According to a recent national survey[7] commissioned CFA, increasing federal fuel economy standards for cars and light duty trucks, to 42 MPG by 2025, is supported by 79 percent of Americans (68 percent of Republicans), and opposed by only 18 percent.

One reason for the widespread support of higher standards is that a large majority (79%) of those intending to purchase a motor vehicle, think that the vehicle's fuel economy is important. In part, this concern reflects the genuine belief that gas prices will rise in the future, as evidenced by the unprecedented flooding in Houston. When asked to predict the price of gasoline in five years, the average price given by all respondents was $3.90. Today's average price is $2.64, up 37 cents in just the last month.

CFA's analysis clearly indicates that the car companies are fully capable of meeting the CAFE standards and they are able to do so with great savings for consumers. Rolling back the standards at this point would not only hurt America's already financially beleaguered consumers, but they would hamper vehicle sales and put U.S. car companies at a distinct competitive disadvantage to the Asian car companies who will meet the standards.

Fuel Efficiency Doesn't Cost More—It Saves Money and Sells Vehicles

Congress and the Administration are receiving pressure from the car companies to roll back the nation's fuel economy standards which they, the unions, consumer groups and environmental organizations agreed to in 2012. They say it costs too much to comply and increased costs won't be accepted by consumers and sales will drop. Nothing could be further from the truth.

When CFA looked[8] at actual fuel efficiency and increases in MPGs among newly introduced vehicles, improvements in MPGs more than pay for themselves. Among the "all-new" 2017 vehicles[9] – the one's which manufacturers have had a chance to make fuel economy improvements we found:

- 27% (21) of the "all-new" vehicles introduced in 2017 actually cost less than their 2011 version and got 1-10 MPG better fuel economy.
- When calculating 5 years of fuel costs (using lower than current gas prices), nearly half of these 2017 vehicles cost less to buy and fuel than their 2011 counterparts.
- 58 of the 79 vehicles increased in price, however;
    - 15% (12 of 79) had fuel savings that offset the entire price increase;

[7] The survey was conducted for CFA by ORC International, which interviewed a representative sample of 1,008 American adults by landline or phone on July 13-16. The margin of error for the survey is plus or minus three percentage points.

[8] Jack Gillis and Richard Eckman, An Analysis of Consumer Savings and Automaker Progress on the Road to 2025 CAFE Standards, July 24, 2017.

[9] Only about 10% of each model year represents these "all-new" vehicles.

- 52% (41 of 79) had fuel savings that offset the increased cost of fuel economy technology;
- 6% (5 of 79) were more expensive in 2017 but their fuel economy stayed the same or decreased from 2011.

Benefits Far Outweigh the Costs

Looking at the cost/benefit average for these 79 "all-new" models—the added cost of fuel economy averaged $320 per vehicle but will save the buyer an average of $946 over the next 5 years, putting $626 back into consumer pocketbooks.

Consumers are Buying the More Fuel Efficient Vehicles

Comparing the sales figures for 2016 SUVs and light duty trucks with the 2011 models, those that increased the fuel efficiency by over 10% sold nearly 20% more vehicles than those with a less than 10% increase in fuel efficiency.

Car Companies on Track to Comply

Auto manufacturers are making good progress in complying with the law:

- 70 percent of the "all-new" 2017 vehicles had a CAFE-compliant trim, compared to 41 percent of the "all-new" 2015 vehicles.
- A record breaking 6 vehicles are compliant all the way to MY 2025.
- In looking at all of the 2017 models, "gas guzzlers" getting below 14 MPG are a miniscule 0.4% in 2017, down from 8.5% in 2011.
- A record 78% of the "all-new" light duty trucks had a CAFE compliant trim for 2017. Percentage-wise, trucks beat cars for CAFE compliance in 2017.
- 15 of the 17 manufacturers improved their CAFE compliance rate from 2015 to 2017.

The reason that the reboot of CAFE signed into law by President Bush and implemented through the National Program has worked so well, is that it is a perfect example of "command-but-not control" regulation that has been evolving under executive orders and OMB guidance written by Republican and Democratic presidents over almost four decades. It has been extremely successful because it implements the changes enacted in EISA in a manner that harnesses market forces to yield consumer pocketbook savings, macroeconomic growth and other public benefits. The CAFE standards set by the National Program are long-term, product neutral, technology-neutral, responsive to industry needs, responsive to consumer needs, and procompetitive.

The substantial empirical record before the agencies supports continuing the National Program at the levels established in the 2012 final rule. If anything, the evidence suggests a strengthening, not weakening of the standards. A rollback and freeze are illegal and uneconomic,

likely costing the nation $500 billion dollars. The damage done to the process of standard setting would double the losses.

The proposed standards recognize the need to keep in touch with reality in several important ways. The standards do not require dramatic shifts in power train technologies or reductions in weight and offer flexibility and incentives for new technologies. The setting of a coordinated national standard that lays out a steady rate of increase over a long time period gives consumers and the industry certainty and time to adapt to change.

The approach to setting standards which has been undertaken is consumer-friendly and facilitates automaker compliance. The attribute-based approach ensures that the standards do not require radical changes in the types or size of vehicles consumers drive; so, the full range of choices will be available to consumers.

- 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.
- They 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.

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.

In closing, the Consumer Federation of America, based on its own analyses and findings as well as the extensive record which has already been established, urges the EPA to move forward with the Final Determination of the Mid-Term Evaluation that has already been issued by the agency. The standards comply with the law and executive orders and OMB guidances in a balanced manner; the auto industry has demonstrated it has the capability to meet the 2022-2025 standards; consumers and our economy will benefit. If anything, the standards should be strengthened.

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Consumer Federation of America's

Submission to the Environmental Protection Agency

Docket No. EPA-HQ-OAR-2015-0827

Attachment C

Comments of the Consumer Federation of America: In the Matter of Transportation Infrastructure: Notice of Review of Policy, Guidance and Regulation Docket No. OST-2017-0057

July 24, 2017

BEFORE THE DEPARTMENT OF TRANSPORTATION

IN THE MATTER OF TRANSPORTATION INFRASTRUCTURE: NOTICE OF REVIEW OF POLICY, GUIDANCE AND REGULATION	**)** **)** **)**	**DOCKET NO. OST-2017-0057**

COMMENTS OF THE CONSUMER FEDERATION OF AMERICA

Mark Cooper
Director of Research

July 24, 2017

The Consumer Federation of America[1] appreciates the opportunity to provide the Department of Transportation (DOT) with guidance in its efforts to improve the regulatory process. Throughout its 50 years of existence, CFA has been a vigorous and continuous participant in the process of setting regulations to improve the efficiency of energy-using consumer durables and lower the cost of energy borne by consumers.[2] Transportation fuels that are the sources of energy most directly affected by DOT regulations are a major household expenditure, representing over 3 percent of total expenditures, one of the 6 largest subcategories listed in the consumer expenditure survey.[3]

To guide the DOT, we have prepared and attached two Appendices. Appendix A (*Pocketbook Savings, Macroeconomic Growth and Other Public Benefits of Fuel Economy Standards*) is an analysis of the forty-year history of fuel economy standards.[4] Appendix B (*An Analysis of Consumer Savings and Automaker Progress on the Road to 2025 CAFE Standards*), looks at the vehicles which manufacturers have had a chance to make fuel economy improvements, those being totally revised in 2017, comparing the price and fuel efficiency of these vehicles with their 2011 counterparts, the year before the new standards were implemented.

CONSUMER POCKETBOOK AND MACROECONOMIC BENEFITS

As discussed in Appendix A, the starting point for the DOT consideration of regulatory reform and relaxation must be a recognition of the remarkable benefits that the fuel economy standards have provided for consumers and nation.

[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://consumerfed.org/issues/energy/) provides links to 140 pieces of testimony and reports published in the past ten years dealing with the efficiency of energy-using consumer durables divided roughly equally between appliances and vehicles.

[3] https://www.bls.gov/cex/22016/midyear/quintile.pdf. Adding in fuel economy standards, which are governed by a structure of legal authority and administrative rules similar to that affecting appliances doubles the level of household expenditures and makes regulatory reform one of the largest consumer pocketbook issues for the Trump or any administration.

[4] Mark Cooper, 2017, *Pocketbook Savings, Macroeconomic Growth and Other Public Benefits of Energy Efficiency Appliance Standards: Benefit-Cost Analysis of Four Decades of Rules Shows they have Delivered Trillions of Dollars of Economic Value to Consumer and the Nation*, Consumer Federation of America, July.

Fuel economy standards adopted prior to 2008 have resulted in extremely large consumer savings and benefits

- consumer pocketbook savings of $2.1 trillion and
- macroeconomic benefits of $1.3 trillion.
- With costs of less than $500 million, the benefit-cost ratio for consumer pocketbook savings over 4-to-1 and for the macroeconomic benefit is close to 3-to-1.
- The total benefit cost ratio, without environmental, public health and other benefits, is close to 7-to-1.

The analysis of pocketbook savings for gasoline put the impact at the household level at savings of $20,000. Over 35 years, the savings work out to about $600 per household per year.

The report notes that 2008-2016 was a particularly active period of standards writing because the courts found that federal agencies had missed their statutory deadlines for updating rules and the Energy Independence and Security Act (EISA) of 2007 rebooted the fuel economy standards for vehicles. The present period, including standards that are not being reviewed at present will result in:

- consumer pocketbook savings of close to $500 billion and
- macroeconomic benefits of over $300 billion, with light duty vehicles accounting for seven-eighths of those gains.
- Environmental, public health and other benefits are about $120 billion.
- With costs just under $120 billion, the overall benefit of about $900 billion are over eight times the cost.
- Combining benefits of past and present standards, standards have provided over $4 trillion in savings, with less than $600 million in costs, for an overall benefit cost ratio of about 7-to-1.

Future benefits expected under the current law and administrative approach that appear to be at risk of rollback, or refusal to adopt have been estimated to be

- over $400 billion in pocketbook savings and
- $260 billion in macroeconomic benefits, for a total of close to $700 billion.
- Environmental, public health benefits and other benefits would add almost $200 billion for a total close to $900 billion.
- The projected cost is just over $125 billion, for a benefit cost ratio over 7-to-1.

THE LEGAL AND ANALYTICAL FRAMEWORK

This background of remarkable success should encourage the DOT to use restraint in changing a highly effective policy approach. Moreover, the Department of Transportation's

efforts to reduce regulatory burdens are constrained by laws.[5] This regulatory reform/relaxation proceeding cannot repeal and must be bound by three sets of laws.

- The laws of policy enacted by Congress that set goals and Executive Orders that define the implementation path for agency action.
- The laws of economics that drive the benefits and costs of regulations.
- The laws of physics that link the consumption of fossil fuels and the emissions of pollutants as waste products.

The DOT is obligated under existing law and executive orders to adopt regulations that:

- strive to deliver the maximum energy savings that are technically feasible and economically practicable.

The calculation of net benefits must

- take all benefits and costs into account, within the constraints of technologies that are feasible and practicable,
- be evaluated with discount rates ranging from 3% to 7%, and
- be quantified, if possible, but,
- where quantification is impossible or uncertain, qualitative evaluations are to be made.

This legal approach is perfectly consistent with the dominant framework of welfare economics.[6] The cornerstone of the policy that was laid forty-years ago is that there are numerous, persistent and substantial imperfections that afflict the market for energy efficiency. The aspiration of Congress and the guidance of the executive branch have established an institutional structure that has served the public and national interest by establishing reasonable and important goals and directing market forces to achieve those goals in the least-cost manner possible.

By statue and regulatory practice, the standards set by the DOT have been well-crafted to ensure their effectiveness. They take a "command-but-not control" approach that sets a performance standard but affords the manufacturers of energy-using consumer durables freedom and flexibility to meet the standards. They are technology and product neutral, setting moderately aggressive and progressive targets that are responsive to the needs of consumers and producers. For the past decade they have been attribute based, which means they better accommodate consumer preferences and afford manufacturers greater flexibility, They unleash market forces of competition and innovation around the standard, which explains why compliance costs have repeatedly, almost invariably, been well below the estimates made by regulators and far below the bloated cost estimates of industry.

[5] Section II discuses all three of these constraints on agency action. Section II-A discusses the legal aspect.
[6] Id., Section II-B discusses the economic analytic framework.

AUTOMAKER RESPONSE TO HIGHER STANDARDS

As described in Appendix B,

- 27% (21) of the "all-new" vehicles introduced in 2017 actually cost less than their 2011 version and got 1-10 MPG better fuel economy.
- When calculating 5 years of fuel costs, nearly half of these 2017 vehicles cost less to buy and fuel than their 2011 counterparts.
- 58 of the 79 vehicles increased in price, however;
- 15% (12 of 79) had fuel savings that offset the entire price increase
- 52% (41 of 79) had fuel savings that offset the increased cost of fuel economy technology
- 6% (5 of 79) were more expensive in 2017 but their fuel economy stayed the same or decreased from 2011.
- Looking at the cost/benefit average for these 79 all-new models—the added cost of fuel economy averaged $320 per vehicle and will save the buyer an average of $946 putting $626 back into consumer pocketbooks.
- 70 percent of the "all-new" 2017 vehicles had a CAFE-compliant trim, compared to 41 percent of the "all-new" 2015 vehicles.
- A record breaking 6 vehicles that are compliant all the way to MY 2025.
- In looking at all of the 2017 models, "gas guzzlers" getting below 14 MPG is a miniscule 0.4% in 2017, down from 8.5% in 2011.
- A record 78% of the "all-new" light duty trucks had a CAFE compliant trim for 2017. Percentage-wise, trucks beat cars for CAFE compliance in 2017.
- 15 of the 17 manufacturers improved their CAFE compliance rate from 2015 to 2017.
- Comparing the sales figures for 2016 SUVs and light duty trucks with the 2011 models, those that increased the fuel efficiency by over 10% sold nearly 20% more vehicles than those with a less than 10% increase in fuel efficiency.

These statistics (with the exception of the 2016 SUV/truck data) clearly indicate that the car companies are fully capable of meeting the CAFE standards and they are able to do so with great savings for consumers. Rolling back the standards at this point would not only hurt America's already financially beleaguered consumers, but they would hamper vehicle sales and put U.S. car companies at a distinct competitive disadvantage to the Asian carmakers who will meet the standards. As has been proven during the first 5 years of the reinvigorated standards program, automotive engineers are fully capable of meeting the very standards agreed to in 2012 and consumers save money in the process. Rolling back the standard would be costly, counterproductive, and harmful to America's competitive position in the now global auto marketplace.

CONSUMER ATTITUDES TOWARD FUEL ECONOMY AND STANDARDS

In mid-July 2017, CFA commissioned its tenth national random sample public opinion poll in the past ten years dealing the public support for fuel economy standards. In that decade, we have been through three presidents and a gasoline price roller coaster, but one thing has remained constant, public support for fuel economy standards. Given the tumultuous times, the strength and consistency of public support is a testament to the importance and power of this policy.

In the most recent survey, increasing federal fuel economy standards for cars and light duty trucks to 42 MPG by 2025 is supported by 79% of respondents in a recent national survey commissioned by the Consumer Federation of America (CFA); eighteen percent oppose this increase. These results reinforce public support for preserving the higher standards which the Administration is reconsidering. There is also legislation pending in Congress to weaken them. 68 percent of Republicans support this increase in standards.

The survey was conducted for CFA by ORC International, which interviewed a representative sample of 1,008 American adults by landline or phone on July 13-16. The margin of error for the survey is plus or minus three percentage points.

One reason for the widespread support of higher standards is that a large majority (79%), of those intending to purchase a motor vehicle in the future, think that the vehicle's fuel economy is important in the purchase of their next vehicle. In part, this concern may reflect their belief that gas prices will rise in the future. When asked to guess the price of gasoline in five years, the average price given by all respondents was $3.90. Today's average price is only $2.27.

Another reason for the support for fuel economy standards is the fact that the public recognizes the broader impact of fuel consumption. Over the years we have asked about the public's concerns about three issues – environment (climate change), mid-East imports (with implications for economic and political vulnerability), and future prices (which impact not only consumer pocketbooks, but also the economy).

Three-fifths of all respondents said they had strong concerns about climate change, Mideast oil, or gasoline prices. Each of these can be said to have an externalities aspect to it. Another one-seventh expresses some concern about one of these. Combined, three quarters of respondents express a concern about one of these.

Each of these has a significant relationship to the extent to which these concerns are related to the level at which fuel economy will be an influence in the next vehicle purchase decision. Concern about fuel economy has a statistically significant relationship to support for standards. Climate change has a statistically significant relationship to support for standards.

We find that the difference between those who are concerned about these three issues are much more likely to support standards. Any level of concern triggers the commitment to purchase more fuel efficient vehicles and support for standards. Aamong those who express great concern about one of the three issues, we find that over three-quarter say fuel economy will be very important in their next vehicle purchase, which is two and a half times as high as those

who express no concern about any of the three. Those with moderate concern fall between these two extremes. Similarly, two thirds of those who express a strong concern about one of the three issues strongly support fuel economy standards, which is more than twice the percentage of support among those who do not express any strong concerns. Again, those who express moderate concerns fall between the two.

CONCLUSION AND RECOMMENDATIONS

President Reagan set the institutional structure to implement all rules, including fuel economy standards, just six years after the legal foundation was enacted. Presidents Clinton and Obama refined that framework with the goal of improving it, within the constraints of law and past practice. Those Executive Orders still govern the process.

The courts and Congress took note of and acted to correct the failure of DOT to adopt beneficial regulation. In many respects, the Trump Administration cannot legally impair this regulatory process. However, even where it can make changes legally, it should proceed with great care because the result would likely be to impose massive, unnecessary costs on consumers and the economy.

Regulatory reforms that relax the burden on businesses will violate the law and well-established policy and practice; if they do not achieve maximum energy savings while balanced with maximum et benefits enjoyed by consumers and the nation. Such counter-productive "reforms" should not be implemented.

Agencies that refuse to adopt or delay the release of rules that increase net benefits because they cannot find two other rules to repeal, will also violate the law and established practice. The law requires the Department of Transportation to act in the public interest, independently of other rules that might have become obsolete.

In sum, regulatory reform should earn its keep the old-fashioned way, by increasing, on a case-by-case basis, the net benefit of energy efficiency measures that raise consumer pocketbook savings and help to grow the economy.

APPENDIX A

POCKETBOOK SAVINGS, MACROECONOMIC GROWTH AND OTHER PUBLIC BENEFITS OF FUEL ECONOMY STANDARDS:

MARK COOPER
DIRECTOR OF RESEARCH
CONSUMER FEDERATION OF AMERICA
JULY 2017

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I. INTRODUCTION

A. THE LEGAL CONTEXT OF REGULATORY REFORM OF FUEL ECONOMY STANDARDS

The Request for Information (RFI) issued by the Department of Transportation (published in the Federal Register on June 8, 2017) is among the first to contemplate fundamental changes in the approach to regulation in America under the Trump Administration.[1] As such, it demands a broad view of the process and how it has functioned in the past. The RFI recognizes that the recent Executive Orders on Regulatory Reform are laid atop the underlying statutes and Executive Orders in force that must be honored.[2] Executive Orders cannot repeal or redefine the Congressional intent of the authorizing statutes, they can only seek to improve the process by which the executive branch exercises the will of the Congress. Moreover, while Executive Orders can supplant earlier orders, great care should be taken in altering regulatory practice that has been successful and stood the test of time.

In the case of the Department of Transportation (DOT) fuel economy standards, there is a remarkable record of success that must provide the context for and restrain efforts to reform the regulatory process. Over the course of more than forty years, with careful statutory goals and guided by a Reagan-era Executive Order whose principles remain in force to give strong guidance to the regulatory review process, Department of Transportation regulations have yielded trillions of dollars of direct pocketbook benefits to consumers and indirect economic and environmental benefits to the nation. The consideration of reform of Department of Transportation regulation must be informed by that remarkable track record of success.

That review must consider both the benefits and costs of standards, not because the deregulatory executive order says so (which it now DOTs),[3] but because the underlying statutes guided by Executive Orders have always required a full and careful benefit-cost analysis. Federal law not only imposes deadlines and requires benefit-cost analysis, but also requires that the conclusions be reasonably related to the facts before the agency.[4] Federal law constrains executive actions in other ways, requiring cooperation between federal and state agencies, and giving states a right to independent action under the American approach to federalism.

In this analysis, we offer guidance to the Department of Transportation's regulatory reform effort that builds on the track record and the legal context.

Triggered four decades ago by the oil price shocks of the 1970s, the use of standards to promote energy efficiency has enjoyed a remarkable degree of bipartisan and public support.[5] This support stems in large measure from the obvious benefit of efficiency. [6] Efficiency standards deliver massive pocketbook savings to consumers that helps to grow the economy. [7] The national security, public health and environmental benefits are substantial too, but much smaller than the direct consumer and indirect economic benefits.

In this paper we analyze the past, present and future impact of fuel economy standards on consumers and the economy using very conservative assumptions and conclude that they have produced, are producing and are likely to continue to produce massive public benefits. The long history of consumer benefits from and support for energy efficiency standards and this huge

consumer stake in continuing to develop these standards make it clear that this is one of the biggest consumer pocketbook issues that the DOT and the current administration will deal with. Regulatory reform that threatens to stymie the implementation and enforcement of current fuel economy standards or the continued development of fuel economy standards would impose harm on the public.

The rule of law requires an agency to reach decisions that reflect a reasonable interpretation of the evidence on the record before it. The impact of policy on consumer pocketbooks and public support for consumer-friendly policies is important evidence. Our public opinion polling data shows that consumers overwhelmingly support efficiency standards.[8] Our economic analysis, summarized below, explains why they are right to do so – these standards have saved and continue to save consumers vast sums.

B. OUTLINE

Given the long history of support for efficiency standards, the strong record of positive results, and the unprecedented nature of recent attacks on standards,[9] this paper presents a comprehensive overview of why and how benefits have been consumer-friendly for over four decades. Given the extensive conceptual and analytic framework we have presented in regulatory proceedings,[10] papers,[11] and research reports[12] over the past decade, this paper presents a brief overview of the analytic framework, but focuses on the quantitative evaluation of a full accounting of benefits and benefits.

Section II explains the legal and analytic terrain on which regulatory reform must operate. It first describes the legal context, then offers an economic explanation of why performance standards work so well to save consumers money and grow the economy, particularly when applied to energy efficiency. It concludes with a brief review of public support for fuel economy standards reflected in national public opinion polling over the past decade.

Section III describes the traditional approach to benefit-cost analysis prepared by regulatory agencies under their authorizing statutes and the Executive Orders in force. It discusses why there is a systematic tendency for regulatory agencies to overestimate the cost of compliance with well-designed performance standards.

Section IV describes the economic growth effects that inevitably flow from well-designed performance standards and argues that they should be included in any comprehensive cost-benefit analysis. We develop and use extremely conservative rules of thumb and show the impact they would have on the bottom line evaluation of efficiency standards.

Section V presents a comprehensive view of the benefits of standards, emphasizing that measures of the benefit that ignores market imperfections should not be the basis for evaluating policy effects.

Section VI describes the quantitative methodology and discusses the estimates of costs and benefits of past, present and future fuel economy standards. It provides a new perspective in two ways. First, it introduces a consistent set of definitions and evaluations across the full range of efficiency standards. Second, it examines the benefits and costs from five points of view.

We examine past standards, generally in the period from the 1980s to 2007, to establish the baseline impact of efficiency standards in which we are not debating projections but looking at actual performance.

We analyze present standards, generally in the period 2008-2016. While there are still uncertainties here, the initial effect of the standards can be seen. Although we rely on the agency regulatory and technology impact assessments, real world effects support the conclusion that the effects have been positive.

We examine pending standards for the current period, 2017- forward. These involve many of the standards that the Trump Administration is seeking to delay, roll back, or repeal. Although they rest on agency documents, the decision to adopt these standards is based on the evidentiary record. Under the process of the Administrative Procedure Act the Trump Administration faces the challenge of reaching a different conclusion either by reinterpreting the record before the agency or by building a new record that reaches a contrary conclusion. Either way, the existing record poses a significant challenge to the new administration.

We consider future standards and the potential for consumer benefit from continued development of standards. Many of the authorizing statutes tell the agencies to adopt standards that achieve maximum practicable economic benefits within the bounds of technological feasibility. Some have timelines for the development of standards. This creates an impetus for the continuous development of standards that are in the public interest, as technology advances. In fact, many of the standards adopted by the Obama Administration were required by the courts because the prior two administrations had failed to execute the statutes responsibly. Moreover, Congress passed a major piece of legislation – the Energy Independence and Security Act of 2007 (EISA), which compelled auto and fuel economy standards to be adopted.

We also offer a separate "pure externalities view" of standards that includes macroeconomic, environmental, public health, and other externality benefits. While we believe the direct consumer pocketbook benefits should be included in the benefit-cost analysis, this "pure externalities view" allows us to estimate the benefit-cost ratio of factors that are not reflected in the market transaction and, therefore, are based on indisputable market imperfections and failures that are corrected by standards.

II. THE LEGAL, ANALYTIC AND PUBLIC OPINION FOUNDATIONS OF BENEFIT-COST ANALYSIS OF FUEL ECONOMY STANDARDS

Because concerns about energy consumption were magnified by the energy price shocks of the 1970s, there is an extremely large and rich literature on why there is a significant and persistent "efficiency gap."[13] While the impetus to setting standards for energy consumption of durable goods was the urgent effect of price shocks on the economy and national security (both of which can be considered, "externalities" of energy consumption), engineering-economic analysis identifies numerous attractive opportunities to invest in energy saving technologies that cost less than the savings they generate. This literature offers a conceptual explanation based on the observation that there are imperfections on both the supply and demand sides of energy markets that lead producers to underinvest in energy efficiency and consumers to demand less efficiency than is economically justified.

That literature also contains hundreds, if not thousands, of peer-reviewed and published empirical studies of the actual and potential energy savings across a broad range of goods. It contains numerous comparisons of policy instruments in which performance standards repeatedly turn out to be among the most effective tools for addressing these market imperfections when they take a "command but not control," approach.[14]

Because the old price shocks had a massive impact on the U.S., the issue has been prominent for a long time, with recent environmental concerns reinforcing its continuing importance. As a result, efficiency has received a great deal of policy, political and polling attention. This Section discusses the decision making terrain of fuel economy standards

A. LAW AND REGULATORY PRACTICE

Law EPCA, 1975, EISA, 2007

The contemporary, substantive requirements for setting standards began at 42 U.S.C. Part A of Title III of the Energy Policy Conservation Act, signed into law in 1975. This Section established the Corporate Average Fuel Economy (CAFE) standards for automobiles. Congress designated the initial targets for three years. The Secretary of Transportation is then authorized to set standards that achieved the maximum feasible average fuel economy until 1985. In doing so, the Secretary must balance a number of factors. Standards must be technically feasibility, economically practicable, take into account other standards and the need to save energy.

The Energy Independence and Security Act of 2007 restarted the CAFÉ program and added a requirement for attribute-based standards.

Executive Orders

E.O. 12291 (Reagan, 1981)

Less than a month into the Reagan Administration, Executive Order 12291 outlined the principles and practices to govern the evaluation and promulgation of rules and standards. Although these were modified slightly by later presidents, the basic structure has remained the

same. Since the law was quite new when Reagan took office and few standards had been written, his executive order essentially established the practice.

Sec. 2. General Requirements. In promulgating new regulations, reviewing existing regulations, and developing legislative proposals concerning regulation, all agencies, to the extent permitted by law, shall adhere to the following requirements:

(a) Administrative decisions shall be based on adequate information concerning the need for and consequences of proposed government action;

(b) Regulatory action shall not be undertaken unless the potential benefits to society from the regulation outweigh the potential costs to society;

(c) Regulatory objectives shall be chosen to maximize the net benefits to society;

(d) Among alternative approaches to any given regulatory objective, the alternative involving the least net cost to society shall be chosen; and

(e) Agencies shall set regulatory priorities with the aim of maximizing the aggregate net benefits to society, taking into account the condition of the particular industries affected by regulations, the condition of the national economy, and other regulatory actions contemplated for the future.

Sec. 3. Regulatory Impact Analysis and Review.

(a) In order to implement Section 2 of this Order, each agency shall, in connection with every major rule, prepare, and to the extent permitted by law consider, a Regulatory Impact Analysis. Such Analyses may be combined with any Regulatory Flexibility Analyses performed under 5 U.S.C. 603 and 604.

(b) Each agency shall initially determine whether a rule it intends to propose or to issue is a major rule, provided that, the Director, subject to the direction of the Task Force, shall have authority, in accordance with Sections l (b) and 2 of this Order, to prescribe criteria for making such determinations, to order a rule to be treated as a major rule, and to require any set of related rules to be considered together as a major rule.

(c) Except as provided in Section 8 of this Order, agencies shall prepare Regulatory Impact Analyses of major rules and transmit them, along with all notices of proposed rulemaking and all final rules, to the Director as follows:

(1) If no notice of proposed rulemaking is to be published for a proposed major rule that is not an emergency rule, the agency shall prepare only a final Regulatory Impact Analysis, which shall be transmitted, along with the proposed rule, to the Director at least 60 days prior to the publication of the major rule as a final rule;

(2) With respect to all other major rules, the agency shall prepare a preliminary Regulatory Impact Analysis, which shall be transmitted, along with a notice of proposed rulemaking, to the Director at least 60 days prior to the publication of a notice of proposed rulemaking, and a final Regulatory Impact Analysis, which shall be transmitted along with the final rule at least 30 days prior to the publication of the major rule as a final rule;

(3) For all rules other than major rules, agencies shall submit to the Director, at least 10 days prior to publication, every notice of proposed rulemaking and final rule.

(d) To permit each proposed major rule to be analyzed in light of the requirements stated in Section 2 of this Order, each preliminary and final Regulatory Impact Analysis shall contain the following information:

(1) A, description of the potential benefits of the rule, including any beneficial effects that cannot be quantified in monetary terms, and the identification of those likely to receive the benefits;

(2) A description of the potential costs of the rule, including any adverse effects that cannot be quantified in monetary terms, and the identification of those likely to bear the costs;

(3) A determination of the potential net benefits of the rule, including an evaluation of effects that cannot be quantified in monetary terms;

(4) A description of alternative approaches that could substantially achieve the same regulatory goal at lower cost, together with an analysis of this potential benefit and costs and a brief explanation of the legal reasons why such alternatives, if proposed, could not be adopted; and

(5) Unless covered by the description required under paragraph (4) of this subsection, an explanation of any legal reasons why the rule cannot be based on the requirements set forth in Section 2 of this Order.

E.O. 12866 (Clinton, 1993)

President Clinton replaced Reagan's executive order, but as the following text shows, his Executive Order 12866 kept the essential elements of the approach in place. In terms of the analysis below, it rendered the review more flexible and encouraged greater reliance on market forces. It introduced the concept of performance standards and called for careful review across all standards.

Section 1. Statement of Regulatory Philosophy and Principles.

a. The Regulatory Philosophy. Federal agencies should promulgate only such regulations as are required by law, are necessary to interpret the law, or are made necessary by compelling public need, such as material failures of private markets to protect or improve the health and safety of the public, the environment, or the well-being of the American people. In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider. Further, in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.

b. The Principles of Regulation. To ensure that the agencies' regulatory programs are consistent with the philosophy set forth above, agencies should adhere to the following principles, to the extent permitted by law and where applicable:

1. Each agency shall identify the problem that it intends to address (including, where applicable, the failures of private markets or public institutions that warrant new agency action) as well as assess the significance of that problem.
2. Each agency shall examine whether existing regulations (or other law) have created, or contributed to, the problem that a new regulation is intended to correct and whether those regulations (or other law) should be modified to achieve the intended goal of regulation more effectively.
3. Each agency shall identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public.
4. In setting regulatory priorities, each agency shall consider, to the extent reasonable, the degree and nature of the risks posed by various substances or activities within its jurisdiction.
5. When an agency determines that a regulation is the best available method of achieving the regulatory objective, it shall design its regulations in the most cost-effective manner to achieve the regulatory objective. In doing so, each agency shall consider incentives for innovation, consistency, predictability, the costs of enforcement and compliance (to the government, regulated entities, and the public), flexibility, distributive impacts, and equity.
6. Each agency shall assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs.
7. Each agency shall base its decisions on the best reasonably obtainable scientific, technical, economic, and other information concerning the need for, and consequences of, the intended regulation.

8. Each agency shall identify and assess alternative forms of regulation and shall, to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt.
9. Wherever feasible, agencies shall seek views of appropriate State, local, and tribal officials before imposing regulatory requirements that might significantly or uniquely affect those governmental entities. Each agency shall assess the effects of Federal regulations on State, local, and tribal governments, including specifically the availability of resources to carry out those mandates, and seek to minimize those burdens that uniquely or significantly affect such governmental entities, consistent with achieving regulatory objectives. In addition, as appropriate, agencies shall seek to harmonize Federal regulatory actions with related State, local, and tribal regulatory and other governmental functions.
10. Each agency shall avoid regulations that are inconsistent, incompatible, or duplicative with its other regulations or those of other Federal agencies.
11. Each agency shall tailor its regulations to impose the least burden on society, including individuals, businesses of differing sizes, and other entities (including small communities and governmental entities), consistent with obtaining the regulatory objectives, taking into account, among other things, and to the extent practicable, the costs of cumulative regulations.
12. Each agency shall draft its regulations to be simple and easy to understand, with the goal of minimizing the potential for uncertainty and litigation arising from such uncertainty.

E.O. 13563 (Obama, 2011)

The Obama Executive Order extended earlier orders by emphasizing efforts to achieve results at least costs and transparency.

Improving Regulation and Regulatory Review
Section 1. *General Principles of Regulation.*

(a) Our regulatory system must protect public health, welfare, safety, and our environment while promoting economic growth, innovation, competitiveness, and job creation. It must be based on the best available science. It must allow for public participation and an open exchange of ideas. It must promote predictability and reduce uncertainty. It must identify and use the best, most innovative, and least burdensome tools for achieving regulatory ends. It must take into account benefits and costs, both quantitative and qualitative. It must ensure that regulations are accessible, consistent, written in plain language, and easy to understand. It must measure, and seek to improve, the actual results of regulatory requirements.

(b) This order is supplemental to and reaffirms the principles, structures, and definitions governing contemporary regulatory review that were established in Executive Order 12866 of September 30, 1993. As stated in that Executive Order and to the extent permitted by law, each agency must, among other things: (1) propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify); (2) tailor its regulations to impose the least burden on society, consistent with obtaining regulatory objectives, taking into account, among other things, and to the extent practicable, the costs of cumulative regulations; (3) select, in choosing among alternative regulatory approaches, those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity); (4) to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt; and (5) identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public.

(c) In applying these principles, each agency is directed to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible. Where appropriate and permitted by law, each agency may consider (and discuss qualitatively) values that are difficult or impossible to quantify, including equity, human dignity, fairness, and distributive impacts.

The pedigree, longevity and success of this law and administrative practice create a formidable institutional structure that deserves a great deal of respect and deference. As a result, energy performance standards enjoy a remarkable degree of public and bipartisan support.[15]

B. THE IMPORTANCE OF RIGOROUS BENEFIT-COST ANALYSIS

Benefits and Costs

The principles that the laws and executive orders teach should be familiar to and learned by anyone who has taken Economics 101. Proper cost benefit analysis must include careful consideration of costs and benefits. In fact, an introductory economics text written by John B. Taylor,[16] who holds prestigious named appointments at Stanford University and the conservative Hoover Institute and who served as an Under Secretary of the Treasury in the George W. Bush administration,[17] defines cost benefit analysis as follows:

> Cost-Benefit Analysis: an appraisal of a project based on the costs and benefits from it.[18]

A more advanced text on *The Economics of Regulation and Antitrust,*[19] 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 serves as the minimum tests for policy efficacy, as our overall objective should be to maximize the spread between benefits and costs.[20]

The recent OMB advice letter calls for careful cost-benefit analysis. [21] The challenge as always will be to ensure that agencies do not engage in "fuzzy math." The threat of "fuzzy math" is nothing new and the APA takes a pragmatic approach to evaluating whether the agency decision is consistent with the record before it. The remainder of this section discusses the rationale for implementing standards to reduce the efficiency gap and describes the key elements that must be included in the benefit cost calculation to avoid "fuzzy math."

Market Imperfections

The cornerstone of the cost benefit justification for standards is the potential to produce a benefit. If the marketplace is performing well, it is difficult to justify policy intervention. If it not performing well for any variety of reasons, policy interventions in the market can improve market performance. Viscusi, et al., present an overarching observation as the starting point for this analysis.

> "If we existed in a world that functioned in accordance with the perfect competitive paradigm, there would be little need for antitrust policies and other regulatory efforts. All markets would consist of a large number of sellers of a product, and consumers would be fully informed of the product's implications. Moreover, there would be no externalities present in this idealized economy, as all effects would be internalized by the buyers and seller of a particular product.
>
> Unfortunately, economic reality seldom adheres very closely to the textbook model of perfect competition. Many industries are dominated by a small number of large firms. In some instances, principally the public utilities, there may even be a monopoly…
>
> Not all market failures stem from actions by firms. In some cases, individuals can also be contributing to the market failure."[22]

The key elements of this analytic framework were put into place a quarter of a century ago in Executive Order 12866 and they remain in effect today. They have stood the test of time because they further the goals enacted by Congress and comport with the precepts of economic analysis. The empirical evidence with respect to energy efficiency indicates is that there is a significant failure of the market to produce optimum results. The recent literature, which has been reviewed in many recent proceedings, shows that there is a massive efficiency gap and there are numerous, well-documented market imperfections that lead to underinvestment and under-supply of energy saving technologies in consumer durable and commercial equipment markets.

Societal failures, like the national security implications of energy imports, were often the starting point for the consideration of policies to intervene in the market. Environmental externalities were another early and obvious market failure. The study of the market for energy efficiency has yielded many other sources of imperfections. We have documented and discussed these at great length in comments, as well as papers and reports. Table II-1 summarizes the intersection of our broad analysis of imperfections in the market for energy efficiency and the empirical evidence we have reviewed in hundreds of studies.

C. Performance Standards, An Effective "Command-But-Not- Control" Approach

Even with well-documented market imperfections, there is no guarantee that the standards will deliver the benefits they claim. The design of standards is important.

Viscusi, et al., go on to describe several attributes of regulation that improve its efficacy, stating that "performance-oriented regulation," "give firms some discretion in terms of the means of their compliance," "utilization of unbiased estimates of benefits and costs," and "avoid… regulation of prices and production."[23] This observation is often repeated with respect to energy efficiency performance standards. Other key characteristics that the literature identifies as making for effective standards that promote innovation, in addition to flexibility, include certainty of standards, progressive moving targets, and elimination of information asymmetry.[24]

> There is a lot of empirical evidence that energy savings measures often provide an effective, cost-efficient approach to reducing greenhouse gas emissions, while generating co-benefits on employment and competitiveness…

Well-designed regulation that is strict in ambition, but flexible in implementation would point companies to the problem of inefficiencies, trigger information gathering, reduce uncertainty and create a market push within an overall level-playing field. Compliance to regulation will lead to greater innovation (cleaner technologies, processes) as key means to reduce inefficiency, which will lead to environmental benefits, hence lower overall costs. Moreover, cost savings can (but do not always) lead to partial or full offset of regulatory compliance and innovation cost and hence increase overall competitiveness.[25]

TABLE II-1: SCHOOLS OF THOUGHT AND MARKET IMPERFECTIONS

Traditional	Transaction Cost/Institutional	Endemic Imperfections
Externalities	Search and Information	Asymmetric Info
Public Goods & Bads	Imperfect information	Agency
Basic Research/Stock of Knowledge	Availability	Adverse selection
Network Effects	Accuracy	Perverse incentives
Learning-by-Doing & Using	Search cost	Lack of capital
Localization	Bargaining	
Industry Structure	Risk & Uncertainty	Political Power & Policy
Imperfect Competition	Liability	Monopoly/lack of competition
Concentration	Enforcement	Incumbent power
Barriers to Entry	Fuel Price	Institutional support
Scale	Sunk costs	Inertia
Cost structure	Hidden cost	Regulation
Switching costs	High Risk Premia	Price
Technology-Innovation	Incomplete Markets	Aggregate, Avg.-cost
Economics		Allocating fuel price volatility
R&D	Behavioral	Permitting
Investment	Motivation & Values	Lack of commitment
Marketing	Non-economic	
Bundling: Multi-attribute	Influence & Commitment	
Cost-Price	Custom	
	Social group & status	
Limit impact of price	Perception	
	Bounded Vision/Attention	
	Prospect/ Risk Aversion	
	Calculation.	
	Bounded Rationality	
	Limited ability to process info	
	Heuristic decision making	
	Discounting difficulty	

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. Most recent update, including climate change literature available in Mark Cooper, 2017, The Political Economy of Electricity: Progressive Capitalism and the Struggle to Build a Sustainable Power Sector, (Praeger), Chapter 7 and Appendix II for a more recent comprehensive review.

In an earlier analysis, CFA explained that well-crafted performance standards exhibit a "command but not control" approach to deliver consumer benefits at least cost. These standards

work best when they embody six principles, as described in Table II-2,[26] because they unleash market forces in pursuit of the goal.

TABLE II-2: ATTRIBUTES OF EFFECTIVE, COMMAND BUT NOT CONTROL 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.

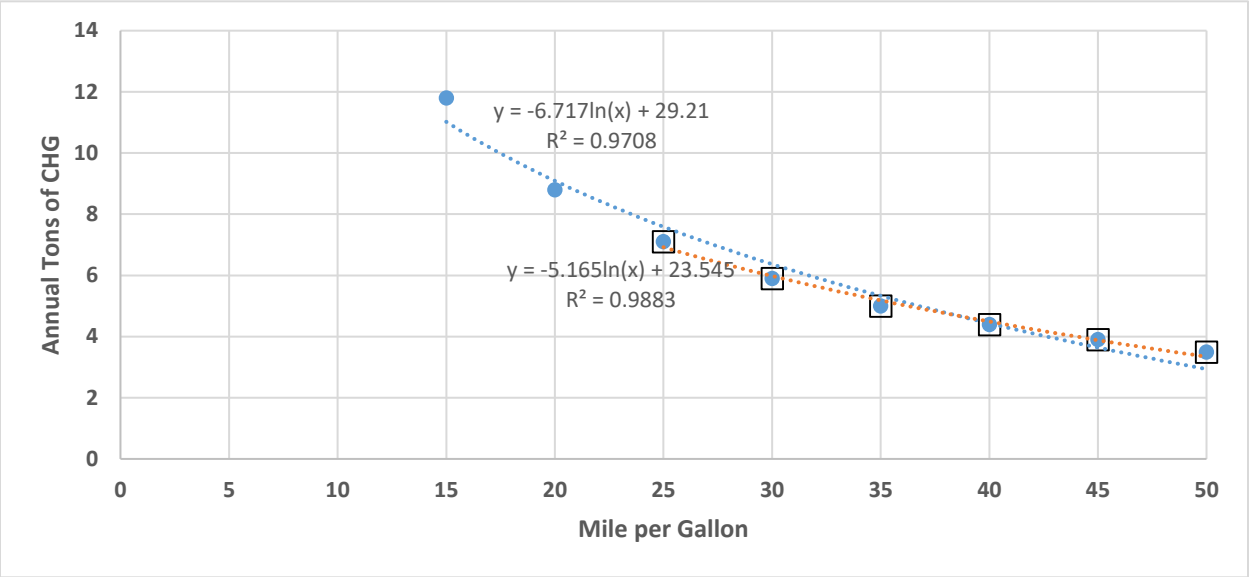
D. TRADITIONAL EXTERNALITIES: ENVIRONMENTAL, PUBLIC HEALTH AND OTHER IMPACTS

The history and broad framework of energy efficiency standards directly raises another important issues, as the Viscusi, et al., discussion highlights. There are a number of effects that can be considered externalities because they do not enter into individual consideration in consumer and producer transactions. One such externality that is grounded in the laws of physics is particularly important.

Because of the physical relationship between energy consumption and pollution emissions, one of the clear impacts of efficiency standards, whether instituted for energy, environmental, or public health reasons, is a reduction in pollution. The reduction of carbon emissions receives a great deal of attention today. The benefits of the reduction of emissions of non-carbon pollutants (e.g. SOX, NOX, particulates) are also important, have long been recognized, and the value of these is subject to less controversy.

As we pointed out long ago in our work on the Clean Cars program,[27] the near perfect correlation between the 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 II-1). The same is true for other fossil fuels used directly by consumers or to produce electricity. The amount of pollution associated with electricity consumption will depend on the mix of resources used to generate it, and as reliance on fossil fuels declines, so too will the amount of pollution reduction, but the least-cost and most effective approach to reduction of emissions remains improving energy efficiency.[28] The least cost approach to emission reductions is to improve the efficiency of vehicles and appliances by reducing their energy consumption. All the agencies involved in setting standards, EPA, NHTSA, DOT, be they emissions, appliances, or fuel economy are required to consider this economic benefit.

FIGURE II-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 because the avoided cost of energy consumption are direct and immediate pocketbook benefits of the standard. Congress' broad language on benefits and the executive orders that seek maximum benefit reflect the fact that neither branch of government has the power to repeal or override the laws of nature. Viewed in this way, it can be argued that the consumer pocketbook savings are an inevitable, unintended consequence (an externality) of the reduction in pollution, which are not considered in the transaction.

E. PUBLIC CONCERN ABOUT POLICY, RECOGNITION OF THE IMPORTANCE OF INCREASING FUEL ECONOMY AND SUPPORT FOR FUEL STANDARDS

The economic success mentioned above and analyzed below and the legal and analytic frameworks provide a firm foundation for the adoption and continued development of fuel economy standards. This foundation rests on a strong base of public support, which we have been measuring regularly and briefly discuss in this section.

Public Opinion about Standards in Mid-2017

In mid-July 2017, CFA commissioned its tenth national random sample public opinion poll in the past ten years dealingwith the public support for fuel economy standards.[29] In that decade, we have been through three presidents and a gasoline price roller coaster, but one thing has remained constant, public support for fuel economy standards. Given the tumultuous times, the strength and consistency of public support is a testament to the importance and power of this policy.

In the most recent survey, increasing federal fuel economy standards for cars and light duty trucks to 42 MPG by 2025 is supported by 79% of respondents; just, eighteen percent

oppose this increase. These results reinforce public support for preserving the higher standards which the Administration is reconsidering. There is also legislation pending in Congress to weaken them. Yet, 68 percent of Republicans support this increase in standards.

One reason for the widespread support of higher standards is that a large majority (79%), of those intending to purchase a motor vehicle in the future, think that the vehicle's fuel economy is important in the purchase of their next vehicle. In part, this concern may reflect their belief that gas prices will rise in the future. When asked to guess the price of gasoline in five years, the average price given by all respondents was $3.90. Today's average price is only $2.27.

Another reason for the support for fuel economy standards is the fact that the public recognizes the broader impact of fuel consumption. Over the years we have asked about the public's concerns about three broad energy policy issues – environment (climate change), mid-East imports (with implications for economic and political vulnerability), and future prices (which impact not only consumer pocketbooks, but also the economy).

Three-fifths of all respondents to the 2017 survey said they had strong concerns about climate change, Mideast oil, or gasoline prices. Another one-seventh expresses some concern about one of these. Combined, three quarters of respondents express a concern about one of these.

Each of these has a significant relationship to the extent to which these concerns are related to the level at which fuel economy will be an influence in the next vehicle purchase decision (See Figure II-2). Concern about fuel economy has a statistically significant relationship to support for standards. Climate change has a statistically significant relationship to support for standards.

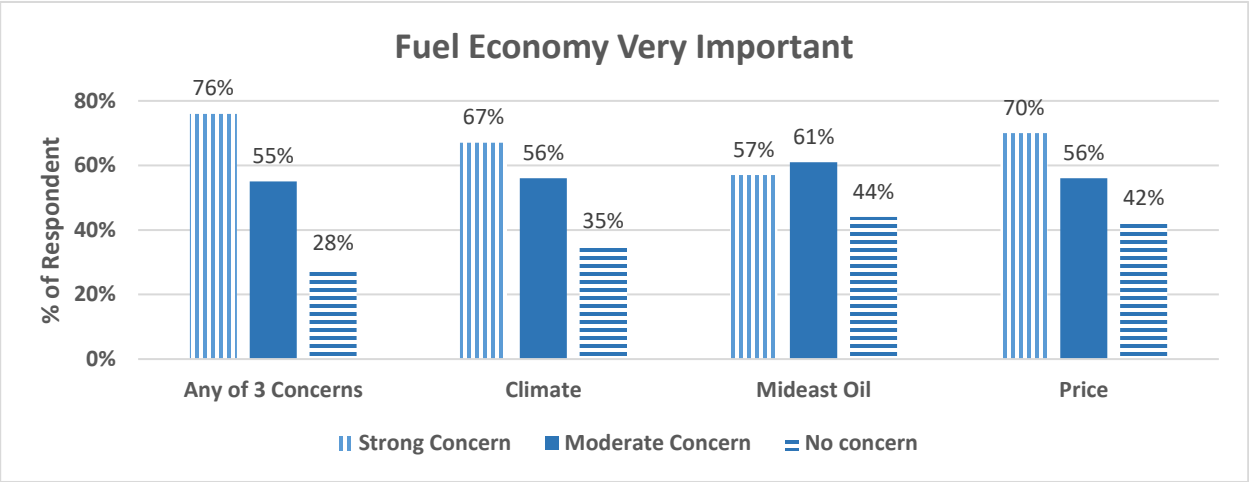
We find that the difference between those who are concerned about these three issues are much more likely to support standards. Any level of concern triggers the commitment, but the stronger the concern, the stronger the commitment. As shown in Figure II-2, among those who express great concern about one of the three issues, we find that over three-quarter say fuel economy will be very important in their next vehicle purchase, which is two and a half times as high as those who express no concern about any of the three. Those with moderate concern fall between these two extremes. Similarly, two thirds of those who express a strong concern about one of the three issues strongly support fuel economy standards, which is more than twice the percentage of support among those who do not express any strong concerns. Again, those who express moderate concerns fall between the two.

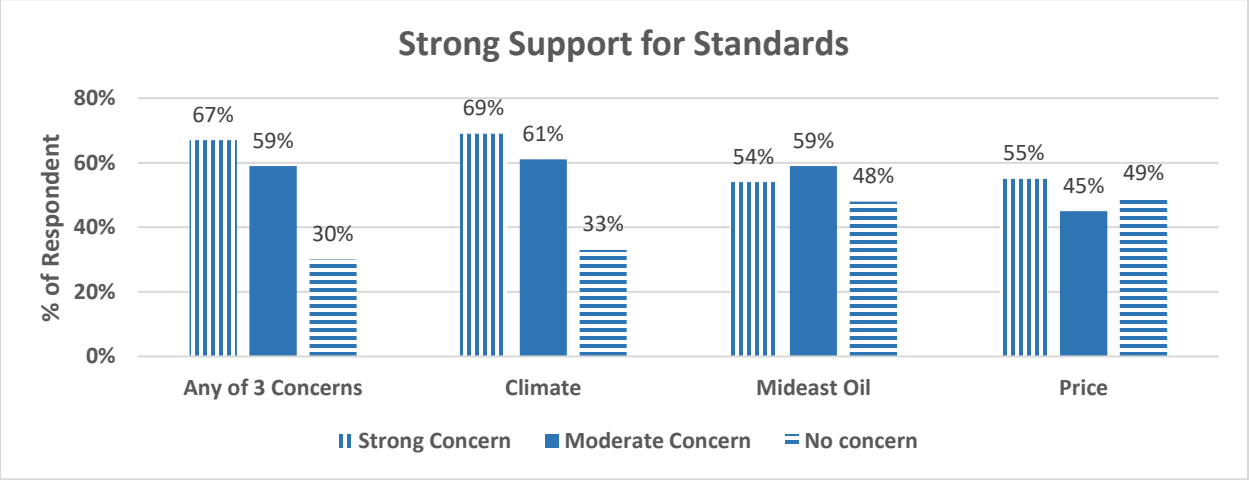
Long Term Support for Fuel Economy Standards

The durability of this support for standards is reflected in our earlier polls. 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.[30]

- Support for the increase stood at 81%.

FIGURE II-2: EXTERNALITY CONCERNS AND ATTITUDES TOWARD FUEL ECONOMY





Source: CFA, ORC, national random sample public opinion poll, July 2017

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).

- 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.

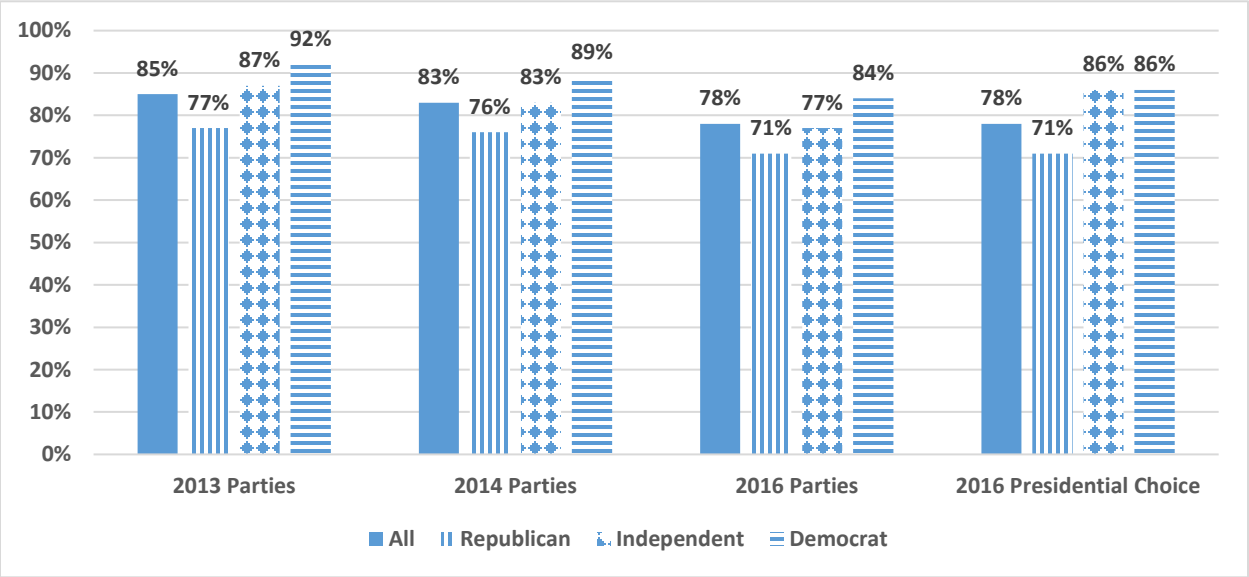
- Support for the standard stood at 81%.

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 II-3.

FIGURE II-3: SUPPORT FOR THE CURRENT STANDARD



Source: CFA commissioned public opinion polls conducted by ORC.

III. THE BENEFIT-COST ANALYSIS OF FUEL STANDARDS

A. COSTS AND THE TENDENCY TO DECLINE

The starting point of the analysis is the costs of standards, which has received a great deal of attention from the opponents of standards.[31] Interestingly, they have used the costs estimated by the agencies in their technical and regulatory analyses, with a 3% discount rate. We believe this is the appropriate basis for the analysis, but it is only the starting point.

The costs presented by the agencies are an appropriate starting point because the agencies tend to spend an immense amount of time analyzing these costs, including technology and maintenance. They do not just accept the high costs suggested by industry or the low costs put forward by efficiency advocates. They do independent analysis of costs, frequently engaging in engineering (tear down) studies and reviewing the technical literature, as well as numerous reports from the National Research Council of the National Academy of Sciences.[32] Although, as discussed below, the regulatory agencies still tend to overestimate costs because they do not fully reflect the dynamic, cost-reducing effects of market forces and market-driven innovation, their cost estimates are the best place to start and anchor the analysis.

For the analysis of the costs of past (older) standards, the studies used below end to look to actual market data to estimate costs rather than projections of costs. This may rely on manufacturer price data, consumer expenditure data, or econometric (hedonic) estimates.

In this section, we argue that the strong evidence of overestimation of cost should be recognized in the cost benefit analysis. We recognize that the agencies run multiple scenarios to test the sensitivity of the results to assumptions and frequently apply Monte Carlo statistical tests to assess the likelihood of outcomes. But with strong historical evidence and well-documented economic processes that explain a persistent and systematic pattern, the pattern demands more than just Monte Carlo sensitivity treatment. The outcome is more likely than a random disturbance.

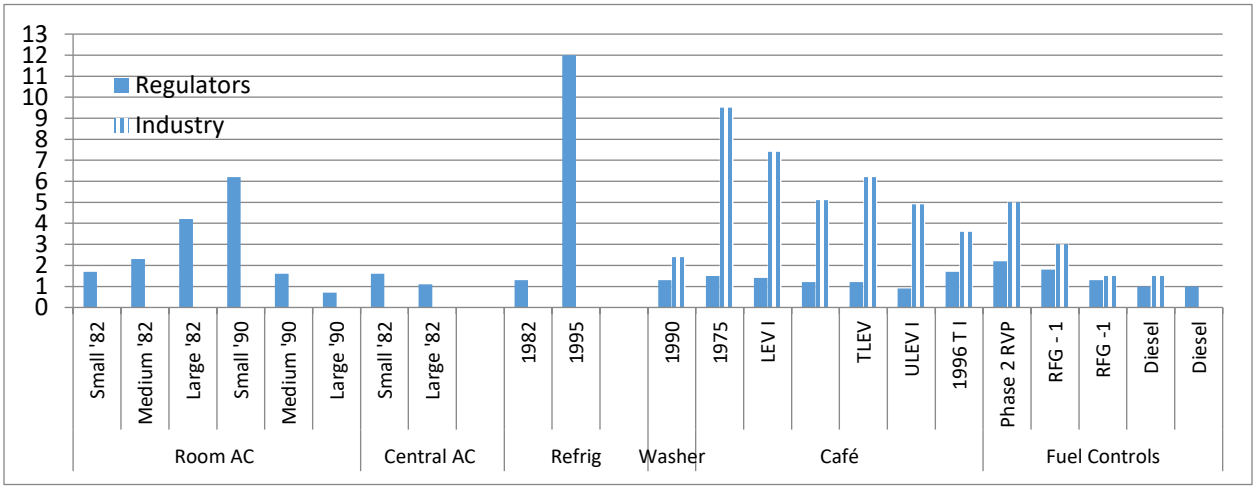
Empirical Evidence of Cost Declines

The consumer pocketbook benefits discussed above are the heart of the evaluation. A key factor that affects the benefit-cost analysis that is not fully included in the agency evaluations involves the tendency for costs to decline. The agencies' tear down analyses endeavor to capture the development of technologies and they have applied learning curves to project cost declines, but the market has proven more dynamic than they estimate.

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.

Figure III-1 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%. The estimates of the cost from industry were even father off the mark, running three times higher for auto technologies.[33] 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."[34]

FIGURE III-1: THE PROJECTED COSTS OF REGULATION EXCEED THE ACTUAL COSTS: RATIO OF ESTIMATED COST TO ACTUAL COST BY SOURCE

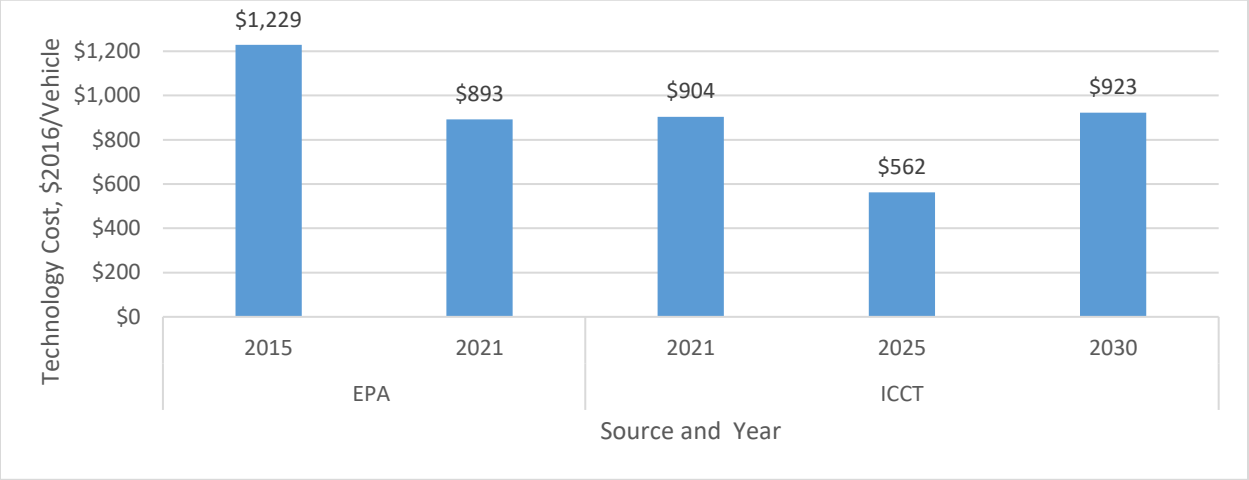


Sources: Winston Harrington, Richard Morgenstern and Peter Nelson, "On the Accuracy of Regulatory Cost Estimates," *Journal of Policy Analysis and Management* 19(2) 2000, *How Accurate Are Regulatory Costs Estimates?,* Resources for the Future, March 5, 2010; ; Winston Harrington, *Grading Estimates 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.

EPA's analysis of the National Program demonstrates that this process is continuing to operate with respect to fuel economy standards, as shown in Figure III-2. EPA found that a technology that had not even been considered is likely to have a substantial penetration, driving costs down by over 25%. Looking forward, a recent study from the International Council on Clean Transportation projects an additional 25% decline in the cost of compliance. This is consistent with the broad pattern of earlier research. There may be several factors, beyond an upward bias in the original estimate and learning in the implementation that produce this result, including pricing and marketing strategies.[35]

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 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.[36]

FIGURE III-2: COST OF EFFICIENCY TECHNOLOGY CONTINUES TO DECLINE



Sources: Environmental Protection Agency and National Highway Traffic Safety Administration, *2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards; Final Rule*, Federal Register, 77: 199, October 15, 2012, Table I-128. Environmental Protection Agency, *Final Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Emission Standards under the Midterm Evaluation,* January 2017, Table ES-1. International Council on Clean Transportation, *Efficiency Technology and cost Assessment for U.S. 2025-2030 Light-Duty Vehicles,* March 1017, Table 2.

Explanations for the Overestimation of Costs

These findings of declining cost are not merely descriptive. Several analyses have introduced controls for quality and underlying trends using regression techniques. The findings are affirmed in these more sophisticated analyses. With such strong evidence of costs far below predictions by regulators who undertake engineering analysis, many authors have sought to identify the processes that account for this systematic phenomenon. For both vehicles and appliances, a long list of demand-side and supply-side factors that could easily combine to produce the result has been compiled.

On the supply-side, a detailed study of dozens of specific energy efficiency improvements pointed to technological innovation.[37] A comprehensive review of *Technology Learning in the Energy Sector* found that energy efficiency technologies are particularly sensitive to learning effects and policy.[38] This was attributed to increases in R&D expenditures, information gathering, learning-by-doing and spillover effects. Increases in competition and competitiveness also play a role on the supply side. 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. it did not export vehicles to Europe or Japan).[39]

While the supply-side drivers of declining costs are primarily undertaken by manufacturers, a number of demand side effects are also cited, which are more the direct result of policy. Standards create market assurance, reducing the risk that cheap, inefficient products will undercut efforts to raise efficiency. Economics of scale lead to accelerated penetration, which stimulates and accelerates learning-by-doing. The effects of demand stimulus through

macroeconomic stimulus also grows demand and accelerates innovation. Experiencing increasing economies and declining costs in an environment that is more competitive, leads to changes in marketing behaviors.

The Cost of Increasing Fuel Economy

Estimating the cost of increasing fuel economy has been a matter of great debate for decades. As noted above, empirical analyses that look at actual costs show that regulators overestimate the cost by a factor of two and automakers overestimate it by much more than that.

David Greene, one of the leading expert on fuel economy recently conducted a review of the literature in which he concluded that an estimate of 27% of increased, or about $150 for every mile per gallon improvement was too high. He gave two reasons for this.[40] First, backward looking analysis of cost increases that included used vehicles (as his analysis did), were double counting the cost of increasing fuel economy because the sellers of vehicles were capturing a significant part of the capitalized value of better fuel economy equal to about 20% of the estimated cost of efficiency) in their sales price. This factor alone would lower the estimate to 21.6% of the increase in price or about $120 for each 1 mile improvement in the MPG. Second, real world experience showed that there was a learning process in which costs fell as automakers gained more experience with increasing fuel economy. He suggested that 2% per year was a reasonable estimate. Over the redesign cycle of vehicles (e.g. five years) this learning rate would lower the cost by about 10%. Thus, one might argue that the appropriate numbers would be about 20% per year and $108 dollars per MPG, as shown in Table III-1.

TABLE III-1: HISTORICAL AND ENGINEERING ESTIMATES OF THE COST OF INCREASING MILEAGE

	Greene Literature Review	Simple Adjustment Approach	Greene Direct	EPA Final 2017- 2025	ICCT Estimate for 2025-2030 4.5%/year
Annual Cost	$213	na	$141	$97	$110
% of Total Cost Increase	27%	20%	18%	na	na
$/MPG	$150	$108	$99	$97	$86

Sources: 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; 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*: *A retrospective and Prospective Analysis* Oak Ridge National Laboratory and the Energy Foundation, March 2017; Environmental Protection Agency and National Highway Traffic Safety Administration, *2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards; Final Rule*, Federal Register, 77: 199, October 15, 2012, Table I-128. Environmental Protection Agency, *Final Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Emission Standards under the Midterm Evaluation*, January 2017, Table ES-1. International Council on Clean Transportation, *Efficiency Technology and cost Assessment for U.S. 2025-2030 Light-Duty Vehicles*, March 1017, Table 2.

There is a third factor that is implicit in Greene's analysis. The distribution of the cost of vehicles is skewed. The much more expensive vehicles purchased by upper income households ae likely to include a larger amount of costs incurred to upscale the vehicles, rather than for fuel economy.

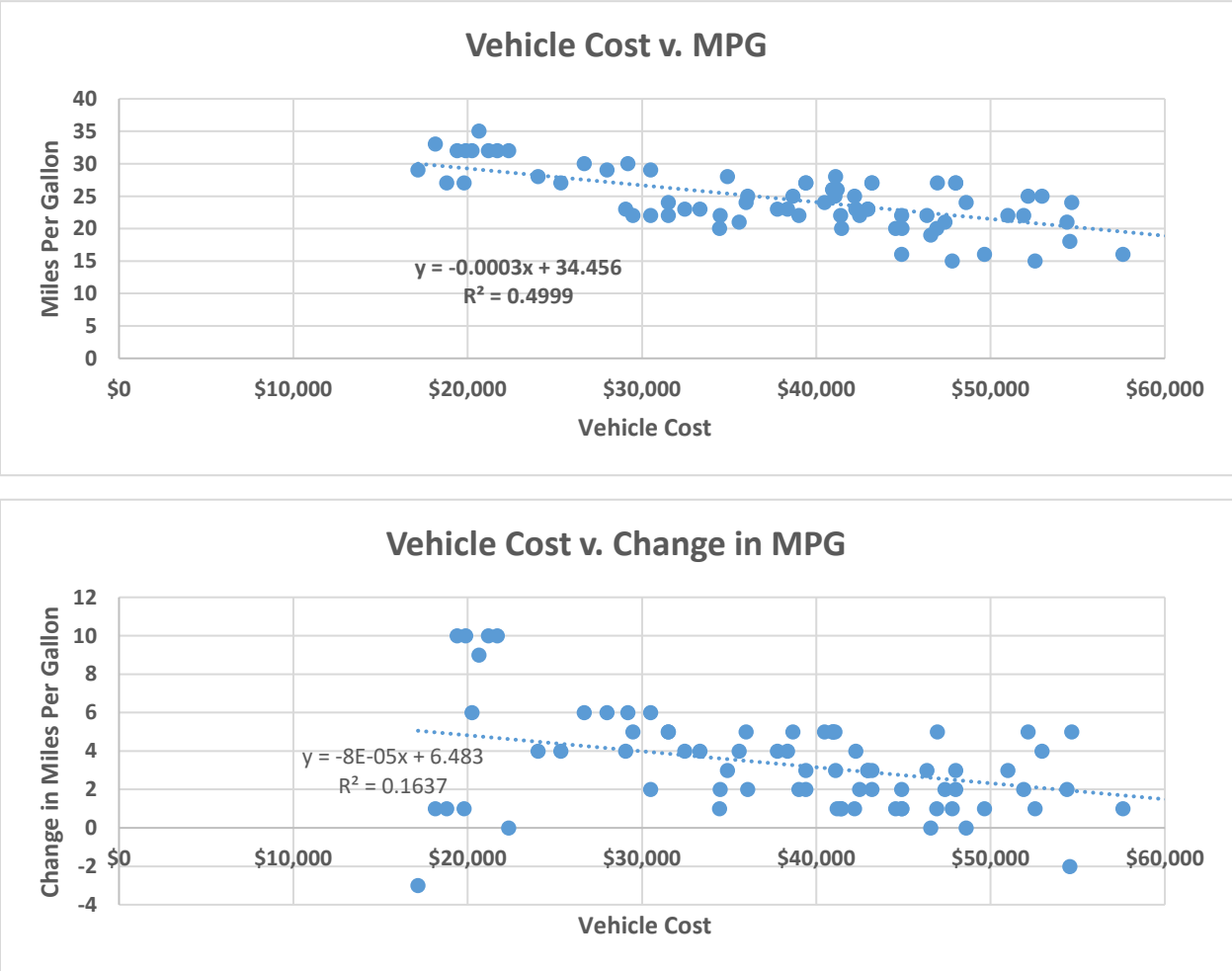
In a subsequent analysis Greene estimated the cost of improving fuel economy directly with an econometric model that corroborated the above concerns. The simple adjustment to a constant 20% of total cost moves the estimate much closer to the empirical evidence offered by

Greene, which suggests that costs that are about two thirds of the literature review—about 18% or $99/MPG.

EPA's analysis of the cost of the National Program currently yield an estimated cost for fuel savings that is similar, $97/MPG. This estimate reflects considerable technological progress over the early years of the National Program, which is consistent with the historical pattern. A recent study by the ICCT offers an estimate of going forward costs of improvement close to the rate of the national program (national program = 3.3%, ICCT = 4% per year). The ICCT study also includes continuing technological progress.

Moreover, our data on new models since the National Program emissions/fuel economy supports the key problem with using a simple percentage of the total cost of the vehicle to approximate the cost of improving fuel economy, as shown in Figure III-3. There is a strong, negative correlation (r = -.7) between the cost of a vehicle and the mileage and a moderate, negative correlation (r= -.4) between the cost of the vehicle and the change in mileage. A fixed percentage makes no sense

FIGURE III-3: VEHICLE COST AND MILEAGE



Source: Appendix B, attached.

In light of this analysis, we believe a cautious estimate of the cost of fuel economy improvements is $100/MPG improvement.

B. BENEFITS

Consumer Pocketbook Savings

In this analysis, we also accept the traditional agency approach to estimating consumer pocketbook savings as the primary benefit of the standards, using the 3% discount. When energy saving technology is added to energy using consumer durables or capital goods, the total amount of energy consumed declines. The decline in operating costs is larger than the capital cost increase, resulting in net pocketbook saving for consumers. As a general proposition, these benefits constitute the majority of the total benefits estimated by the agencies (two-thirds to four-fifths).

For studies of past (older) standards, analysts use actual market data on the energy consumption of the durable goods to calculate the annual savings. They then multiply by the average price of energy in each year (generally stated in constant, real terms) by the level of consumption. In the analysis that follows, all benefits are stated in 2106 dollars and discounted at 3%, to the extent possible.

Pass Through of Intermediate Costs

It is important to recognize that consumers are the primary beneficiaries of all efficiency standards, whether they apply to household consumer durables, or commercial/industrial energy consuming equipment. Just like any other cost, like wages or capital investment, the costs of energy are recovered by businesses from consumers in the prices they charge for goods and services that they sell.[41] We call this the "tooth fairy principle," since the tooth fairy does not pay for the energy consumed in the production and distribution of goods and services, consumers do.

Our analysis shows that the residential sector accounts for about half of the total revenue recovered for the production and delivery of transportation fuels.[42] In econometric studies, these intermediate goods costs are not counted separately, rather they are reflected in the final goods and services. In fact, because energy costs are intermediate, and therefore a cost that is bundled and hidden from consumers, standards may be more necessary in this area, since the ability of demand to influence the energy market is shrouded.[43]

C. THE DISCOUNT RATE

No matter how lofty the goal of policy, the use of the public's money (whether for increased costs for energy consuming durables or to administer programs) to achieve a goal must not only deliver a benefit above the cost, it should also deliver a return at least as large as it could have if put to other uses. This is the opportunity cost of capital which is operationalized as the discount rate in the cost-benefit analysis.

Discounting over long periods of time has the effect of reducing the present value of dollars spent or saved later. However, when costs are incurred and benefits enjoyed over a long

period, the benefit cost ratio is less affected than the total dollar amount. This is particularly true with standards that increase over time, since the marginal cost of later savings are assumed to increase in real terms. At year 15, a discounted dollar is worth $0.66 at 3%, while it is worth $0.38 at 7%. At year 30, which tends to be the time horizon for the analysis, it is worth $0.42 at 3% and $0.14 at 7%. Since later values have less impact, the average value over 30 years is close to the mid-point value, $0.63 at 3% and $0.32 at 7%.

We have frequently argued that the 3% discount rate is the correct discount rate from the consumer point of view. It is a good, perhaps somewhat high estimate of the opportunity cost of consumer capital. It is also one of the anchor points ordered by the Office of Management and Budget (OMB), making it available in all formal agency evaluations.

In this paper, all values are converted to $2016, with BLS Consumer Price Index. All values are discounted at 3%, to the extent possible. For present and near future values, the Technical Support Documents and Federal Register notices provide the basic analysis so only a slight adjustment for the based bear is necessary.

D. REBOUND EFFECT

The studies by regulatory agencies also include a rebound effect. That is, consumers use part of the increase in pocketbook disposable income to do things that consume energy. From the environmental or energy reduction point of view, this is a negative. Energy consumption or emissions of pollutants is more than the simple improvement in efficiency suggests. From the consumer point of view, this is a positive, not a negative. That is, the fact that consumers use some of increased disposable income on energy indicates that they are using it to increase their utility. The rebound numbers (recently put at 10%, which is too high), are embedded in the analysis, and we have accepted them rather than recalculate benefits. Therefore, the rebound effect provides a small (at most 10%) “margin for error” in favor of the standards that will raise the economic benefit-cost ratio because the increase in utility has been incorrectly subtracted from the energy savings.

IV. MACROECONOMIC GROWTH AS A POSITIVE EXTERNALITY OF WELL-DESIGN PERFORMANCE STANDARDS

In this section, we argue that one major externality has been present throughout the history of the energy efficiency standard setting process and should be recognized in rigorous cost benefit analysis. The macroeconomic stimulus that results from efficiency standards is a true externality, which Taylor broadly defined as "the situation in which the cost of producing or the benefits of consuming a good spill over onto those who are neither producing nor consuming the good."[44] These changes are invariably driven by the adoption of the rule and are not likely to be considered by the parties to the transaction.

A. CONCEPTUALIZING THE SOURCES OF MACROECONOMIC STIMULUS

The direct pocketbook savings of efficiency standards are the largest and most direct benefit of the standards, but this benefit has a second immediate and inevitable economic benefit. We have argued for at least a decade that the macroeconomic stimulus that results from shifting consumer spending from energy consumption to other goods and services is substantial. The academic literature supports the proposition that the higher multiplier on consumer disposable income results in an additional dollar of economic stimulus for each dollar of consumer savings.

This outcome reflects three effects. Direct and indirect growth comes from the economic activity (jobs) stimulated by the development and deployment of the energy saving technologies, which occurs directly in the new technologies and indirectly in the firms that supply new inputs for new technologies. Induced growth comes from the fact that the multiplier on energy spending is quite low compared to other activities. As disposable income is shifted from energy consumption to other goods and services, more economic activity is stimulated.

The literature on energy efficiency has a large body of research on the positive impact of reduced energy consumption on economic output. While the economic externalities of energy consumption originally entered the policy arena through the study of the negative recessionary impact of oil price shocks,[45] the positive impact of energy efficiency is becoming widely recognized and consistently modeled.[46] Importantly, the literature now goes well beyond the negative national security and environmental externalities, which are frequently noted in energy policy analysis. The macroeconomic effects of energy consumption and energy savings are important externalities of the efficiency gap.

The analyses cover a wide range of approaches. The qualitative analyses focus on very micro level impacts on individuals and utilities. For example, a recent analysis prepared for the OECD/IEA catalogued the varied positive impacts of energy efficiency, identifying over a dozen specific impacts, see Table IV-1. This list is replicated in several other qualitative analyses. Direct estimates of the non-economic benefits have been estimated at between 50% and 300% of the underlying energy bill savings.[47]

At a more macro and quantitative level, econometric models that use general flows of resources between economic activities have been used to assess the impact of increasing efficiency. In a sense, the coefficients in the macro models are representations of the

relationships in the economy through which the micro level effects flow. No matter the level or approach, the evidence strongly supports the conclusion that there is a positive impact.

TABLE IV-1: MULTIPLE BENEFITS OF ENERGY EFFICIENCY

Area of impact & Specific Benefits
Economic
Provider Benefit & Infrastructure
Energy Prices
Public Budgets
Energy Security
Macro-economic effects
Social
Health
Affordability
Access
Development
Job Creation
Asset Values
Disposable Income
Productivity
Environment
GHG Emissions
Resource Mgmt.
Air/Water Pollutants

Sources: Lisa Ryan and Nina Campbell, *Spreading the Net: The Multiple Benefits of Energy Efficiency Improvements* (International Energy Agency, Insight Series 2012), p. 25.

Utility System
Generation
Transmission
Distribution
Line Loss, Reserves
Credit & Collections
Demand Response
Price Effect
Reduced Risk
Avoided Regulatory Obligations & Costs
Reduced Terminations
Reduced Uncollectibles
Participant
Societal Risk & Security
Employment, Development
Productivity, Other economic
Health, Comfort, Bill Savings
O&M, Other resource Savings
Low Income Consumer Needs
Development
Employment
Property Values
Productivity
Societal Non-energy
Electricity/Water Nexus
Air quality
Water Quantity & Quality
Coal Ash & Residuals

Sources: James Lazar and Ken Colburn, *Recognizing the Full Value of Energy Efficiency* (Regulatory Analysis Project, September 2013), p. 6;

Benefit Type	Specific Benefit
Financial (other than energy cost savings)	Water and waste bill savings
	Reduced repaid and maintenance
	Increased resale value
	Improved durability
Comfort	Improved airflow
	Reduced drafts and temperature swings
	Better humidity control
Aesthetic	More attractive windows/appliances
	Less dust
	Reduced mold and water damage
	Protection of furnishings
	Dimmable lighting
Health & Safety	Improved respiratory health
	Reduced allergic reactions
	Lower fire/accident risk (from gas equipment)
Noise Reduction	Quieter equipment
	Less external noise intrusion
Education-related	Reduced transaction costs (knowing what to look for when purchasing equipment; ease of locating products)
	Persistence of savings
	Greater understanding of home operation
Convenience	Automatic thermostat controls]
	Easier filter changes
	Faster hot water delivery
	Less dusting and vacuuming
Other	Greater control over energy use/bills
	Reduced sick days
	Ease of selling home
	Enhanced pride
	Improved sense of environmental responsibility
	Enhanced peace of mind & responsibility for family well-being

Source: Jennifer Thorne Amann, 2006, *Valuation of Non-Energy Benefits to Determine Cost-Effectiveness of Whole-House Retrofit Programs: A Literature Review*, American Council for an Energy Efficient Economy, p. 8.

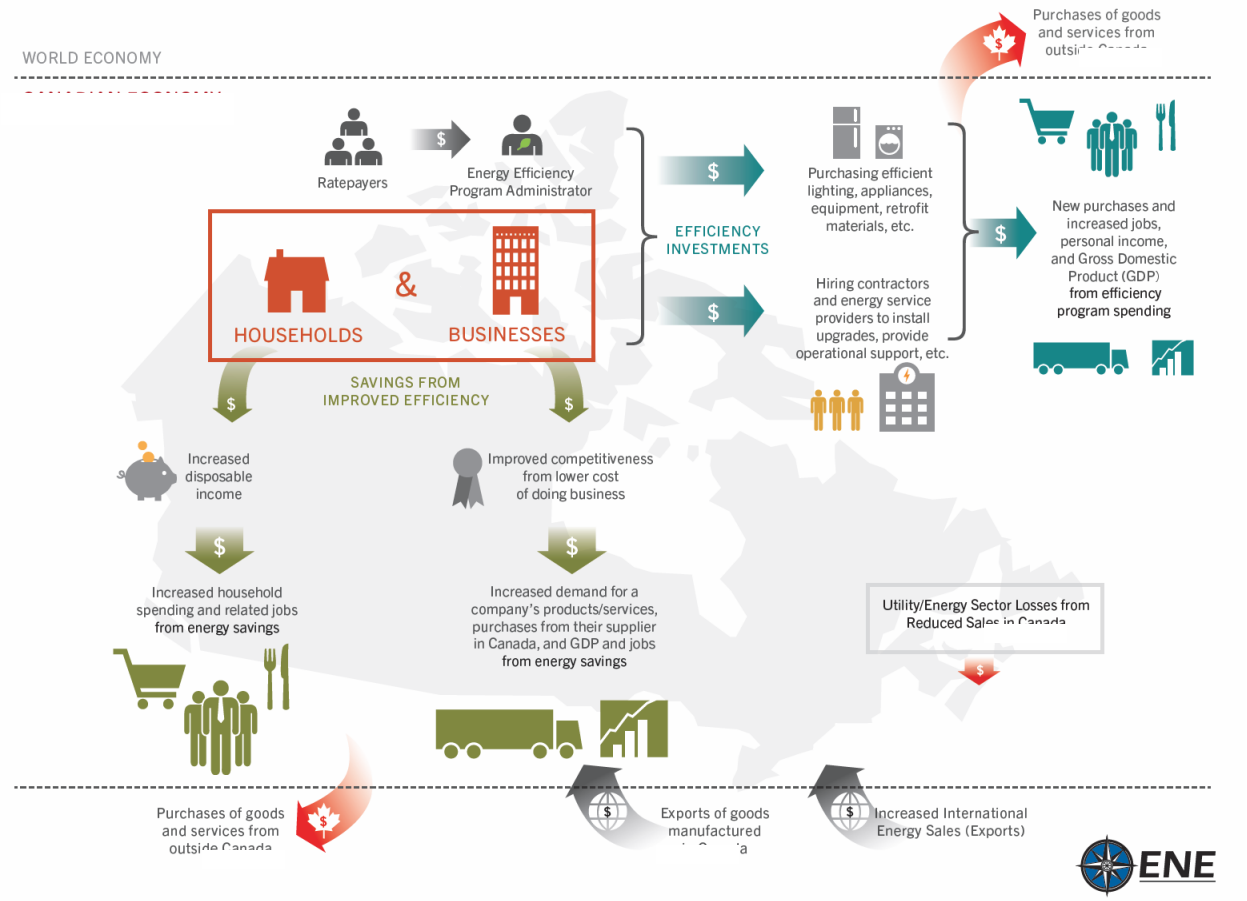
More Goods/Less Bads (in addition to waste & emission reduction)

Operation & Maintenance	Production
Engineering controls	Output
Cooling requirements	Performance
Facility reliability	Process cycles
Wear and tear	Product quality
Labor requirement	Production Reliability
Work Environment	**Other**
Protective equipment	Less liability
Lighting	Public image
Noise	Capital saving
Temperature controls	Space saving
Air quality	Worker Moral

Source: Ernst Worrell, et al., *Productivity Benefits of Industrial Energy Efficiency Measures*, U.S. EPA, December 4, 2001.

Figure IV-1 presents the conceptual framing that describes on of the more frequently used models – the REMI model, which has been repeatedly applied in the U.S. and Canada.

FIGURE IV-1: MACROECONOMIC IMPACT FROM INVESTING IN ENERGY EFFICIENCY



Source: ENE (Acadia Centre),

> Increasingly, research is showing that energy savings from energy efficiency improvements can deliver wider benefits across the whole economy such as increases in employment, GDP, trade balances, energy security, etc.…
>
> One way to look at the macroeconomic impacts is to separate them into:
>
> The cost and effects derived from investing in energy efficiency goods and services, and the effects derived from the energy savings (or reduced costs) from realizing an improvement in energy efficiency…
>
> Increased energy efficiency can lead to more competitive production for 'business consumers" or energy, while for final consumers increased efficiency mainly leads to a demand shift from energy consumption to other goods. For the consuming sectors, it is relatively straightforward to observe how investment in energy efficiency and energy savings can lead to increased spending and economic activity with second round effects such as employment, government revenue, and price effects (if other investment and spending is not crowded out). There are likely to be positive income effects, unless household wage demand increases as the labor supply becomes more competitive.[48]

> Additional investment increases demand in the short-run and reduces energy costs in the long-term. On a regional level, efficiency and renewable measures create additional value added and employment…
>
> Due to the cost-efficiency of measures, additional expenditures and investment will not crowd out other investments or consumption. Energy savings and the decrease in energy costs are fully accounted for in the model…
>
> The direct effect comes from consumption of durable energy efficient goods, but there is a large indirect effect from additional consumption due to energy savings. The reallocation from energy expenditures leads to more employment. Employment rises significantly in the construction sector in industry, adding to the consumption effect.[49]

B. QUANTITATIVE ESTIMATES

In 2010, NHTSA noted one of the important externalities of reduced consumption, the downward pressure on prices, is a consumption externality. Derived from an auto standard, it provides a comprehensive discussion of the macroeconomic benefits that we find in all efforts to apply these models. "Lower prices allow for additional purchase of investment goods, which, in turn, lead to a larger capital stock. These price reductions also allow higher levels of 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 because of this rule.[50]

The EPA reviewed the literature on the macroeconomic impact of reduced energy consumption.[51] It ran econometric models driven by the pocketbook savings. The analysis models three effects on impacts of the rule that trigger adjustments in the economy – increased cost for vehicles, decreased consumption of gasoline, and a reduction in the price of petroleum. It DOTs not model the impact of reduced pollutions (carbon and non-carbon) or other changes (like reduced fueling time). It found a very substantial multiplier effect increasing the GDP by just under 1%, or $340 billion, by 2050. Discounting the incremental growth of the economy at 3%, which is the discount rate used as the base case in this paper, the total is just under $100 billion and it is reached by 2030. This is slightly larger than the total consumer pocketbook savings.

> This combination of effects—price increases for vehicles and lower demand and world oil prices—would impact all sectors of the economy that use light-duty vehicles and fuels as intermediate inputs (e.g., delivery vehicles) to produce final goods. Households would also be impacted indirectly as consumers of final goods, and directly as consumers of fuels and light-duty vehicles.
>
> It is important to note, however, that these potential impacts do not represent additional benefits or costs from the regulation. Instead, they represent the effects on the U.S. economy as its direct benefits and costs are transmitted through changes in prices in the affected markets, including those for vehicles and their components, fuel, and the various resources used to supply them.[52]

The way the memo discusses these impacts, they are an indirect effect of the rule, a genuine externality. This approach has become quite common with detailed analyses of energy

efficiency across a range of activities (autos, appliances, buildings, industries),[53] sectors (e.g. energy, manufacturing, service, particularly as it impacts use of labor)[54] and with a variety of analytic approaches (qualitative, econometric).[55] These efforts to model the economic impact of energy efficiency have proliferated with different models[56] being applied to different geographic units, including states[57] and nations.[58] The results differ across studies because the models are different, the impact varies according to the size of the geographic unit studied and because the assumptions about the level and cost of energy savings differ. These differences are not an indication that the approach is wrong. On the contrary, all the analyses conclude that there will be increases in economic activity and employment. Given that there are different regions and different policies being evaluated, we should expect different results.

The intense interest in jobs since the financial meltdown represents the beginning of the period we refer to as "the present" for the adoptions of standards, regulatory analyses tend to estimate the job impact on the industry. While this narrow view of economic impacts misses the much broader macroeconomic view discussed above, it is notable that the impact on the industry that is the target of the standard tends to be positive.[59] This results in part from the indirect effect – shifting jobs to new technology production within the sector – and in part from the induced effect, since reducing the total (ownership plus operating) cost use goes down, tends to increase demand in the mid and long terms. The energy sector is less than half as labor intensive as the rest of the economy, so the ratio of job creation for efficiency, compared to other production option in electricity is also two to one.[60] This effect is compounded where energy is imported (as in the transportation sector). As consumers substitute away from energy, the goods and services they purchase stimulate economic and disproportionately large job growth.

The rule of thumb – an approximate doubling of the economic impact – that emerges in the literature reflects the observation on jobs.[61] Similarly, in a study of 52 examples of increases in industrial productivity, where benefit was monetized, the productivity savings were 1.25 times as large as the energy savings.[62] Macroeconomic models measuring the outcome in change in GDP yield a "respending" effect that clusters around 90%.[63]

In this analysis, we take a very cautious approach to estimating the induced macroeconomic benefits of efficiency. We apply the multiplier only to the net pocketbook savings. That is, we subtract the technology cost from the savings before we use the multiplier. This ensures that we do not double count the indirect effect, although that might have an induced multiplier effect of its own.

We also do not include a separate impact of the consumption externality, the effect that U.S. consumption has on lowering the market price of energy. In petroleum, this number is substantial. Agencies have estimated it, but not included it in their cost benefit analysis. Where they have presented the calculations, it is equal to about one-fifth of what we call the macroeconomic multiplier.[64] In the appliance sector, this effect has been model by considering the impact that reduced electricity demand has on the price of natural gas.[65]

We do not apply the multiplier to the value of environmental, public health and other externalities. Although these have been monetized in the traditional cost benefit analysis, that monetization DOTs not generally include macroeconomic multipliers. Since it could be argued that these costs are reflected in the model coefficients that are a representation of empirically

observed real world relationships, out of an abundance of caution we do not apply the multiplier to these benefits, which is the traditional approach.

Table IV-2 shows the multiplier, with the GDP impact expressed as a multiplier of the value of net pocketbook savings. That is, we subtract costs from the estimated value of energy savings. This ensures we do not double count benefits.

Since none of these studies take the rebound effect into account, which the regulatory impact analyses subtract from total benefits, we show a multiplier adjusted for the rebound effect. While we have chosen not to add the rebound effect back into the pocketbook savings, it is necessary to add it into macroeconomic effect, since that is essentially what the rebound effect (to the extent there is one) represents, i.e. a respending of savings. To err on the side of caution, we assume the lowest value in the table and set the multiplier equal to the net pocketbook savings.

TABLE IV-2: ESTIMATES OF MACROECONOMIC MULTIPLIERS AS A MULTIPLE OF NET POCKETBOOK SAVINGS

Modeler	Model	Date	Policy Assessed	Region	GDP/$ of Net Savings	
					Base Case	Rebound Adjustment
Roland-Holst	DEAR		Computer Standard	California	1.8	2.0
ENE	REMI		Utility Efficiency	Northeast	2.2	2.4
Cadmus	REMI		Utility Efficiency	Wisconsin	2.5	2.8
Arcadia	REMI		Utility Efficiency	Canada	2.7	3.0

Sources:
David Roland-Holst, 2016, *Revised Standardized Regulatory Impact Assessment: Computers, Computer Monitors, and Signage Displays*, prepared for the California Energy Commission, June. ENE, *Energy Efficiency: Engine of Economic Growth: A Macroeconomic Modeling Assessment*, October 2008. Cadmus, 2015, *Focus on Energy, Economic Impacts 2011–2014*, December. Arcadia Center, 2014, *Energy Efficiency: Engine of Economic Growth in Canada: A Macroeconomic Modeling & Tax Revenue Impact Assessment*, October 30.

V. A COMPREHENSIVE VIEW OF THE BENEFITS OF EFFICIENCY STANDARDS

In the analysis that follows, we include a "pure externalities" view of the cost benefit rules. This consists of two components (macroeconomic effects and environmental, public health and other externalities) that are very unlikely to be internalized in the private transaction of the manufacture sale of an energy using consumer durable. As noted above, one can argue that consumer pocketbook savings are an externality of environmental regulation. In this analysis, we treat it as a direct benefit in of the rule.

Although we identify these separate components of the benefits, we believe that the correct way to view the standards is to start with the consumer pocketbooks savings and traditional externalities and recognize the additional macroeconomic stimulus created by adding new technology and lowering the total cost of owning and operating energy consuming durable goods. We also offer a scenario in which costs are projected to be 70% of the based case assumptions as a separate scenario.

In this section, in laying out our comprehensive approach, we reject several arguments that would narrow the view of the benefits of efficiency standards because the externalities are real.

A. CONSUMER PREFERENCES AND MARKET IMPERFECTIONS

Opponents of regulation take a different view, arguing that, since there are choices in the marketplace, there can be no consumer utility gain from imposing standards. Consumers express their preferences and get what they want. We believe this is wrong on several counts.

First, the outcome in the market is not simply the result of consumer preferences, it is the result of all the forces that affect the options presented to consumers and that weigh on and constrain their choices. Manufacturers determine a narrow range of choices to present consumers and seek to influence consumers, through advertising and incentives, to purchase the vehicles that manufacturers want to sell. Consumer are imperfect in their calculations and projections about fuel usage and prices. Market imperfects matter and cannot be dismissed.

Second, consumers do express a great deal of interest in and concern about energy usage.

Third, more importantly, as noted, once a well-crafted standard is adopted and implemented, it lowers the cost of driving. To the dismay of anti-standard, free market ideologues, and the surprise of consumers who end up with a more fuel-efficient cars than they thought they could get, it puts more money in the consumer's pocket. The inevitable result is to increase disposable income and, under any reasonable assumption, trigger the macroeconomic multiplier effect, which includes the consumption externality that lower prices because of reduced consumption. The environmental and public health benefits of reduced pollution are also realized.

B. TRANSFER PAYMENTS AND ECONOMIC GROWTH

It is possible to argue that the consumer pocketbook savings are just a transfer payment from energy producers to consumers and manufacturers of energy saving technology. As a transfer payment, they might not be considered a net gain for the economy or society.

We disagree with this on two grounds. First, transfers do matter. Manufacturers of energy-using consumer durables are quick to argue distributive effects when it comes to low income households, claiming incorrectly that it prices them out of the market. We think the distribution between consumers and energy suppliers does matter.

Second, if the transfers are not counted, but still recognized, then the macroeconomic effect becomes extremely important. Some uses of disposable income have much larger multipliers than others. Transferring wealth from energy producers to energy consumers has a substantial positive impact on economic growth that should be taken into account.

This categorization and recognition of the broad benefits is not unique to energy efficiency standards. For example, a recent National Academy of Sciences Transportation Research Board report prepared for the Transit Cooperative Research Program, entitled, *Practices for Evaluating the Economic Impacts and Benefits of Transit,* noted that "Because of shifting demands and constrained budgets, transit agencies have an increasing need to consistently and defensibly document the economic impacts and benefits of the services they provide."[66] The report identifies direct and indirect benefits that are akin to those discussed in this section.

> Two primary forms of economic analysis are discussed in this report:
>
> *Impacts on the economy* – most often referred to as "economic impacts" or "economic development impacts," which encompass effects on jobs and income: and
>
> *The economic valuation of broader societal benefits* – sometimes referred to as "social welfare," benefits which encompass the valuation of "non-user benefits" (affecting quality of life, environments, and productivity) in addition to user benefits….
>
> Economic impact = the study of the net change in economic activity (jobs, income, investment or value added) resulting from a project, event, or policy.
>
> Economic valuation of societal benefits = the social welfare value of prices ($) and non-prices (non-$) benefits associated with a project, policy or event. The non-priced benefits are assigned a valued based on revealed or stated preference methods. [67]

This quote includes all the impacts we have identified and the approach to valuing them. We agree they are the building blocks of a comprehensive and rigorous benefit-cost analysis.

C. WILLINGNESS-TO-PAY

Willingness-to-pay studies that address the core issue in benefit-cost analysis – valuing benefits – have been prominent in the benefit-cost literature and extensively criticized for underestimating the value of public policies that correct market imperfections.[68] The willingness-to-pay observed in survey analysis and derived as implicit through econometric

analysis reflect opinions and decisions offered or made by individuals in the context of all the imperfections that afflict the market. They reflect the market structure the policy is intended to correct more than the "true" value of correction, as shown in Table V-1. The problems with willingness-to-pay analysis are not limited to survey (contingent valuation) based studies. They also apply to econometric studies that base their estimates on econometrically identified implicit willingness-to-pay.

TABLE V-1: QUESTIONS ABOUT THE CONCEPT OF WILLINGNESS-TO-PAY

Conceptual Problems
Individual
Lack of (sufficient & appropriate) information
Willingness v. Capacity to pay
Inherent discrimination (value)
Risk aversion
Marginal v. average
Respondent Characteristics
SES
Experience v. Hypothetical
Market Structure
Information asymmetries
Availability in market
Aggregation of preferences
Lack of competition
Externalities
Positive effects
Importance of public (social) value

Methodological Problems
Internal and External validity
Representativeness
Variability
Generalization
Surveys
Questions
Order & presentation of
Open v. Closed
Provision of information
Response sets
Choice Set
Emphasis on costs, not benefits

Sources: Benjamin Leard, et al., 2017, *How Much Do consumers Value Fuel Economy and Performance? Evidence from Technology Adoption*, Brookings Institution, June; David Green, et. al., 2017, *Consumer Willingness to Pay for Vehicle Characteristics: What Do We Know?*, March; Mark Sagoff, What does willingness to pay measure/" University of Maryland; Frank Ackerman,, 2008 *Critique of Cost-Benefit Analysis, and Alternative Approaches to Decision-Making*, Report toe Friends of the Earth Engaln,, Wales and Northern Ireland; , Joaquin F. Mould Quevedo, et al., "The Willingness-to-Pay Concept in Question," Rev. Sauide Publica: 43(2), for health care.

A recent study from Resources for the Future provides a lens to identify some of the key concerns.[69] It advances the art significantly, but leaves many of the underlying issues unaddressed. RFF finds a substantial "efficiency gap" based on a hedonic analysis that puts the willingness to pay at just $0.54 on the $1.00. It goes on to argue that the welfare gain of increased fuel economy created by increasing fuel economy standards is offset by lost value of performance.

The argument is that, even though the pocketbooks of consumers have more money as a result of the standards, they would have preferred to have the increased performance (horsepower/weight). The study concludes that the gain from fuel economy is offset by the loss in performance. In a sense this is an encouraging result, since all of the public benefits are "free." The authors recognize that this analysis does not take into account the social value of

reduced fuel consumption in terms of improved national security, pollution reduction, and climate change. The welfare value of these benefits could be significant.

The analysis also does not take into account the welfare value of the good and services consumers purchase with the increased disposable income that fuel economy standards create. Since they cannot spend their money on more performance and they have more money in their pockets, they spend it on other things. The multiplier still operates.

There is also a sense in which the analysis conceptually begs the question. The analysis ignores the fundamental problem – it assumes no market failure. The preferences reflect the market imperfections, the restricted choices the automakers choose to offer and the distorted choices consumers make, given the limitations on their time and ability to search and calculate. The specific market imperfections not considered include induced innovation, insufficient incentives for innovation, imperfect competition, the interaction between new and used vehicles, and transitional dynamics.[70] As is typical of these studies, the supply-side does not play a key role in determining the outcomes observed in the marketplace.[71]

Of equal, if not greater importance are empirical and measurement questions. The study appears to derive an implicit cost per MPG of about $300, engineering estimates are less than $100. Although it has tried to capture the impact of other "quality" factors, it has failed. Given the value of pocketbook savings in the study, adjusting the cost of fuel economy would double it, meaning that the performance preference is half the fuel economy value. Of course, consumer might be overestimating the cost of fuel economy, which would be a market imperfection that the standards could correct.

The study may have overestimated the value placed on performance. The authors note that automaker behavior is inconsistent with their theoretical approach, in that under their assumptions the automakers should not trade off fuel economy for performance, absent the standard[72]. There is clear evidence that they did. A quick look at trends in fuel economy and horsepower suggests that attitudes may have changed (see Figure V-1). Declining marginal value of going faster at 0-60 mph and a shift in attitudes highlights one of the great weaknesses of willingness to pay analysis – whose willingness and under what circumstances.

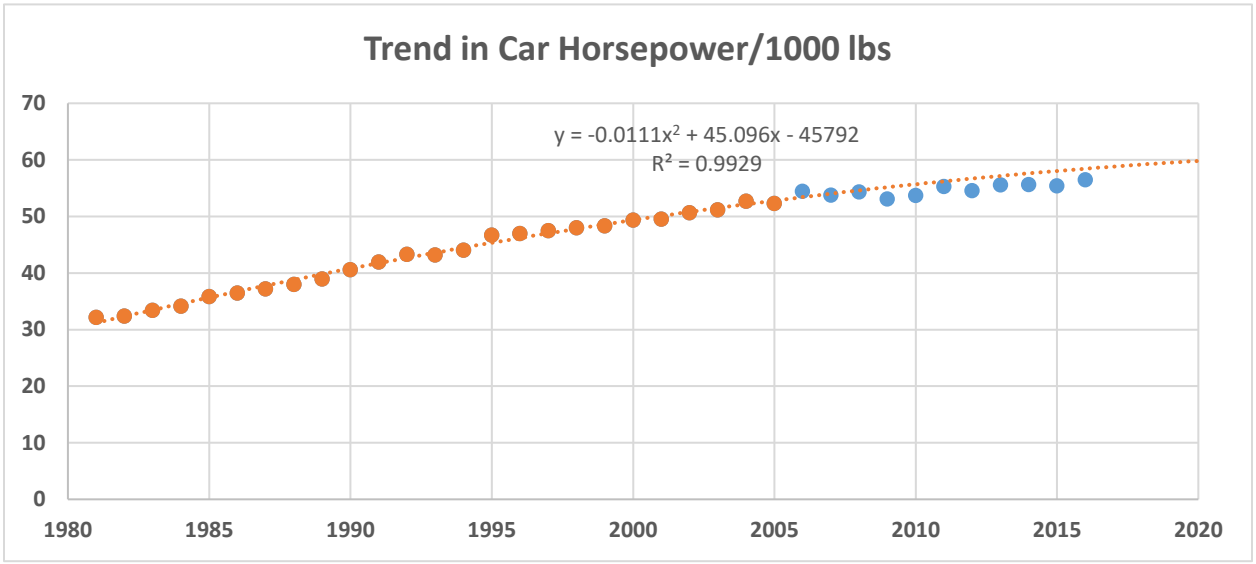
D. THE PUBLIC IS NOT AS ENAMORED OF GASOLINE POWERED MUSCLE CARS AND TRUCKS AS THE AUTOMAKERS CLAIM.

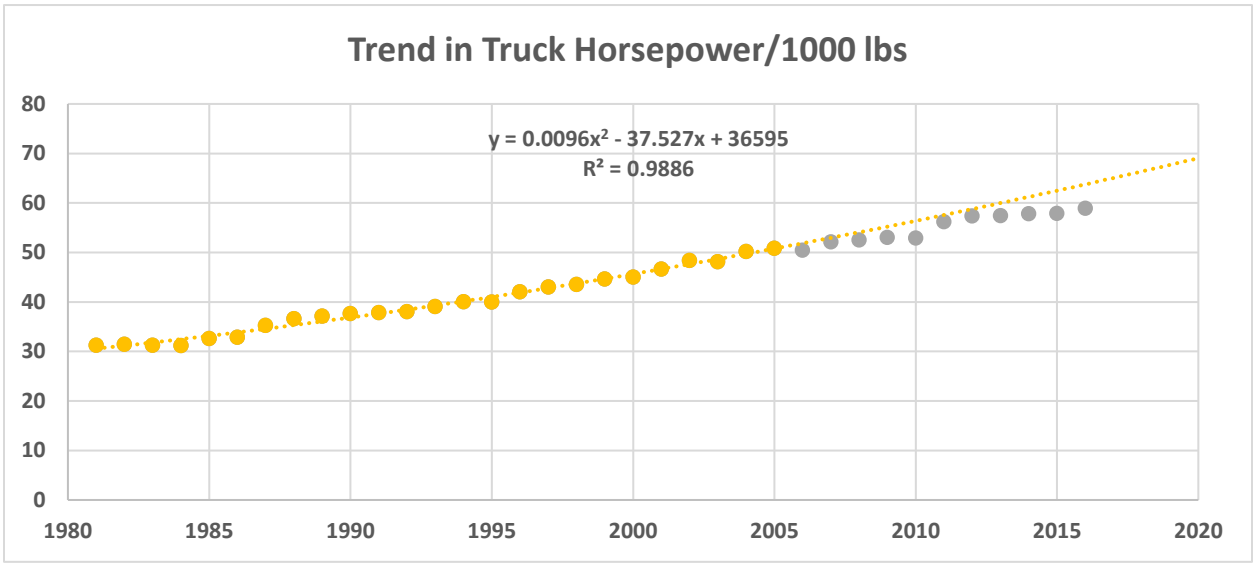
The automaker spend a great deal of time complaining about policies to promote electric vehicles (EVs), claiming they will drive up the cost of the National Program. We have shown that the EV program will have little impact on the cost of compliance for three reasons.

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.

FIGURE V-1: TRENDS IN PERFORMANCE INCREASES





Source: EPA, 2016, Trends Report, 2016, pp. 26-27, Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2016, November,

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.

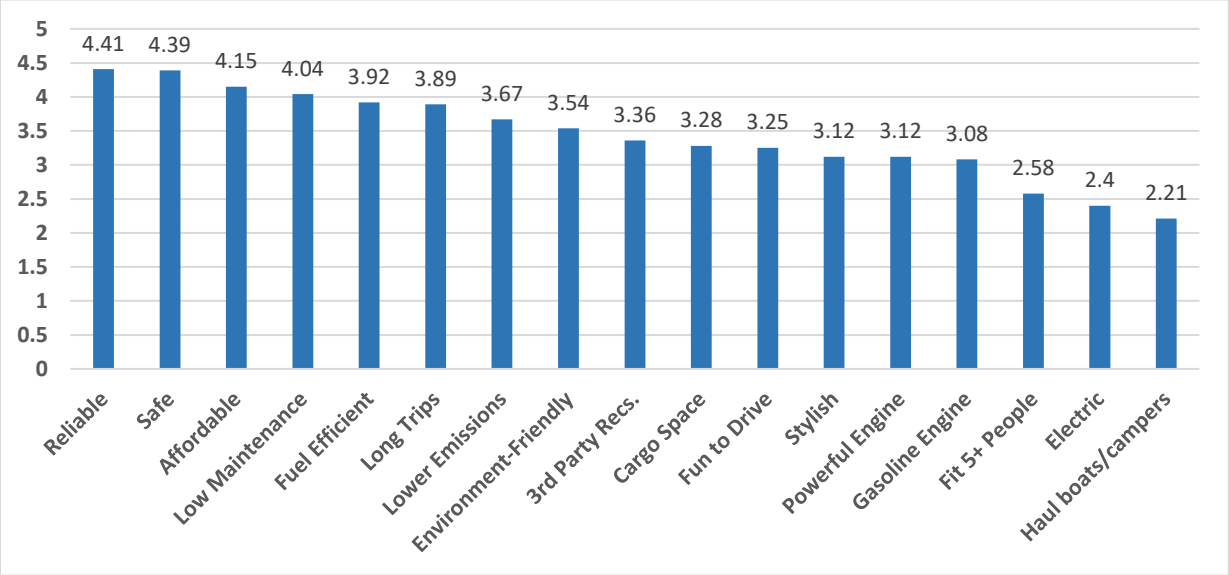
As we pointed out during the House hearing, this was the experience with hybrid vehicles. California's leadership in the LEV program created the global market for those vehicles. With respect to EV's, the global market is rapidly emerging. In this case, California's leadership will help to ensure that 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,[73] 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 V-2 shows, the analysis of desirable vehicle attributes shows that consumers want reliable, safe, affordable and low maintenance vehicles.[74] 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.

As Figure V-2 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). If you watch the TV ads and go into the showrooms, you would have to conclude that the automakers are pushing the wrong vehicles.

FIGURE V-2: 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).

The analysis of our most recent public opinion poll discussed in Section II, reinforces the thrust of this discussion in two respects. First, fuel economy is an important consideration for the majority of respondents. Second, it is driven to some extent by concerns about externalities that are notoriously difficult to quantify for consumers. The engineering/pocketbook analysis should remain the primary basis on which regulatory impact analysis rests.

VI. QUANTITATIVE ANALYSIS

In this section, we discuss the costs and benefits of four decades of fuel economy standard (see Table VI-1). We discuss the basic methodological approach to the analysis first. We then discuss the results in chronological order and start with the traditional benefit- cost factors.

A. EVALUATION METRICS AND OVERVIEW

Benefit/Cost Ratios: Since the agencies report the costs and pocketbook benefits, it is straight forward to estimate the benefit cost ratios.

B/C = (Units Saved * $ per unit)/ ($ per appliance* number of vehicles) =$ benefits/ $ costs

Each of the variables in this equation are estimates that are subject to uncertainties. The agencies engage in extensive technical analysis and utilize numerous sensitivity cases to build confidence in their results. We use their preferred or base case for our analysis.

Cost of Saved Energy: We have long argued that the cost of saved energy (which is frequently calculated in the academic literature on efficiency)[75] is a second, intuitive evaluation metric. Since the agencies identify all the technology costs (initial capital and additional maintenance) and the physical quantity of energy saved, it is possible to calculate the cost per unit of saved energy. The proposition is simple, if a consumer must spend X-$ to save Y-kWh of electricity, the cost per kWh saved can be calculated as

Cost of Saved Energy = $ Cost of Technology/# of kWh saved = $/kWh.

Using discounted, real costs and physical quantities provides an estimate that can be compared to the current, or excepted cost of consuming energy. Given that the efficiency investment brought about by the standards is highly beneficial, the cost of saved energy tends to be far below the cost of consumed energy. This view helps to understand how "bullet proof" the standards are in the sense that they are not dependent on projecting the future price of energy. That is, the real cost of consumed energy would have to fall to very, improbably low levels to make the standards a bad deal from the consumer point of view.

Payback periods: More recently, agencies have begun to show simple payback periods. While we believe that these are important from the consumer point of view, there are few examples of these. Those that have been done indicate attractive paybacks. Given the benefit cost ratios across the studies, they are generally less than half of the life the durable good. In some cases, where investments are financed, cash flow is positive in the first year.

Each of the metrics involves assumptions, about costs and some involve assumptions about the value of benefits. In this analysis, we report the benefit/cost ratio and the comparison between cost of saved energy and the current cost of consumed energy. The sources and notes identify the source of the estimates and any features of the analysis that deviate from the basic assumptions discussed earlier.

TABLE VI-1: EVALUATION OF EFFICIENCY STANDARDS, PAST, PRESENT AND FUTURE

Type of Durable Good	Period (Source) (Discount rate, 3% exceptons noted)	Cost & Benefits Type	$2,016 Billions at 3% discou (except as Noted)	Evaluation of Standard Benefit/ Cost Ratio (b/c)	*b/c @ 70% of Cost*	Resource Value Cost of Saved Energy $/Gallon Gasoline	Cost of Consumed Energy $/Gallon Gasoline	Value of other externalities Primarily Envirionmental $2016, billions	b/c	Externalities Macro-econ + Enviro/Health b/c	*b/c @ 70% of Cost*	Total benefits b/c	*b/c @ 70% of Cost*
Past													
Light Duty Vehicles	980-2014 (Greene & Walsh) 6%	Technology Cost	$499										
		Pocketbook Savings	$2,121	**4.25**								**4.25**	
		Macroconomic Benefits	$1,622	3.25									
		Total Economic Benefit	$3,743	7.50								**7.50**	
Present													
Light Duty Vehicles	2008-2011 (NHTSA, TSD)	Technology Cost	$9			$1.11	$2.47						
		Pocketbook Savings	$27	**3.00**	*4.29*			$6	**0.67**			**3.67**	*5.24*
		Macroconomic Benefits	$18	2.00	*2.86*					2.67	*3.81*		
		Total Economic Benefit	$45	5.00	*7.14*							**5.67**	*8.10*
	2012-2016 (EPA/NHTSA, TSD)	Technology Cost	**62**										
		Pocketbook Savings	$182	**2.94**	*4.19*			$41	**0.66**				*0.00*
		Macroconomic Benefits	$120	1.94	*2.76*					2.60	*3.71*		
		Total Economic Benefit	$302	4.87	*6.96*							**5.53**	*7.90*
	2017-2021 (National Program, NHTSA)	Technology Cost	$47			$0.88	$2.47						
		Pocketbook Savings	$192	**4.09**	*5.84*			$48	**1.02**			**5.11**	*7.29*
		Macroconomic Benefits	$131	**2.78**	*3.97*					3.80	*5.43*		
		Total Economic Benefit	$323	**6.86**	*9.80*							**7.88**	*11.26*
Heavy Duty Trucks	Present, Phase I (EPA, NHTSA)	Technology Cost	$9			$1.07	$2.70						
		Pocketbook Savings	$56	**6.22**	*8.89*			$6	**0.67**			**6.89**	*9.84*
		Macroconomic Benefits	$47	5.22	*7.46*					5.89	*8.41*		
		Total Economic Benefit	$103	11.44	*16.35*							**12.11**	*17.30*
Near Future													
Light Duty Vehicles	2022-2025 (EPA Determination, CFA Suporting)	Technology Cost	$36			$0.75	$2.47						
		Pocketbook Savings	$92	**2.56**	*3.65*			$41	**1.14**			**3.69**	*5.28*
		Macroconomic Benefits	$56	**1.56**	*2.22*					2.69	*3.85*		
		Total Economic Benefit	$148	**4.11**	*5.87*							**5.25**	*7.50*
Heavy Duty,	Phase II (EPA, NHTSA CFA Supporting)	Technology Cost	$29										
		Pocketbook Savings	$163	**5.62**	*8.03*	$0.33	$2.70	$66	**2.28**			**7.90**	*11.28*
		Macroconomic Benefits	$134	**4.62**	*6.60*					6.90	*9.85*		
		Total Economic Benefit	$297	**10.24**	*14.63*							**12.52**	*17.88*
Far Future													
Ligth duty Vehicles	2025-2030 (ICCT Adapted)	Technology Cost	$39										
		Pocketbook Savings	$117	**3.00**				$52	**1.33**	2.92	*4.18*	**3.00**	*4.29*
		Macroconomic Benefits	$78	1.59									
		Total Economic Benefit	$195	4.59								**4.59**	*6.56*
Heavy Duty,	Alt. 5 Increment (EPA, NHTSA)	Technology Cost	$24										
		Pocketbook Savings	$66	**2.28**	*3.26*	$0.33	$2.70	$27	**1.12**			**3.40**	*4.86*
		Macroconomic Benefits	$42	**1.45**	*2.07*					2.57	*3.67*		
		Total Economic Benefit	$108	**3.73**	*5.33*							**4.85**	*6.92*

Sources and Notes

Past: Light Duty Vehicles: This estimate is based on 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, Howard Baker Center for Public Policy, January 2017. A slight period of overlap between past and present is subtracted based on the NHTSA estimate of 208-2012.

Present: Light Duty Vehicles: These are from the Technical Support Documents. Here we use the Federal Register Notice with the EPA economic analysis, since EPA separated out pocketbook (fuel) and other benefits. The inflator to bring the estimates to 2016 is 1.1.

2008-2011:https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/2006_friapublic.pdf
2012-2016: https://nepis.epa.gov/Exe/ZyPDF.cgi/P1006V2V.PDF?Dockey=P1006V2V.PDF
2017-2025: https://nepis.epa.gov/Exe/ZyPDF.cgi/P100F1E5.PDF?Dockey=P100F1E5.PDF

Heavy Duty Trucks: The first standard for heavy duty trucks adopted as a result of the Energy Independence and Security Act. Taken from the Technical Support Document: Phase I: https://nepis.epa.gov/Exe/ZyPDF.cgi/P100EG9C.PDF?Dockey=P100EG9C.PDF, In the Technical Assessment Report (TAR) and the Final Determination, EPA projects substantial cost reductions from the original Technical Support Document for the National Program. The current incremental cost estimate is almost 20% lower than the original incremental cost for 2022-2025. Taking a cautious approach for this analysis, we assume that the cost decline represents a 10% decline in the 2025 costs (assuming no cost overestimation in the 2017-2021).

Near Future: Light Duty Vehicles: These are from the Technical Support Documents in the mid-term review. TAR: https://nepis.epa.gov/Exe/ZyPDF.cgi/P100OXEO.PDF?Dockey=P100OXEO.PDF Final Determination:

Heavy Duty Trucks: These are from the Technical Support Documents: Phase II: https://www.gpo.gov/fdsys/pkg/FR-2016-10-25/pdf/2016-21203.pdf
Far Future: Light Duty Vehicles: This is based on a comparison of the ICCT projections for the five years between 2025-2030 to the analysis of the 2022-2025 period in the mid-term review. We use a 4.5% improvement scenario (the average of the ICCT 4% and 5% scenarios) because EPA discusses a 4.5% scenario for going forward in the mid-term review. The ICCT cost numbers are 10% higher and the savings rate 10% lower, compared to the EPA analysis, which seems reasonable given the movement up the supply curve for efficiency technology and the short period of time covered. ICCT: Nuc Lutsey, et al., *Efficiency Technology and Cost Assessment of U.S. 2025-2030 Light Duty Vehicles,* March 2017.

Heavy Duty Trucks: This is based on the Regulatory Impact Assessment of the Phase II Heavy Duty Truck Rule. We use the difference between the most stringent alternative considered and the final rule.

In Table V-1 we have highlighted the key results. The traditional factors included – consumer pocketbook and traditional externalities are in bold. The "pure externalities" view that adds the macroeconomic and traditional externalities are underlined. The total benefits view, which combines the pure externalities and consumer pocketbook benefits are bold and underlined. The view that assumes costs are only 70% of the regulatory estimate is in italics. We do not apply this view to the past standards, since those costs are estimated directly from experience.

The results of the analysis in Table VI-1 send a loud and clear message, which explains the strong public and bipartisan support for efficiency standards.

- Over forty years, past, present, and future, the consumer pocketbook savings of fuel economy standards have far exceeded the cost of technology.
- The cost of saved energy is generally between one-third and one-half of the current cost of consuming energy.
- Macroeconomic benefits generally run between two and four times the cost.
- The environmental, public health, and other externalities equal between two-third to100% of the costs.
- Thus, the "pure externalities" are between three- and five- times the cost.
- Total benefits are generally six times or more the cost.

B. BENEFIT-COST ANALYSIS BY PERIOD

Past Standards

The backward-looking evaluations of the broad impact of past standards are quite different than the technical support analyses that evaluate current and future standards, but they reach similar conclusions and support the methodology used for projections. The studies examine the units shipped, prices paid and the efficiency of specific products. They tend to use a higher discount rate than the one we use, but it is extremely difficult to adjust their findings, so we have only inflated the dollar amounts to state all costs and benefits in terms of 2016 dollars. The actual benefits would be higher with lower discount rates.

We do not have a means to readily assess the other externalities over this long period. However, even without an estimate of the environmental benefits, which are certainly substantial, as the analysis of vehicle standards in later years shows, the standard is clearly beneficial. This is true, even in the externalities only view because the very large pocketbook benefit drives a very large macroeconomic benefit is so large.

The backward looking analysis of the auto standards shows strong economic benefits. The dollar values are extremely large, with consumer pocketbook savings of $2.1 trillion and macroeconomic benefits of $1.3 trillion. The benefit-cost ratio for consumer pocketbook savings is 4.25-to-1. Consequently, the macroeconomic benefit is also larger, with a ratio of 2.6-to-1. The analysis of pocketbook savings for gasoline put the impact at the household level at savings of $20,000. Over 35 years, the savings work out to about $600 per household per year.

Present Standards

For present standards that do not appear to be under threat at present we see consumer pocketbook savings of close to $500 billion and macroeconomic benefits of over $300 billion, with light duty vehicles accounting for seven-eighths of those gains. Environmental benefits are about $120 billion. Costs are just under $120 billion. Thus, the overall benefit of about $900 billion are over eight times the cost. If costs follow their historic pattern of decline through the implementation phase, the benefit-cost ratio would be over 10-to-1.

Future Standards

We divide the future into two periods. The standards in the near future appear to be the targets of attack by the Trump Administration. Longer term standards that could advance fuel economy are also at risk in the new regulatory environment.

Future standards that are at risk are projected to deliver over $400 billion in pocketbook savings and $260 billion in macroeconomic benefits, for a total of close to $700 billion. Environmental, public health benefits and other benefits would add almost $200 billion for a total close to $900 billion. The projected cost is just over $125 billion, for a benefit cost ratio over seven-to-one. If costs follow their historic pattern, the benefit-cost ratio would be above 10-to-1.

C. CONCLUSION

Every present and near future fuel economy standard passes the benefit cost test either on the consumer pocketbook test or the externalities test standing alone. The statistics demonstrate that these standards are equally attractive from the consumer and the societal point of view.

Economic theory provides a clear explanation for this large benefit-cost ratio in the combination of significant, persistent market imperfections that are addressed by well-crafted, "command-but-not-control," performance standards. We believe the strong public and bipartisan support for these programs reflects their positive economics, which should also inform policymakers and regulatory agencies in their regulatory "reform" endeavors. Reductions of regulatory burdens that do not increase net benefits should be rejected.

ENDNOTES

[1] 82 Fed. Reg. 24582 (May 30, 2017).While the RFI is narrowly styled in terms of infrastructure projects, the notice makes it clear that comments will broadly impact the DOT thinking on regulatory reform. (p. 26735), In EO 13771 and EO 13777, President Trump directed agencies to further scrutinize their regulations. The review described in this notice will supplement the Department's periodic regulatory review and its activities under EO 13771 and EO 13777. Unlike those activities, this request for input is narrowly focused on identifying and addressing impediments to the completion of transportation infrastructure projects. The comments that DOT receives in response to this notice will inform those other, broader activities." We believe it is important for the agency to have the broad terrain of regulatory reform in view.

[2] Id., Acknowledging the Superior Force of the Law and Executive Orders in force.

[3] Office of Management and Budget, Memorandum For: Regulatory Policy Officers at Executive Departments and Agencies and Managing and Executive Directors of Certain Agencies and Commissions, May 5, 2017, states "Agencies should continue to comply with all applicable laws and requirements. In addition, EO 12866 remains the primary governing EO regarding regulatory planning and review. Accordingly, among other requirements, except where prohibited by law, agencies must continue to assess and consider both the benefits and costs of regulatory actions, including deregulatory actions, when making regulatory decisions, and issue regulations only upon a reasoned determination that benefits justify costs."

[4] The Administrative Procedure Act (APA), Pub.L. 79–404, 60 Stat. 237, establishes the nature of judicial oversight over rulemaking agencies (https://en.wikipedia.org/wiki/Administrative_Procedure_Act_(United_States). The APA requires that in order to set aside agency action not subject to formal trial-like procedures, the court must conclude that the regulation is "arbitrary and capricious, an abuse of discretion, or otherwise not in accordance with the law." However, Congress may further limit the scope of judicial review of agency actions by including such language in the organic statute. To set aside formal rulemaking or formal adjudication whose procedures are trial-like, a different standard of review allows courts to question agency actions more strongly. For these more formal actions, agency decisions must be supported by "substantial evidence" after the court reads the "whole record", which can be thousands of pages long. Unlike arbitrary and capricious review, substantial evidence review gives the courts leeway to consider whether an agency's factual and policy determinations were warranted in light of all the information before the agency at the time of decision. Accordingly, arbitrary and capricious review is understood to be more deferential to agencies than substantial evidence review. Arbitrary and capricious review allows agency decisions to stand as long as an agency can give a reasonable explanation for its decision based on the information it had at the time. In contrast, the courts tend to look much harder at decisions resulting from trial-like procedures because those agency procedures resemble actual trial-court procedures, but Article III of the Constitution reserves the judicial powers for actual courts. Accordingly, courts are strict under the substantial evidence standard when agencies acts like courts because being strict gives courts final say, preventing agencies from using too much judicial power in violation of separation of powers.

[5] The Energy Policy Conservation Act was signed by a Republican president and had large majorities in both houses of congress. In fact, eight of the nine major pieces of legislation that effect the energy efficiency of consumer durables were signed by Republican presidents. Both the House and the Senate have voted overwhelmingly in favor of these laws (14 times in all) with over 85 percent voting in favor.

[6] CFA has argued this throughout its regulatory interventions, starting with fuel economy standards () and ending, most recently and explicitly in comments on EPA's final determination in the National Program for light duty vehicles ()

[7] CFA emphasized this throughout our regulatory interventions, see note 1. The issue was formally recognized in the National Program rule.

[8] Results of over a dozen national random sample public opinion polls are among the 140 pieces of research to be found at the CFA website (http://consumerfed.org/issues/energy/)

[9] The Executive Orders cited in the RFI combined with the use of the Congressional Review Act, a dozen times within a year, compared to once, in the previous twenty, constitute an unprecedented attack.

[10] In addition to the comments, testimony and reports listed on the CFA web site, CFA has presented a comprehensive analytic framework and literature review to the California Energy Academy (Mark Cooper, 2014, *Energy Efficiency Performance Standards: Driving Consumer and Energy Savings in California.* Presentation at the California Energy Commission's Energy Academy, February 20, 2014; 2013; *Energy Efficiency Performance Standards: The Cornerstone of Consumer-Friendly Energy Policy*, Consumer Federation of America, October 2013).

[11] The comprehensive literature review has been updated to include over 400 peer-reviewed papers published in the past 10-years that provide the conceptual and empirical foundation for understanding the market imperfection that policy can address to deliver substantial net benefits to consumers and society (see Appendices II and III in Mark Cooper, *The Political Economy of Electricity: Progressive Capitalism and the Struggle to Build a Sustainable Sector* (Santa Barbara, Praeger, 2017).

[12] We have identified these characteristics in the study of standards in a broad range of goods not limited to energy consuming durables (including light duty vehicles, heavy duty trucks, to gas furnaces) but also other goods computers and services (see Mark Cooper, "Command But Not Control: Progressive Capitalism and Regulatory Institutions for the Third Industrial Revolution: The Paris Agreement on Climate Change," *Session on Regulation and Industry Structure The Digital Broadband Migration*: *The Evolving Industry Structure of the Digital Broadband Landscape*, 2016).

[13] Mark Cooper, 2014, *Energy Efficiency Performance Standards: Driving Consumer and Energy Savings in California.* Presentation at the California Energy Commission's Energy Academy, February 20, 2014; 2013; *Energy Efficiency Performance Standards: The Cornerstone of Consumer-Friendly Energy Policy*, Consumer Federation of America, October 2013. See Mark Cooper, 2017, *The Political Economy of Electricity: Progressive Capitalism and the Struggle to Build a Sustainable Power Sector*, (Praeger), Chapter 7 and Appendix II for a more recent comprehensive review.

[14] We have identified these characteristics in the study of standards in a broad range of goods including light duty vehicles, heavy duty trucks, gas furnaces and computers. The key characteristics of "command but not control" regulation extend to policies that create institutional arrangement as discussed in Cooper, 2017.

[15] Republican presidents signed the legislation that created the fuel economy program in 1976 and then reformed it in 2007. The laws passed both houses of Congress with large majorities. In fact, eight of the nine major pieces of legislation that effect the energy efficiency of consumer durables were signed by Republican presidents. Both the House and the Senate have voted overwhelmingly in favor of these laws (14 times in all) with over 85 percent voting in favor.

[16] 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.

[17] 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.

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

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

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

[21] Office of Management and Budget, Memorandum For: Regulatory Policy Officers at Executive Departments and Agencies and Managing and Executive Directors of Certain Agencies and Commissions, May 5, 2017,

[22] Viscusi, Vernon, and Harrington, 2000, pp. 2-3.

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

[24] Luke Stewart, 2010, The impact of Regulation on Innovation in the United States: A Cross-Industry Literature Review, Institute of Medicien Committee on Patient Safety and Health IT, June.

[25] Institute for European Environmental Policy, Review of Costs and Benefits of Energy Savings: Task 1 Report 'Energy Savings 2030, May 2013 IEER, pp. 4…6.

[26] Cooper, 2014, "Energy Efficiency Performance Standards, slide 22.

[27] 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.

[28] Cooper, 2017, *The Political Economy of Electricity*, Chapter 5.

[29] The survey was conducted for CFA by ORC International, which interviewed a representative sample of 1,008 American adults by landline or phone on July 13-16. The margin of error for the survey is plus or minus three percentage points.

[30] 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

[31] American Action Forum, *Regulatory Rodeo*.

[32] National Academy of Sciences analyses have played a large part in the estimation of vehicle technology costs.

[33] Roland Hwang and Matt Peak, 2006, Innovation and Regulation in the Automobile Sector: Lessons Learned and Implications for California's CO2 Standard, Natural Resources Defense Council, April.

[34] Winston Harrington, 2006, Grading Estimates of the Benefits and Costs of Federal Regulation: A Review of Reviews, Resources for the Future, 2006; p. 3.

[35] Steven Nadel and Andrew Delaski, *Appliance Stnadards: Comparing Predicted and Observed Prices*, American Council for an Energy Efficient Economy and Appliance Standards Awareness Project, July 2013.

[36]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. 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.

[37] Worrell, Ernst, et al., 2003, "Productivity Benefits of Industrial Energy Efficiency measures," Energy, 28(11): 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. (p 1)

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

[39] Onno Kuok, 2006, "Environmental Innovation Dynamics in the Automotive Industry," 2006, "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…. 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." R D Van Buskirk, et al., 2014, "A retrospective investigation of energy efficiency standards: policies may have accelerated long term declines in appliance costs," Environmental Research Letter, November 14.

[40] 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, pp. 60- 62; 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*: *A retrospective and Prospective Analysis* Oak Ridge National Laboratory and the Energy Foundation, March 2017, section 5.2.

[41] CFA laid out this argument in comments supporting the heavy duty truck standard.

[42] Residential electricity revenues represent about 46% of total revenues, see the EIA data base at https://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_02; Residential natural gas revenues represent about 65% of natural gas revenues, excluding for electric utilities, whose costs would be recovered in electricity bills. Allocating petroleum cost recovery is more complicated, but CFA concluded that residential consumer account for about 55% of transportation fuel costs. See, Mark Cooper, Paying the Freight, Consumer Federation of America, 2012.

[43] Jennifer, Brown, , Tanjim Hossain and John Morgan, 2007, Shrouded Attributes and Information Suppression: Evidence from the Field, November; Xavier Gabaix and David Laibson, 2005, Shrouded Attributes, Consumer Myopia, and Information Suppression I Competitive Markets, NBER Working Paper 11755, November; Tanjim Hosain and John Morgan, 2006, Shrouded Attributes and Information Suppression: Evidence from Field Experiments, Competition Policy Center, UC Berkeley, September.

[44] Taylor, p. 898.

[45] James D. Hamilton, "Causes and Consequences of the Oil Shock of 2007–08," *Brookings Papers on Economic Activity* Spring; Warr, Benjamin S, Robert U. Ayres, and Eric Williams, 2009, *Increase Supplies, Increase Efficiency: Evidence of Causality Between the Quantity and Quality of Energy Consumption and Economic Growth*. 2009/22/EPS.ISIC, Faculty & Research Working Paper. INSEAD.

[46] In addition to the recent U.S. analysis by U.S. EPA/NHTSA, 2011, see Jamie Howland, et al., 2009, *Energy Efficiency: Engine of Economic Growth.* Rockport, ME: Environment Northeast; and New York State Energy Research & Development Authority, 2011, *Macro-Economic Impact Analysis of New York's Energy Efficiency Programs: Using REMI Software*. Albany NY: NYSERDA, August 4; Holmes Ingrid and Rohan Mohanty, 2012, *The Macroeconomic Benefits of Energy Efficiency: The Case for Pubic Action*, E3G, April; Cambridge Centre for Climate Change Mitigation Research, 2006, *The Macro-Economic Rebound Effect and the UK Economy*. Cambridge, U.K.: Cambridge Econometrics and Policy Studies Institute, May; and Lisa, Ryan, and Nina Campbell, 2012, *Spreading the Net: The Multiple Benefits of Energy Efficiency Improvements*. Insight Series. Paris, France: International Energy Agency, for a general global review.

[47] James Lazar and Ken Colburn, *Recognizing the Full Value of Energy Efficiency* (Regulatory Analysis Project, September 2013),

[48] Ryan, and Campbell, 2012, *Spreading the Net: The Multiple Benefits of Energy Efficiency Improvements*. Insight Series. Paris, France: International Energy Agency, pp. 1…2 …3.

[49] Lutz, Christian, Ulrike Lehr and Martin Pehnt, 2012, *Economic impacts of energy efficiency and Renewable energy in Germany, 20th* International Input-Output Conference, June 26-29, pp. 1… 6-7…8.

[50] U.S. EPA, 2010, pp. 3-4.

[51] Memorandum To: Docket EPA-HQ-OAR-2009-0472, Subject: Economy-Wide Impacts of Greenhouse Gas Tailpipe Standards, March 4, 2010.

[52] Id., p. 1.

[53] The IEER review of studies lists seven studies covering the residential building and the industrial sectors covering a handful of European nations in 2010-2013. The effects studies were primarily employment, cost of saved energy and competitiveness. Worrel, et al., identified 70 industrial case studies, with 52 that monetized the benefits.

[54] Max Wei, Shana Patadia, and Daniel Kammen, 2010, "Putting Renewables and Energy Efficiency to Work: How Many Jobs Can the Clean Energy Industry Generate in the US?" *Energy Policy* 38.

[55] Ryan and Campbell, identify a dozen partial equilibrium models that have been applied to regions within nations, individual nations, groups of nations and the global economy. The effects analyze include GDP, employment by sector, public budgets, trade, distribution, and investment.

[56] For example, EPA, 2010, IGEM; Rachel Gold, et al., 2011, *Appliance and Equipment Efficiency Standards: A Money Maker and Job Creator,* American Council for an Energy Efficient Economy, January 2011, p. 9, based on the IMPLAN Model, 2009. Howland and Murrow and NYSERDA 2011, REMI),

[57] For example, New York (NYSERDA, 2011), New England (Howland and Murrow), California (David Roland-Holst, 2016)

[58] For example, U.S. (Gold,, 2011, EPA, 2010, Warr, Ayres and Williams, 2009) and UK (Cambridge Center, 2006), note recent studies on Asian economies, Korea, Canada and Spain,

[59] In the mid- and long-terms employment and output increase.

[60] Wei, Patadia, and Kammen, 2010, Gold, et al., 2011.

[61] ACEEE, "In our experience modeling efficiency investments, we find that re-spending the energy savings typically creates an equivalent number of jobs as implementing the investment." (p. 2)

[62] Worrell, et al., p. 5.

[63] Ryan and Campbell, p. 5., Howland, et al., 2009.

[64] EPA, 2012-2016,

[65] Wiser, Bolinger and St. Clair, 2005.

[66] 2017, forward. This example is particularly appropriate since infrastructure spending and projects, on which transit would be an important area, appear to be widely supported because of the benefits they deliver to individuals and the economy

[67] Id., pp. 3… 10.

[68] Thomas G. Poder and Jie He, 2017, Willingness to pay for a cleaner car: The case of car pollution in Quebec and France, Energy 130; Susan Rose-Ackerman, 2011, Putting Cost-Benefit Analysis in Its Place: Rethinking Regulatory Review, Yale Law School Legal Scholarship Repository.; Lisa Heinzerling, Frank Ackerman, 2002, Pricing the Priceless: Cost-Benefit Analysis of Environmental Protection, 150 U. Pa. L. Rev. 1553.

[69] Benjamin Leard, et al., 2017, How Much Do consumers Value Fuel Economy and Performance? Evidence from Technology Adoption, Brookings Institution, June;

[70]Leard, et al., 2017, p. 27, put it as follows, "Moreover, this conclusion does not account for potential induced innovation caused by tighter standards, market failures associated with insufficient market incentives for innovation, market failures associated with imperfect competition (such as the possible underprovision of fuel economy), and interactions between new and used vehicle smarkets. Finally, the conclusion does not account fro transitional dynamics. 2

[71]For example, a similar sentiment is expressed by one critique of willingness-to-pay studies in healthcare (Joaquin F. Mould Quevedo, et al., "The Willingness-to-Pay Concept in Question," Rev. Sauide Publica: 43(2), as follows: "[M]ost of these investigations still do not differentiate the economic factors that might be distorting the market, centering the investigation on a hypothetical aggregate demand when whoever defines the price and amount offered of a particular medication or medial intervention in the health sector generally comes from the supply-side.

[72] Leard, et al., p. p. 29.

[73] 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).

[74] Id., p. 10.

[75] Cooper, 2017, Chapter 5.

Appendix B

An Analysis of Consumer Savings and Automaker Progress On the Road to 2025 CAFE Standards

Jack Gillis

Richard Eckman

Consumer Federation of America

July 24, 2017

INTRODUCTION

This report evaluates the direct consumer savings, and automaker progress, associated with the 2025 CAFE standards. It is in response to current efforts by certain members of Congress and the current Administration to roll back those standards. The rationale for the rollback is that it costs too much to comply with the standards and, as a result, vehicle prices will increase, thus dissuading consumers from buying new cars. The fact is, rolling back the standards would not only cause great harm to consumer pocketbooks, but, because of consumer demand for fuel efficiency, would also harm sales.

Public opinion surveys, including one recently conducted by the Consumer Federation of America, demonstrate unquestionably that consumers want more fuel efficient vehicles and that they strongly support standards requiring them. Consumers understand that gasoline costs are a major household expenditure and improvements in vehicle fuel economy puts money directly back into their pocketbooks. Furthermore, while gas prices are currently low, they understand the cyclical nature and volatility of those prices.

Our analysis shows that Congress and the Administration would be making a serious mistake in rolling back the standards. Not only would the impact be immediately felt by already financially strapped Americans, but it would put the U.S. car companies at a distinct disadvantage, both nationally and globally, in competing with the Asian manufacturers, who are quite capable of complying with the standards. As this report will demonstrate, not only do fuel economy standards pay off in lower ownership and operating costs, but the carmakers are fully capable of meeting the standards at a reasonable cost, and improving fuel economy improves sales.

We examined the current progress in meeting fuel economy standards by analyzing the performance of 2017 and 2016 vehicles from a variety of perspectives. On

July 24, 2017, CFA released its most recent survey of consumer attitudes towards fuel economy in link.

NEARLY HALF OF "ALL-NEW" 2017 VEHICLES COST LESS TO BUY AND FUEL THAN THEIR 2011 COUNTERPARTS

25% of the 2017 All-New Vehicles Cost Less Than Their 2011 Counterparts AND Got Better Fuel Economy

Manufacturers have the greatest opportunity to improve vehicle fuel economy when they introduce a truly new vehicle.[1] For this analysis, we compared the cost and fuel economy of 19 of the 27 "all-new" 2017 models which had a 2011 version, the year before the current standard was put in place.[2] These 19 models included 79 different EPA designated engine/drive train/transmission/MPG configurations (or what are called "trims"). When we compared the cost difference between the "all-new" 2017 models and their 2011 version, after factoring in inflation, 21 or 27% actually went down in price, yet every one of these vehicles saw a 1 to 10 MPG increase. Vehicles that improved their fuel economy while going down in price ranged from the Subaru Impreza and GMC Acadia to the Mercedes E Series, clearly demonstrating that improvements in fuel economy do not have to generate higher prices.

FUEL SAVINGS EXCEEDED FUEL ECONOMY TECHNOLOGY COSTS FOR 94% OF ALL-NEW 2017 MODELS

Annual vehicle price increases (less inflation) cover many different improvements such as new safety technology, convenience items, design changes, as well as upgraded fuel economy technology. By separating out the cost of fuel economy improvements from these other costs, we were able to get a more accurate look at the impact of the

[1] Each year only about 10 percent of the fleet is made up of truly "all-new" vehicles. Typically, when a new model is introduced, that vehicle essentially stays the same for 5-6 years. This is called a "model series" and while there may be some style and feature changes during a model's series, the mechanics of the vehicle generally stay the same

[2] There were 27 all new vehicles introduced in 2017, 19 of them had a previous version available in 2011. These 19 vehicles were the ones we included in this analysis.

standards on consumer pocketbooks. Overall, for 74 of the 79 vehicles (94%), the added cost of new fuel efficient technology was far exceeded by the resulting fuel cost savings over the first 5 years of ownership.

EVEN IF THE PRICE OF THE VEHICLE GOES UP, FUEL ECONOMY SAVINGS CAN OFFSET THE INCREASE

For 12 of the 58 vehicles whose cost went up, the savings in fuel costs exceeded the entire price increase for that vehicle, even though only part of that increase can be attributed to fuel efficiency.

Each mile per gallon of improvement is estimated to cost about $100 in improved fuel economy technology.[3] For 41 of the 58 vehicles whose cost went up, the savings in fuel costs outweighed the cost of the fuel economy technology. Finally, for the few vehicles whose fuel economy stayed the same or actually decreased, all experienced an increase in price.

Figure 1: 2011 vs. 2017 "All-New" Price Comparison (Accounting for Inflation)

	"All-New" Trims[123]	Percent of "All-New Trims"
Total "All-New" Vehicles with 2011 Counterpart	79	100%
2011 Vehicles Which Were LESS Expensive in 2017 Dollars and Had Higher MPG	21	27%
2011 Vehicles Which Were MORE Expensive in 2017, Who's Fuel[4] Savings Offset the Entire Price Increase	12	15%
2011 Vehicles Which Were MORE Expensive in 2017, Whose Fuel[4] Savings Offset the $100/MPG Cost of Fuel Economy Technology[5]	41	52%
2011 Vehicles Which Were MORE Expensive in 2017, Who's Fuel Economy Stayed the Same or Decreased	5	6%

[1]Inflation was calculated using BLS average inflation numbers from 2011-2016.

[2]Average "All-New" Vehicle Price from the New Car Cost Guide.

[3] CFA bases its estimate of the cost of fuel economy on a review of the literature including historical, market-based and engineering studies, as described in Appendix B.

[3]Fuel Economy of "All-New" Vehicles based on EPA combined estimates.
[4] Gas costs from AAA $2.27 (7/19/17) and driving an average of 14,000 miles per year.
[5] CFA bases its estimate of the cost of fuel economy on a review of the literature including historical, market-based and engineering studies, as described in Appendix B.

OVERALL, FUEL ECONOMY IMPROVEMENTS FAR EXCEED THEIR COST, AND PARTIALLY OFFSET THE COST OF OTHER IMPROVEMENTS

The average "all-new" vehicle increased in price from $37,808[4] in 2011 to $39,723 in 2017, (4.8%). Their increase in fuel economy went from an average of 21.0 to 24.2 MPG, (13.2%). Considering that every mile per gallon of improvement costs about $100, the average cost of these improvements was $320. However, this fuel economy increase saved owners of these "all-new" vehicles an average of $946 in gas costs over 5 years. The difference between the cost of these improvements and their benefit provided consumers with an average savings of $626 over 5 years in gasoline costs. These savings go directly into consumer pocketbooks and back into the economy or offset about 40% of the non-fuel efficiency technology component of the average price increase of "all-new" cars from 2011-2017.

[4] 2017 Dollars

Figure 2: 2011 & 2017 Average "All-New" Vehicle Price and Fuel Economy (Accounting for Inflation)			
Year	**Ave. "All-New" Vehicle Price[1][2]**	**Ave. Fuel Economy of "All-New" Vehicles[3]**	**Gas Cost for 5 Years[4]**
2011 Price in 2017 Dollars	$37,808	21.0	$7,567
2017 Price	$39,723	24.2	$6,621
Change in Price	$1,915	3.2	-$946
% Change	4.8%	13.2%	-14.3%
COST: $100 per MPG Increase for Fuel Economy Technology[5]	-$320		
BENEFIT: Gas Savings Due to Fuel Efficient Technology	$946		
SAVINGS: Average Savings for "All-New" Car Buyers	$626		

[1]Inflation was calculated using BLS average inflation numbers from 2011-2016 averaging 1.4% per year.

[2]Average "All-New" Vehicle Price is from the New Car Cost Guide for the 79 vehicles.

[3]Average Fuel Economy of 79 "All-New" Vehicles is based on EPA combined mileage estimates.

[4]Gas costs from AAA $2.27 (7/19/17) and driving an average of 14,000 miles per year.

[5] CFA bases its estimate of the cost of fuel economy on a review of the literature including historical, market-based and engineering studies, as described in Appendix B.

CAFE COMPLIANCE AMONG "ALL-NEW" VEHICLES SHOW MANUFACTURERS ARE ON THEIR WAY TO 2025 COMPLIANCE

The introduction of "all-new" vehicles is the best barometer of a manufacturer's ability to comply with CAFE standards. Changing the fuel economy of existing vehicles is difficult, as the vehicle is already designed and is being manufactured to its original specifications. With "all-new" vehicles, manufacturers can incorporate their latest fuel-saving technologies.

In comparing the CAFE compliance of "all-new" models introduced in 2015, 2016 and 2017, there was a significantly higher percentage of CAFE-compliant vehicles in 2017. In fact, 70 percent of the "all-new" 2017 vehicles had a CAFE-compliant trim, compared to 41 percent of the "all-new" 2015 vehicles (Figure 3). Particularly noteworthy was the fact that 78% of the "all-new" light duty trucks had a CAFE

compliant trim for 2017. Interestingly, percentage-wise, trucks beat cars for CAFE compliance in 2017.

Figure 3: Percentage of CAFE Compliant Vehicles Among "All-New" Models 2015-2017			
	2015	**2016**	**2017**
Total "All-New" Vehicles	34	32	27
Total CAFE Compliant	14 (41%)	19 (60%)	19 (70%)
Percentage of CAFE Compliant Vehicles Among "All-New" Model Cars 2015-2017			
	2015	**2016**	**2017**
Total "All-New" Cars	19	19	18
Total CAFE Compliant	8 (42%)	15 (80%)	12 (67%)
Percentage of CAFE Compliant Vehicles Among "All-New" Model Trucks 2015-2017			
	2015	**2016**	**2017**
Total "All-New" Trucks	15	13	9
Total CAFE Compliant	6 (40%)	5 (40%)	7 (78%)

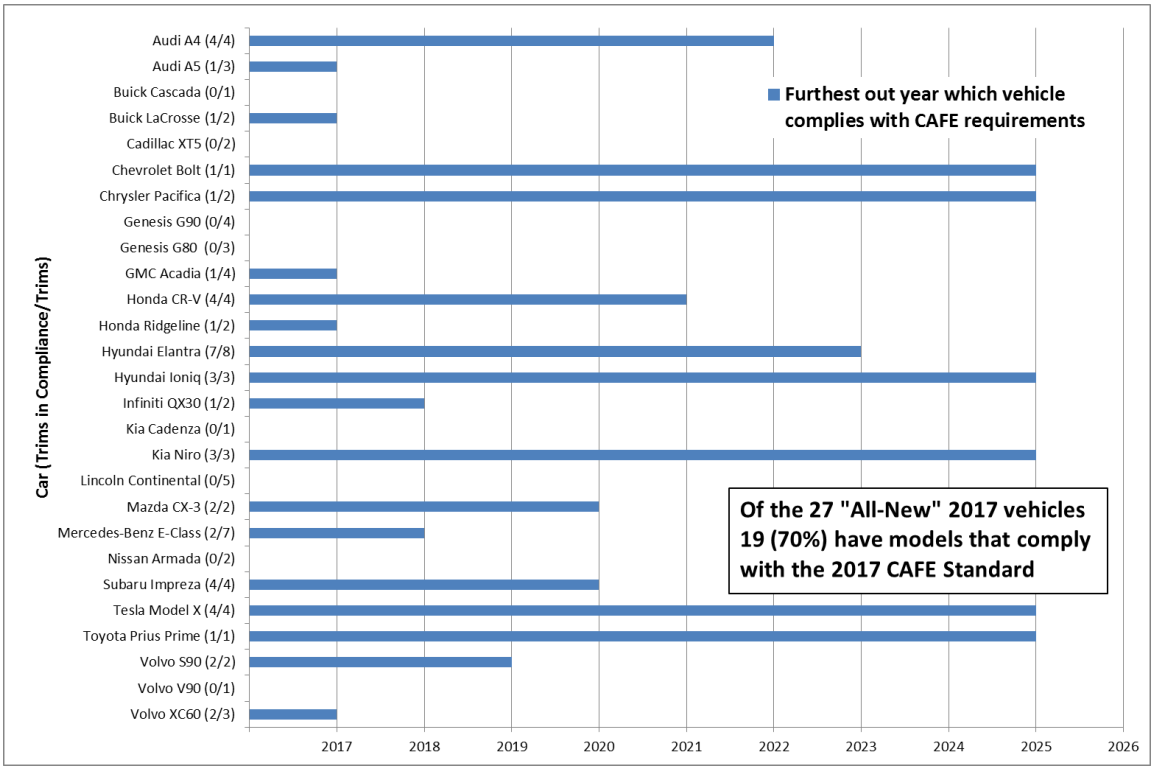
MANY MODELS EXCEED CURRENT YEAR CAFE REQUIREMENTS – SOME COMPLYING TO 2025

In reviewing the "all-new" vehicles, we also determined how many years into the future each model would comply with the *gradual increase* in CAFE requirements. Current vehicles that meet CAFE requirements for future years indicate that manufacturers are actually "ahead of the game" in terms of compliance.

70% (19) of the 27 "all-new" vehicles for 2017 had models which met, at the minimum, the 2017 CAFE standard. In fact, from 2015-2017, the majority of these compliant cars actually exceeded the minimums required for that year. Figure 4a shows that 6 of the 2017 vehicles are already CAFE compliant with the 2025 standard—a record number.

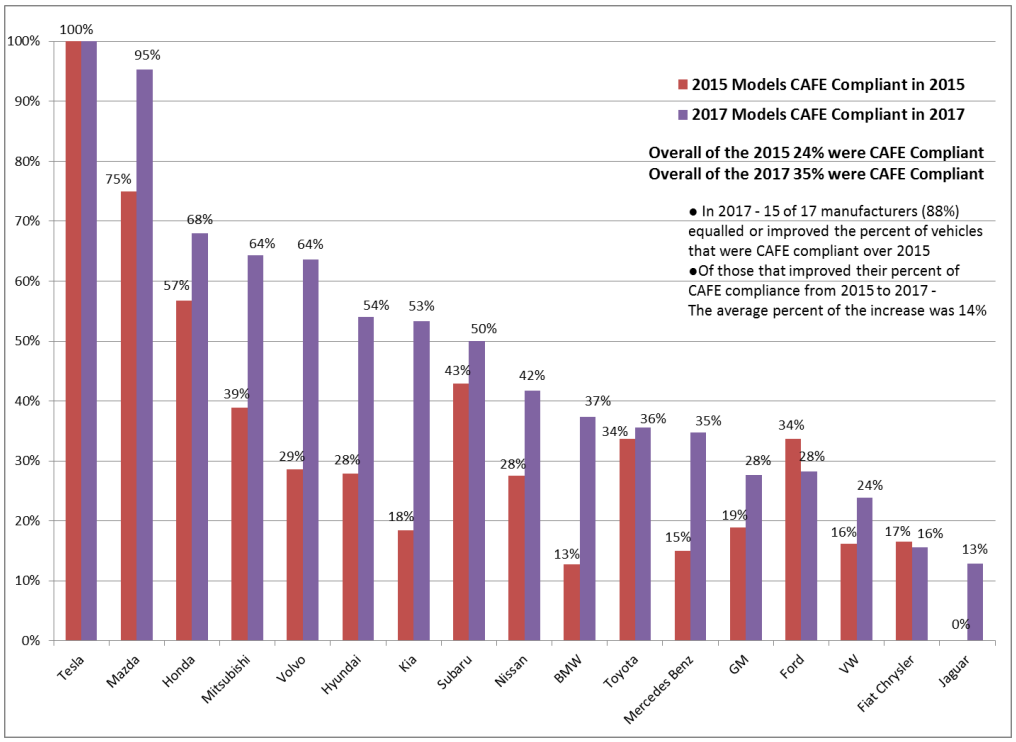
Figure 4a: Among the "All-New" Vehicles – How Many Will Continue Their CAFE Compliance Until:											
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
2015	14	10 (71%)	8 (57%)	6 (43%)	5 (36%)	3 (21%)	3 (21%)	2 (14%)	0	0	0
2016	-	19	18 (95%)	18 (95%)	15 (79%)	14 (74%)	11 (58%)	7 (37%)	6 (32%)	4 (21%)	2 (11%)
2017	-	-	19	14 (74%)	11 (58%)	10 (53%)	8 (42%)	8 (42%)	7 (37%)	6 (32%)	6 (32%)

Figure 4b. 2017 "All-New" Vehicles and Their CAFE Compliance



What is particularly remarkable is the improvements in CAFE compliance by each of the manufacturers. 14 of the 17 major manufacturers improved the percent of their vehicles that were CAFE compliant from 2015 to 2017. (Tesla at 100% compliance matched its 2015 compliance.) While Ford and Fiat Chrysler lost ground, many of the other manufacturers actually doubled the percent of CAFE compliant vehicles. (Figure 4c)

Figure 4c. Percent of 2015 and 2017 Vehicle Trims that were CAFE Compliant by Manufacturer

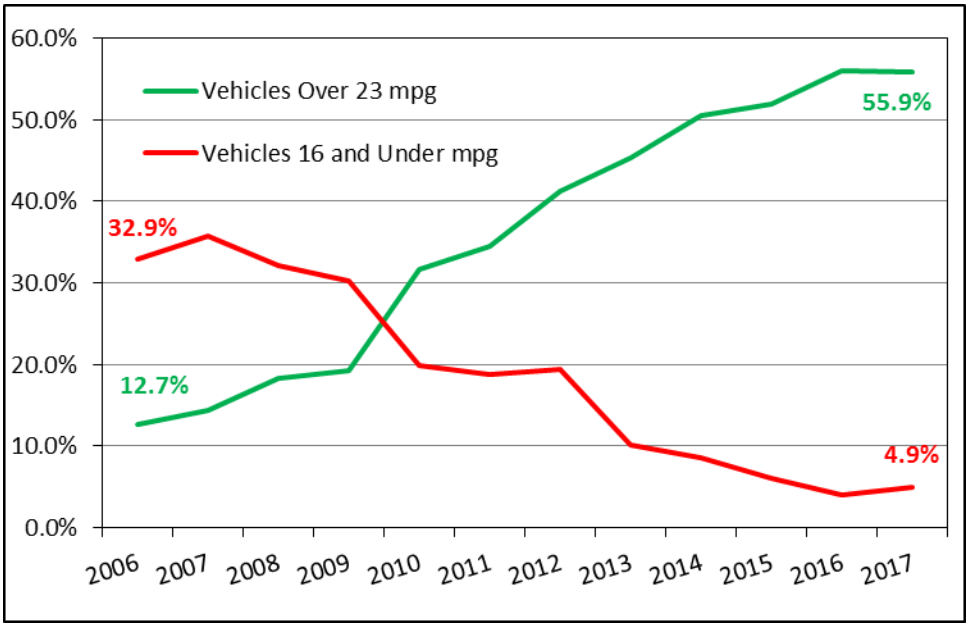


GAS GUZZLERS DECLINE SIGNIFICANTLY IN 2017 - VEHICLES GETTING OVER 30 MPG STAYS STEADY

Fuel economy progress is going well. In looking at all of the 2017 models, "gas guzzlers" getting below 14 MPG are a miniscule 0.4% in 2017, down from 8.5% in 2011. At the other end, there was a small increase in vehicles getting over 38 MPG, going from 4% last year to 4.3% in 2017. (Figure 5a)

Figure 5a: On the Road to 40 mpg by 2025: Carmakers Demonstrate Significant Progress													
EPA Grade	**MPG**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
10	38+	0.4%	0.2%	0.2%	0.2%	0.6%	1.0%	1.1%	2.9%	3.1%	3.0%	4.0%	4.3%
9	31-37	0.7%	0.4%	0.8%	1.1%	2.1%	3.2%	4.7%	6.4%	8.5%	8.7%	9.3%	8.8%
Over 30MPG		**1.1%**	**0.6%**	**1.0%**	**1.3%**	**2.7%**	**4.2%**	**5.8%**	**9.3%**	**11.6%**	**11.7%**	**13.4%**	**13.0%**
8	27-30	2.4%	3.0%	3.5%	4.4%	7.3%	7.8%	9.2%	12.0%	14.8%	16.5%	17.3%	15.8%
7	23-26	10.3%	10.2%	12.8%	12.4%	18.9%	18.3%	20.4%	25.0%	24.1%	23.8%	25.4%	27.1%
Acceptable		**12.7%**	**14.4%**	**18.3%**	**19.3%**	**31.6%**	**34.5%**	**41.2%**	**45.3%**	**50.5%**	**52.0%**	**56.1%**	**55.9%**
6	22	10.4%	10.4%	7.2%	11.7%	8.4%	8.0%	7.0%	7.7%	6.1%	8.0%	7.5%	7.7%
5	19-21	28.2%	26.5%	28.5%	27.6%	29.2%	30.4%	26.9%	26.5%	24.3%	22.2%	21.8%	21.1%
4	17-18	14.7%	13.7%	14.9%	12.5%	13.8%	12.5%	11.3%	9.4%	10.6%	11.7%	10.7%	10.5%
3	15-16	24.4%	24.6%	16.6%	15.6%	11.4%	10.3%	9.8%	6.7%	6.1%	4.7%	3.7%	4.5%
2	13-14	5.0%	5.9%	9.9%	8.2%	6.7%	6.8%	7.8%	3.0%	2.4%	1.4%	0.3%	0.4%
1	0-12	3.5%	5.2%	5.7%	6.4%	1.7%	1.7%	1.8%	0.4%	0.0%	0.0%	0.0%	0.0%
Poor		**86.2%**	**86.3%**	**82.8%**	**82.0%**	**71.2%**	**69.7%**	**64.6%**	**53.7%**	**49.5%**	**48.0%**	**43.9%**	**44.1%**
# of Trims[1]		**1076**	**1184**	**1198**	**1182**	**1101**	**1053**	**901**	**1057**	**1091**	**1194**	**1094**	**1097**
[1]We did not include large passenger vans or exotic vehicles.													

Figure 5b. Percent of Gas Guzzlers and Misers



SUVs, Crossovers and Pickups with Higher MPG Increases Sell Better

A key concern among U.S. automakers is the impact of fuel economy standards on sales. Rolling back the standards, they say, is necessary to maintain sales. Our analysis specifically demonstrates just the opposite.

SUVs, pickups and crossovers, whose MPGs (miles per gallon) increased by over 10% between 2011 to 2016, had a 59% increase in sales. On the other hand, those same vehicles with less than a 10% increase in MPGs from 2011 to 2016 experienced only a 41% increase in sales, almost 20% less. (Figure 6) This analysis completely debunks automaker claims that consumers don't value good gas mileage. Clearly, the more improvement in MPG, the better the sales. NOTE: 2011 was the year prior to when the current CAFE requirements went into effect.

Figure 6: SUVs, Crossovers, Light Trucks - 2011-2016

Percent Increase in MPG 2011 - 2016	Number of Vehicles	2011 Average Sales Per Model	2016 Average Sales Per Model	Average Change in Sales (Units)	2011 - 2016 Average % Change in Sales
10% or More	29	95,143	150,828	55,685	59%
Under 10%	37	63,423	89,696	26,273	41%
Mileage figures from EPA and Sales from Auto News					

The Toyota RAV4, which increased by 10 MPG from 2011 to 2016 and saw a sales increase of almost 220,000 or a 166% increase in annual vehicle sales. Meanwhile, the GMC Terrain which had a 1 MPG decrease saw only a 6% increase in sales from 2011 to 2016. And even though consumers are increasingly choosing crossover models over sedans, the typical crossover now gets 10% better gas mileage than in 2011, thanks to fuel economy standards which are currently under threat of a rollback.

Conclusion: Rolling Back Fuel Economy Standards Will Hurt Both the U.S. Car Companies and the American Consumer—There's No Need For A Roll Back

Not only do consumers want more fuel efficiency, but this data and analysis make it abundantly clear that manufacturers are fully capable of meeting the current standard and that fuel economy helps sales. This should be no surprise, because the standard was specifically designed to help manufacturers meet the challenges they face with improving fuel efficiency. The current standards are not "one-size fits all" and were specifically crafted to respect the differing vehicle mixes among manufacturers as well as consumer choice. Acknowledging the fuel economy challenges inherent in larger vehicles, the standard incorporates two separate calculations, one for cars and one for light trucks, SUVs, and most crossovers. Furthermore, within those calculations, a sliding scale further reduces the requirements on larger vehicles. Finally, automakers meet requirements on an average basis across their entire fleet, which means that not all of the manufacturer's models have to meet a given year's target. This enables automakers to produce a mix of vehicles in response to consumer demand. The result: the standards have helped create a much more efficient U.S. auto fleet while preserving both manufacturer and consumer choice on size, weight and performance.

It is also evident that increased fuel economy plays an important role in vehicle sales. That was made clear in the mid 2000's when auto dealer lots were filled with gas guzzlers they simply couldn't sell, resulting in government bailouts for the industry. Rolling back the standards today would not only hurt U.S. automakers as the Asian companies roar ahead with vehicles in compliance, but would be a big blow to American pocketbooks, especially as gas prices rise in the future.

In spite of their current compliance with the standards and the positive impact on sales, the auto manufacturers want to roll-back the requirements. They've lobbied the President to reopen the final determination on fuel economy standards for 2025, inviting a rollback from the Environmental Protection Agency. In addition, Congress is now working on bills (S.1273 and an anticipated House Bill) that will lower mileage requirements for these larger vehicles. While the automakers may try to "lay the blame" on their customers for "needing" to roll back the standards, consumers are voting for the higher mileage vehicles with their dollars. This shortsighted thinking by certain members

of Congress, the Administration and the auto companies ignores consumer demand for more fuel efficiency. As gas prices creep back up, car companies will be in the same spot they were back in 2009 when they had to be bailed out by the government, with lots filled with larger, fuel inefficient vehicles they can't sell.

APPENDIX A: VEHICLE AND PRICE CHANGES AMONG "ALL-NEW" MODELS 2011 TO 2017

The following information was used to analyze the performance of "all-new" vehicles in the 2017 fleet with their 2011 counterparts. 2011 was the year before the current standard was implemented. The 2011 vehicle pricing was adjusted for inflation in order to fairly compare price changes with the 2017 models. There were 27 "all new" models in 2017. For 19 of those models, there was a corresponding vehicle available in 2011. Those are the vehicles we were able to compare. Among the 19 models, there were 79 different trim configurations each having a separate cost and MPG rating. Using current gas prices and assuming 14,000 miles driven in a typical year, the savings from increased fuel economy was determined for all 79 different trim configurations.

Vehicle Price Change From 2011 to 2017 Compared to Gas Savings Due to Increased Fuel Efficiency										
Division	Model	Trim	2011 Price in 2017 Dollars[12]	2017 Price	Change in Price	Change in MPG[3]	Cost of FE Tech ($100/ MPG)[4]	Change in 5 Yr. Gas Costs[5]	Price Difference Plus Gas Savings	FE Tech Cost Plus Gas Savings
GMC	Acadia FWD	2011 - SL [3.6, V6, A(A6)] 2017 - SL [2.5, I4, A(A6)]	$34,005	$29,070	-$4,935	4	$400	-$1,474	-$6,409	-$1,074
GMC	Acadia FWD	2011 - SLE [3.6, V6, A(A6)] 2017 - SLE-1 [2.5, I4, A(A6)]	$36,809	$32,450	-$4,359	4	$400	-$1,474	-$5,832	-$1,074
GMC	Acadia AWD	2011 - SLE [3.6, V6, A(A6)] 2017 - SLE-1 [3.6, V6, A(A6)]	$38,945	$34,450	-$4,495	1	$100	-$424	-$4,918	-$324
Honda	Ridgeline 4WD	2011 - RTS [3.5, V6, A(A5)] 2017 - RTS [3.5, V6, A(A6)]	$33,754	$31,515	-$2,239	5	$500	-$2,152	-$4,392	-$1,652
GMC	Acadia FWD	2011 - SLT [3.6, V6, A(A6)] 2017 - SLT-1 [2.5, I4, A(A6)]	$40,782	$38,350	-$2,432	4	$400	-$1,474	-$3,905	-$1,074
Honda	Ridgeline 4WD	2011 - RT [3.5, V6, A(A5)] 2017 - RT [3.5, V6, A(A6)]	$30,865	$29,475	-$1,390	5	$500	-$2,152	-$3,543	-$1,652
Honda	Ridgeline 4WD	2011 - RTL [3.5, V6, A(A5)] 2017 - RTL [3.5, V6, A(A6)]	$36,825	$35,580	-$1,245	4	$400	-$1,804	-$3,049	-$1,404
Subaru	Impreza Wagon	2011 - 2.5i Premium [2.5, I4, A(S4)] 2017 - Premium [2.0, I4, A(AV-S7)]	$20,287	$19,895	-$392	10	$1,000	-$2,287	-$2,679	-$1,287
Subaru	Impreza AWD	2011 - 2.5i [2.5, I4, A(S4)] 2017 - Base [2.0, I4, A(AV-S7)]	$19,753	$19,395	-$358	10	$1,000	-$2,287	-$2,645	-$1,287
Mercedes	E-Series	2011 - E 350 4MATIC [3.5, V6, A(A5)] 2017 - 300 4MATIC [2.0, I4, A(A9)]	$55,429	$54,650	-$779	5	$500	-$1,765	-$2,545	-$1,265
Cadillac	SRX/XT5 AWD	2011 - Luxury [3.0, V6, A(S6)] 2017 - Luxury [3.6, V6, A(S8)]	$49,229	$47,390	-$1,839	2	$200	-$807	-$2,646	-$607
Hyundai	Elantra	2011 – Touring SE [2.0, I4, A(A4)] 2017 - Eco [1.4, I4, A(AM7)]	$21,675	$20,650	-$1,025	9	$900	-$1,592	-$2,617	-$692
Chrysler	T&C/Pacifica	2011 - Touring [3.6, V6, A(A6)] 2017 - Touring [3.6, V6, A(A9)]	$32,211	$30,495	-$1,716	2	$200	-$732	-$2,448	-$532
GMC	Acadia AWD	2011 - SLT [3.6, V6, A(A6)] 2017 - SLT-1 [3.6, V6, A(A6)]	$42,918	$41,450	-$1,468	1	$100	-$424	-$1,891	-$324
GMC	Acadia AWD	2011 - Denali [3.6, V6, A(A6)] 2017 - Denali [3.6, V6, A(A6)]	$48,295	$46,920	-$1,375	1	$100	-$424	-$1,799	-$324
Hyundai	Elantra	2011 - Touring SE [2.0, I4, M(M5)] 2017 - Value Edition [2.0, I4, A(S6)]	$20,821	$20,250	-$571	6	$600	-$1,161	-$1,732	-$561
GMC	Acadia FWD	2011 - Denali [3.6, V6, A(A6)] 2017 - Denali [3.6, V6, A(A6)]	$46,159	$44,920	-$1,239	1	$100	-$424	-$1,663	-$324
Mercedes	E-Series	2011 - E 350 Coupe [3.5, V6, A(A5)] 2017 - 300 [2.0, I4, A(A9)]	$52,172	$52,150	-$22	5	$500	-$1,610	-$1,632	-$1,110
Mercedes	E-Series	2011 - E 550 [5.5, V8, A(A7)] 2017 - 550 (coupe) [4.7, V8, A(A7)]	$60,983	$60,650	-$333	3	$300	-$1,278	-$1,611	-$978
Mercedes	E-Series	2011 - E 550 (CONVERTIBLE) [5.5, V8, A(A7)] 2017 - 550 (convertible) [4.7, V8, A(A7)]	$69,206	$69,100	-$106	3	$300	-$1,421	-$1,527	-$1,121
Hyundai	Elantra	2011 - GLS [1.8, I4, A(A6)] 2017 - SE [2.0, I4, A(S6)]	$18,241	$18,150	-$91	1	$100	-$152	-$244	-$52
Subaru	Impreza Wagon	2011 - 2.5i Premium [2.5, I4, A(S4)] 2017 - Premium [2.0, I4, A(AV-S7)]	$21,355	$21,695	$340	10	$1,000	-$2,287	-$1,947	-$1,287
Subaru	Impreza AWD	2011 - 2.5i [2.5, I4, A(S4)] 2017 - Base [2.0, I4, A(AV-S7)]	$20,821	$21,195	$374	10	$1,000	-$2,287	-$1,913	-$1,287
Mazda	CX-9 2WD	2011 - Sport [3.7, V6, A(S6)] 2017 - Sport [2.5, I4, A(S6)]	$31,116	$31,520	$404	5	$500	-$1,765	-$1,362	-$1,265

Division	Model	Trim	2011 Price in 2017 Dollars[12]	2017 Price	Change in Price	Change in MPG[3]	Cost of FE Tech ($100/ MPG)[4]	Change in 5 Yr. Gas Costs[5]	Price Difference Plus Gas Savings	FE Tech Cost Plus Gas Savings
Volvo	XC60 FWD	2011 - 3.2 R [3.2, V6, A(S6)] 2017 - T5 Inscription [2.0, I4, A(S8)]	$40,637	$40,950	$313	5	$500	-$1,474	-$1,162	-$974
Volvo	XC60 AWD	2011 - 3.2 R [3.2, V6, A(S6)] 2017 - T5 Inscription [2.0, I4, A(S8)]	$42,773	$42,950	$177	3	$300	-$1,050	-$873	-$750
Mazda	CX-9 4WD	2011 - Sport [3.7, V6, A(S6)] 2017 - Sport [2.5, I4, A(S6)]	$32,601	$33,320	$719	4	$400	-$1,474	-$754	-$1,074
Honda	CR-V 4WD	2011 - EX-L [2.4, I4, A(A5)] 2017 - EX-L [1.5, I4, A(AV)]	$29,792	$30,495	$703	6	$600	-$1,448	-$745	-$848
Honda	CR-V 2WD	2011 - EX [2.4, I4, A(A5)] 2017 - EX [1.5, I4, A(AV)]	$28,457	$29,195	$738	6	$600	-$1,342	-$604	-$742
Chrysler	T&C/Pacifica	2011 - Touring L [3.6, V6, A(A6)] 2017 - Touring L [3.6, V6, A(A9)]	$34,347	$34,495	$148	2	$200	-$732	-$584	-$532
Honda	CR-V 4WD	2011 - EX [2.4, I4, A(A5)] 2017 - EX-L [1.5, I4, A(AV)]	$26,962	$27,995	$1,033	6	$600	-$1,448	-$415	-$848
Honda	CR-V 2WD	2011 - EX-L [2.4, I4, A(A5)] 2017 - EX [1.5, I4, A(AV)]	$25,627	$26,695	$1,068	6	$600	-$1,342	-$273	-$742
Honda	CR-V 2WD	2011 - LX [2.4, I4, A(A5)] 2017 - LX [2.4, I4, A(AV)]	$23,170	$24,045	$875	4	$400	-$958	-$84	-$558
Mazda	CX-9 2WD	2011 - Touring [3.7, V6, A(S6)] 2017 - Touring [2.5, I4, A(S6)]	$33,167	$35,970	$2,803	5	$500	-$1,765	$1,038	-$1,265
Mazda	CX-9 2WD	2011 - Grand Touring [3.7, V6, A(S6)] 2017 - Grand Touring [2.5, I4, A(S6)]	$35,399	$40,470	$5,071	5	$500	-$1,765	$3,306	-$1,265
Buick	Lacrosse	2011 - CXS [3.6, V6, A(A6)] 2017 - Premium [3.6, V6, A(S8)]	$36,061	$41,065	$5,004	5	$500	-$1,610	$3,394	-$1,110
Buick	Lacrosse	2011 - CXL [3.6, V6, A(A6)] 2017 - Essence [3.6, V6, A(S8)]	$31,565	$38,665	$7,100	5	$500	-$1,610	$5,490	-$1,110
Mazda	CX-9 4WD	2011 - Touring [3.7, V6, A(S6)] 2017 - Touring [2.5, I4, A(S6)]	$34,651	$37,770	$3,119	4	$400	-$1,474	$1,645	-$1,074
Mazda	CX-9 4WD	2011 - Grand Touring [2.5, I4, A(S6)] 2017 - Grand Touring [3.7, V6, A(S6)]	$36,883	$42,270	$5,387	4	$400	-$1,474	$3,913	-$1,074
Volvo	XC60 FWD	2011 - 3.2 [3.2, V6, A(S6)] 2017 - T5 Dynamic [2.0, I4, A(S8)]	$34,603	$40,950	$6,347	5	$500	-$1,474	$4,872	-$974
Volvo	XC60 AWD	2011 - T6 [3.0, V6, A(S6)] 2017 - T6 Inscription [2.0, I4, A(S8)]	$41,011	$46,350	$5,339	3	$300	-$1,156	$4,183	-$856
Volvo	XC60 AWD	2011 - T6 R [3.0, V6, A(S6)] 2017 - T6 R-Design [2.0, I4, A(S8)]	$44,375	$51,000	$6,625	3	$300	-$1,156	$5,469	-$856
Volvo	S80/S90 FWD	2011 - 3.2 [3.2, V6, A(S6)] 2017 - T5 Momentum [2.0, I4, A(S8)]	$39,463	$46,950	$7,487	5	$500	-$1,355	$6,132	-$855
Volvo	S80/S90 AWD	2011 - T6 [3.0, V6, A(S6)] 2017 - T6 Momentum [2.0, I4, A(S8)]	$43,468	$52,950	$9,482	4	$400	-$1,227	$8,256	-$827
Volvo	XC60 AWD	2011 - 3.2 [3.2, V6, A(S6)] 2017 - T5 Dynamic [2.0, I4, A(S8)]	$36,739	$42,950	$6,211	3	$300	-$1,050	$5,161	-$750
Hyundai	Equus/G90	2011 - Signature [4.6, V8, A(A6)] 2017 - Premium [3.3, V6, A(S8)]	$61,944	$68,100	$6,156	2	$200	-$894	$5,262	-$694
Nissan	Armada AWD	2011 - SV [5.6, V8, A(A5)] 2017 - SV [5.6, V8, A(S7)]	$46,469	$47,800	$1,331	1	$100	-$767	$565	-$667
Nissan	Armada AWD	2011 - SL [5.6, V8, A(A5)] 2017 - SL [5.6, V8, A(S7)]	$48,744	$52,550	$3,806	1	$100	-$767	$3,040	-$667

Division	Model	Trim	2011 Price in 2017 Dollars[12]	2017 Price	Change in Price	Change in MPG[3]	Cost of FE Tech ($100/ MPG)[4]	Change in 5 Yr. Gas Costs[5]	Price Difference Plus Gas Savings	FE Tech Cost Plus Gas Savings
Nissan	Armada AWD	2011 - Platinum [5.6, V8, A(A5)] 2017 - Platinum [5.6, V8, A(S7)]	$56,487	$60,490	$4,003	1	$100	-$767	$3,237	-$667
Honda	CR-V 4WD	2011 - LX [2.4, I4, A(A5)] 2017 - LX [2.4, I4, A(AV)]	$23,170	$25,345	$2,175	4	$400	-$1,037	$1,138	-$637
Cadillac	SRX/XT5 AWD	2011 - Premium [3.0, V6, A(S6)] 2017 - Premium Luxury [3.6, V6, A(S8)]	$51,841	$54,390	$2,549	2	$200	-$807	$1,742	-$607
Nissan	Armada 2WD	2011 - SL [5.6, V8, A(A5)] 2017 - SL [5.6, V8, A(S7)]	$45,753	$49,650	$3,897	1	$100	-$671	$3,226	-$571
Nissan	Armada 2WD	2011 - Platinum [5.6, V8, A(A5)] 2017 - Platinum [5.6, V8, A(S7)]	$53,496	$57,590	$4,094	1	$100	-$671	$3,423	-$571
Nissan	Armada 2WD	2011 - SV [5.6, V8, A(A5)] 2017 - SV [5.6, V8, A(S7)]	$40,488	$44,900	$4,412	1	$100	-$671	$3,741	-$571
Cadillac	SRX/XT5 FWD	2011 - Performance [3.0, V6, A(S6)] 2017 - Premium Luxury [3.6, V6, A(S8)]	$45,337	$51,895	$6,558	2	$200	-$732	$5,827	-$532
Cadillac	SRX/XT5 FWD	2011 - Base [3.0, V6, A(S6)] 2017 - Base [3.6, V6, A(S8)]	$36,130	$38,995	$2,865	2	$200	-$732	$2,133	-$532
Cadillac	SRX/XT5 FWD	2011 - Luxury [3.0, V6, A(S6)] 2017 - Luxury [3.6, V6, A(S8)]	$40,862	$44,895	$4,033	2	$200	-$732	$3,302	-$532
Chrysler	T&C/Pacifica	2011 - Limited [3.6, V6, A(A6)] 2017 - Limited [3.6, V6, A(A9)]	$41,289	$42,495	$1,206	2	$200	-$732	$474	-$532
Audi	A4 Quattro	2011 - Prestige [2.0, I4, A(S8)] 2017 - Prestige [2.0, I4, A(AM-S7)]	$45,646	$48,000	$2,354	3	$300	-$745	$1,608	-$445
Audi	A4 Quattro	2011 - Premium [2.0, I4, A(S8)] 2017 - Premium [2.0, I4, A(AM-S7)]	$36,462	$39,400	$2,938	3	$300	-$745	$2,193	-$445
Audi	A4 Quattro	2011 - Premium Plus [2.0, I4, A(AM-S7)] 2017 - Premium Plus [2.0, I4, A(S8)]	$40,093	$43,200	$3,107	3	$300	-$745	$2,362	-$445
Audi	A4	2011 - Premium [2.0, I4, A(AV)] 2017 - Premium [2.0, I4, A(AM-S7)]	$34,123	$34,900	$777	3	$300	-$690	$87	-$390
Audi	A4	2011 - Premium Plus [2.0, I4, A(AV)] 2017 - Premium Plus [2.0, I4, A(AM-S7)]	$37,807	$41,100	$3,293	3	$300	-$690	$2,603	-$390
Hyundai	Equus/G90	2011 - Ultimate [4.6, V8, A(A6)] 2017 - Ultimate [5.0, V8, A(S8)]	$68,886	$69,700	$814	1	$100	-$471	$343	-$371
Buick	Lacrosse	2011 - CX [2.4, I4, A(S6)] 2017 - Preferred [3.6, V6, A(S8)]	$28,831	$36,065	$7,234	2	$200	-$560	$6,674	-$360
Lincoln	MKS/Continental FWD	2011 - FWD [3.7, V6, A(S6)] 2017 - Premiere [3.7, V6, A(S6)]	$44,076	$44,560	$484	1	$100	-$424	$60	-$324
Audi	A4 Quattro	2011 - Prestige [2.0, I4, M(M6)] 2017 - Prestige [2.0, I4, M(M6)]	$44,269	$48,000	$3,731	2	$200	-$477	$3,254	-$277
Audi	A4 Quattro	2011 - Premium [2.0, I4, M(M6)] 2017 - Premium[2.0, I4, M(M6)]	$35,084	$39,400	$4,316	2	$200	-$477	$3,839	-$277
Audi	A4 Quattro	2011 - Premium Plus [2.0, I4, M(M6)] 2017 - Premium Plus[2.0, I4, M(M6)]	$38,715	$43,200	$4,485	2	$200	-$477	$4,008	-$277
Hyundai	Genesis/G80	2011 - V6 [3.8, V6, A(A6)] 2017 - 3.8L V6 [3.8, V6, A(S8)]	$35,244	$41,400	$6,156	1	$100	-$348	$5,808	-$248
Audi	A5 Quattro	2011 - Premium [2.0, I4, A(S8)] 2017 - Sport [2.0, I4, A(S8)]	$40,360	$42,200	$1,840	1	$100	-$268	$1,572	-$168
Audi	A5 Quattro	2011 - Premium [2.0, I4, M(M6)] 2017 - Sport [2.0, I4, M(M6)]	$38,982	$41,200	$2,218	1	$100	-$248	$1,970	-$148

Division	Model	Trim	2011 Price in 2017 Dollars[1][2]	2017 Price	Change in Price	Change in MPG[3]	Cost of FE Tech ($100/ MPG)[4]	Change in 5 Yr. Gas Costs[5]	Price Difference Plus Gas Savings	FE Tech Cost Plus Gas Savings
Hyundai	Elantra	2011 - Touring GLS [2.0, I4, A(A4)] 2017 - GT [2.0, I4, A(S6)]	$18,364	$19,800	$1,436	1	$100	-$229	$1,206	-$129
Hyundai	Elantra	2011 - Touring GLS [2.0, I4, M(M5)] 2017 - GT [2.0, I4, M(M6)]	$17,083	$18,800	$1,717	1	$100	-$229	$1,488	-$129
Audi	A5 Cabriolet Quattro	2011 - Premium [2.0, I4, A(S8)] 2017 - Sport [2.0, I4, A(AM-S7)]	$47,195	$48,600	$1,405	0	$0	$0	$1,405	$0
Hyundai	Elantra	2011 - Limited [1.8, I4, A(A6)] 2017 - Limited [2.0, I4, A(S6)]	$21,339	$22,350	$1,011	0	$0	$0	$1,011	$0
Lincoln	MKS/Continental AWD	2011 - AWD [3.7, V6, A(S6)] 2017 - Premiere [3.7, V6, A(S6)]	$46,095	$46,560	$465	0	$0	$0	$465	$0
Hyundai	Elantra	2011 - GLS [1.8, I4, M(M6)] 2017 - SE [2.0, I4, M(M6)]	$15,838	$17,150	$1,312	-3	$0	$520	$1,832	$520
Hyundai	Genesis/G80	2011 - V8 [4.6, V8, A(A6)] 2017 - 5.0L V8 [5.0, V8, A(S8)]	$45,924	$54,550	$8,626	-2	$0	$894	$9,520	$894

[1]Inflation was calculated using BLS average inflation numbers from 2011-2016.

[2]Vehicle Price is from the New Car Cost Guide.

[3]Fuel Economy of Vehicles is from the EPA.

[4]CFA bases its estimate of the cost of fuel economy on a review of the literature including historical, market-based and engineering studies, as described in Appendix B.

[5]Gas costs based on driving the vehicle 14,000 miles per year for 5 years and using gas prices from AAA (7/10/17).

2011 Vehicles Which Were Less Expensive in 2017 Dollars and Had Higher MPG

2011 Vehicles Which Were More Expensive in 2017, but Who's Fuel Savings Offset the Entire Price Increase

2011 Vehicles Which Were More Expensive in 2017, but Who's Fuel[4] Savings Offset the $100 per MPG Cost of Fuel Efficient Technology

2011 Vehicles Which Were More Expensive in 2017 and Whose Fuel Economy Stayed the Same or Decreased

Appendix B: The Cost of Increasing Fuel Economy: Support for Identifying an Average of $100 as the Cost Per Mile of Fuel Economy Improvement

Estimating the cost of increasing fuel economy has been a matter of great debate for decades. Empirical analyses that look at actual costs show that regulators overestimate the cost by a factor of two and automakers overestimate it by much more.

David Greene, one of the leading experts on fuel economy, recently conducted a review of the literature in which he concluded that an estimate of 27% of the increase in vehicle cost, or about $150 for every mile per gallon improvement, was too high. He gave two reasons for this.

First, backward looking analysis of cost increases that included used vehicles (as his analysis did), were double counting the cost of increasing fuel economy because the sellers of vehicles were capturing a significant part of the capitalized value of better fuel economy equal to about 20% of the estimated cost of efficiency, in their sales price. This factor alone would lower the estimate to 21.6% of the increase in price or about $120 for each 1 mile improvement in the MPG.

Second, real world experience showed that there was a learning process in which costs fell as automakers gained more experience with increasing fuel economy. He suggested that 2% per year was a reasonable estimate. Over the redesign cycle of vehicles (e.g. five years) this learning rate would lower the cost by about 10%. Thus, one might argue that the appropriate numbers would be about 20% per year and $108 dollars per MPG, as shown in Table 1.

There is a third factor that is implicit in Greene's analysis. The distribution of the cost of vehicles is skewed. The much more expensive vehicles purchased by upper income households are likely to include a larger amount of costs incurred to upscale the vehicles, rather than for fuel economy.

In a subsequent analysis Greene estimated the cost of improving fuel economy directly with an econometric model that corroborated the above concerns, as shown in Table 1. The simple adjustment to a constant 20% of total cost moves the estimate much closer to

the empirical evidence offered by Greene suggesting costs that are about two thirds of the literature review—about 18% or $99/MPG.

EPA's analysis of the cost of the National Program currently yields an estimated cost for fuel savings that is similar, $97/MPG. This estimate reflects considerable technological progress over the early years of the National Program, which is consistent with the historical pattern. A recent study by the ICCT offers an estimate of going forward costs of improvement close to the rate of the national program (national program = 3.3%, ICCT = 4% per year). The ICCT study also includes continuing technological progress.

Moreover, our data on new models since the National Program reducing emissions/fuel economy, supports the key problem with using a simple percentage of the total cost of the vehicle to approximate the cost of improving fuel economy, as shown in the charts below. There is a strong, negative correlation (r = -.7) between the cost of a vehicle and the mileage and a moderate, negative correlation (r= -.4) between the cost of the vehicle and the change in mileage. A fixed percentage makes no sense.

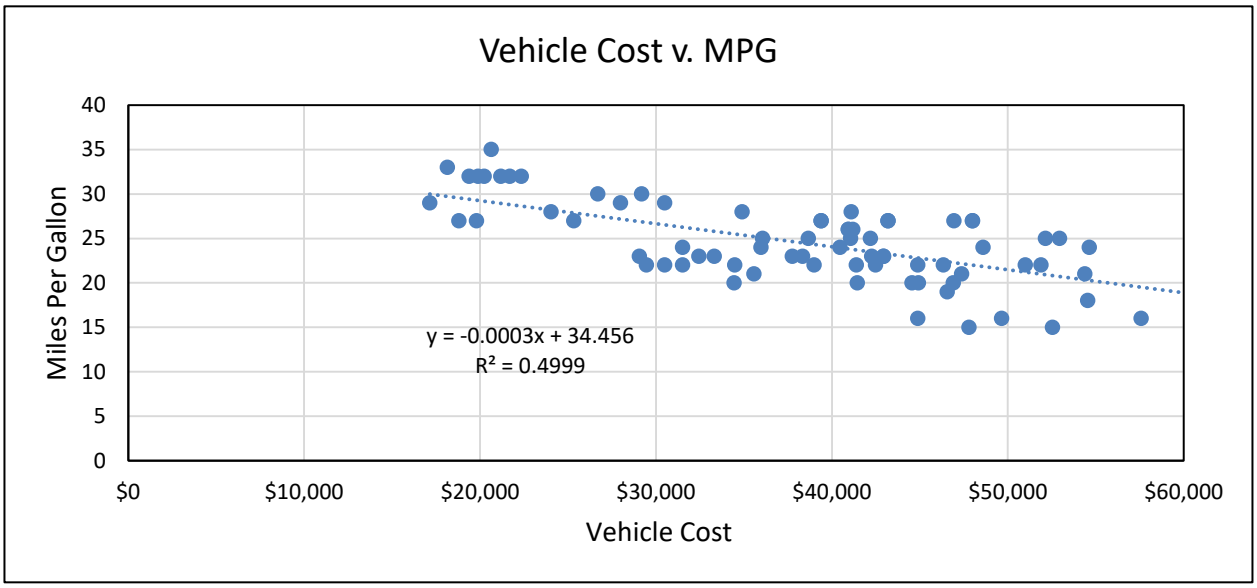
In light of this analysis, we believe a cautious estimate of the cost of fuel economy improvements is $100/MPG improvement.

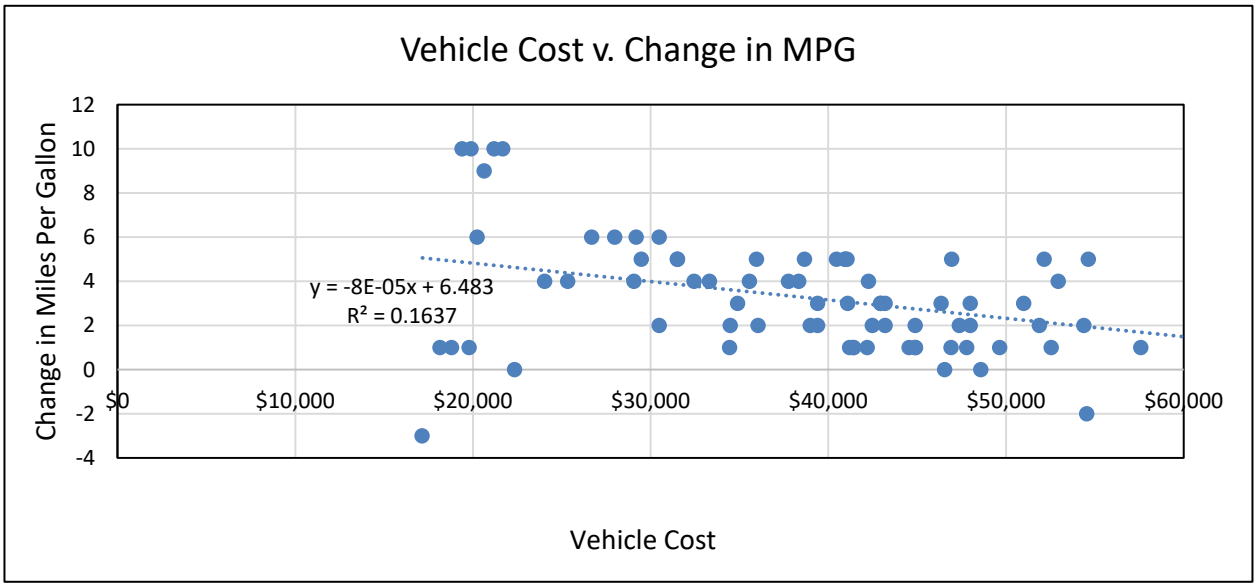
TABLE 1: HISTORICAL AND ENGINEERING ESTIMATES OF THE COST OF INCREASING MILEAGE

	Greene Literature Review	Simple Adjustment Approach	Greene Direct	EPA Final 2017-2025	ICCT Estimate for 2025-2030 4.5%/year
Annual Cost	$213	na	$141	$97	$110
% of Total Cost Increase	27%	20%	18%	na	na
$/MPG	$150	$108	$99	$97	$86

Sources: Greene 1,2, EPA Determination, ICT

VEHICLE COST AND MILEAGE





Consumer Federation of America's

Submission to the Environmental Protection Agency

Docket No. EPA-HQ-OAR-2015-0827

Attachment D

Comments of the Consumer Federation of America On the California Air Resources Board Mid-Term Review

March 24, 2017

BEFORE THE
CALIFORNIA AIR RESOURCES BOARD

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

MARK COOPER
JACK GILLIS

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.

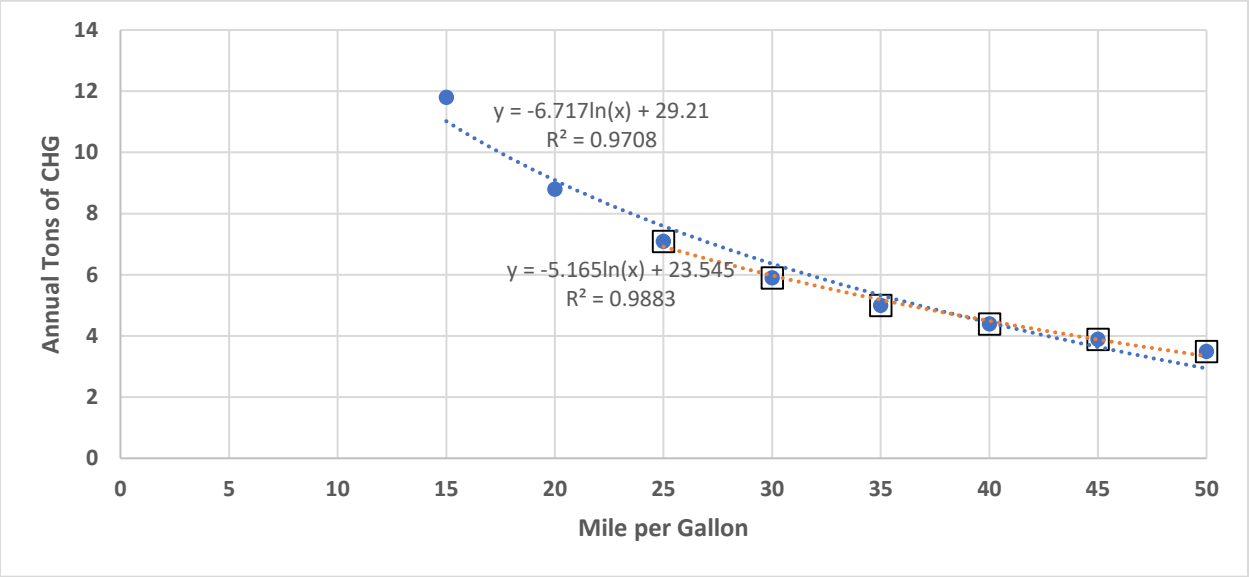
[5] See Attachment I, *American Federalism at its Best.*

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.

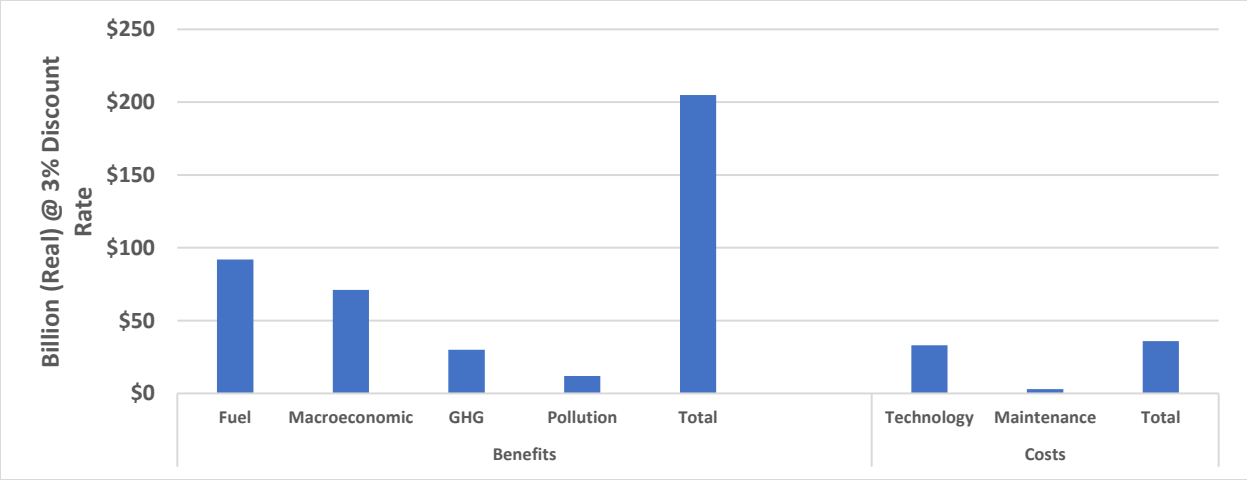
- On average, households save over $1600 over the life of the vehicle.
- Cash flow benefits exceed costs incurred to reduce gasoline consumption early in the asset life (the first year).

[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

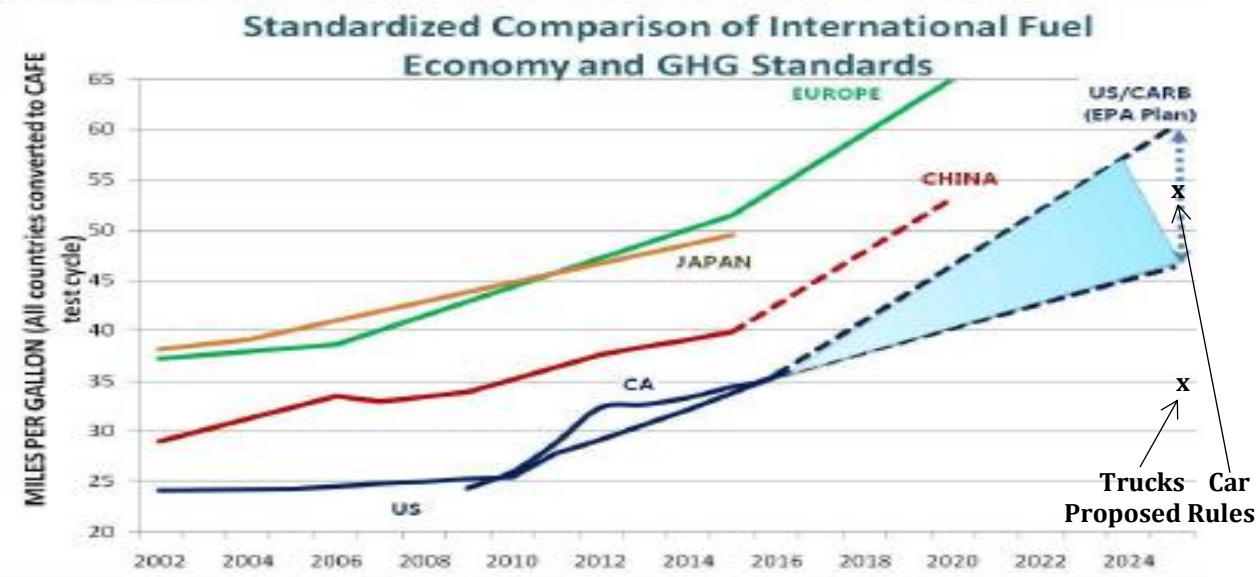
The findings of the EPA and the CARB also reaffirm one of the most important aspects of regulatory implementation in the past four decades. The dynamic policy effect of American federalism at its best has produced a uniquely powerful and beneficial standard setting process.

[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.

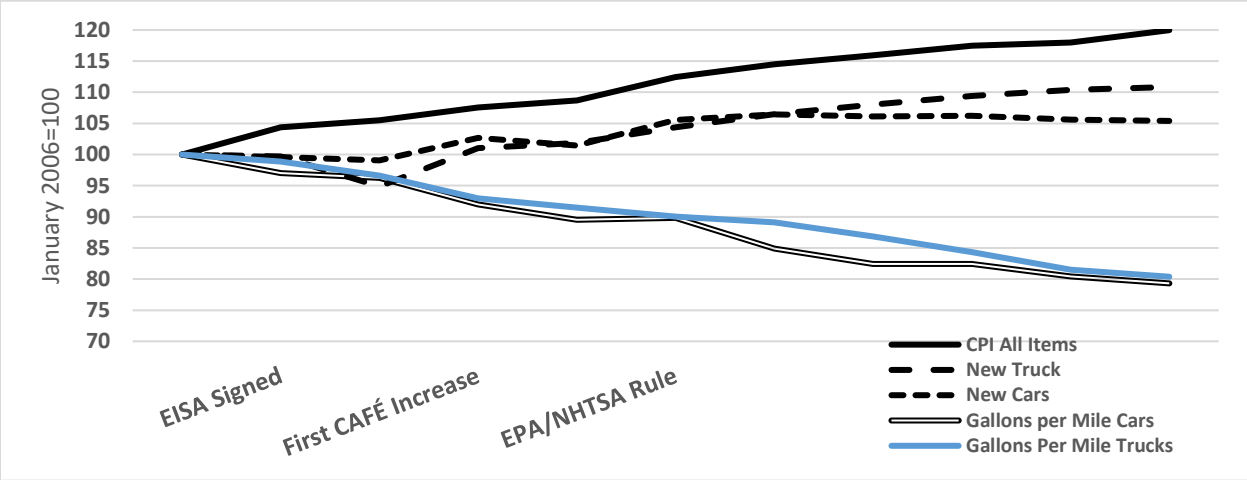
Bringing the Auto Industry into the 21st Century

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''

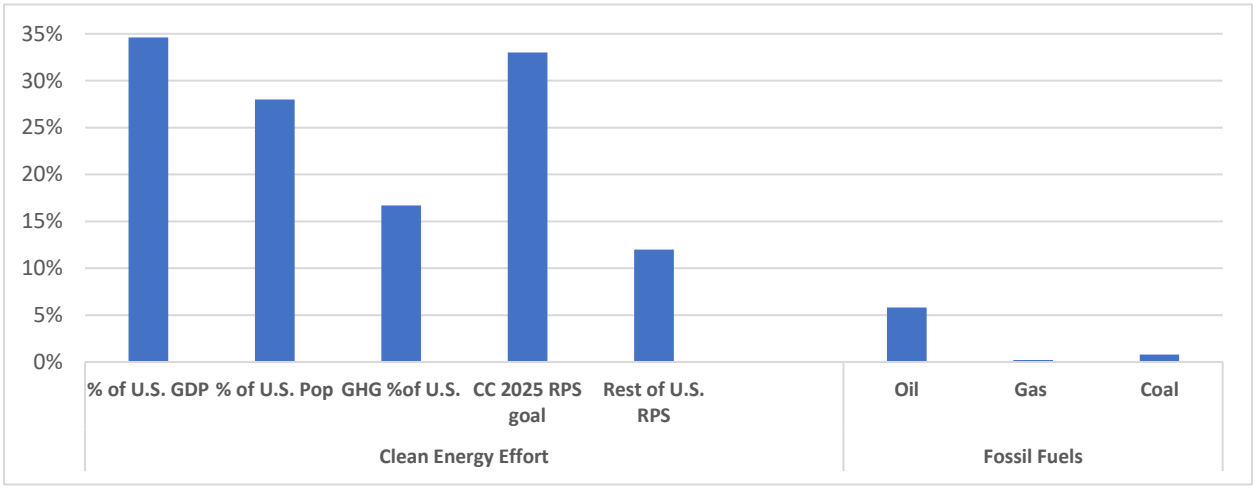
nurture it. The design of the California efforts to create the conditions for the market success of electric vehicles is complementary to and respectful of the standards adopted in the *Final Determination* and supported by the *Mid Term Review*. The California policies are very much complementary policies 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]

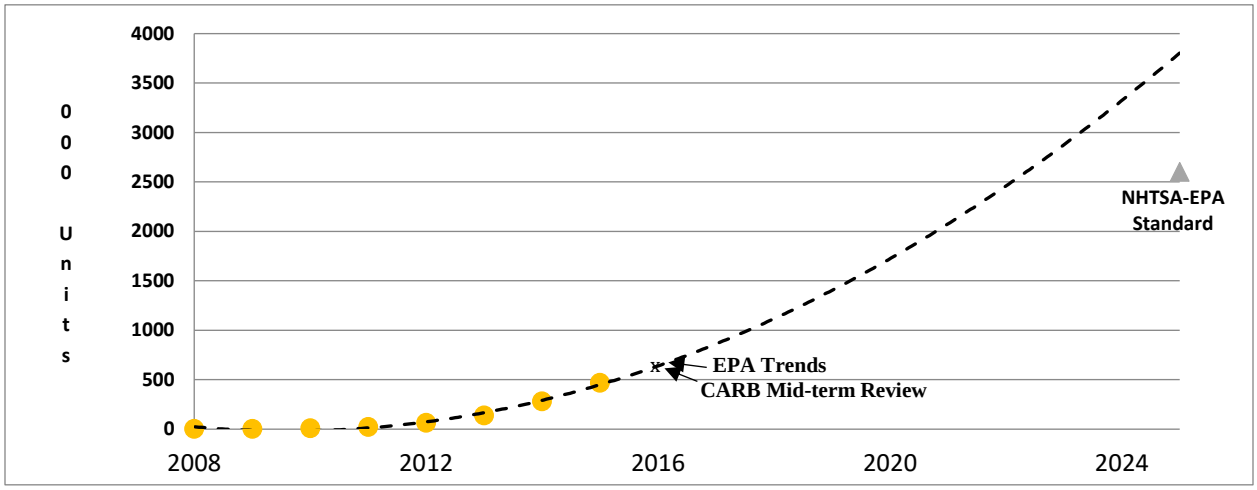
While the automakers claim that all they do with vehicles is "just what consumers want," we showed that their own survey results contradicted that claim. Because we believe this misreading of consumers has been persistent and their erroneous portrayal of consumer attitudes will likely play an important 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.

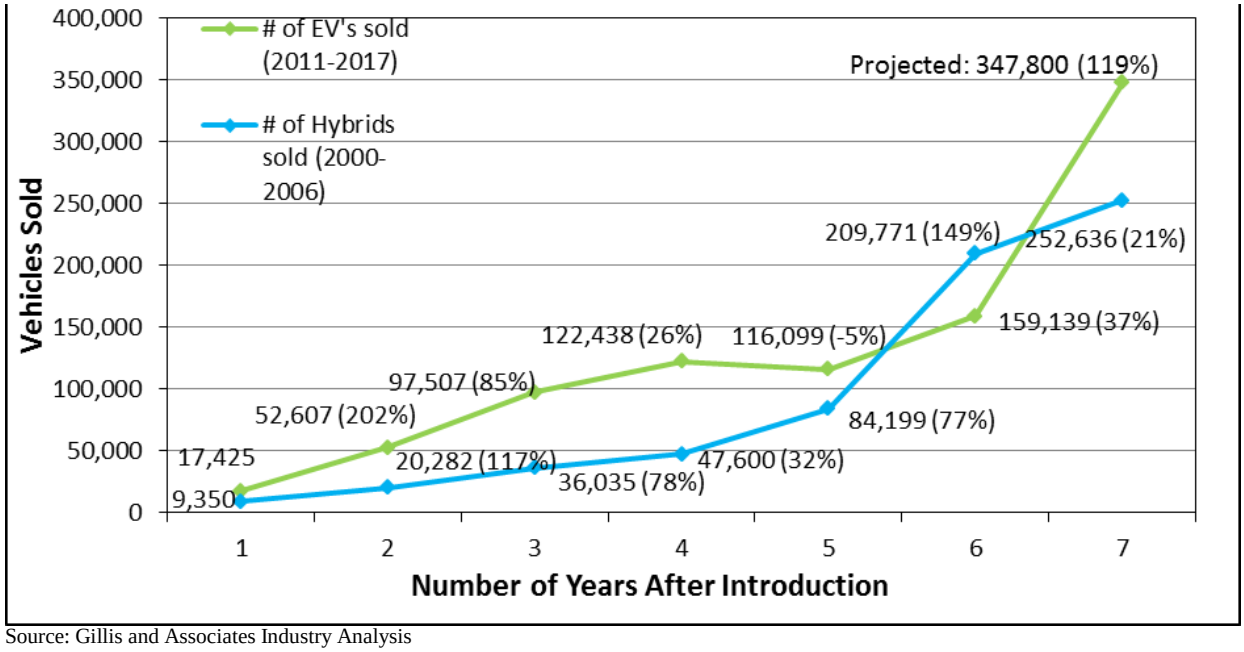
Figure 6: CFA's Analysis of Electric Vehicle Diffusion

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



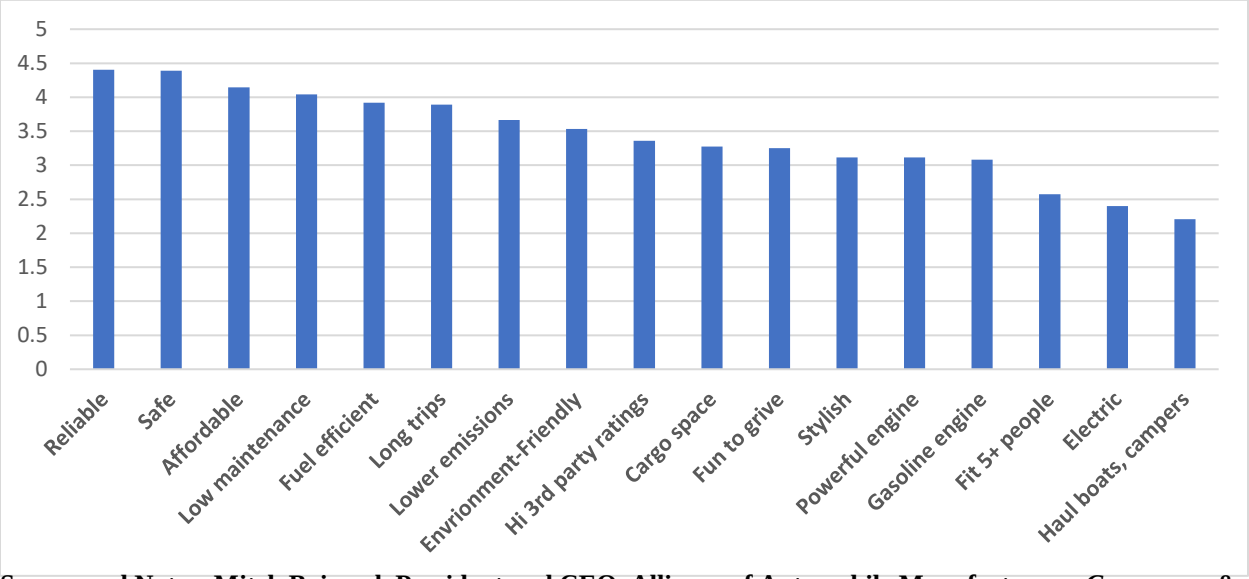
Sources: Consumer Federation of America, Technical Appendix, p. 32, based on Rudi Halbirght, Max Dunn, *Case Study: The Toyota Prius, Lessons in Marketing Eco-Friendly Products*, March3, 2010, http://www.hybridcars.com/hybrid-sales-dashboard/... Various years; J.D. Power, ,Mike Omotoso, *Global Alternative 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.

The following sections have been removed:

Evaluation Draft Technical Assessment Report for Model Year 2022–2025 Light Duty Vehicle GHG Emissions and CAFE Standards

In the Matter of Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation

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

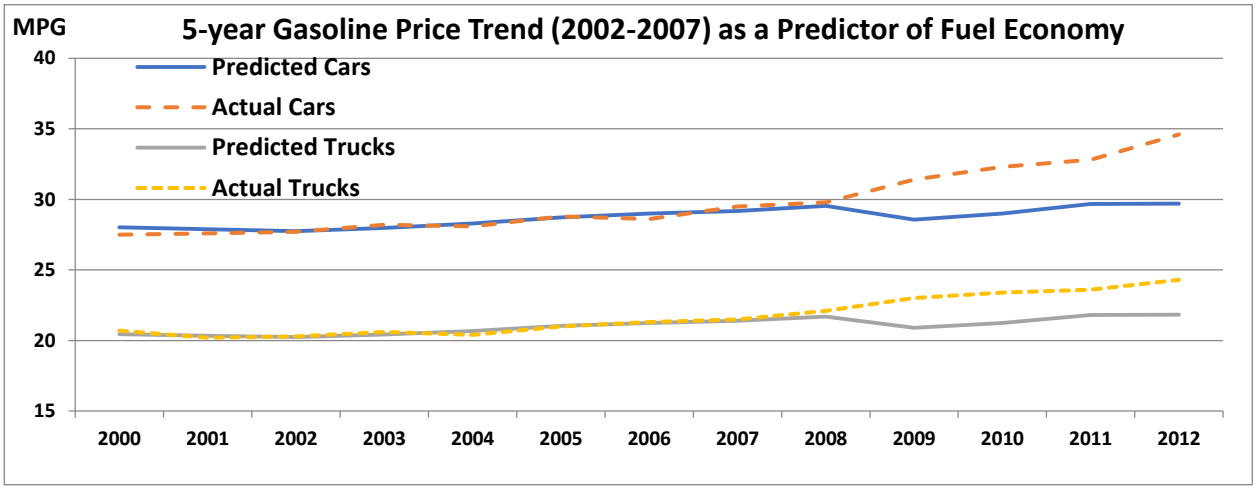
III. A DEEPER DIVE INTO THE NEW FUEL ECONOMY STANDARDS AND THE AUTO MARKET RESPONSE

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]

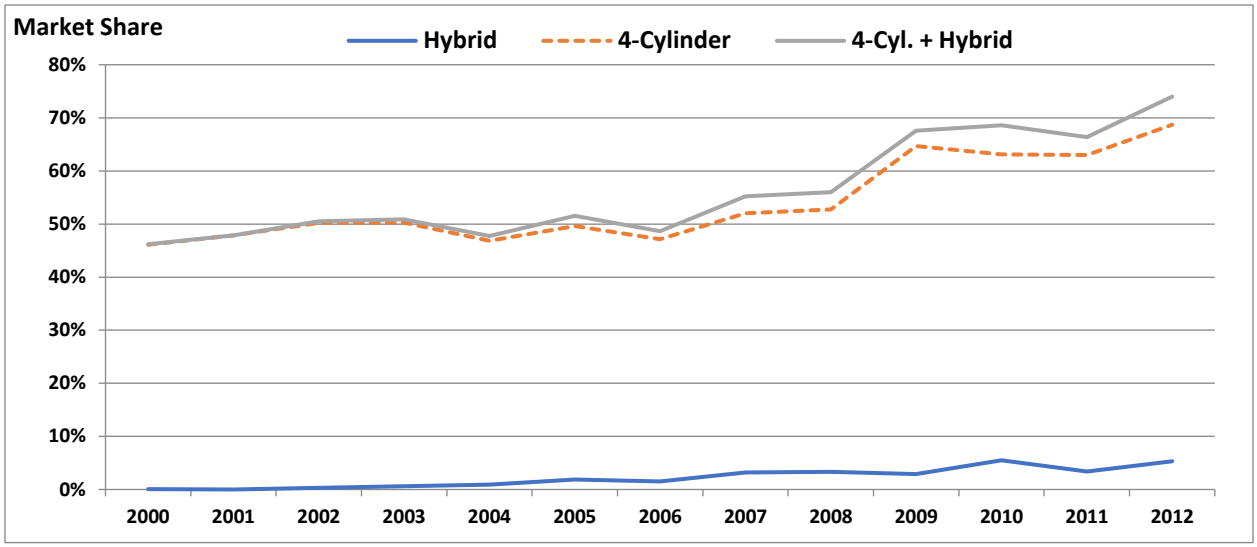
FOUR-CYLINDER ENGINES: EFFICIENT, POPULAR

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.

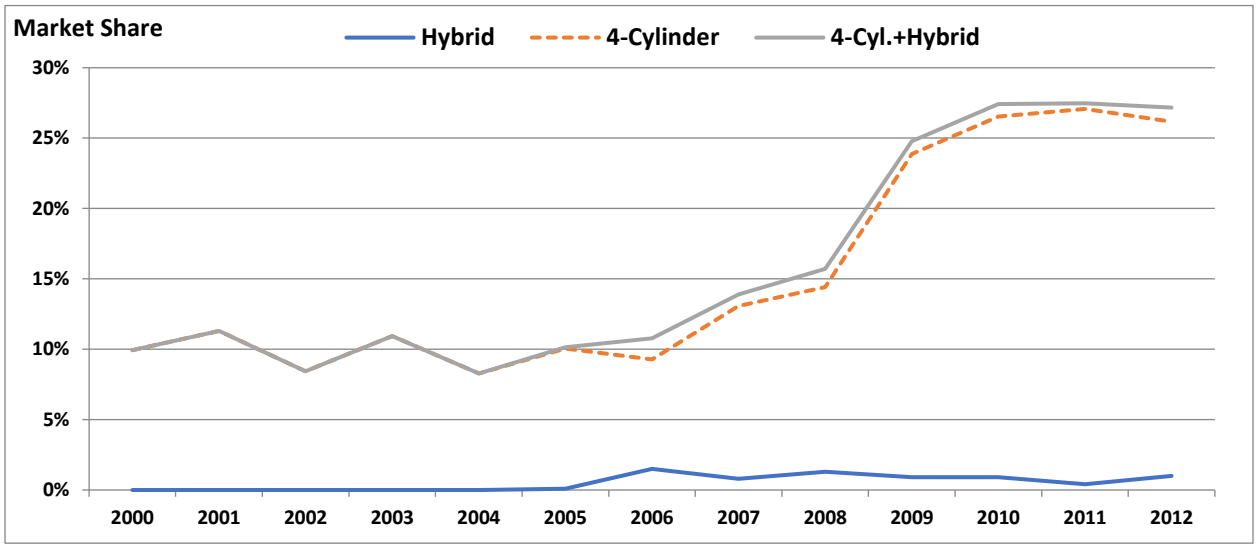
The recent increase in popularity of four-cylinder engines is due to manufacturers building more power into smaller, more efficient engines. As shown in Exhibit 17, the improving performance of four-cylinder engines was an important factor in increasing their market share. Four-cylinder engines get much 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

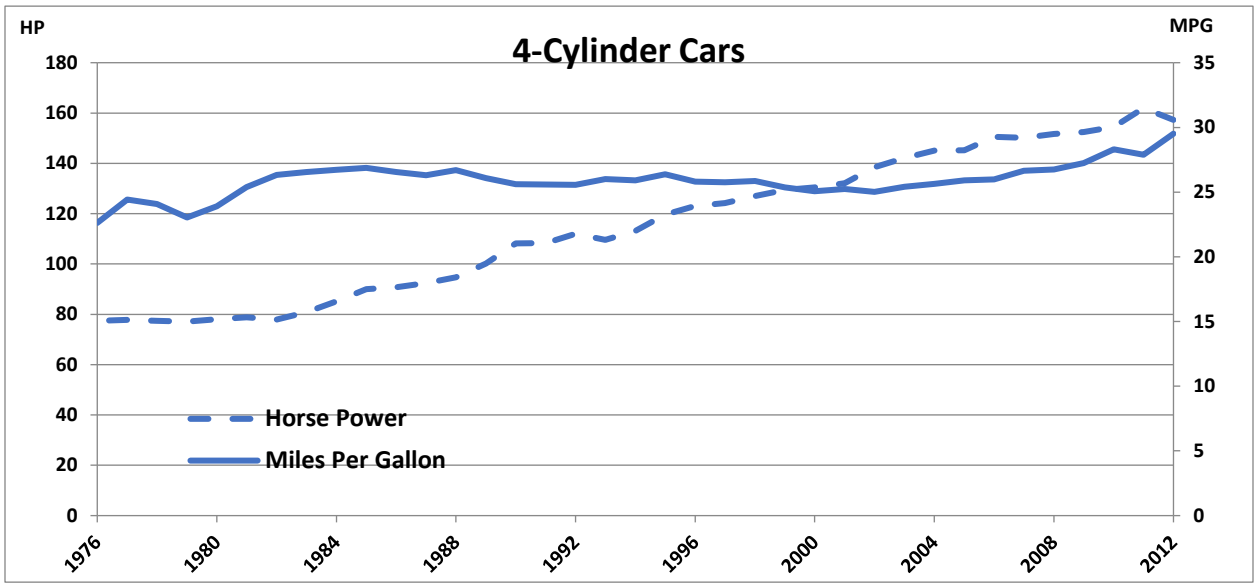


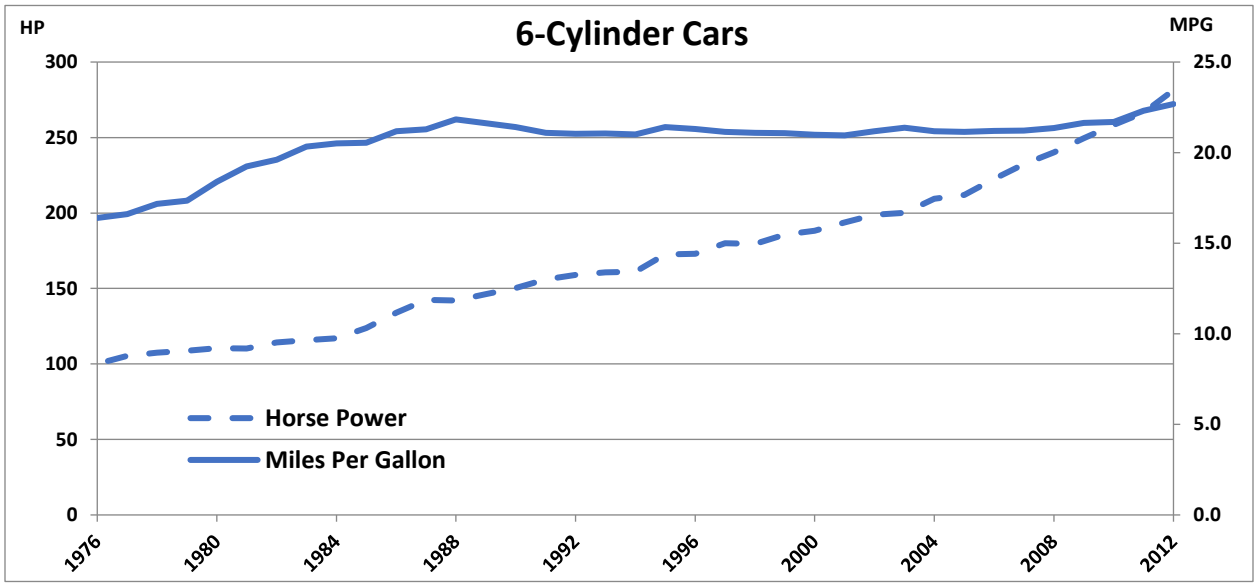
Trucks and SUVs



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]

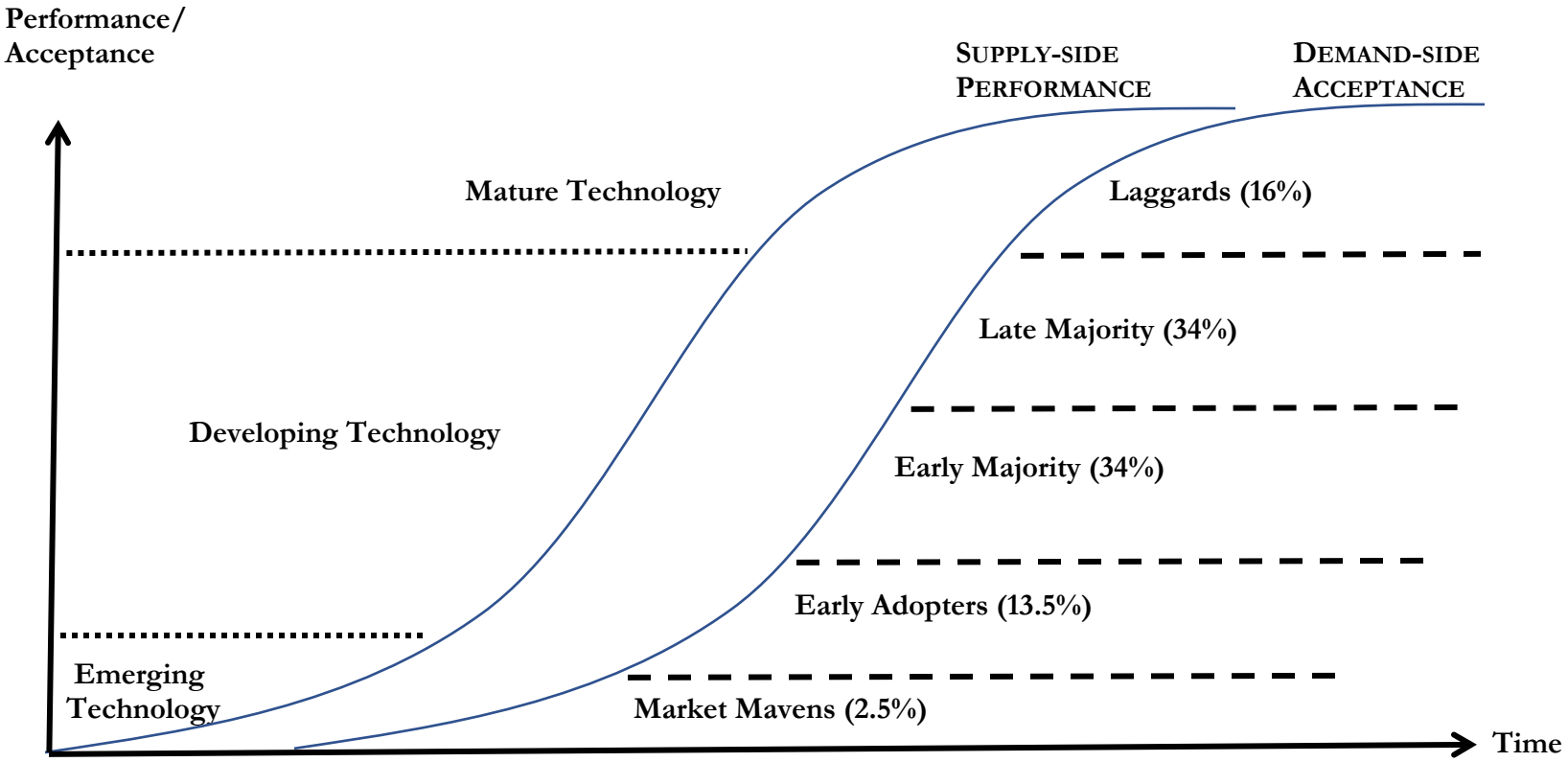
Eight states representing a quarter of the U.S. auto-buying market are joining forces to push for more zero-emission vehicles (ZEVs). Their goal: to get 3.3 million of these clean vehicles on the road by 2025. Governors from California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island 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..**

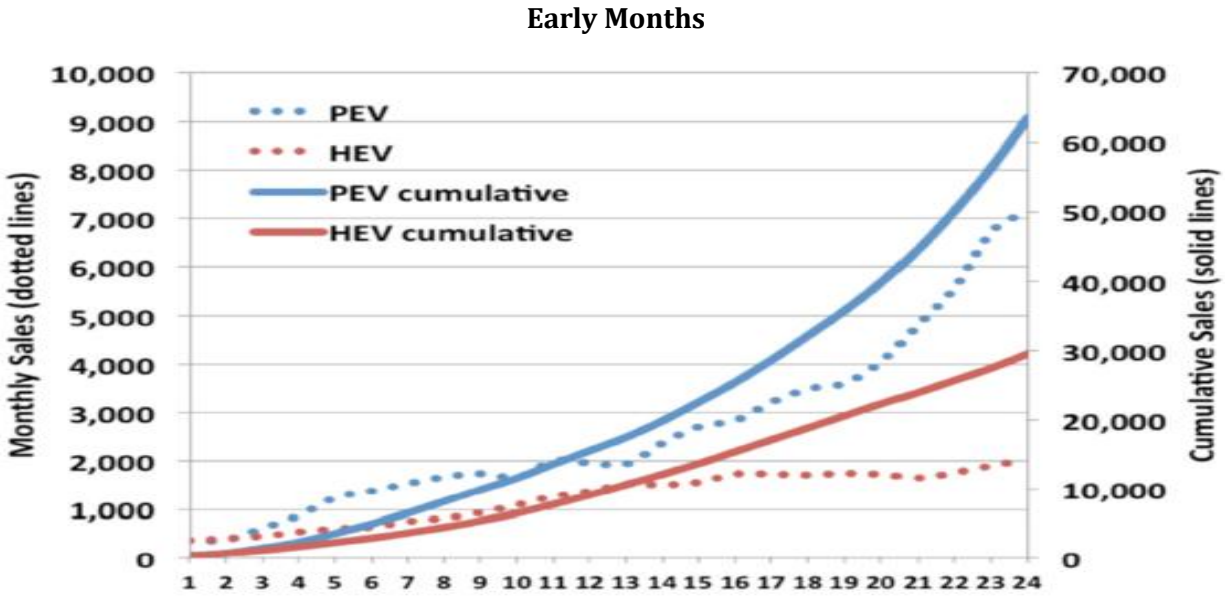
[82] Mark Cooper, *Rising Gasoline Prices And Record Household Expenditures: Will Policymakers Get Serious About Ending Our "Addiction To Oil" By Supporting A 60 Mile Per Gallon Standard?* (Consumer Federation of America, May 16, 2011).
[83] Dave Hurst and John Gartner, *Electric Vehicle Market Forecasts*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

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

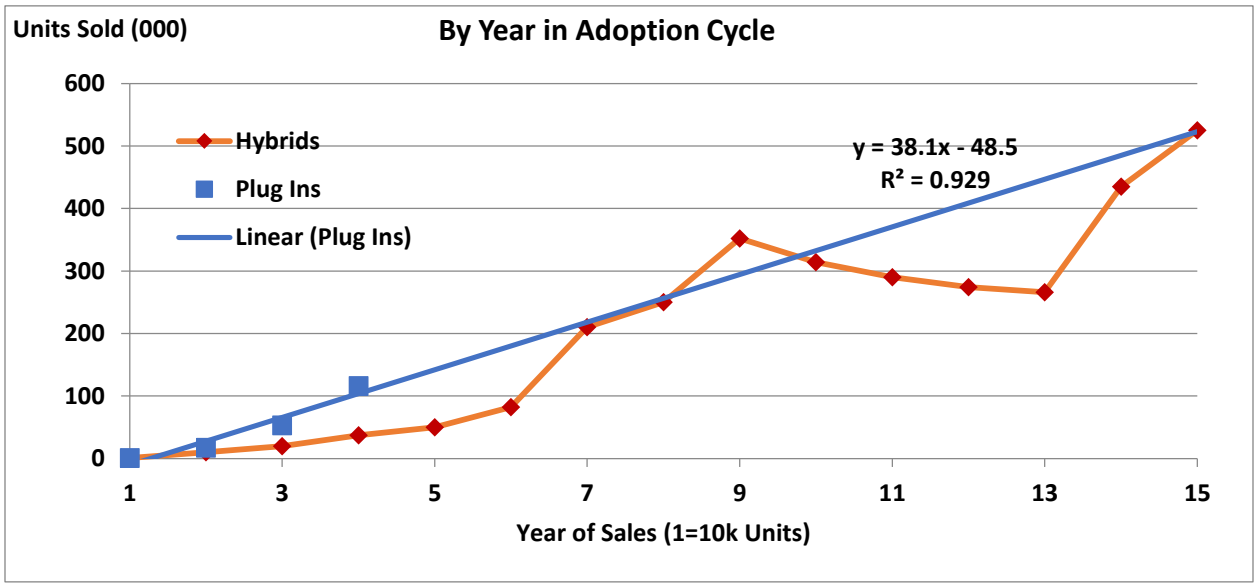


Sources: Mark Cooper, *Energy Efficiency Performance Standards: The Cornerstone of Consumer-Friendly Energy Policy* (Consumer Federation of America, October 2013, p. 50)derived from Mahajan, Vijay, Eitan Muller and Frank M. Bass,1990, "New Product Diffusion Models in Marketing: A Review and Directions 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

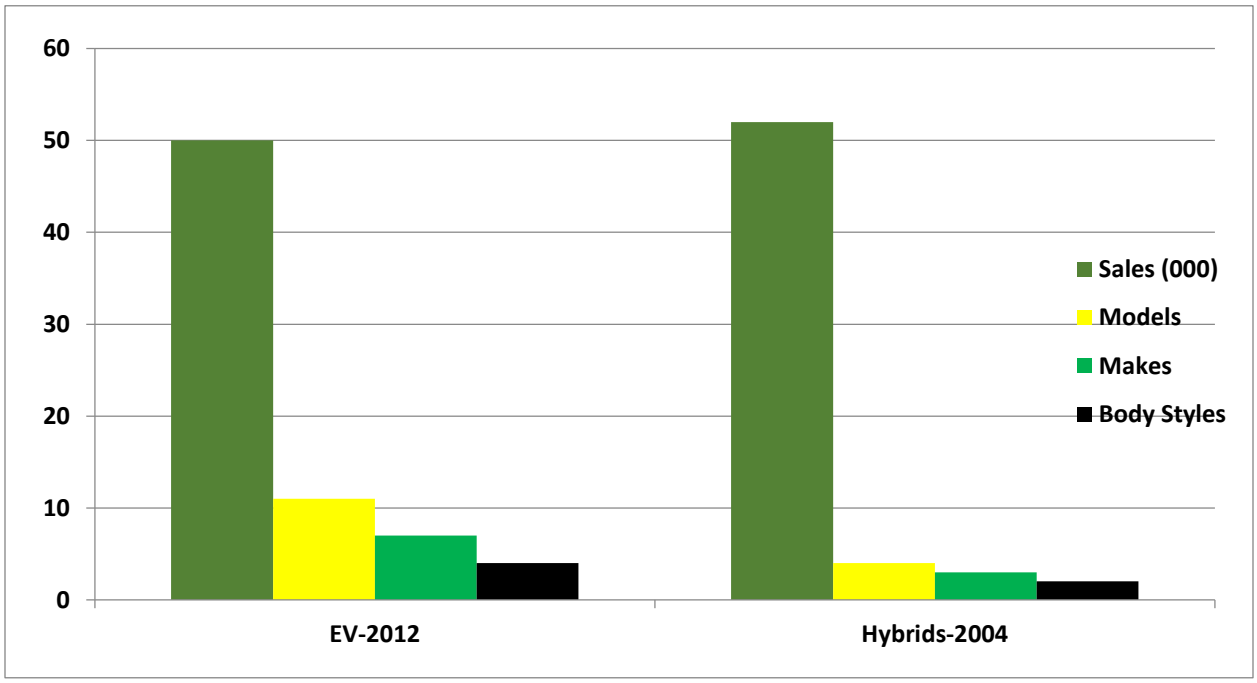


http://en.wikipedia.org/wiki/File:DoE_EV_Everywhere_Blueprint_p5.png



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

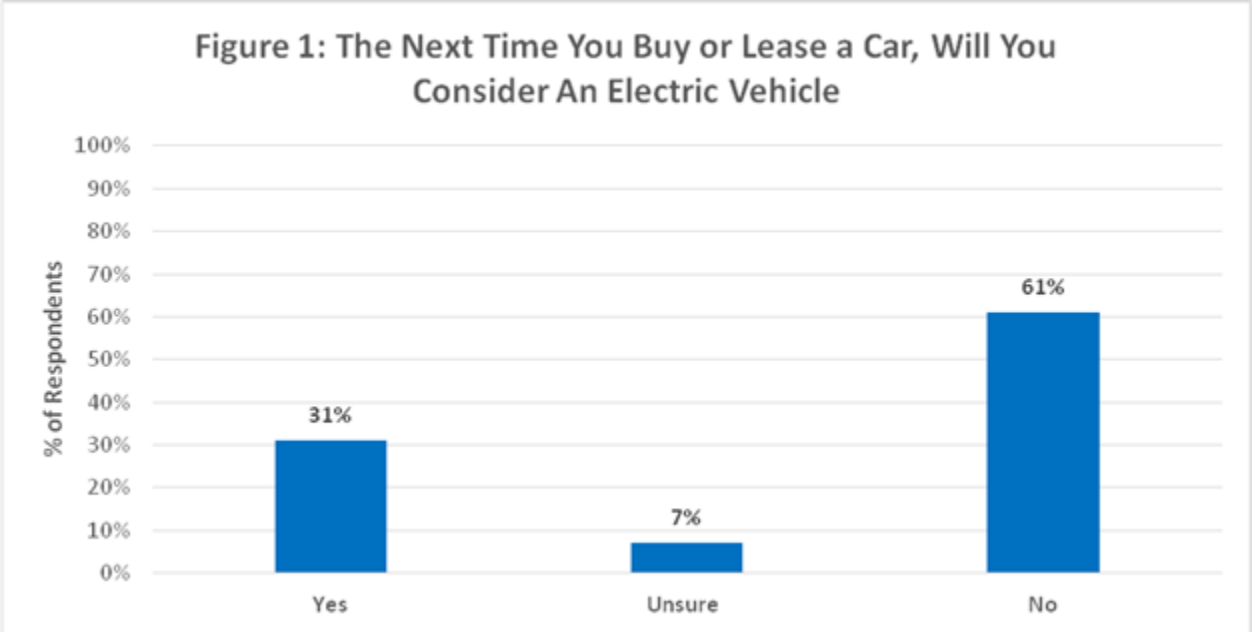
consumers to readily compare the mileage, range, and charging types available among the new models. The guide is designed to improve consumer knowledge and understanding of EVs as well as provide a comparative road map to the choices available for 2016. The guide is available here.

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

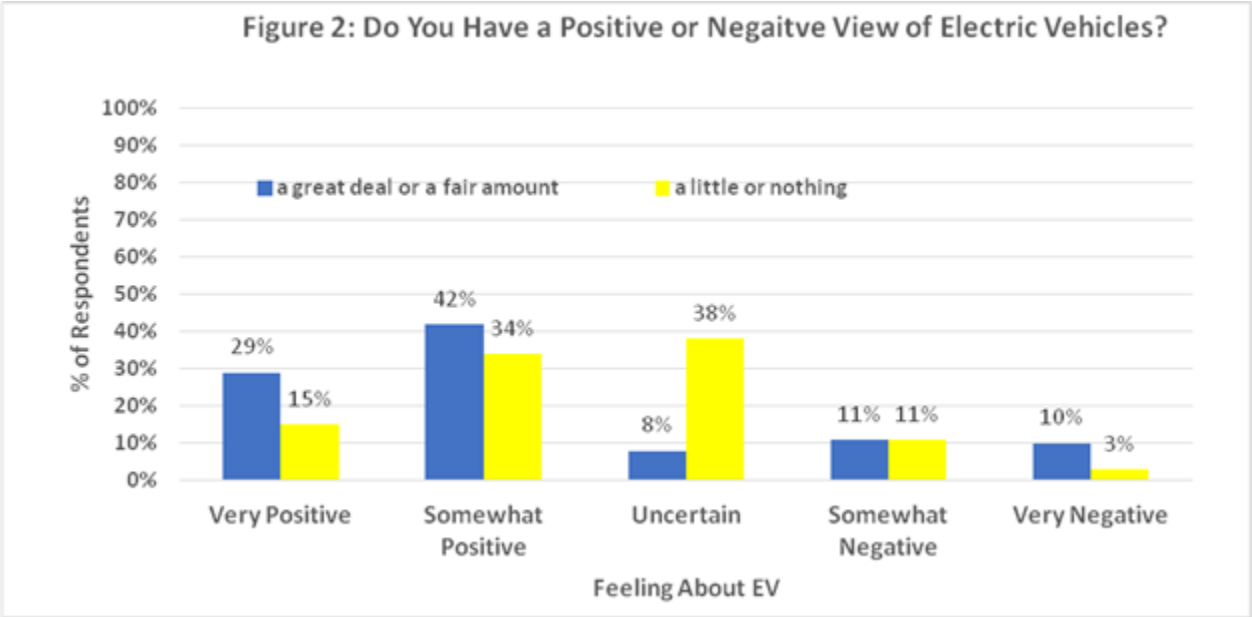
Overall, a surprising percentage of respondents are interested in purchasing an EV. This interest provides a catalyst for manufacturers to aggressively promote EVs and improve their designs.



How Does Knowledge about EVs Affect Attitudes Towards Them?

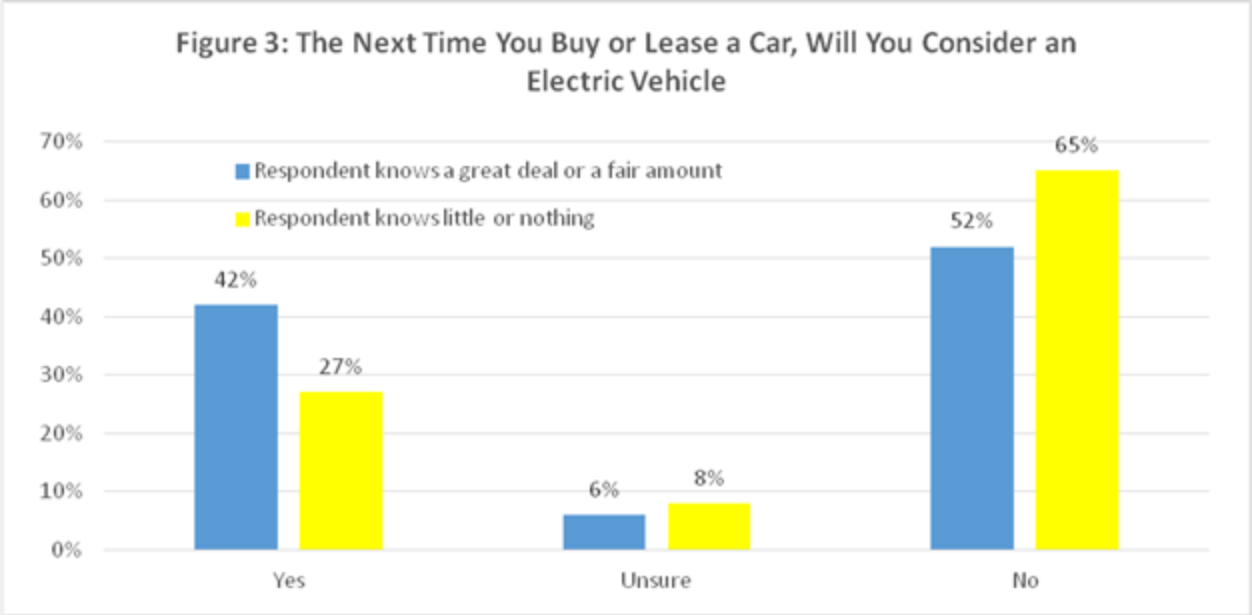
As Figure 2 shows, there is a correlation between consumer knowledge about EVs and their attitude towards them. While 71 percent of those that know about EVs have a "Very Positive" or "Positive" attitude about EVs, it is important to note that there is a remarkably high "Very Positive" or "Positive"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

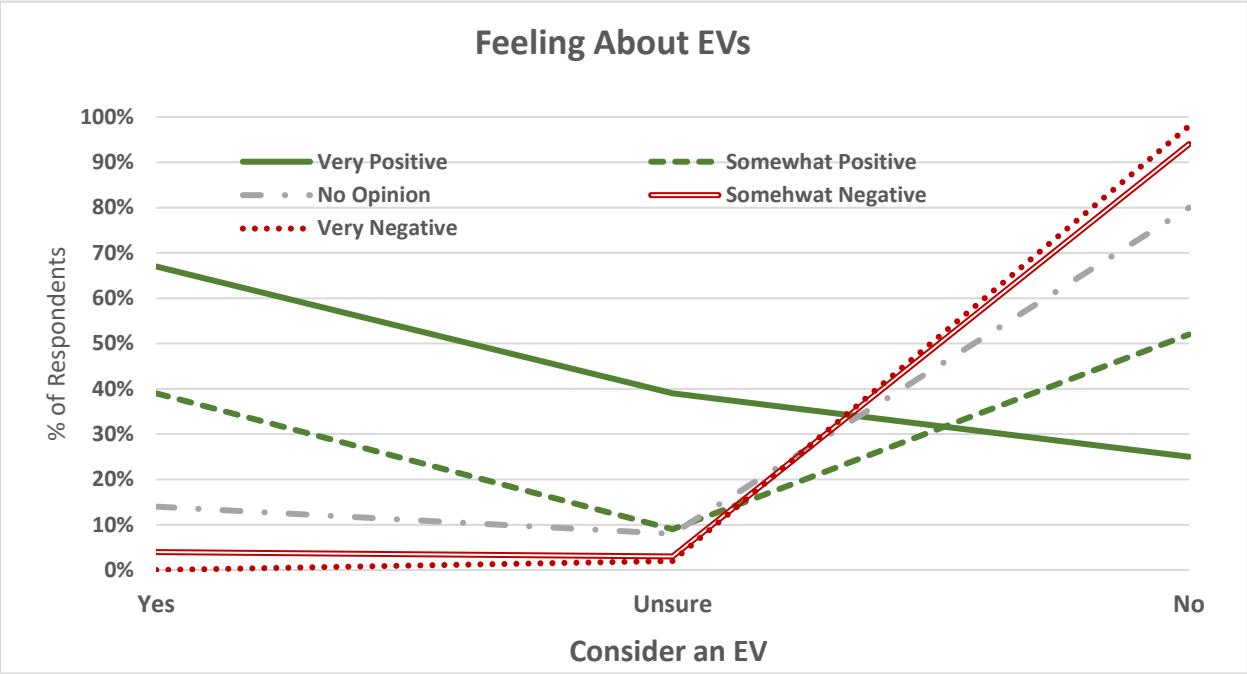


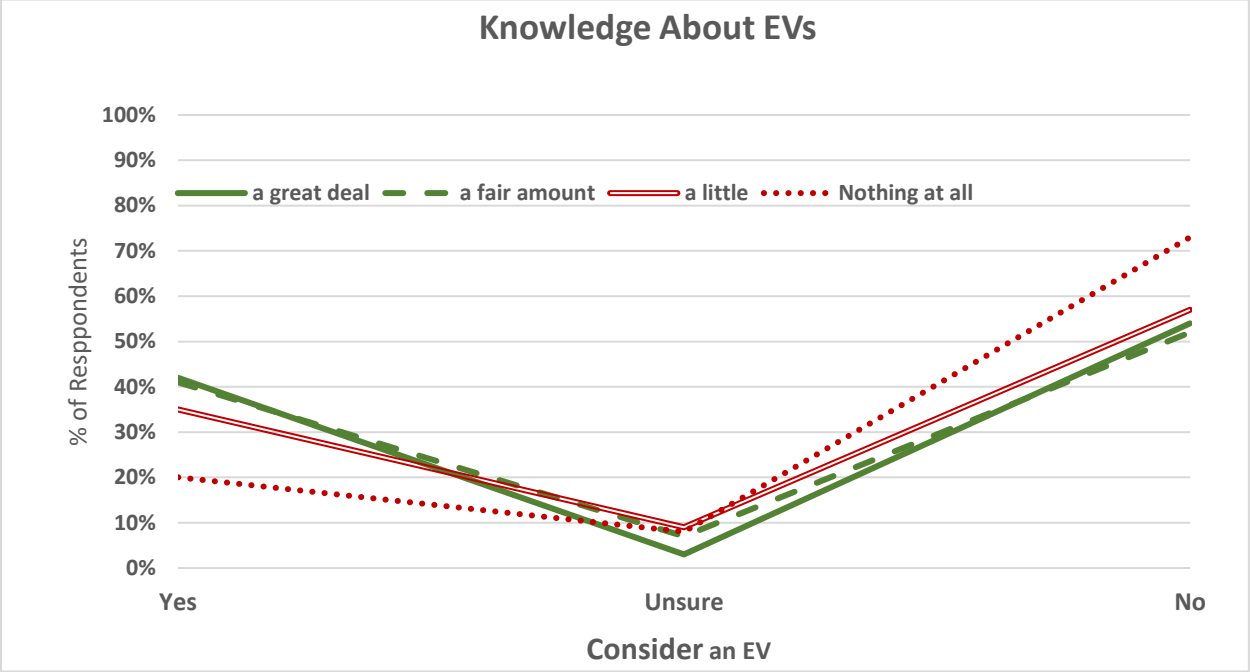
"Our research shows a clear, statistically significant, correlation between knowledge about EVs and positive feelings about EVs. Furthermore, there is a statistically significant correlation between positive feelings about EVs and a willingness to purchase these vehicles—those who feel positively about 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

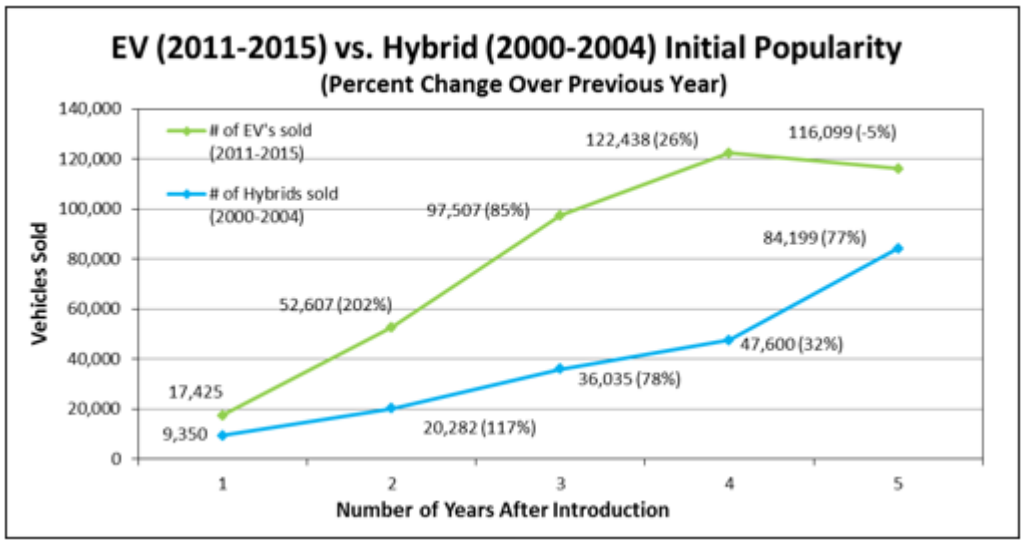
Because research demonstrates a correlation of interest in EVs with knowledge of EVs, CFA has updated its EV guide in order to improve consumer understanding of EVs. **The Car Book's Snapshot Guide to Electric Vehicles** is available for free on the ConsumerFed.org website.

"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

Consumer Federation of America's

Submission to the Environmental Protection Agency

Docket No. EPA-HQ-OAR-2015-0827

Attachment E

Comments of the Consumer Federation of America: In the Matter of Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards Under the Midterm Evaluation Docket No. EPA-HQ-OAR-2015-0827

December 30, 2016

Before the
Environmental Protection Agency

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

COMMENTS OF THE THE CONSUMER FEDERATION OF AMERICA

MARK COOPER,
DIRECTOR OF RESEARCH

December 30, 2016

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THE CONSUMER FEDERATION OF AMERICA

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] 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)[3] 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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[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] 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).[4]
- Subsequent analyses in the Technical Assessment Report (TAR) and in the Determination not only support the same conclusion, they reinforce it.[5]
- 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.[6]

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,"[7] 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

[4] 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.

[5] 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.

[6] 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,

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

minute benefits. The decision to continue the march toward more fuel-efficient vehicles delivers significant net benefits to consumers and the nation.[8]

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.
- 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,[9] 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,[10] defines cost benefit analysis as follows:

[8] See notes 4 and 5 above.

[9] 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.

[10] 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.

> Cost-Benefit Analysis: an appraisal of a project based on the costs and benefits from it.[11]

A more advanced text on *The Economics of Regulation and Antitrust,*[12] 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 serves as the minimum tests for policy efficacy, as our overall objective should be to maximize the spread between benefits and costs.[13]

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. [14]

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

[11] John, B. Taylor, *Economics* (Houghton Mifflin, 11998, pp. 410, 896.
[12] W. Kip Viscusi, John M. Vernon and Joseph E. Harrington, Jr., *Economics of Regulation and Antitrust* (MIT, 2001).
[13] Id., pp. 28-29.
[14] 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.

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.[15]

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.[16]

TABLE 1:
IMPERFECTIONS POTENTIALLY ADDRESSED BY STANDARDS[1]

[15] Viscusi, et al., 2001, pp. 31-32.
[16] Taylor, 1998, p. 412.

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

the means of their compliance," "utilization of unbiased estimates of benefits and costs," and "avoid… regulation of prices and production."[17]

In our earlier analysis CFA explained why the National Program has the key attributes of an effective performance standard.[18] 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,[19] 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. [20]

- 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

[17] Viscusi, et al., 2001, pp. 35-37.
[18] CFA, 2012, National Program Comments, Technical Appendix, pp. 28-31.
[19] Mark Cooper, "Energy Efficiency Performance Standards: Driving Consumer and Energy Savings in California, February 20, 2014), slide 22.
[20] 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.

much larger part in the vehicle fleet.[21]

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

[21] 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**.**

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.[22] 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

[22] 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.

calculate the return on the average cost of technology yielded by the average savings over the life of the vehicle.

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[23]	2.7 - 4.2	3.3 - 4.9
Forward Looking				
National Program (MY 2017-2025)[24]		EPA	3.2	6.9
		NHTSA	2.3	5.7
TAR, MY 2022-2025[25]		EPA	2.5	6.1
		NHTSA	1.3	3.9
Determination (MY 2022-2025)[26]		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[27]				
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

[23] 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.

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

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

[26] Derived from Determination, p. 44,

[27] 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/

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.

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 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).

TABLE 4:
CONSUMER POCKETBOOK IMPACTS

	Monthly			Cost per gallon saved	Payback in years	Lifecycle savings		Total National ($, billion)	
	Cost	first year savings	Net			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).

- 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%.

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. 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.

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

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.[28]

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

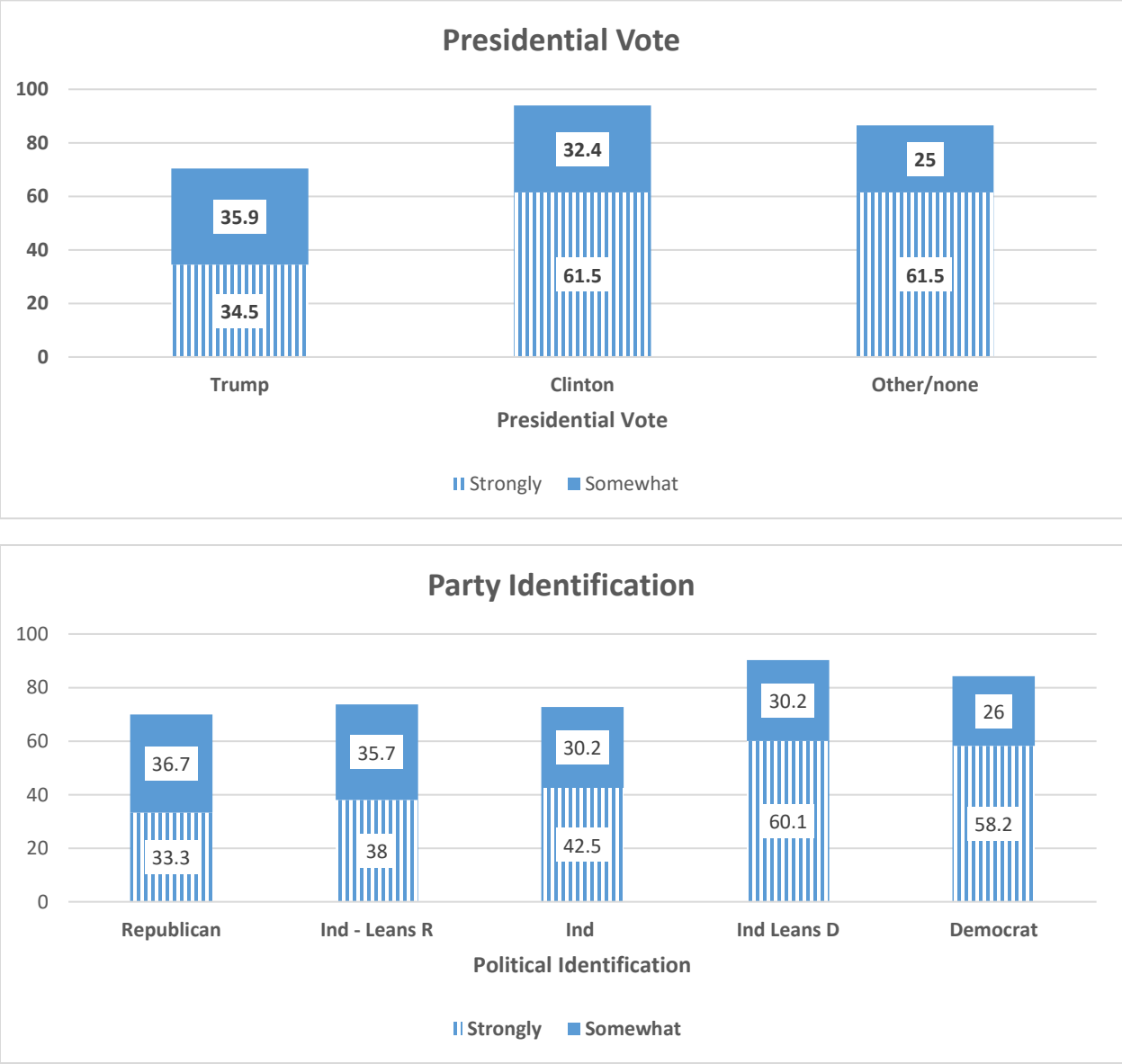
Support for Standards Post-2016 Presidential Election

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

[28] 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.

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.

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.

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.[29]

- 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).

- 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,

[29] 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 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.

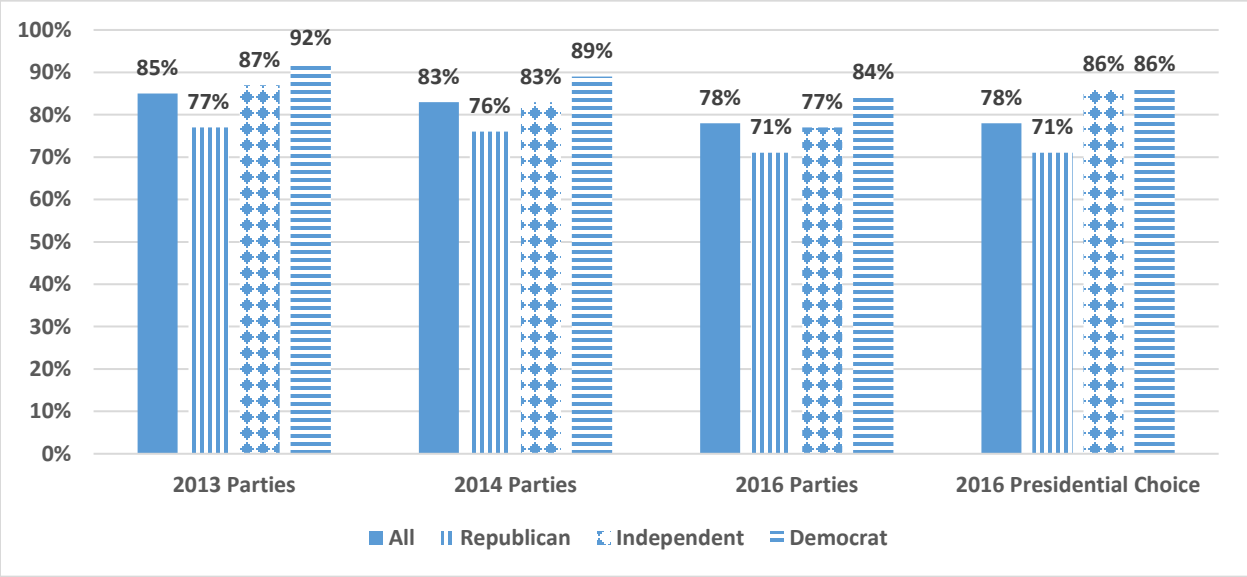
- Support for the standard stood at 81%.

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.[30] 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.[31] 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.[32]

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

[30] 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.

[31] 7 Reasons Why the Trump Administration Won't Put the Brakes on Fuel Economy Standards, November 14, 2016

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

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.

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.

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…

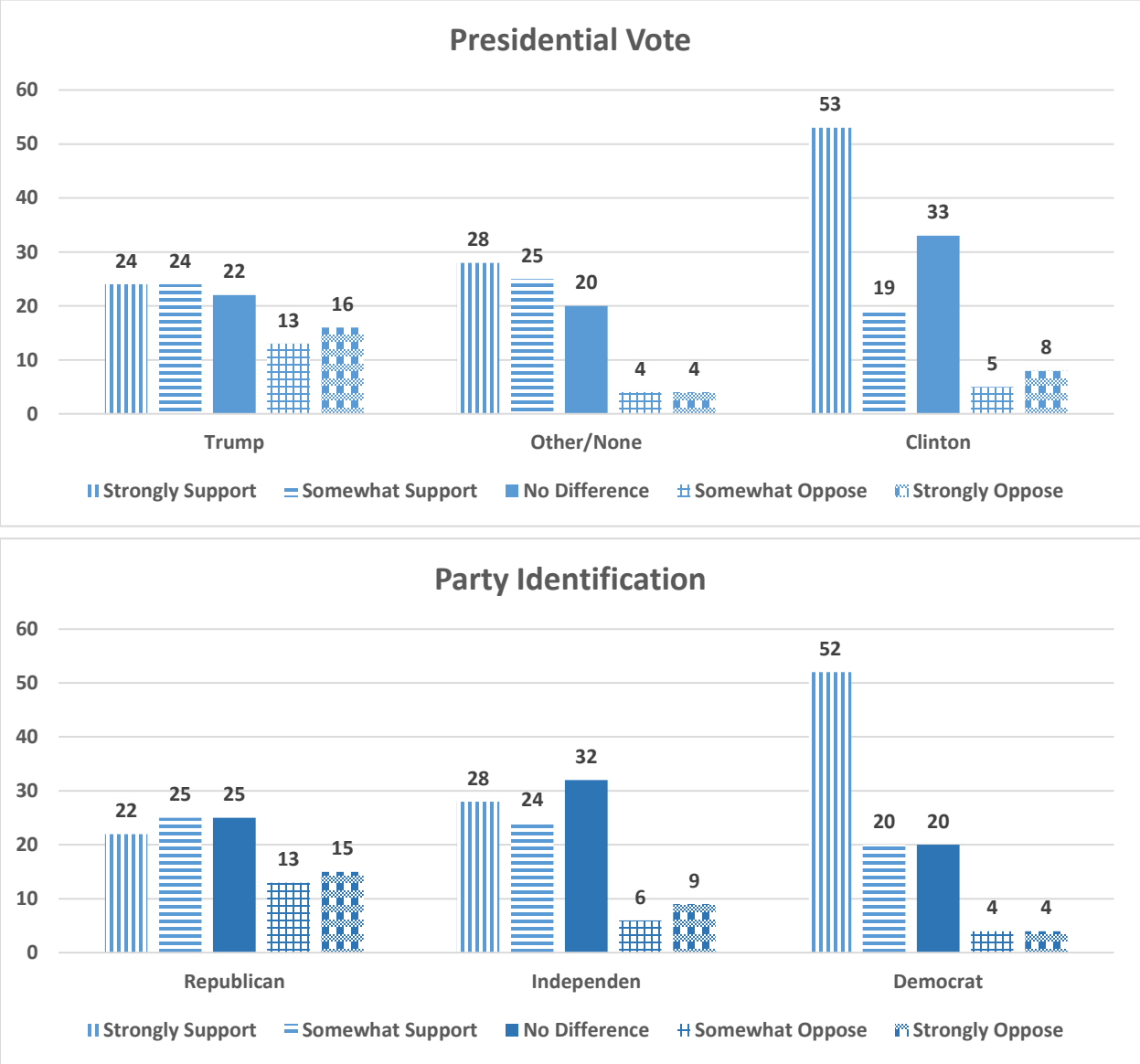
(READ ENTIRE LIST BEFORE RECORDING ONE ANSWER)

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

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.

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 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.

The AAM analysis makes a remarkable series of erroneous assumptions and misleading comparisons and claims.[33]

The first slide claims that "only OEMs have real skin in the game."[34] 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 health and macroeconomic benefits should also be included. In other words, consumers and

[33] 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)

[34] Id., p. 2.

society have as much as four to six times as much "skin in the game" as the automakers.[35] 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.[36] 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…[37] 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.[38] 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.[39] 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

[35]Id., p. 35.
[36] Id., p. 7.
[37] Id., p. 7.
[38] Id., p. 8.
[39] Id., p. 10.

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.

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.

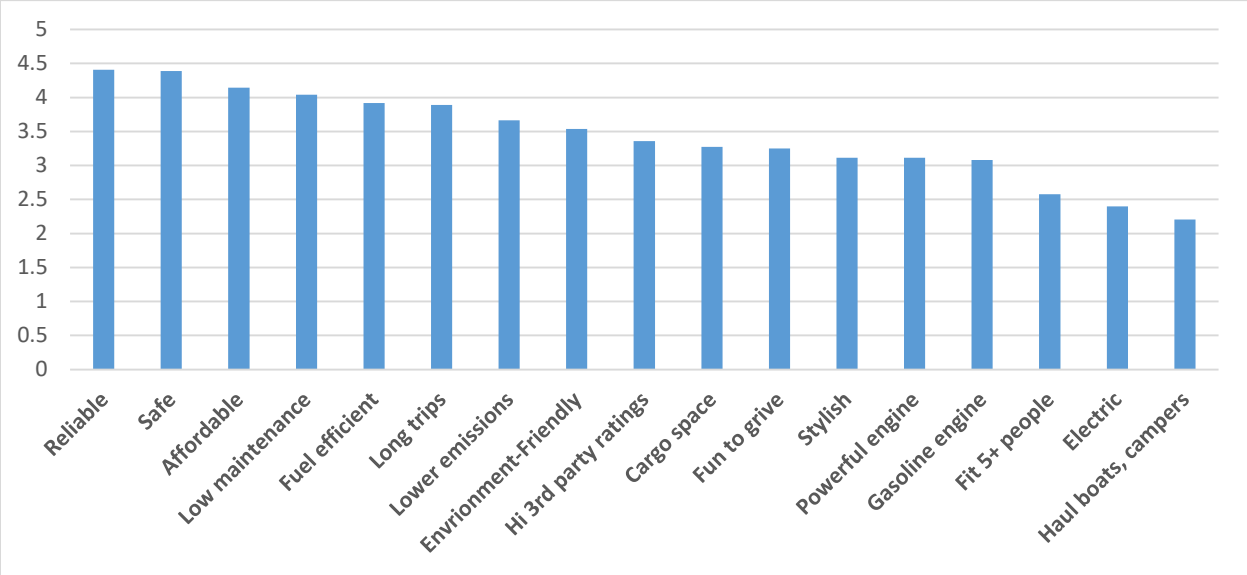
As we pointed out during the House hearing, this was the experience with hybrid vehicles. California's leadership in the LEV program created the global market for those vehicles. With respect to EV's, the global market is rapidly emerging. In this case, California's leadership will help to ensure that 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[40], 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

[40] Id., p. 9).

reliable, safe, affordable and low maintenance vehicles.[41]. 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 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

[40] Id., p. 10.

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.[42] 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.

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.

[42] *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 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.[43]

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 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

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

> 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.[44]

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).

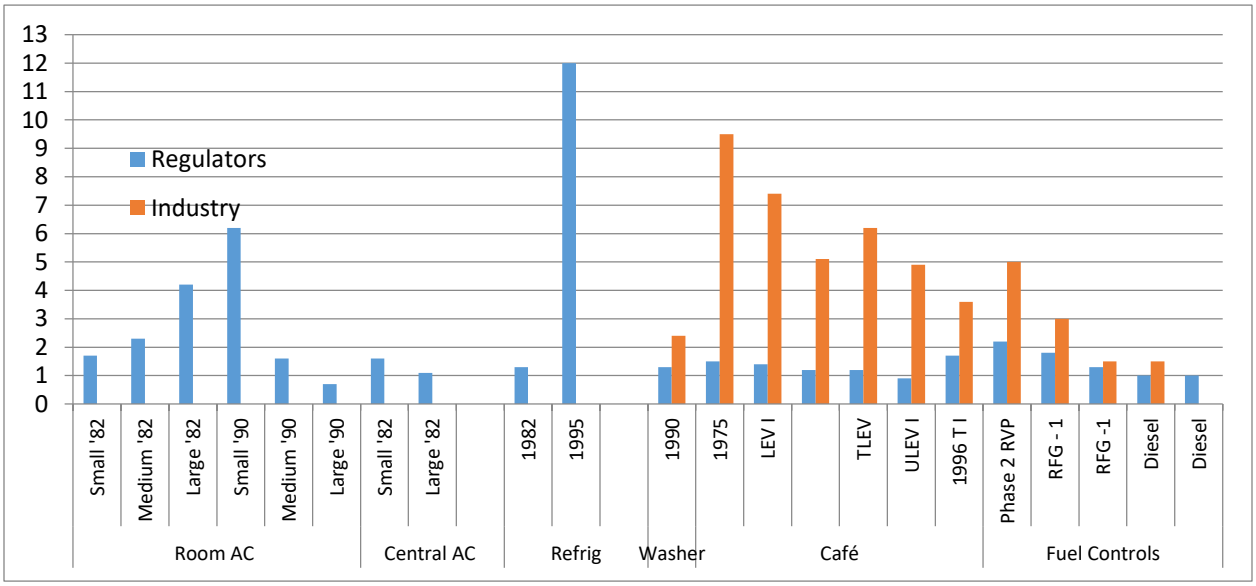
> The European car industry is highly dynamic and innovative. Its R&D expenditures are well above average in Europe's manufacturing sector. Among the most important drivers of innovation are consumer demand (for comfort, safety and fuel economy), international competition, and environmental objectives 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…
> 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.[45]

[44] 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.

[45] Kuok, On, *Environmental Innovation Dynamics in* the *Automotive Industry:* Project Assessing Innovation Dynamics Induced by Environmental Policy, November 3, 2006.

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

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.

times higher for auto technologies.[46] 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."[47]

[46] 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.
[47] Winston Harrington, Grading Estimates of the Benefits and Costs of Federal Regulation: A Review of Reviews, Resources for the Future, 2006; p. 3.

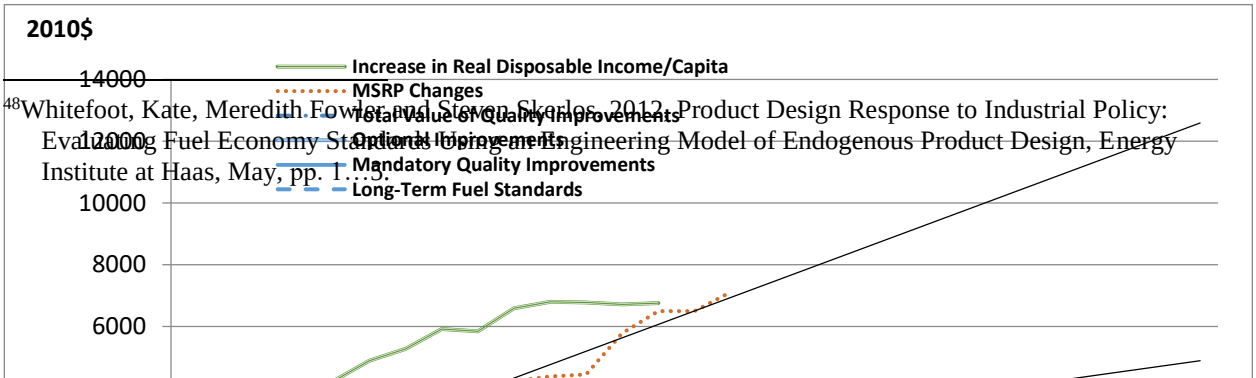
While the very high estimates of compliance costs offered by the auto manufacturers can be readily dismissed as self-interested political efforts to avoid regulation, they can also be seen as a worst case scenario in which the manufacturers take the most irrational approach to compliance under an assumption 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.[48]

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



[48] Whitefoot, Kate, Meredith Fowlie 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.

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.

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.[49]

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.[50] 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.[51] 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 Figure 7 with data from the Consumer Expenditure Survey of 2015 broken down by deciles of income.

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

[50] 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.

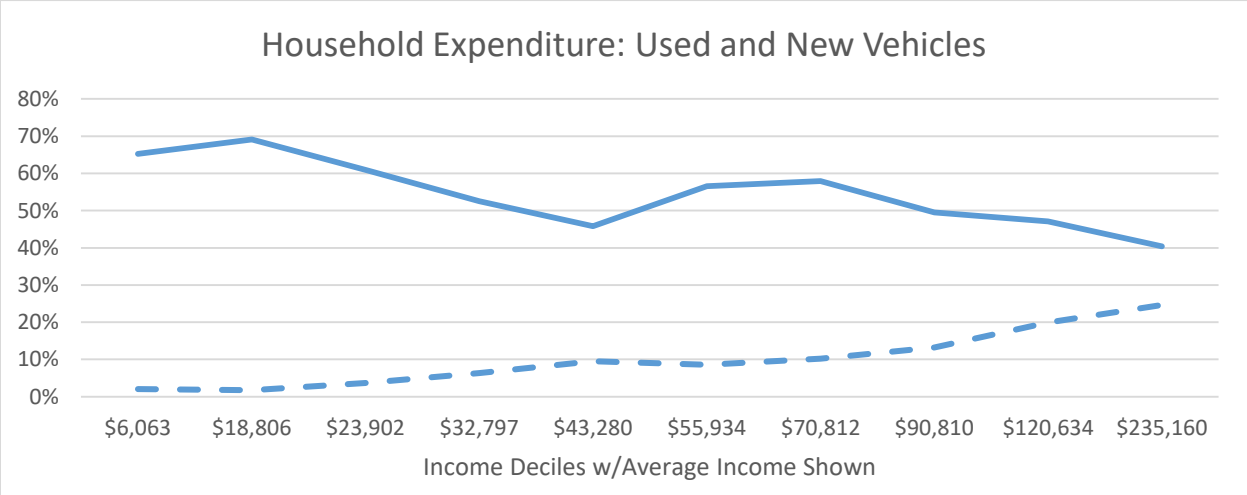
[51] TAR, pp. 6-16 to 6-22.

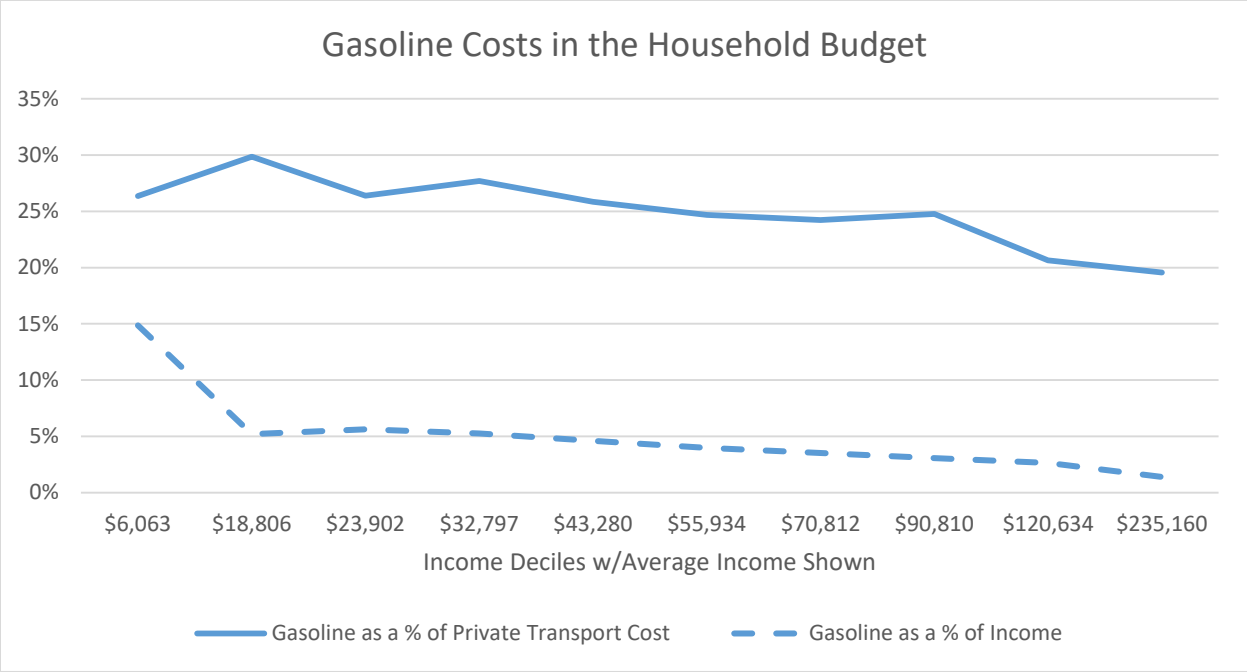
First, low income households make up a much smaller part of the new vehicle market than their share in the overall population. The upper graph of Figure 7 shows that the two lowest income categories –bottom 20% of households -- account for less than 4% of the expenditures on new vehicles. The share of 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.

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.

FIGURE 7:
OWNERSHIP AND OPERATING COSTS ACROSS INCOME DECILES





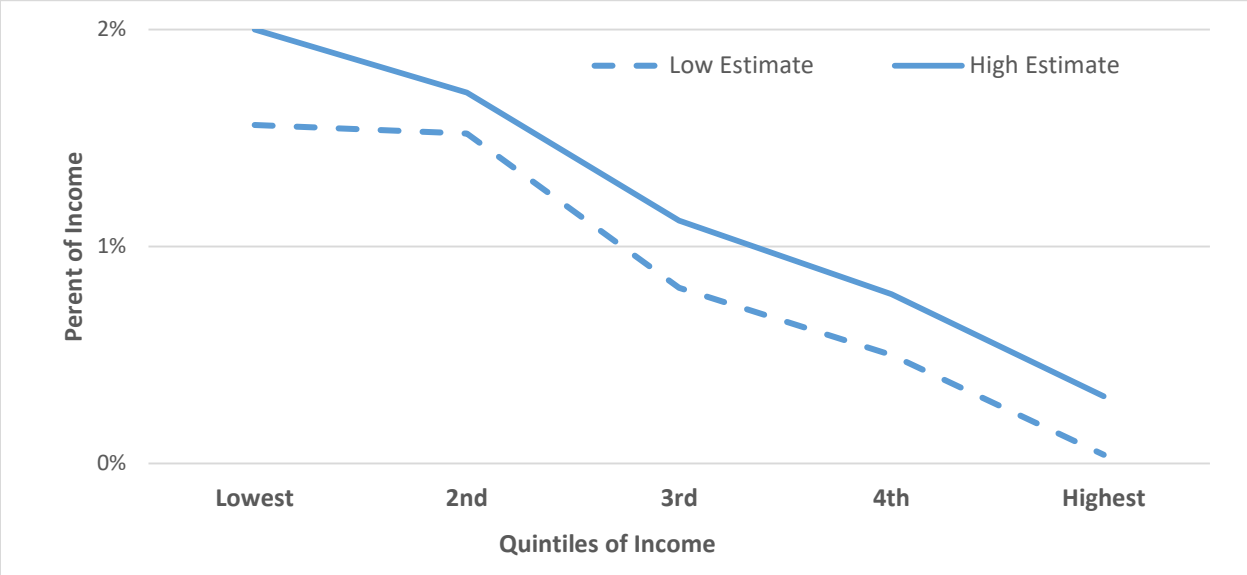
Source: Bureau of Labor Statistics, Consumer Expenditure Survey, 2015.

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.

Consumer Federation of America's

Submission to the Environmental Protection Agency

Docket No. EPA-HQ-OAR-2015-0827

Attachment F

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 Docket No. EPA–HQ–OAR–2015–0827; NHTSA–2016– 0068

September 26, 2016

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

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September 26, 2016

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THE CONSUMER FEDERATION OF AMERICA

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] 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 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.

[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..

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, 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 CAFE.

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 of the agencies' 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 in 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 the California Air Resources Board) 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 recommendations.

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 dissension 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 CO2 emissions and oil consumption). We add monthly cash flow analysis and cost per gallon saved, they are 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 gallon saved	Payback in years	Lifecycle savings		Total National ($, billion)	
	Cost	first year savings	Net			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 have 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.[3] 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.[4]

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

[3] 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.

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

spend about one-ninth as much on vehicle ownership as non-low income households but about one half as much of gasoline.[5]

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.

3. WELL-CRAFTED STANDARDS

We approach the setting of standards from a uniquely consumer point of view, always starting from three basic questions:[6]

- 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.

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

[6] 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 view the energy efficiency and climate change reflect significant market imperfection and market failure problems.

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 Availability[18]			Execution[17]
	Produce differentiation[19]			
	Incrementalism[30]			

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

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.

- 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.

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 FROM THE AUTOMAKERS

The AAM analysis makes a remarkable series of erroneous assumptions and misleading comparisons and claims.[7]

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.[8]

The Alliance makes a series of erroneous and misleading comparisons.

[7] 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)

[8] 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.

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 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 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 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.

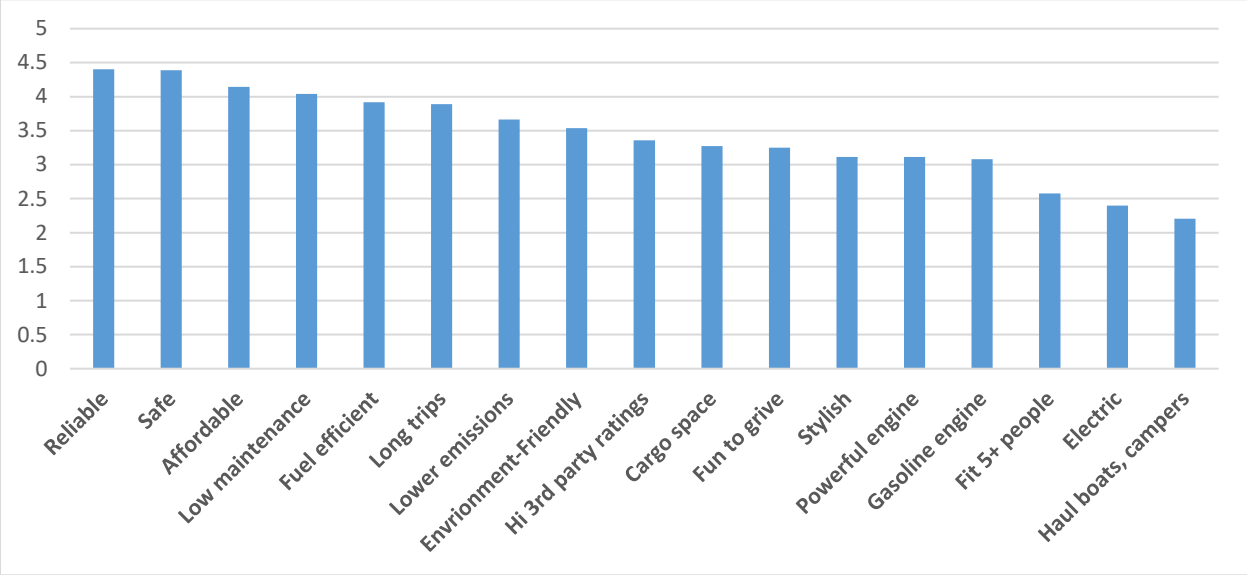
The public is not as enamored of gasoline powered muscle cars and trucks as the automakers claim.

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.

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 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 means

that EVs are on the early part of the adoption curve and there is a very strong basis to expect success.

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)

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.

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.

6. ONE NATIONAL PROGRAM

The automakers claim "there is no One National Plan" (ONP, p. 31-33). However, 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.

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.

NHTSA has headed in a tangential direction based on 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.

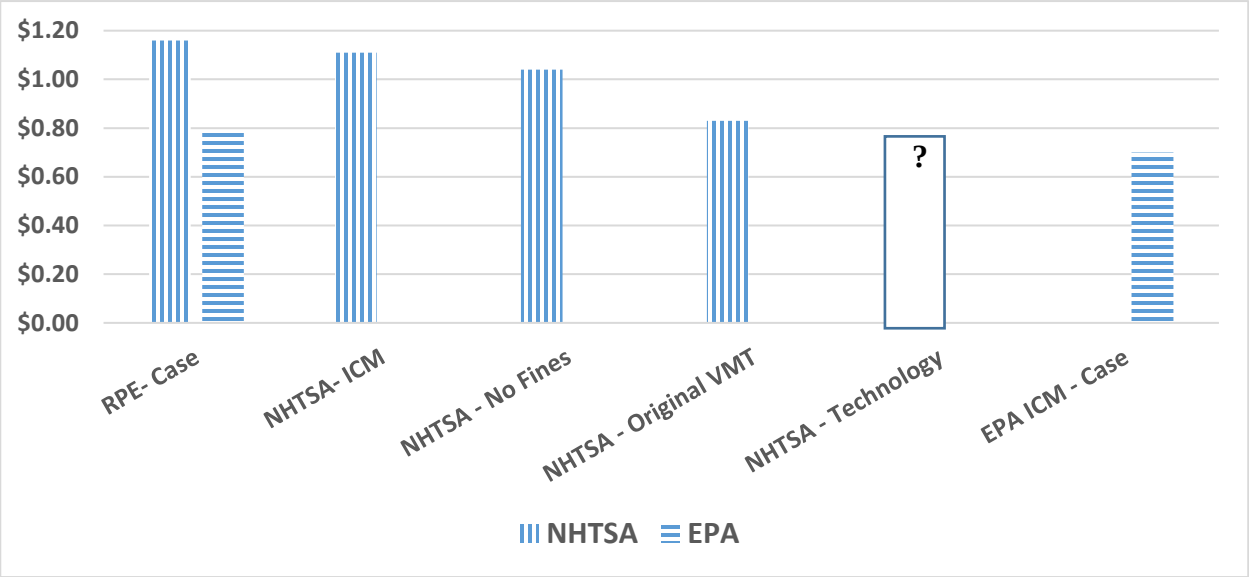
In our view NHTSA has gone off on a tangent from the other two agencies because of erroneous assumptions in its analysis. It increased the estimate of costs by unjustifiably raising the mark-up on fuel efficiency technologies and including fines paid in the cost. If lower cost technologies are available 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.[9] That assumption was never justified, since consumers are willing to accept

[9] 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

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.

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.

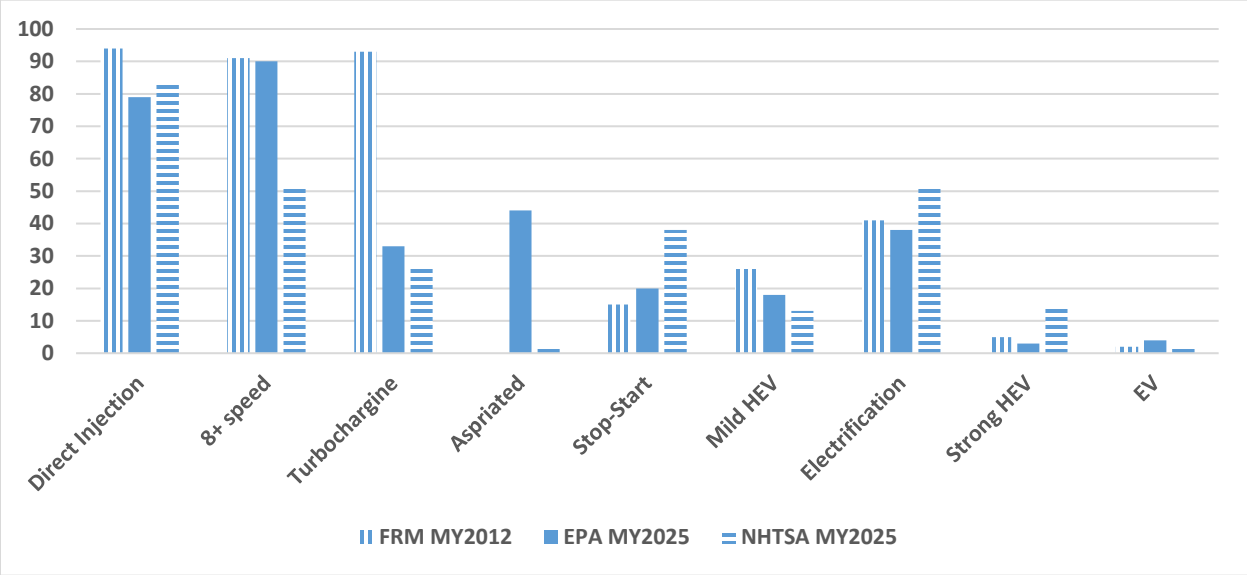
In one sense we should welcome differences in the penetration of technologies between manufacturers and across the fleet. This should indicate that different automakers are pursuing those technologies that suit them best and there are a lot of alternative pathways available. At the same time, extremely large differences might reflect the assumptions made by the modelers, rather than what is going in in the market. If there were 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

consumers and to reify them in the economic analysis, since they embody the market imperfections that the rules are intended to correct.

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 resolved.[10]

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



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

7. 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

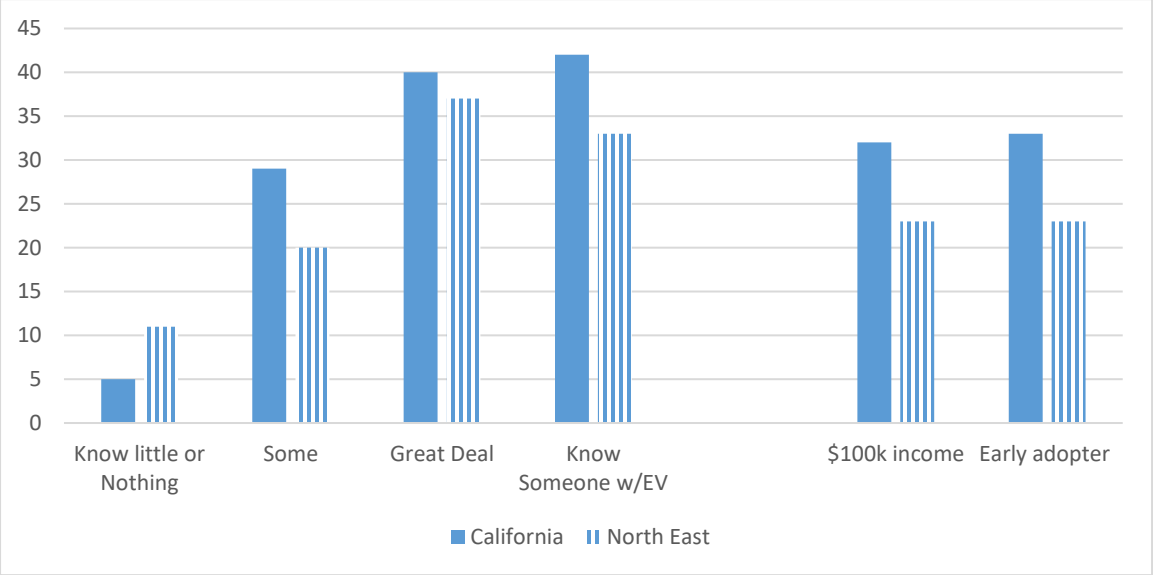
[10] Appendix F argues that the intersection of the "efficiency gap" and climate change create an urgent need for vigorous policy action. Appendix G outlines our thinking about the legal and institutional factors that affect the agencies' ability to undertake those vigorous actions.

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 know 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 encouraging 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)

APPENDIX A:

DEFINITION AND APPLICATION OF THE PERFORMANCE STANDARD CRITERIA

This Appendix contains examples of the framework as we have presented and applied it in various energy policy contexts and proceedings.

PRESENTATION TO THE CALIFORNIA ENERGY ACADEMY

***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, slide 22.**

> **Performance Standards**: Evaluations of policy options to close the efficiency gap consistently find that standards that require consumer durables to use less energy are a very attractive approach to closing the gap. Energy performance standards address many of the most important market barriers and imperfections. They tend to reduce risk and uncertainty by creating a market for energy saving technologies, lower technology costs by stimulating investment in and experience with new technologies, reduce the need for information and the effect of split incentives, all of which help to overcome the inertia of routine and habit. However, the literature points out that performance standards have positive effects if they are well-designed, enforced and updated. Key principles for the design of performance standards to ensure they are effective include the following.

- **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.

LIGHT DUTY VEHICLES

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, pp. 9-12.

The proposed rule recognizes the need to keep the standards in touch with reality in several important ways.

- The standards are set at a moderately aggressive level that is clearly beneficial and achievable.
- The cost estimates are consistent with the results of independent analyses of technology costs made over the past decade.
- The proposed standards are consistent with the rate of improvement that the auto industry achieved in the first decade of the fuel economy standard setting program.

The new approach to setting standards is consumer-friendly and facilitates automaker compliance.

- The attribute-based approach ensures that the standards do not require radical changes in the types or size of vehicles consumers drive; so, the full range of choices will be available to consumers.
- The standards do not require dramatic shifts in power train technologies or reductions in weight and offer flexibility and incentives for new technologies, and include a mid-term review.
- The setting of a coordinated national standard that lays out a steady rate of increase over a long time period gives consumers and the industry certainty and time to adapt to change.

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.

HEAVY DUTY TRUCKS

Mark Cooper, Jack Gillis. Comments of the Consumer Federation of America, before the Environmental Protection Agency, Department of Transportation, National Highway Traffic Safety Administration, Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium and Phase 2; Proposed Rule, 40 CFR Parts 9, 22, 85, et al 49 CFR Parts 512, 523, 534, et al., October 1, 2015, Technical Appendix, pp. 28, 31.

Long Term: Setting a progressively rising standard that targets a high long term goal over the course of a decade or more will foster and support a long-term perspective for the truck manufacturers, transportation companies and public, by reducing the marketplace risk of investing in new technologies. The long-term view gives the truck makers time to re-orient their thinking, retool their plants and help re-educate the transportation industry. It also gives the industry buying and using these trucks time to adjust.

Phase II: EPA/NHTSA point out that the cycle can take as long as ten years. They see this as a fundamental constraint on the ability to set standards to require technologies to be included. The agencies go through potential technologies one-by-one to assess the time frame in which they could be implemented and find several that have rather long periods. The 10 year time frame chosen by EPA/NHTSA represents a reasonable balance. It is hard to predict much beyond that period, but it gives the industry the opportunity to implement technologies. On the other hand, given the legislative mandates to maximize efficiency and reduce environmental harms to the extent feasible, the long cycle demands that the agencies actively monitor developments within the industry to see whether technologies have become feasible for the purpose of setting future standards. It also puts a spotlight on the importance of other policies, beyond standards, to speed the product cycle.

Technology Neutral: Taking a technology neutral approach to a long term standard unleashes competition around that ensures that the industry will get a wide range of choices at that lowest cost possible.

Phase II: The agencies achieve this outcome in two ways. They do not mandate any specific technology and they do not assume a very high level of penetration of many technologies. By relying on a variety of technologies that affect several of the key attributes of the vehicle that affect energy consumption, they create a rich palate of alternatives from which the manufacturers can choose to meet the standard. EPA/NHTSA assume a high penetration (over 50%) of a couple of the technologies based on their analysis of the market. However, even though they assume this high level to set the standard, manufacturers would not have to uniformly include the measures that EPA/NHTSA use to set the standard. They could meet the standard using a mix of other technologies, including many of those that were not used to set the standard. Given the level of the standard, there is a lot of head room for manufacturers to be innovative.

Product Neutral: Attribute-based approach to standards accommodates buyer preferences; it does not try to supplant them. This levels the playing field between truck makers and removes any pressure to push inappropriate vehicles into the market.

Phase II: The large amount of head room that EPA/NHTSA have left for manufacturers applies to alternative technologies across the board. Thus, entirely new approaches to meeting the standards are welcome and a small penetration of alternative engine types (Rankin and hybrid engines) factors into the level of the standards. This is a step back from Phase I in which these alternatives were given additional credits as incentives to develop and deploy the technologies.

Responsive to industry needs: Establishing a long term performance standard recognizes the need to keep the standards in touch with reality. The standards can be set at a moderately aggressive level that is clearly beneficial and achievable. With thoughtful cost estimates, consistent with the results of independent analyses of technology costs, a long term performance standard will contribute to the significant reduction of cost.

Phase II: The adoption cycle is also a constraint on the speed of penetration of technologies into the market. Given the amount of capital, the life of the product and its uses, the speed of adoption can vary substantially. Again, EPA/NHTSA evaluate specific technologies with respect to adoption cycles. The challenge of the adoption cycle reinforces the challenge of the product design cycle. Monitoring the development and adoption of technologies and using other policies to accelerate both are important activities to undertake. The agencies have outlined a list of key technologies that are already feasible or candidates for future inclusion in standards.

Responsive to consumer needs: The approach to standards should be consumer-friendly and facilitate compliance. An 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. We include the principle that standards should be attribute based as the key to this criteria. Consumers purchase and use durables for specific purposes. The attributes of the durables are extremely important. To the extent that agencies design standards to ensure consumers get the functionalities they need, the standards will be more effective. The setting of a coordinated national standard that lays out a steady rate of increase over a long time period gives the market and the industry certainty and time to adapt to change.

Phase II: As in all cases, balance is necessary. Just as some consumers are more demanding, the agency may well conclude that those consumers are also more willing to pay for attributes, so higher levels of efficiency are feasible and practicable in the marketplace. EPA/NHTSA have certainly made that effort here. For example, the target levels and development paths for the fuel consumption of tractor trailers taking their class, cab height and use into account. There is a 30% difference in targets across the nine categories and a 3% difference in the rate of improvement.

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. Well-designed performance standards that follow these principles command but they do not control. They ensure consumer needs are met while delivering energy savings and increasing consumer and total social welfare.

Phase II: Given the above description of the Phase II proposal, we conclude that it would be procompetitive. It would induce competition around the standard in which manufacturers would install those technologies in which they have an advantage, given the nature of their expertise and the customers they serve.

COMPUTERS

Comments of Consumer Federation of America, Consumers Union, Consumer Action and Consumer Federation of California, Docket Number: 14-AAER-02, Project Title: Computer, Computer Monitors, and Electronic Displays. TN #: 20385333, Date: 5/29/2015, pp. 27-29.

THE IMPORTANT ROLE OF STANDARDS

The strongly positive cost benefit analysis that supports including energy saving technologies in these household digital devices, always raises the question:

- Why hasn't the marketplace driven this result?

The answer to this question is well-known:

- The market for energy efficiency suffers from numerous obstacles, barriers and imperfections that inhibit the investment in energy efficiency technologies.

We have examined the debate over the "efficiency gap" – the gap caused by the failure to make economically beneficial energy efficiency investments – and the role of performance standards as a policy response to close it in great detail in a recent report. Many of the obstacles to investment in energy efficiency that we have identified apply to household digital devices. The electricity consumption of these devices is a particularly difficult problem for the marketplace to solve.

- The electricity consumption of these devices is not visible to consumers.

- The devices are purchased for their functionalities, which, given the dramatic increase in penetration and use, are highly desirable. The level of electricity

consumption is not an attribute of the product to which consumers will pay much attention (a shrouded attribute problem).

- Even if consumers are paying attention to energy use, it would be difficult for them to determine how much energy the devices use and the impact of reducing consumption. The information is either not readily available (information problems) and/or the transaction cost of obtaining it is high (transaction cost problems) and/or the calculations are difficult for consumers to make given uncertainties about consumption and prices (behavioral and information problems).

- The manufacturers of the products make the key decisions about energy consumption and the bundle of attributes that will be made available in the market, thereby constraining the range of energy consumption levels the consumer has to choose from (principal agent problems).

- The manufacturers tend to focus on the primary product attributes and the first cost of the device, ignoring the life cycle cost (i.e. the total of acquisition and operating costs) since they do not pay the electricity bills. The manufacturers' interests are separate and different from the consumers' interests (split incentives problem).

- Ultimately, the benefit of reducing energy consumption has value beyond the benefit that each individual directly enjoys from reduced energy consumption (a public goods problem).

These characteristics make it highly unlikely that the marketplace will overcome these obstacles on its own to stimulate investment in energy efficiency increasing technologies. Simply providing consumers with more information about electricity consumption of the devices does not overcome the underlying problem on the demand side or the supply side.

Therefore, standards can play an important role. They address all four of the barriers identified.

- Standards put a floor under the level of energy consumption, without dictating which technologies can be utilized.

- Consumers do not have to master the economics of the level of energy consumption of the device.

- Because all manufacturers must abide by the same rule, there is less risk of adding the cost of the energy savings technology to the product.

- Producers who are better at adding technology at lower cost may benefit.

- Competition can be stimulated around the standard and may even go beyond it as the standard raises awareness.

Thus, the barriers are overcome to the level of the standard.

California's role in moving the nation forward in setting standards for these devices is also appropriate for a number of reasons.

- California is a large enough market to get the attention of the product manufacturers.
- Not only is the California economy large even on a global scale, but Silicon Valley in Northern California has a special place in the digital revolution, so it is likely to get the broad attention of policy makers.
- Given the experience of the past quarter of a century, there is a great deal of experience with this type of standards setting process in California.
- The fact that the California IOUs have conducted extensive analysis and proposed a set of standards that achieves significant savings reflects this history and bodes well for the process.

Given the highly positive cost benefit analysis and the demonstration that there are numerous technologies available that could meet or beat the standard, the proposed levels are a good starting point, but just a starting point. In our review of the literature, we identified a number of characteristics that make performance standards effective in responding to the market barriers and imperfections that inhibit investment in efficiency. The proposed initial levels of the standards would capture many of the characteristics.

GAS FURNACES

Joint Comments of the Consumer Federation of America, National Consumer Law Center, Massachusetts Union of Public Housing Tenants and Texas Ratepayers' Organization to Save Energy, before the U.S. Department of Energy Building Technologies Program, RE: Notice of Proposed Rulemaking for Energy Conservation Standards for Residential Furnaces,J uly 10, 2015, p. 23

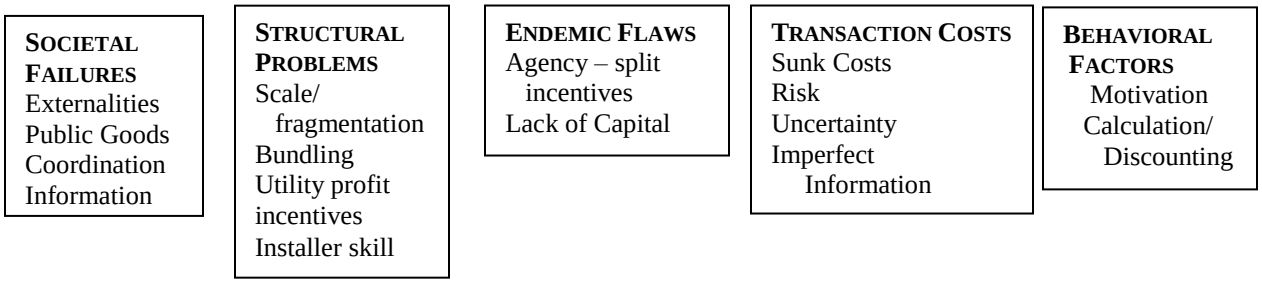
A. Market Imperfections as the Cause of Consumer Harm in the Market for Gas Furnaces

A well-designed performance standard that raises the efficiency of gas furnaces will deliver benefits to consumers and the nation because it addresses important market imperfections that are difficult to correct with other policies. Our extensive analysis of several literatures and hundreds of studies has identified five broad categories and three dozen specific market imperfections. The upper graph of Exhibit 9 identifies the broad categories and specific types of market failures that our analysis shows performance standards are adept at addressing. We described the specific market imperfections that affect the energy consumption of gas furnaces in the lower section of Exhibit 9.

The numerous, varied and significant market imperfections mean that weak, single purpose policies, like information programs, will not be effective. Stronger policies, like price increases (e.g. a gas guzzler tax), do not address many of the imperfections. Simply raising the price of natural gas may impose a great deal of cost on uses that do not suffer market

imperfections, while the market imperfections in other markets sectors diminishes the impact of prices.

EXHIBIT 9: IMPERFECTIONS ADDRESSED BY STANDARDS: HIGHLIGHTING FACTORS AFFECTING DIGITAL DEVICES



The Gas Consumption of Furnaces is a Particularly Difficult Problem for the Marketplace to Solve.

Externalities: Ultimately, the benefit of reducing energy consumption has value beyond the benefit that each individual directly enjoys from reduced energy consumption (environmental, public health, and market processes like consumption externalities, learning by doing, coordination and network effects, a public goods problem).

Market Structure: Market characteristics can reduce the incentive to invest in economically beneficial technologies. Utilities profit from increased sales and have little incentive to promote conservation. The housing market, and therefore the furnace market, is fragmented. Financial practices reduce the appropriability of gains from efficiency investments. Quality installation of high efficiency products is challenging.

Agency: The builders and landlords make the key decisions about energy consumption by choosing the durables and the bundle of attributes that will be made available in the market, thereby constraining the range of energy consumption levels the consumer has to choose from. The supply-side interests are separate and different from the consumers' interests (split incentives problem).

Bundling and Access to Capital: Owners and landlords tend to focus on the primary product attributes and the first cost of the consumer durable, ignoring the life cycle cost (i.e. the total of acquisition and operating costs) since they do not pay the energy bills.

Risk: Moving efficiency into mass market products runs the risk of being underpriced by inefficient products. Learning new installations is challenging.

Imperfect Information: Installers lack information and skills with higher technologies in some situations. Consumers do not know how to calculate the economic benefit of long-lived durables or judge the quality of the installation.

Motivation/Calculation: Consumers frequently make replacement decisions under severe time constraints. Even if consumers are paying attention to energy use, it would be difficult for them to determine how much energy the devices use and the impact of reducing consumption based on long-term price predictions. The information is either not readily available or the transaction cost of obtaining it is high (information and transaction cost problems).

C. WELL-DESIGNED PERFORMANCE STANDARDS

We believe the proposed standards possess these characteristics. The levels of efficiency and products are widely available in the market. The lead time is more than adequate. The one unique characteristic of the standard is that the higher levels require a different technology (condensing furnaces) because the non-condensing furnaces simply cannot perform much better. The physics of the furnace require shifting to a new technology to achieve efficiencies above 90%. Manufacturers can implement the technology in different ways, however.

APPENDIX B
CONCEPTUAL SPECIFICATION OF MARKET IMPERFECTIONS

Energy Efficiency Performance Standards: The Cornerstone of Consumer-Friendly Energy Policy, October 2013. (Updated)

The effort to create a unified National Program to improve fuel economy and reduce greenhouse gas emissions ties together two major fields of energy policy and research. Over the past several decades, these areas have been the subject of a great deal of conceptual and empirical analysis. These are summarized in the following tables.

EFFICIENCY

LBNL Market Barriers to Energy Efficiency

Barriers[1]	Market Failures	Transaction Cost[2]	Behavioral factors[16]
Misplaced incentives	Externalities	Sunk costs[3]	Custom[17]
Agency[4]	Mis-pricing[20]	Lifetime[5]	Values[18] & Commitment[19]
Capital Illiquidity[8]	Public Goods[22]	Risk[6] & Uncertainty[7]	Social group & status[21]
Bundling	Basic research[23]	Asymmetric Info.[9]	Psychological Prospect[24]
Multi-attribute	Information	Imperfect Info.[10]	Ability to process info[27]
Gold Plating[11]	(Learning by Doing)[25]	Availability	Bounded rationality[26]
Inseparability[13]	Imperfect Competition/	Cost[12]	
Regulation	Market Power[28]	Accuracy	
Price Distortion[14]			
Chain of Barriers			
Disaggregated Mkt.[15]			

William H. Golove and Joseph H. Eto, *Market Barriers to Energy Efficiency: A Critical Reappraisal of the Rationale for Public Policies to Promote Energy Efficiency;*

1) Six market barriers were initially identified: 1) misplaced incentives, 2) lack of access to financing, 3) flaws in market structure, 4) mis-pricing imposed by regulation, 5) decision influenced by custom, and 6) lack of information or misinformation. Subsequently a seventh barrier, referred to as "gold plating," was added to the taxonomy (9).
2) Neo-classical economics generally relies on the assumption of frictionless transactions in which no costs are associated with the transaction itself. In other words, the costs of such activities as collecting and analyzing information; negotiating with potential suppliers, partners, and customers; and assuming risk are assumed to be nonexistent or insignificant. This assumption has been increasingly challenged in recent years. The insights developed through these challenges represent an important new way to evaluate aspects of various market failures (especially those associated with imperfect information). Transaction cost economics examines the implications of evidence suggesting that transaction costs are not insignificant but, in fact, constitute a primary explanation for the particular form taken by many economic institutions and contractual relations (22).
3) Transaction cost economics also offers support for claims that the illiquidity of certain investments leads to higher interest rates being required by investors in those investments (23).
4) Misplaced, or split, incentives are transactions or exchanges where the economic benefits of energy conservation do not accrue to the person who is trying to conserve (9).
5) Thus, as the rated lifetime of equipment increases, the uncertainty and the value of future benefits will be discounted significantly. The irreversibility of most energy efficiency investments is said to increase the cost of such investments because secondary markets do not exist or are not well-developed for most types of efficient equipment. This argument contends that illiquidity results in an option value to delaying investment in energy efficiency, which multiplies the necessary return from such investments (16)
6) If a consumer wishes to purchase an energy-efficient piece of equipment, its efficiency should reduce the risk to the lender (by improving the borrower's net cash flow, one component of credit-worthiness5) and should, but does not, reduce the interest rate, according to the proponents of the theory of market barriers. (p.10). Potential investors, it is argued, will increase their discount rates to account for this uncertainty or risk because they are unable to diversify it away. The capital asset pricing model (CAPM) is invoked to make this point (16).
7) Perfect information includes knowledge of the future, including, for example, future energy prices. Because the future is unknowable, uncertainty and risk are imposed on many transactions. The extent to which these unresolvable uncertainties

affect the value of energy efficiency is one of the central questions in the market barriers debate. Of course, inability to predict the future is not unique to energy service markets. What is unique is the inability to diversify the risks associated with future uncertainty to the same extent that is available in other markets (20).

8) In practice, we observe that some potential borrowers, for example low-income individuals and small business owners, are frequently unable to borrow at any price as the result of their economic status or "credit-worthiness." This lack of access to capital inhibits investments in energy efficiency by these classes of consumers (10).

9) Finally, Williamson (1985) argues that the key issue surrounding information is not its public goods character, but rather its asymmetric distribution combined with the tendency of those who have it to use it opportunistically (23).

10) [K]nowledge of current and future prices, technological options and developments, and all other factors that might influence the economics of a particular investment. Economists acknowledge that these conditions are frequently not and in some cases can never be met. A series of information market failures have been identified as inhibiting investments in energy efficiency: (1) the lack of information, (2) the cost of information, (3) the accuracy of information, and (4) the ability to use or act upon information (20).

11) The notion of "gold plating" emerged from research suggesting that energy efficiency is frequently coupled with other costly features and is not available separately (11).

12) Even when information is potentially available, it frequently is expensive to acquire, requiring time, money or both (20).

13) Inseparability of features refers specifically to cases where availability is inhibited by technological limitations. There may be direct tradeoffs between energy efficiency and other desirable features of a product. In contrast to gold plating where the consumer must purchase more features than are desired, the inseparability of features demands purchases of lower levels of features than desired. (2)

14) The regulation barrier referred to mis-pricing energy forms (such as electricity and natural gas) whose price was set administratively by regulatory bodies (11).

15) On the cost-side of the equation, the critics contend that, among other things, information and search costs have typically been ignored or underestimated in engineering/economic analyses. Time and/or money may be spent: acquiring new information (search costs), installing new equipment, training operators and maintenance technicians, or supporting increased maintenance that may be associated with the energy efficient equipment (p.16). [T]he class, itself, consists of a distribution of consumers: some could economically purchase additional efficiency, while others will find the new level of efficiency is not cost effective (13).

16) Discounted cash-flow, cost-benefit, and social welfare analyses use price as the complete measure of value although in very different ways; behavioral scientists, on the other hand, have argued that a number of "noneconomic" variables contribute significantly to consumer decision making (17).

17) [C]ustom and information have evolved significantly during the market barrier debate (11).

18) In the language of (economic) utility theory, the profitability of energy efficiency investments is but one attribute consumers evaluate in making the investment. The value placed on these other attributes may, in some cases, outweigh the importance of the economic return on investment (19).

19) [P]sychological considerations such as commitment and motivation play a key role in consumer decisions about energy efficiency investments (17).

20) Externalities refer to costs or benefits associated with a particular economic activity or transaction that do not accrue to the participants in the activity (18).

21) Other factors, such as membership in social groups, status considerations, and expressions of personal values play key roles in consumer decision-making (17). In order for a market to function effectively, all parties to an exchange or transaction must have equal bargaining power. In the event of unequal bargaining positions, we would expect that self-interest would lead to the exploitation of bargaining advantages (19).

22) Public goods are said to represent a market failure. It has been generally acknowledged by economists and efficiency advocates that public good market failures affect the energy services market. (19) [T]he creation of information is limited because information has public good qualities. That is, there may be limits to the creator's ability to capture the full benefits of the sale or transfer of information, in part because of the low cost of subsequent reproduction and distribution of the information, thus reducing the incentive to create information that might otherwise have significant value (20).

23) Investment in basic research in believed to be subject to this shortcoming; because the information created as a result of such research may not be protected by patent or other property right, the producer of the information may be unable to capture the value of his/her creation (19).

24) Important theoretical refinements to this concept, known as prospect theory, have been developed by Tversky and Kahneman (1981, 1986). This theory contends that individuals do not make decisions by maximizing prospective utility, but rather in terms of difference from an initial reference point. In addition, it is argued that individuals value equal gains and losses from this reference point differently, weighing losses more heavily than gains (21).

25) The information created by the adoption of a new technology by a given firm also has the characteristics of a public good. To the extent that this information is known by competitors, the risk associated with the subsequent adoption of this same technology may be reduced, yet the value inherent in this reduced risk cannot be captured by its creator (19).

26) This work is consistent with the notion of bounded rationality in economic theory. In contrast to the standard economic assumption that all decision makers are perfectly informed and have the absolute intention and ability to make decisions that maximize their own welfare, bounded rationality emphasizes limitations to rational decision making that are imposed by

constraints on a decision maker's attention, resources, and ability to process information. It assumes that economic actors intend to be rational, but are only able to exercise their rationality to a limited extent (p.21).

27) Finally, individuals and firms are limited in their ability to use — store, retrieve, and analyze — information. Given the quantity and complexity of information pertinent to energy efficiency investment decisions, this condition has received much consideration in the market barriers debate (20).

28) This barrier suggests that certain powerful firms may be able to inhibit the introduction by competitors of energy-efficient, cost-effective products (10).

RFF Market and Behavioral Failures Relevant to Energy Efficiency

Societal Failures	***Structural Failures***	***Potential Behavioral Failures[11]***
Energy Market Failures	Capital Market Failures	Prospect theory[12]
Environmental Externalities[1]	Liquidity constraints[5]	Bounded rationality[13]
Energy Security	Information problems[6]	Heuristic decision making[14]
Innovation market failures	Lack of information[7]	Information[15]
Research and development spillovers[2]	Asymmetric info. >	
Learning-by-doing spillovers[3]	Adverse selection[8]	
Learning-by-using[4]	Principal-agent problems[9]	
	Average-cost electricity pricing[10]	

Source: Kenneth Gillingham, Richard G. Newell, and Karen Palmer, *Energy Efficiency Economics and Policy* (Resources for the Future, April 2009)

1) Externalities: the common theme in energy market failures is that energy prices do not reflect the true marginal social cost of energy consumption, either through environmental externalities, average cost pricing, or national security (9).

2) R&D spillovers may lead to underinvestment in energy-efficient technology innovation due to the public good nature of knowledge, whereby individual firms are unable to fully capture the benefits from their innovation efforts, which instead accrue partly to other firms and consumers (11).

3) Learning-by-doing (LBD) refers to the empirical observation that as cumulative production of new technologies increases, the cost of production tends to decline as the firm learns from experience how to reduce its costs (Arrow 1962). LBD may be associated with a market failure if the learning creates knowledge that spills over to other firms in the industry, lowering the costs for others without compensation.

4) Positive externalities associated with learning-by-using can exist where the adopter of a new energy-efficient product creates knowledge about the product through its use, and others freely benefit from the information generated about the existence, characteristics, and performance of the product (12).

5) Capital: Some purchasers of equipment may choose the less energy-efficient product due to lack of access to credit, resulting in underinvestment in energy efficiency and reflected in an implicit discount rate that is above typical market levels (13).

6) Information: Specific information problems cited include consumers' lack of information about the availability of and savings from energy-efficient products, asymmetric information, principal-agent or split-incentive problems, and externalities associated with learning-by-using (11).

7) Lack of information and asymmetric information are often given as reasons why consumers systematically underinvest in energy efficiency. The idea is that consumers often lack sufficient information about the difference in future operating costs between more-efficient and less-efficient goods necessary to make proper investment decisions (11).

8) Asymmetric information, where one party involved in a transaction has more information than another, may lead to adverse selection (11).

9) Agency: The principal-agent or split-incentive problem describes a situation where one party (the agent), such as a builder or landlord, decides the level of energy efficiency in a building, while a second party (the principal), such as the purchaser or tenant, pays the energy bills. When the principal has incomplete information about the energy efficiency of the building, the first party may not be able to recoup the costs of energy efficiency investments in the purchase price or rent charged for the building. The agent will then underinvest in energy efficiency relative to the social optimum, creating a market failure (12).

10) Prices faced by consumers in electricity markets also may not reflect marginal social costs due to the common use of average-cost pricing under utility regulation. Average-cost pricing could lead to under- or overuse of electricity relative to the economic optimum (10).

11) Systematic biases in consumer decision making that lead to underinvestment in energy efficiency relative to the cost-minimizing level are also often included among market barriers. (8); The behavioral economics literature has drawn attention to several systematic biases in consumer decision making that may be relevant to decisions regarding investment in energy efficiency. Similar insights can be gained from the literature on energy decision-making in psychology and sociology. The evidence that consumer decisions are not always perfectly rational is quite strong, beginning with Tversky and Kahneman's research indicating that both sophisticated and naïve respondents will consistently violate axioms of rational choice in certain situations (15).

12) The welfare change from gains and losses is evaluated with respect to a reference point, usually the status quo. In addition, consumers are risk averse with respect to gains and risk seeking with respect to losses, so that the welfare change is much greater from a loss than from an expected gain of the same magnitude (Kahneman and Tversky 1979). This can lead to loss aversion, anchoring, status quo bias, and other anomalous behavior (16).
13) Bounded rationality suggests that consumers are rational, but face cognitive constraints in processing information that lead to deviation from rationality in certain circumstances (16); Assessing the future savings requires forming expectations of future energy prices, changes in other operating costs related to the energy use (e.g., pollution charges), intensity of use of the product, and equipment lifetime. Comparing these expected future cash flows to the initial cost requires discounting the future cash flows to present values (3).
14) Heuristic decision-making is related closely to bounded rationality and encompasses a variety of decision strategies that differ in some critical way from conventional utility maximization in order to reduce the cognitive burden of decision-making. Tversky (1972) develops the theory of elimination-by-aspects," wherein consumers use a sequential decision making process where they first narrow their full choice set to a smaller set by eliminating products that do not have some desired feature or aspect (e.g., cost above a certain level), and then they optimize among the smaller choice set, possibly after eliminating further products. (16) For example, for decisions regarding energy-efficient investments consumers tend to use a simple payback measure where the total investment cost is divided by the future savings calculated by using the energy price today, rather than the price at the time of the savings— effectively ignoring future increases in real fuel prices (p. 17). The salience effect may influence energy efficiency decisions, potentially contributing to an overemphasis on the initial cost of an energy-efficient purchase, leading to an underinvestment in energy efficiency. This may be related to evidence suggesting that decision makers are more sensitive to up-front investment costs than energy operating costs, although this evidence may also be the result of inappropriate measures of expectations of future energy use and prices (17).
15) Alternatively, information problems may occur when there are behavioral failures, so that consumers are not appropriately taking future reductions in energy costs into account in making present investments in energy efficiency (12).

UNIDO Barriers to Industrial Energy Efficiency

	Perspectives	**Barriers**
	Orthodox Economics	**Risk (1)**
		Access to capital (2)
Add information costs & opportunism		
	Agency theory	**Split Incentives (3)**
	Economics of information	**Imperfect & Asymmetric Information (4)**
Add bounded rationality & broader concept of transaction cost	**Transaction cost economics**	**Adverse Selection (5)**
		Hidden Costs (7)
Add biases, error and decision heuristics	**Behavioral Economics**	**Bounded Rationality (6)**
		Inertia & Status Quo Bias (8)
		Routine (9)

Steve Sorrell, Alexandra Mallett & Sheridan Nye. ***Barriers to industrial energy efficiency, A literature review,*** **United Nations Industrial Development Organization, Vienna, 2011, Figure 3.1 & Section 3.**

(1) Risk: The short paybacks required for energy efficiency investments may represent a rational response to risk. This could be because energy efficiency investments represent a higher technical or financial risk than other types of investment, or that business and market uncertainty encourages short time horizons.
(2) Access to capital: If an organization has insufficient capital through internal funds, and has difficulty raising additional funds through borrowing or share issues, energy efficient investments may be prevented from going ahead. Investment could also be inhibited by internal capital budgeting procedures, investment appraisal rules and the short-term incentives of energy management staff.
(3) Split incentives: Energy efficiency opportunities are likely to be foregone if actors cannot appropriate the benefits of the investment. Wide applicability… Landlord-tenant problems may arise in the industrial, public and commercial sectors through the leasing of buildings and office space. The purchaser may have a strong incentive to minimize capital costs, but may not be accountable for running costs….maintenance staff may have a strong incentive to minimize capital costs and/or to get failed

equipment working again as soon as possible, but may have no incentive to minimize running costs. If individual departments within an organization are not accountable for their energy use they will have no incentive to improve energy efficiency.

(4) Imperfect information: Lack of information on energy efficiency opportunities may lead to cost-effective opportunities being missed. In some cases, imperfect information may lead to inefficient products driving efficient products out of the market. Information on: the level and pattern of current energy consumption and comparison with relevant benchmarks; specific opportunities, such as the retrofit of thermal insulation; and the energy consumption of new and refurbished buildings, process plant and purchased equipment, allowing choice between efficient and inefficient options.
Asymmetric information exists where the supplier of a good or service holds relevant information, but is unable or unwilling to transfer this information to prospective buyers.

(5) Asymmetric information may lead to the adverse selection of energy inefficient goods.

(6) Hidden costs Engineering-economic analyses may fail to account for either the reduction in utility associated with energy efficient technologies, or the additional costs associated with them. As a consequence, the studies may overestimate energy efficiency potential. Examples of hidden costs include overhead costs for management, disruptions to production, staff replacement and training, and the costs associated with gathering, analysing and applying information.
General overhead costs of energy management: employing specialist people (e.g., energy manager); energy information systems (including: gathering of energy consumption data; maintaining sub metering systems; analysing data and correcting for influencing factors; identifying faults; etc.); energy auditing;
Costs involved in individual technology decisions: i) identifying opportunities; ii) detailed investigation and design; iii) formal investment appraisal; formal procedures for seeking approval of capital expenditures; specification and tendering for capital works to manufacturers and contractors additional staff costs for maintenance; replacement, early retirement, or retraining of staff; disruptions and inconvenience;
Loss of utility associated with energy efficient: problems with safety, noise, working conditions, service quality etc. (e.g., lighting levels); extra maintenance, lower reliability,

(7) Bounded rationality: Owing to constraints on time, attention, and the ability to process information, individuals do not make decisions in the manner assumed in economic models. As a consequence, they may neglect opportunities for improving energy efficiency, even when given good information and appropriate incentive consumers do not attempt to maximise their utility or producers their profits.

(8) Inertia and the status quo bias: Routines can be surprisingly persistent and entrenched. … This type of problem has been labeled *inertia* within the energy efficiency literature and identified as a relevant explanatory variable for the efficiency gap

(9) Routines as a response to bounded rationality the use of formal capital budgeting tools within investment decision-making. Other types of rules and routines which may impact on energy efficiency include: operating procedures (such as leaving equipment running or on standby); safety and maintenance procedures; relationships with particular suppliers; design criteria; specification and procurement procedures; equipment replacement routines and so on.

McKinsey and Company Market Barriers to Home energy Efficiency

Kckinsey Category	McKinsey Nature	McKinsey Description	Cluster
Behavioral	Awareness	Low priority, Preference for other attributes	CD, RLA
Availability	Availability	Restricted procurement, 1st cost focus	CD
Behavioral	Awareness	Shop for price and features	RD
Behavioral	Awareness	Limited understanding of use and savings	CEPB, EH, GB, RLA
Behavioral	Custom & Habit	Little attention at time of sale	NH
Behavioral	Custom & Habit	Underestimation of plug load	RD
Behavioral	Custom & Habit	Aversion to change	CI,
Behavioral	Custom & Habit	CFLS perceived as inferior	RLA
Behavioral	Hurdle	Payback-Hurdle, 28% discount rate	CEPB
Behavioral	Hurdle	Payback-Hurdle,40% discount rate	EH
Behavioral	Use	Improper use and maintenance	CEPB, EH, RD
Behavioral	Awareness	Not accountable for efficiency	CI
Availability	Capital	Competing use of capital	EH, GB, RLA, CI
Structural	Agency	Tenant pays, builder ignores	CEPB, EH, RD
Availability	Availability	Lack of contractors	EH
Availability	Availability	Lack of availability in area	NH
Availability	Availability	Lack of demand => lack of R&D	RD
Availability	Availability	Emergency replacement	RLA
Availability	Bundling	Efficiency bundled with other features	RLA
Structural	Owner Transfer	Lack of premium at time of sale	CD, NH, NPB, RLA
Structural	Owner Transfer	Limits payback to occupancy period	EH
Structural	Transaction	Lack of information	NPB
Structural	Transaction	Disruption during improvement process	EH
Structural	Transaction	Difficult to identify efficient devices	RD
Behavioral	Risk/Uncertainty	Business failure risk	CEPB
Behavioral	Risk/Uncertainty	Lack of reliability	CI
Structural	Transaction	Research, procurement and preparation	EH, GB, RLA

SOURCE:
McKinsey and Company, *Unlocking Energy Efficiency in the U.S. Economy,* July 2009, Tables 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, Exhibits 14, 15, 16, 19, 21, 24, 26, 27, 29, 30.

Clusters
CD = Commercial Devices;
CEPB = Commercial Existing Private Buildings;
CI = Commercial Infrastructure;
EH = Existing Homes;
GB = Government Buildings;
NH = New Homes;
NPB = New Private Commercial Buildings;
RD = Residential Devices;
RLA = Residential Lighting and Appliances

McKinsey Categories Defined:

Structural. These barriers arise when the market of environment makes investing in energy efficiency less possible or beneficial, preventing measures that would be NPV-positive from being attractive to an end-user:

Agency issues energy efficiency less possible or beneficial, preventing a measure that would be NPV misaligned between economic actors, primarily between landlord and tenant These barriers arise when the market or environment makes investing in (split incentives), in which energy bills and capital rights are

Ownership transfer issues, in which the current owner cannot capture the full duration of benefits, thus requiring assurance they can capture a portion of the future value upon transfer sufficient to justify upfront investment; this issue also affects builders and buyers… Because developers do not receive the future energy savings from efficient buildings and are often unaware or uncertain of the market premium energy efficient building can command, developers have little financial incentive to invest in energy efficiency above the required minimum.

"Transaction" barriers, a set of hidden "costs" that are not generally monetizable, associated with energy efficiency investment; for example, the investment of time to research and implement a new measure High transaction barriers arise as consumers incur significant time "costs" in researching, identifying, and procuring efficiency upgrades

Pricing distortions, including regulatory barriers that prevent savings from materializing for users of energy-savings devices.

Behavioral: These barriers explain why an end-user who is structurally able to capture a financial benefit still decides not to

Risk and uncertainty over the certainty and durability of measures and their savings generates an unfamiliar level of concern for the decision maker. Many operators are risk averse and put a premium on reliability; they may not be inclined to pursue energy efficiency activities for fear of disrupting essential services.

Lack of awareness, or low attention, on the part of end-users and decision makers in firms regarding details of current energy consumption patterns, potential savings, and measures to capture those savings. Homeowners typically do not understand their home energy consumption and are unaware of energy-saving measures.

Custom and habit, which can create inertia of "default choices" that must be overcome. Enduring lifestyle disruptions during the improvement process. End-users retain preconceived and often inaccurate ideas about differences in functionality that limit the acceptance of certain products.

Elevated hurdle rates, which translate into end-users seeking rapid pay back of investments - typically within 2 to 3 years. This expectation equates to a discount rate of 40 percent for investments in energy efficiency, inconsistent with the 7-percent discount rate they implicitly use when purchasing electricity (as embodied by the energy provider's cost of capital). It is beyond the scope of this report to evaluate the appropriate risk-adjusted hurdle rate for specific end-users, though it seems clear that the hurdle rates of energy delivery and energy efficiency are significantly different.

Availability: These barriers prevent adoption even for end-users who would choose to capture energy efficiency opportunities if they could

Adverse bundling or "gold plating," situations in which the energy efficient characteristic of a measure is bundled with premium features, or is not available in devices with desirable features of higher priority, and is therefore not selected

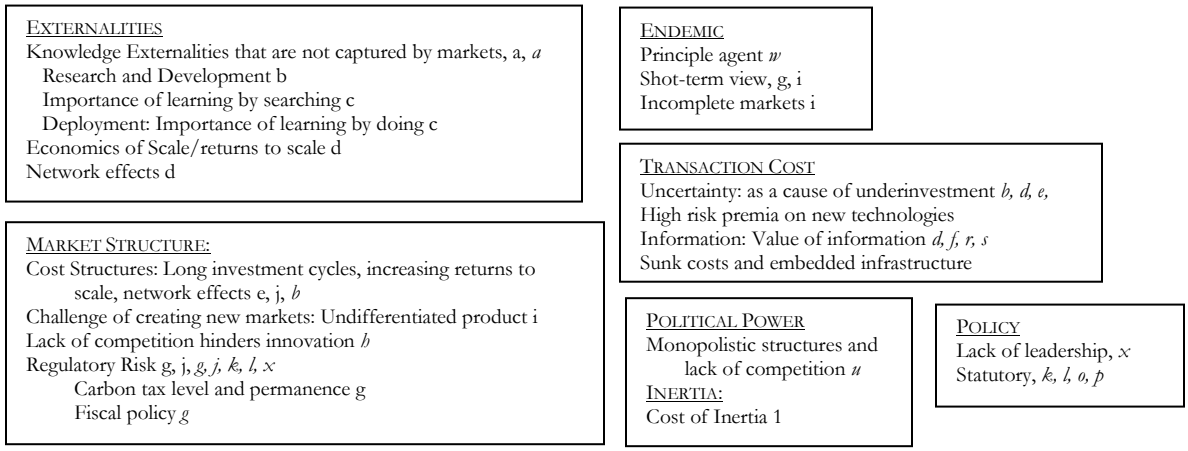
Capital constraints and access to capital, both access to credit for consumers and firms and (in industry and commerce) competition for resources internally within balance-sheet constraints. Energy efficiency projects may compete for capital with core business projects.

Product (and service) availability in the supply chain; energy efficient devices may not be widely stocked or available through customary purchasing channels, or skilled service personnel may not be available in a particular market

Inconsistent quality of installation (sizing, sealing and charging, code compliance and enforcement) and improper use eliminates savings

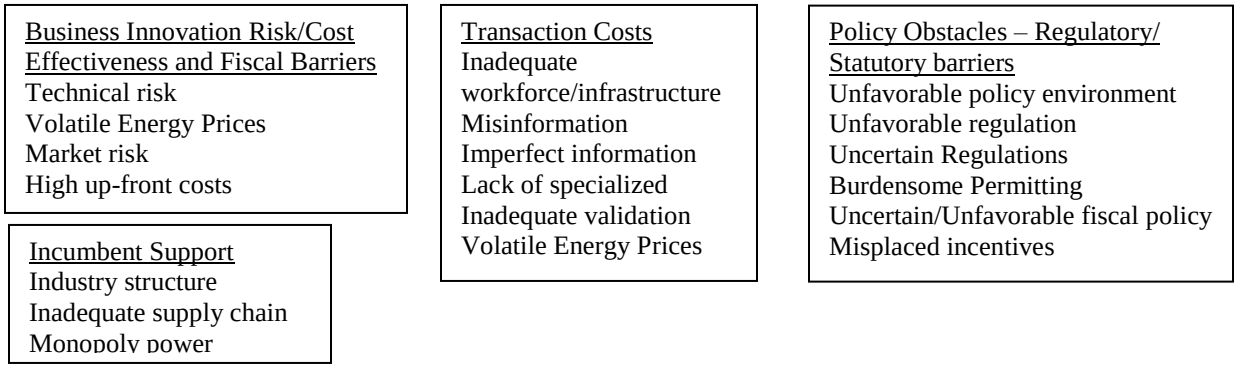
CONCEPTUAL SPECIFICATION FOR THE CLIMATE CHANGE ANALYSIS

Resources for The Future



Oak Ridge

Causes of Carbon Lock-In



Sources:

Lower case letters (a) from Raymond J. Kopp and William A Pizer, *Assessing U.S. Climate Policy Options* (Washington, D.C.: November 2007)

***Italicized Letters (a) are from* Marylin A. Brown, et al., *Carbon Lock-In: Barriers to Deploying Climate Mitigation Technologies,* Oak ridge National Laboratory, January 2008.**

a) Public Goods: Similarly, rationales for public support of technology demonstration projects tend to point to the… inability of private firms to capture the rewards for rewards for designing and constructing first-of-a-kind facilities. (p. 120)

(b) R&D tends to be underprovided in a competitive market because its benefits are often widely distributed and difficult to capture by individual firms…. economics literature on R&D points to the difficulty firms face in capturing all the benefits from their investments in innovation, which tend to spill over to other technology producers and users.. (pp. 118-120); In addition, by virtue of its critical role in the higher education system, public R&D funding will continue to be important in training researchers and engineers with the skill necessary to work in either the public or private sector to product GHG-reducing technology innovations (p. 120)… Generic public funding for research tends to receive widespread support based on significant positive spillovers that are often associated with the generation of new knowledge. (p. 136).

(c) Another potential rationale involves spillover effects that he process of so-called "learning-by-doing" – a term that describes the tendency for production costs to fall as manufacturers gain production experience."(p. 136)

(d) Network Effects: Network effects provide a motivation for deployment policies aimed at improving coordination and planning – and where appropriate, developing compatibility standards – in situations that involve interrelated technologies, particularly within large integrated systems (for example, energy productions, transmission, and distribution networks). Setting standards in a network context may reduce excess inertia (for example, the so-called chicken-and-egg problems with alternative

fuel vehicles), while simultaneously reducing search and coordination costs, but standard scan also reduce the diversity of technology options offered and may impede innovation over time. (p. 137)

(e) Similarly, rationales for public support of technology demonstration projects tend to point to the large expense; high degree of technical, market and regulatory risk; and inability of private firms to capture the rewards for rewards for designing and constructing first-of-a-kind facilities. (p. 120)

(f) Finally, incomplete insurance markets may provide a rationale for liability protection or other policies for certain technology options (for example, long-term CO2 storage). (p. 137)

(g) Regulatory risk: Similarly, rationales for public support of technology demonstration projects tend to point to the… high degree of technical, market and regulatory risk. The problem of private-sector under investment in technology innovation may be exacerbated in the climate context where the energy assets involved are often very-long lives and where the incentives for bringing forward new technology rest heavily on domestic and international policies rather than natural market forces. Put another way, the development of climate-friendly technologies has little market value absent a sustained, credible government commitment to reducing GHG emissions. (p. 120)

(h) The mismatch between near-term technology investment and long-term needs is likely to be even greater in situation where the magnitude of desired GHG reductions can be expected to increase over time. If more stringent emissions constraint will eventually be needed, society will benefit from near-term R&D to lower the cost of achieving those reductions in the future. (p. 120)."

(i) Finally, incomplete insurance markets may provide a rationale for liability protection or other policies for certain technology options (for example, long-term CO2 storage, (p.137)."

(j) The problem of private-sector under investment in technology innovation may be exacerbated in the climate context where the energy assets involved are often very-long lives and where the incentives for bringing forward new technology rest heavily on domestic and international policies rather than natural market forces… "Put another way, the development of climate-friendly technologies has little market value absent a sustained, credible government commitment to reducing GHG emissions (p.12).

Cost-Effectiveness Barriers

a) External Benefits and Costs: External benefits of GHG-reducing technologies that the owners of the technologies are unable to appropriate (e.g., GHG emission reductions from substitutes for high GWP gases and carbon sequestration).

b) External costs associated with technologies using fossil fuels (e.g., GHG emissions and health effects from small particles) making it difficult for higher priced, GHG-reducing technologies to compete.

c) High Costs: High up-front costs associated with the production and purchase of many low carbon technologies; high operations and maintenance costs typical of first-of-a-kind technologies; high cost of financing and limited access to credit especially by low-income households and small businesses.

d) Technical Risks: Risks associated with unproven technology when there is insufficient validation of technology performance. Confounded by high capital cost, high labor/operating cost, excessive downtime, lack of standardization, and lack of engineering, procurement and construction capacity, all of which create an environment of uncertainty.

e) Market Risks: Low demand typical of emerging technologies including lack of long-term product purchase agreements; uncertainties associated with the cost of a new product vis-à-vis its competitors and the possibility that a superior product could emerge; rising prices for product inputs including energy feedstocks; lack of indemnification.

f) Lack of Specialized Knowledge: Inadequate workforce competence; cost of developing a knowledge base for available workforce; inadequate reference knowledge for decision makers.

Fiscal Barriers

g) Unfavorable Fiscal Policy: Distortionary tax subsidies that favor conventional energy sources and high levels of energy consumption; fiscal policies that slow the pace of capital stock turnover; state and local variability in fiscal policies such as tax incentives and property tax policies. Also includes various unfavorable tariffs set by the public sector and utilities (e.g., import tariffs for ethanol and standby charges for distributed generators) as well as unfavorable electricity pricing policies and rate recovery mechanisms.

h) Fiscal Uncertainty Short-duration tax policies that lead to uncertain fiscal incentives, such as production tax credits; uncertain future costs for GHG emissions.

Regulatory Barriers

i) Unfavorable Regulatory Policies: Distortionary regulations that favor conventional energy sources and discourage technological innovation, including certain power plant regulations, rules impacting the use of combined heat and power, parts of the federal fuel economy standards for cars and trucks, and certain codes and standards regulating the buildings industry; burdensome and underdeveloped regulations and permitting processes; poor land use planning that promotes sprawl.

j) Regulatory Uncertainty: Uncertainty about future regulations of greenhouse gases; uncertainty about the disposal of spent nuclear fuels; uncertain siting regulations for off-shore wind; lack of codes and standards; uncertainty regarding possible future GHG regulations.

Statutory Barriers

k) Unfavorable Statutory Policies: Lack of modern and enforceable building codes; state laws that prevent energy saving performance contracting.

l) Statutory Uncertainty: Uncertainty about future statutes including renewable and energy efficiency portfolio standards; unclear property rights relative to surface injection of CO2, subsurface ownership of CO2 and methane, and wind energy.

Intellectual Property Barriers

m) High Intellectual Property

n) Transaction Costs: High transaction costs for patent filing and enforcement, conflicting views of a patent's value, and systemic problems at the USPTO

o) Anti-competitive Patent Practices Techniques such as patent warehousing, suppression, and blocking.

p) Weak International Patent Protection: Inconsistent or nonexistent patent protection in developing countries and emerging markets.

q) University, Industry, Government Perceptions: Conflicting goals of universities, national laboratories, and industry concerning CRADAs and technology commercialization.

Other Barriers

r) Incomplete and Imperfect Information: Lack of information about technology performance – especially trusted information; bundled benefits and decision-making complexities;

s) High cost of gathering and processing information; misinformation and myths; lack of sociotechnical learning; and lack of stakeholders and constituents

t) Infrastructure Limitations: Inadequate critical infrastructure – including electric transmission capabilities and long-term nuclear fuel storage facilities; shortage of complementary technologies that encourage investment or broaden the market for GHG-reducing technologies; insufficient supply and distribution channels; lack of O&M facilities and other supply chain shortfalls

u) Industry Structure: Natural monopoly in utilities disenabling small-scale competition

\v) Industry fragmentation slowing technological change, complicating coordination, and limiting investment capital.

w) Misplaced Incentives: Misplaced incentives when the buyer/owner is not the consumer/user (e.g., landlords and tenants in the rental market and speculative construction in the buildings industry) – also known as the principal-agent problem.

x) Policy Uncertainty: Uncertainty about future environmental and other policies; lack of leadership

MARKET FAILURES, BARRIERS AND NON-ECONOMIC FACTORS

Neo Classical Economics

Explanations for the gap:

1. The gap is illusory
2. There are hidden or unaccounted for costs of energy efficiency investments
3. Consumer markets are heterogeneous
4. High discount rates assigned to energy efficiency investments resulting from perceived risk

Conditions that are known to cause market failure:

1. externalities
2. public goods
3. imperfect information
4. imperfect competition

Market Barriers

1. Situations involving Misplaced or Split Incentives (also called agency problems)
2. Limited Availability of Capital,
3. Market Power
4. Regulatory Distortions
5. Transaction Costs
6. Inseparability of energy efficiency features from other desirable or undesirable product features

Non-Economic Explanations

1. Rationality is only one of several decision-making heuristics that may be applied in a given decision-making situation.
2. Decision makers employ varying decision-making heuristics depending on the situation.
3. Decision-making units are often not individuals.
4. Decisions made by organizations are affected by a wide variety of social processes and heavily influenced by the behaviors of their leaders.

Organizational Influences:

Authority

Size

Hierarchy of needs (1. Health and Safety Requirements,2. Regulatory Compliance, 3. Corporate Improvement Initiatives, 4. Maintenance) 5. Productivity, 6. Importance of Energy Efficiency to Profitability

Management policy 1. Whether the organization has annual energy efficiency goals. 2. Whether reserves and budgets are established for funding energy efficiency investments. 3. Whether hurdle rates for energy efficiency investments are high or low. 4. The review process that is to be used to evaluate energy efficiency improvements. 5. Who is responsible for "managing" the company's energy efficiency program).

Sources: Edward Vine, 2009, *Behavior Assumptions Underlying Energy Efficiency Programs For Businesses,* California Institute for Energy and Environment, January.

APPENDIX C

EMPIRICAL EVIDENCE SUPPORTING THE MARKET IMPERFECTION AND POLICY ANALYSIS

***Energy Efficiency Performance Standards: The Cornerstone of Consumer-Friendly Energy Policy*, October 2013. (Updated)**

This Appendix presents an update of sources and citations from our review of the empirical literatures that supports the existence of an "efficiency gap" that is caused by a number of market imperfections and demonstrates the close parallel in the climate change literature. analysis in this Chapter. We present the sources in alphabetical order, with each source having a number. The numbers from the tables correspond to the numbers in the source list. The numbering enables us to assign each source to a specific market imperfection or policy conclusion. Many of the sources are multifaceted, so they appear several times.

The citations are presented next. Lower case letters refer to citation from the efficiency gap literature. Uppercase letters refer to citations from the climate change literature. Here we use the short form citation to identify the source in the alphabetical list. We have tried to extract quotes that bear directly on the area they are listed.

EMPIRICAL EVIDENCE SUPPORTING THE MARKET IMPERFECTION AND POLICY ANALYSIS

Schools of Thought/ Imperfection	Efficiency	Climate
Traditional		
Externalities		
Public goods & Bads	28, 55, a, b	24,132, 177, 197, ZL
Basic research/Stock of Knowledge		46, 37, N
Network effects	127,.ak	134, I
Learning-by-doing & Using	47, i	134, 105,120, 153 E
Localization		101, 153, 182, H
Industry Structure	122, 127, 163, 167	
Imperfect Competition		
Concentration	16, m	
Barriers to entry		
Scale	39, r	
Cost structure		44, 106, 134, I
Switching costs	165, t	
Technology	136, w	
R&D		90, 143, 15, E
Investment		
Marketing		
Bundling: Multi-attribute	162, 21, 116, z	
Cost-Price		
Limit impact of price	74, 116,, ac	
Sluggish Demand/Fragmented Mkt.		82, 97, 110, W
Limited payback	74, 165, ae	
Behavioral	117,133,144,149,159,173	
Motivation & Values	6, 10, h	39, ZM
Influence & Commitment		
Custom	145, 146	
Social group & status	6, h	97, ZN
Perception	13, al	
Bounded Vision/Attention	1,162, k	
Prospect/ Risk Aversion	151,165, l	
Calculation.		78, Z
Bounded rationality	10, 75, d, o	
Limited ability to process info	4, q	
Heuristic decision making	95, s	
Discounting difficulty	47,95,96,113,136, v	

Schools of Thought/ Imperfections	Efficiency	Climate
Transaction Cost/ Institutional		
Search and Information	88, 108	
Imperfect information	10, 100, n	19, 62, 90, U
Availability	10, 185, d	
Accuracy		
Search cost	41, 185, u	
Bargaining		
Risk & Uncertainty	32, 33, 165, t	42, 83, 103, 180, 188, R
Liability		
Enforcement		
Fuel Price		82, 134.
Sunk costs		83
Hidden cost	185, ab	106
High Risk Premia		106, T
Incomplete Markets		82, 97, 179
Endemic Imperfections		
Asymmetric Info		
Agency	72, 163, 185, c, ad	83, 193, Q
Adverse selection	41, e	79, 44, X
Perverse incentives	167, f	
Lack of capital		
Political Power & Policy		
Monopoly/lack of competition		101, 155, 187, 188, ZB
Incumbent power		182, ZA
Institutional support	167, af	
Inertia	136, ag	83, 1, 69, 106, M, V
Regulation	al	
Price	41, 88, 121, ah	
Aggregate, Avg.-cost	95, ai	
Allocating fuel price volatility		82, 98, 203, O
Permitting		
Lack of commitment	108, aj	83, 110, 156, 181,

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2 Allcott, Hunt and Nathan Wozny, 2011, *Gasoline Prices, Fuel Economy and the Energy Paradox?",* MIT, Working Paper.
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Citations

a. Macroeconomic: Edelstein and Killian, 2009, p. 13, [T]he cumulative effects on real consumption associated with energy price shocks are quantitatively important. We showed that the responses of real consumption aggregates are too large to reflect the effects of unanticipated change in discretionary income alone. Our analysis suggests that the excess response can be attributed to shifts in precautionary savings and to changes in the operating costs of energy using durables.

b. Committee On Health, Environmental, And Other External Costs And Benefits Of Energy Production And Consumption, **2011,** p. I, [D]espite energy's many benefits, most of which are reflected in energy market prices, the production, distribution, and use of energy also cause negative effects. Beneficial or negative effects that are not reflected in energy market prices are termed "external effects" by economists. In the absence of government intervention, external effects associated with energy production and use are generally not taken into account in decision making. When prices do not adequately reflect them, the monetary value assigned to benefits or adverse effects (referred to as damages) are "hidden" in the sense that government and other decision makers, such as electric utility managers, may not recognize the full costs of their actions. When market failures like this occur, there may be a case for government interventions in the form of regulations, taxes, fees, tradable permits, or other instruments that will motivate such recognition.

c. UNIDO, 2011, p. 19, Asymmetric information exists where the supplier of a good or service holds relevant information, but is unable or unwilling to transfer this information to prospective buyers. The extent to which asymmetric information leads to market failure will depend upon the nature of the good or service…. In contrast to energy commodities, energy efficiency may only be considered a search good when the energy consumption of a product is clearly and unambiguously labelled and when the performance in use is insensitive to installation, operation and maintenance conditions. But for many goods, the information on energy consumption may be missing, ambiguous or hidden, and the search costs will be relatively high. In the absence of standardised performance measures or rating schemes, it may be difficult to compare the performance of competing products. Taken together, these features tend to make energy efficiency closer to a *credence good* and hence more subject to market failure. Thus, to the extent that energy supply and energy efficiency represent different means of delivering the same level of energy service, the latter is likely to be disadvantaged relative to the former. The result is likely to be overconsumption of energy and under-consumption of energy efficiency.

d. Alcott, 2011, p. 1, Results show that beliefs are both highly noisy, consistent with imperfect information and bounded computational capacity, and systematically biased in manner symptomatic of "MPG illusion;" Alcott and Wozny, 2010.

e. Davis, 2010, p. 1; Extensive analysis of U.S. and global markets support the conclusion that this is an important impediment to greater energy efficiency of consumer durables. "The results show that, controlling for household income and other household characteristics, renters are significantly less likely to have energy efficient refrigerators, clothes washers and dishwashers."

f. UNIDO, 2011, p. 19, In some circumstances, asymmetric information in energy service markets may lead to the adverse selection of energy inefficient goods. Take housing as an example. In a perfect market, the resale value of a house would reflect the discounted value of energy efficiency investments. But asymmetric information at the point of sale tends to prevent this. Buyers have difficulty in recognising the potential energy savings and rarely account for this when making a price offer. Estate agents have greater resources than buyers, but similarly neglect energy efficiency when valuing a house. Since the operating costs of a house affect the ability of a borrower to repay the mortgage, they should be reflected in mortgage qualifications. Again, they are not. In all cases, one party (e.g., the builder or the seller) may have the relevant information, but transaction costs impede the transfer of that information to the potential purchaser. The result may be to discourage house builders from constructing energy efficient houses, or to discourage homeowners from making energy efficiency improvements since they will not be able to capture the additional costs in the sale price.

g. Ozaki and Sevastyanove, 2009.

h. Claudy and O'Dricoll, 2008, p. 11, "A growing body of literature around energy conservation contends that investment into energy efficiency measure is often motivated by "conviction" rather than "economics." Behavioral factors, including attitudes and values, explain a greater amount of variation in proenvironmental behaviour and provide valuable insights for policy makers and analysts."

i. Desroches, 2011, p. 1, Costs and prices generally fall in relations to cumulative production, a phenomenon known as experience and modeled as a fairly robust empirical experience curve… These experience curves… incorporated into recent energy conservation standards… impact on the national modeling can be significant, often increasing the net present value of potential standard levels… These results imply that past energy conservation standards analyses may have undervalued the economic benefits of potential standard levels.

j. UNIDO, 2011, p. iii, If an organization has insufficient capital through internal funds, and has difficulty raising additional funds through borrowing or share issues, energy efficient investments may be prevented from going ahead. Investment could also be inhibited by internal capital budgeting procedures, investment appraisal rules and the short-term incentives of energy management staff.

k. Alcott, 2009, p. 1. "I provide evidence to suggest that at least some of this effect is because consumers' attention is malleable and non-durable." UNIDO, pp. viii, Owing to constraints on time, attention, and the ability to process information, individuals do not make decisions in the manner assumed in economic models. As a consequence, they may neglect opportunities for improving energy efficiency, even when given good information and appropriate incentive consumers do not attempt to maximise their utility or producers their profits.

l. Sardiano, 2007, p. 1417, Decision making process to invest in energy efficiency improvement, like other investments, is a function of the behavior of individual or of various actors within the industrial firm. In this context, managerial attitudes toward energy conservation are also important factors… [E]nergy efficiency measures are often overlooked by management because it is not a core business activity and it is thus not worth much attention.

m. Blumstein, 2013, p. 5, [T]he existence of market power dampens the responsiveness of suppliers of goods or services to consumer demand, as actors in a monopolistic or oligopolistic setting can more or less set prices and quality attributes.

n. Atari, et. al., 2010, p. 1. For a sample of 15 activities, participants underestimated energy use and savings by a factor of 2.8 on average, with small overestimates for lower-energy activities and large, underestimates for high-energy activities.

o. Green, German and Delucchi, 2009, p. 203; "The uncertainty/loss aversion model of consumers' fuel economy decision making implies that consumers will undervalue expected future fuel savings to roughly the same degree as manufacturers' perception that consumers demand short payback periods."

p. UNIDO, 2011, p. iii, Lack of information on energy efficiency opportunities may lead to cost-effective opportunities being missed. In some cases, imperfect information may lead to inefficient products driving efficient products out of the market. Information on: the level and pattern of current energy consumption and comparison with relevant benchmarks; specific opportunities, such as the retrofit of thermal insulation; and the energy consumption of new and refurbished buildings, process plant and purchased equipment, allowing choice between efficient and inefficient options.

q. Atari, et. al., 2010, p. 1. For a sample of 15 activities, participants underestimated energy use and savings by a factor of 2.8 on average, with small overestimates for lower-energy activities and large, underestimates for high-energy activities."

r. Montalvo, 2007, p. S10, Due to the size of investment and longevity or production processes it is very likely that the diffusion of new processes will occur in an incremental way.

s. Ito, 2010, p. 1, Evidence from laboratory experiments suggests that consumers facing such price schedules may respond to average price as a heuristic. I empirically test this prediction using field data.

t. Sardianou, 2007, p. 1419, Our empirical results also confirm that organizational constraints and human related factors can be thought of as barriers in incorporating the energy saving technology in incorporating the energy saving technology in the existing production process.

u. Sardianou, 2007, p. 1419, Having limited information with regard to energy conservation opportunities and their profitability is considered an obstacle…. Other possible barriers include lack of documentation of energy data.

v. Kurani and Turrentine, 2004, p. 1, One effect of limited knowledge is that when consumers buy a vehicle, they do not have the basic building blocks of knowledge to make an economically rational decision. When offered a choice to pay more for better fuel economy, most households were unable to estimate potential savings, particularly over periods of time greater than one month. In the absence of such calculations, many households were overly optimistic about potential fuel savings, wanting and thinking they could recover an investment of several thousand dollars in a couple of years.

w. Montalvo, 2007, p. A10, Finally, firms face the challenge of technological risk. The gains promised by new technologies have yet to materialize, a situation that contrasts strongly with the perceived reliability of the current, familiar operating process. In the literature on technology management it has been established that adoption or development of new production processes implies the capacity to integrate new knowledge and large organizational change.

x. UNIDO, 2011, p. iii, The short paybacks required for energy efficiency investments may represent a rational response to risk. This could be because energy efficiency investments represent a higher technical or financial risk than other types of investment, or that business and market uncertainty encourages short time horizons.

y. Montalvo, 2007, p. s10, Closely related to these technological opportunities are the firm and sector level capabilities to actually adopt new technologies. It has been reported that insufficient availability of expertise in clear production (eco-design) the current training and clean technology capacity building at the sector level and the insufficient understanding and experience in cleaner production project development and implementation, play a role in the adoption of new cleaner production processes. These factors can be expected to become even more critical at the level of small- and medium sized enterprises..

z. Gabaix and Laibson, 2005, p. 1; "We show that information shrouding flourishes even in highly competitive markets, even in markets with costless advertising, and even when the shrouding generation allocational inefficiencies." Hosain and Morgan, Brown, Hossain and Morgan

aa. Sallee, 2012, "The possibility of rational inattention has two key implications. First, if consumers rationally ignore energy efficiency, this could explain the energy paradox. In equilibrium, firms will underprovide energy efficiency if consumers ignore it. If true, this would qualitatively change the interpretation of empirical work on the energy paradox. Most empirical work tests for the rationality of consumer choice across goods that are actually sold in the market. If rational inattention leads to an inefficiency set of *product offerings* (emphasis added), consumer might choose rationally among goods in equilibrium but a paradox still exists. Second, if consumers are rationally inattentive to energy efficiency, this could provide direct justification for regulatory standards and "no tech policies, such as the Energy Star Label System."

ab. UNIDO, 2011, p. iii, Hidden costs Engineering-economic analyses may fail to account for either the reduction in utility associated with energy efficient technologies, or the additional costs associated with them. As a consequence, the studies may overestimate energy efficiency potential. Examples of hidden costs include overhead costs for management, disruptions to production, staff replacement and training, and the costs associated with gathering, analyzing and applying information. General overhead costs of energy management: employing specialist people (e.g., energy manager); energy information systems (including: gathering of energy consumption data; maintaining sub metering systems; analyzing data and correcting for influencing factors; identifying faults; etc.); energy auditing; Costs involved in individual technology decisions: i) identifying opportunities; ii) detailed investigation and design; iii) formal investment appraisal; formal procedures for seeking approval of capital expenditures; specification and tendering for capital works to manufacturers and contractors additional staff costs for maintenance; replacement, early retirement, or retraining of staff; disruptions and inconvenience; Loss of utility associated with energy efficient: problems with safety, noise, working conditions, service quality etc. (e.g., lighting levels); extra maintenance, lower reliability.

ac. Li, Timmins and von Haefen, 2009, "we are able to decompose the effects of gasoline prices on the evolution of the vehicle fleet into changes arising from the inflow of new vehicles and the outflow of used vehicles. We find that gasoline prices have statistically significant effects on both channels, but their combined effects results in only modest impacts on fleet fuel economy. The short-run and long-run elasticities of fleet fuel economy with respect to gasoline prices are estimated at 0.022 and 0.204 in 2005. "

ad. Committee to Assess Fuel Economy, 2010, p. 2, The [Medium and Heavy Duty] truck world is more complicated. There are literally thousands of different configurations of vehicle including bucket trucks, pickup trucks, garbage trucks, delivery vehicles, and long-haul trailers. Their duty cycles vary greatly… the party responsible for the final truck configuration is often not well defined.

ae. Sardianou, 2007, p. 1419, The lack of access to capital (76%) and the slow rate of return (74%) of energy savings investments are categorized as barriers.

af. UNIDO, 2011, p. iii, Routines as a response to bounded rationality the use of formal capital budgeting tools within investment decision-making. Other types of rules and routines which may impact on energy efficiency include: operating procedures (such as leaving equipment running or on standby); safety and maintenance procedures; relationships with particular suppliers; design criteria; specification and procurement procedures; equipment replacement routines and so on.

ag. Montalvo, 2007, A11, organization capabilities refer to the firm's endowments and capabilities to carry out innovation… When the knowledge is not present in the firm adoption will depend on the firm's capacity to overcome shill lock-in, and to unlearn and acquire new skills. UNIDO, Inertia and the status quo bias: Routines can be surprisingly persistent and entrenched. … This type of problem has been labeled inertia within the energy efficiency literature and identified as a relevant explanatory variable for the efficiency gap.

ah. Sardianou, 2007, p. 1419, Uncertainty about future energy prices (62%) is also characterized as a barrier [leading] to the postponement of energy efficiency measures.

ai. Ito, 2010, p. 1, I find strong evidence that consumers respond to average price rather than marginal or expected marginal price.

aj. UNIDO, 2011, p. 67, The government does not give financial incentives to improve energy efficiency, Lack of coordination between different government agencies, Lack of enforcement of government regulations, There is a lack of coordination between external organizations; Sardianou, 2007, p. 1402, [B]ureaucratic procedure to get government financial support is a barrier to energy efficiency improvements for the majority (80%) of industries.

aj. Consumers Union, 2012, p. 8, "this suggests that many consumers are misinformed about the program

ak. Lutzenheiser, et al., (2001, cited in Blumstein, 2013), p. viii, The commercial building "industry" is in fact a series of linked industries arrayed along a "value chain" or "value stream" where each loosely coupled link contributes value to a material building in process. Each link, while aware of the other links in the process, is a somewhat separate social world with its own logic, language, actors, interests, and regulatory demands. For the most part "upstream" actors constrain the choices and actions of "downstream" actors.

al. Jessoe and Rapson, 2013, p. 34, These results confirm the practical importance of one of economics' most ubiquitous assumptions – that decision makers have perfect information. Indeed, the absence of perfect information is likely to cause substantial efficiency loses both in this setting and others in which quantity is also infrequently or partially observed by decision makers.

CLIMATE CHANGE ANALYSIS

A Walz, Schleich and Ragwitz, 2011, p. 16, Power prices, however, are not found to drive patent activity. Hence power prices alone would likely not be sufficient to spur innovation activities in wind and arguably also other, currently less cost-efficient renewable technologies.

B The stability and long term vision of policy target setting are important policy style variables, which contribute to the legitimacy of technology and provide guidance of search…

C Calel and Dechezloprete, 2012, p. 1. "[M]ore refined estimates that combine matching methods with different-in-difference provide evidence that the EU ETS has not impacted the direction of technological change. This finding appears to be robust to a number of stability and sensitivity checks. While we cannot completely rule out the possibility that the EU ETS has impacted only large companies for which suitable unregulated comparators cannot be found, our findings suggest that the EU ETS so far has had at best a very limited impact on low-carbon technological change.

E Massetti and Nicita, 2010, p. 17, We find that a [carbon] stabilization policy together with an R&D policy targeted at the only energy sector is significantly less costly than the stabilization policy alone. We find that energy R&D does not crowd-out non-energy R&D, and thanks to intersectoral spillovers, the policy induced increase in energy efficiency R&D spills over to the non-energy sector, contributing to knowledge accumulation and the reduction of knowledge externalities.

G Qui and Anadon, pp. 782, The size of the wind farm is another significant factor in all specifications… indicate that a doubling in wind farm size could lead to price reductions of about 8.9%.

H Qui and Anadon, pp. 782, Localization rate is a significant factor in all specifications… indicate that a doubling of localization rate was associated with reductions in wind electricity price ranging from 10.9% to 11,4%.

I de Cian and Massimo, 2011, p. 123, Uncertainty and irreversibility are two features of climate change that contribute to shape the decision making process. Technology cost uncertainty can depress the incentive to invest. The risk of underinvestment is even more severe considering that energy infrastructure has a slow turnover. Capital irreversibility and uncertainty heighten the risk of locking into existing fossil-fuel-based technologies. Additional investments are sunk costs that increase the opportunity cost of acting now… The result is reinforced when uncertain costs have a large variance, showing that investments decrease with risk. Jamasb and Nicita, (2007, p 8) R&D activity can be subject to three main types of market failure namely indivisibility, uncertainty and externalities.

K Gross, et al. 2012, p. 18, In the energy sector, such "network externalities" rise for example in the physical structures of large scale high voltage alternating current (AC) power grids themselves (themselves a reminders of early energy planners' desire to locate power stations close to the source of coal) which now provides a cost advantage to large scale centralized station over distributed alternatives.

M Grimaud and Lafforgue, 2008, p. 1…20,The main results of the paper are the following: i) both a carbon tax and a green research subsidy contribute to climate change mitigation; ii) R&D subsidies have a large impact on the consumption, and then social welfare, as compared to the carbon tax alone; IV) those subsidies allow to spare the earlier generations who are, on the other hand, penalized by a carbon tax….In a second-best world, a carbon tax used alone leads to a higher social cost (with respect to first-best) than a research policy alone;

N Jamasb and Kohler, 2007, p. 9, Information technology and pharmaceuticals, for example, are both characterized by high degrees of innovation, with rapid technological change financed by private investment

amounting typically to 10-20% of sector turnover. This is in dramatic contrast with power generation, where a small number of fundamentals technologies have dominated for almost a century and private sector RD&D has fallen sharply with privatization of energy industries to the point where it is under 0.4% of turnover.

O Gross, et al., 2012, p. 14, Capital intensive, zero fuel cost power stations like wind farms, need to cover their long run average costs—namely the cost of capital. They can neither actively affect/set marginal power prices nor respond to power price changes, except to curtail output, which does not save costs (as there are no fuel cost to save), but does lose revenue. However, carbon prices only affect the marginal price of fuel and power. We should therefore expect that an emissions trading scheme will encourage fuel switching from coal to gas, and efficiency first and renewable energy (or indeed nuclear) investment last. This is exactly what we have seen in reality.

Q Gross, 210, p. 802, "A range of factors that relate to the amount and quality of information about technology costs and risks available to policymakers and market participants are relevant when considering incentives and investment in new technologies: Policymakers may have relatively poor information about costs for emerging technologies. 'Appraisal optimism' (where technology/project developers under estimate the cost of unproven technology/systems) is a common feature in the development of new technologies. When providing cost data to policymakers technology developers or equipment suppliers may also have incentives to up or play down costs and potential according to circumstances. Where new or unproven technologies are being utilized for the first time, information about costs may be limited for all concerned... There may be an 'option value' to potential investors in waiting (delaying investment) where there is poor information and high levels of technology and market risk. The first conclusion is that policymaking in the energy area needs new tools of analysis that can deal with the market risks associated with policy design… In particular, policymakers need to be mindful of the role of revenue risk as well as cost risk in the business case for investment.

R Fuss and Szolgayosva, 2010, p.2938, We find that the uncertainty associated with the technological progress of renewable energy technologies leads to a postponement of investment. Even the simultaneous inclusion of stochastic fossil fuel prices in the same model does not make renewable energy competitive compared to fossil-fuel-fired technology in the short run based on the data used. This implies that policymakers have to intervene if renewable energy is supposed to get diffused more quickly. Otherwise, old fossil-fuel-fired equipment will be refurbished or replaced by fossil-fuel-fired capacity again, which enforces the lock-in of the current system into unsustainable electricity generation..

T Gross, Blyth and Heponstall, 2012, p. 802.The first conclusion is that policymaking in the energy area needs new tools of analysis that can deal with the market risks associated with policy design… In particular, policymakers need to be mindful of the role of revenue risk as well as cost risk in the business case for investment.

U Horbach, 2007, p. 172, Environmental management tools help to reduce the information deficits to detect cost savings (especially material and energy savings) that are an important driving force of environmental innovation.

V Weyant, 2011, p. 677, The infrastructure for producing, distributing, and promoting the industries' current products require large investments that have already been incurred.

W Jamasb and Kohler, 2007, Thus, the 'market pull' forces reach deep into the innovation chain…This is in contrast with power generation, where a small number fundamental and private sector RD&D has fallen sharply with privatization of energy industries. technologies have dominated for almost a century and private RD&D has fallen sharply with privatization... In turn, market pull measures are devised to promote technical change by creating demand and developing the market for new technologies.

X Weyant, 2011, p. 675, The situation can develop from several different types of market failure, including poor or asymmetric information available to purchasers, limits on individual's ability to make rational decisions because of time or skill constraints, principle agent incongruities... and lack of financing opportunities.

Z Green, 2010, p. 6, The rational economic consumer considers fuel saving over the full life of a vehicle, discounting future fuel savings to present value. This requires the consumer to know how long the vehicle will remain in operation; he distances to be traveled in each future year, the reduction in the rate of fuel consumptions, and the future price of fuel…. The consumer must also estimate the fuel economy that will be achieved in real world driving based on the official estimate. Finally, the consumer must know how to make a discounted present value calculation, or must know how to obtain one… The utility-maximizing rational consumer has fixed preferences, possesses all complete and accurate information about all relevant alternatives, and has all the cognitive skills necessary to evaluate the alternatives. These are strict requirements indeed….

ZA Nicolli and Vona, p. 1, Our empirical results are consistent with predictions of political-economy models of environmental policies as lobbying, income and to a less extent, inequality have expected effects on policy. The brown lobbying power, proxied by entry barriers in the energy sector, has negative influence on the policy

indicators even when taking into account endogeneity in its effect. The results are also robust to dynamic model specifications and to the exclusion of groups of countries

ZB Weyant, 2011, p. 677, Further complicating matters, existing companies in energy-related industries --- those that produce energy, those that manufacture the equipment that produces, converts and uses energy, and those that distribute energy – can have substantial incentives to delay the introduction of new technologies. This can happen if their current technologies are more profitable than the new ones that might be (or have been) invented, or if they are in explicitly (oil and gas) or implicitly (electric generation equipment producers and automakers) oligopolistic structured, or if they are imperfectly regulated (electric and gas utilities). The incentive arises partly because the infrastructure for producing, distributing, and promoting the industries' current products require large investments that have already been incurred.

ZC Horbach, 2008, p. 172, An environmentally oriented research policy has not only to regard traditional instruments like the improvement of the technological capabilities of a firm but also the coordination with soft environmental policy instruments like the introduction of environmental management systems.

ZE Wilson, et al., p. 781, The institutions emphasized in our analytic framework are twofold: the propensity of entrepreneurs to invest in risky innovation activities with uncertain pay-offs; and shared expectation around an innovation's future trajectory. Other important and related institutions include law, markets and public policy. Public resources are invested directly into specific innovation stages, or are used to leverage private sector resources through regulatory or market incentives structured by public policy…. New technologies successfully diffuse as a function of their relative advantage over incumbent technologies. For energy technologies, this can be measured by the difference in cost and performance of energy service provision in terms of quality, versatility, environmental impact and so on. Many of these attributes of relative advantage can be shaped by public policy as well as the other elements of the innovation system.

ZF Walz, Schleich and Ragwitz, 2011, p. 5, The specific advantage of feed-in tariffs is seen in lower transaction costs and reduced risk perception for investors and innovators, which are extremely important especially for new entrants and for financial institutions.

ZH Walz, Schleich and Ragwitz, 2011, p. 16, Our econometric analyses also imply that the existence of targets for renewables/wind and a stable policy support environment are associated with higher patent activity.

ZLMaxim, 2014, 284, Measuring the sustainability of the energy sector has evolved around three main dimensions: environmental, economic and social.

ZMCroson, 2014, 336, This literature has often discussed how traditional policy instruments (like taxes), or traditional methods (like cost-benefit analysis), can be affected by behavioral concerns, including taxes crowding out public good contributions or the impact of hyperbolic discounting or reference dependent preferences on environmental policy. This research which integrates human limitations into environmental economics is refreshing, and shows great promise. Scholars, policy makers and politicians have enthusiastically embraced this research. One reason may be the increasing awareness of environmental problems, and of the evident difficulty in solving these problems using traditional instruments. Another reason may be the low cost of many behavioral interventions. An additional, more concealed, reason may be a general distrust in the market system and classical economics by individuals in these positions.

ZO Cordes and Schwesinger, 2014, passim, Proposition 1. Preference acquisition processes based upon social learning can override a technology's relative cost and/or hedonistic disadvantages and therefore lead to its diffusion in a population of interacting adopters…Proposition 2. If a dedicated cultural rolemodel takes effect in consumers' preference learning during certain critical time spans or "windows of opportunity", it can persistently promote the diffusion of a green technology…Proposition 3. State regulation that temporarily creates a niche for a green technology by preventing competitive impacts of other technologies can help decreasing its cost or hedonistic disadvantages by gaining adopters in the niche market. Subsequently, a technology can be able to diffuse further even after the removal of this kind of governmental protection… Proposition 4. Environmental policy instruments that comprise the promotion of "green preferences" via social learning in combination with measures to lower relative cost disadvantages can be expected to be more efficient and effective as to the fostering of a green technology's diffusion in a population of interacting adopters.

ZP Spence, et al., 2015, 550, We show that, although cost is likely to be a significant reason for many people to take up DSM measures, those concerned about energy costs are actually less likely to accept DSM. Notably, individuals concerned about climate change are more likely to be accepting. A significant proportion of people, particularly those concerned about affordability, indicated unwillingness or concerns about sharing energy data, a necessity for many forms of DSM. We conclude substantial public engagement and further policy development is required for widespread DSM implementation.

ZQ Zinaman, 2015, pp. 113…125, Rapid cost reductions—for example, of photovoltaic modules—have changed the economic landscape for what is feasible. Yet established asset bases, and their supporting business models and regulatory frameworks, still retain significant inertia in most power systems. These longstanding financial and institutional ‘‘legacy’’ arrangements promote incremental change…Whether the trends outlined in Section II are ‘‘headwinds’’ or ‘‘tailwinds’’ will depend on the orientation set by decisionmakers for their power systems. Policymakers and regulators can choose to let these external forces determine how power systems unfold, or they can promote policies and build regulatory and finance frameworks that drive the transformation toward a desired vision. As a final organizing principle, early and frequent stakeholder engagement will encourage the emergence of modern power systems that accommodate a broad set of interests and best serve citizens and energy customers.

ZR Zinaman, 2015, passim, Trends: Ten Trends: Renewable energy cost reductions, Innovations in data, intelligence, and system optimization, Energy security, reliability, and resilience goals, Evolving customer engagement, Bifurcated energy demands, Increased interactions with other sectors, Local and global environmental concerns over air emissions, Energy access imperatives, Increasingly diverse participation in power markets, Revenue and investment challenges. Power Sector Finance: Regulations on commercial banking risk, Risk-premium environment for investments, Interest rates on government bonds, Capital availability from development authorities, Tax structures, Credit rating of electric utilities, Price and availability of inputs, Market structure and valuation constructs, Policy and regulatory environment.

ZS Fratzscher, 2015, p. III, Utilities are experiencing an unprecedented change in their operating environment, which requires a broad reinvention of business models. Historically, a centralized and grid-connected power generation structure positioned utilities in the center of the power system, with a culture focused on regulators and mandates rather than innovation and customer service expectations. This utility business model is now profoundly questioned by the accelerated deployment of distributed energy resources and smart grid technologies, as well as profound changes in market economics and regulatory frameworks. This is a global trend, to which utilities and regulators around the world seek to find adequate solutions.

ZT Eichman, Joshua D., 2013, p.353 Three renewable deployment strategies are explored including all wind, all solar photovoltaic, and 50/50 mixture. Initially, wind is the preferred candidate from a cost and required installed capacity perspective; however, as the penetration increases excess wind generation encourages installation of solar. The 50/50 case becomes more cost competitive at high renewable penetrations (greater than 32.4%) and provides the highest system-wide capacity factor and CO2 reduction potential. Results highlight the value of optimizing the renewable deployment strategy to minimize costs and emphasize the importance of considering capacity factor and curtailment when representing the true cost of installing renewables.

ZU Yun Yang, Yun, Shijie Zhang, and Yunhan Xiao, 2015, p. 433, The introduction of energy distribution networks and/or storages has significant and similar effects on optimal system configuration and can improve the system's economic efficiency because of the elimination of some of the strong coupling relation between demands and generators.

ZZ Friebe, 2014, pp. 223-224, In fact, our qualitative results underline that in emerging markets Feed-in-Tariffs combined with guaranteed grid access are even more important than in industrialized countries. Both mechanisms considerably reduce comparatively high investment risk, which is typical for emerging countries… Our results show that in emerging markets – in addition to technology-specific factors – generic influencing factors such as transparency and legal security for international private sector organizations must be considered. We add to the (renewable) energy policy literature, which focuses on policy formulation, by emphasizing these implementation factors for emerging markets.

ZAA Green, German and Delucchi, 2009, p. 203; This suggests that increasing fuel prices may not be the most effective policy for increasing the application of technologies to increase passenger and light truck fuel economy. This view is supported by the similar levels of technology applied to U.S. and European passenger cars in the 1990s, despite fuel prices roughly three times higher in Europe. It is also circumstantially supported by the adoption by governments around the world of regulatory standard for light-duty vehicle fuel economy and carbon dioxide emissions.

ZAD Lizal, 2014, p. 114, Producers could, however, withhold part of production facilities (i.e., apply a capacity cutting strategy) and thereby push more expensive production facilities to satisfy demand for electricity. This behavior could lead to a higher price determined through a uniform price auction. Using the case of the England and Wales wholesale electricity market we empirically analyze whether producers indeed did apply a capacity cutting strategy. For this purpose we examine the bidding behavior of producers during high- and low-demand trading periods within a trading day. We find statistical evidence for the presence of capacity cutting by several producers, which is consistent with the regulatory authority's reports.

APPENDIX D
OVERESTIMATION OF COSTS IN REGULATORY PROCEEDINGS

***Energy Efficiency Performance Standards: The Cornerstone of Consumer-Friendly Energy Policy,* October 2013, pp. 28-32.**

While the aggregate data in Exhibit III-1 appear to suggest a very strong downward trend, the data for individual utilities suggest a moderate downward trend. Exhibit III-1 shows the trend line for one individual utility. The trend is very slightly negative. The authors suggest that declining costs for higher levels of efficiency can be explained by economies of scale, learning and synergies in technologies. As utilities do more of the cost effective measures, costs decline. Also, if technical potential is much higher than achievable savings, economies of scale and scope and learning could pull more measures in and lower costs. This explanation introduces an important area of analysis in the "energy gap" debate – learning curves.

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.

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 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.

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.[11]

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.[12]

A comparative study of European, Japanese and American auto makers 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. it did not export vehicles to Europe or Japan).

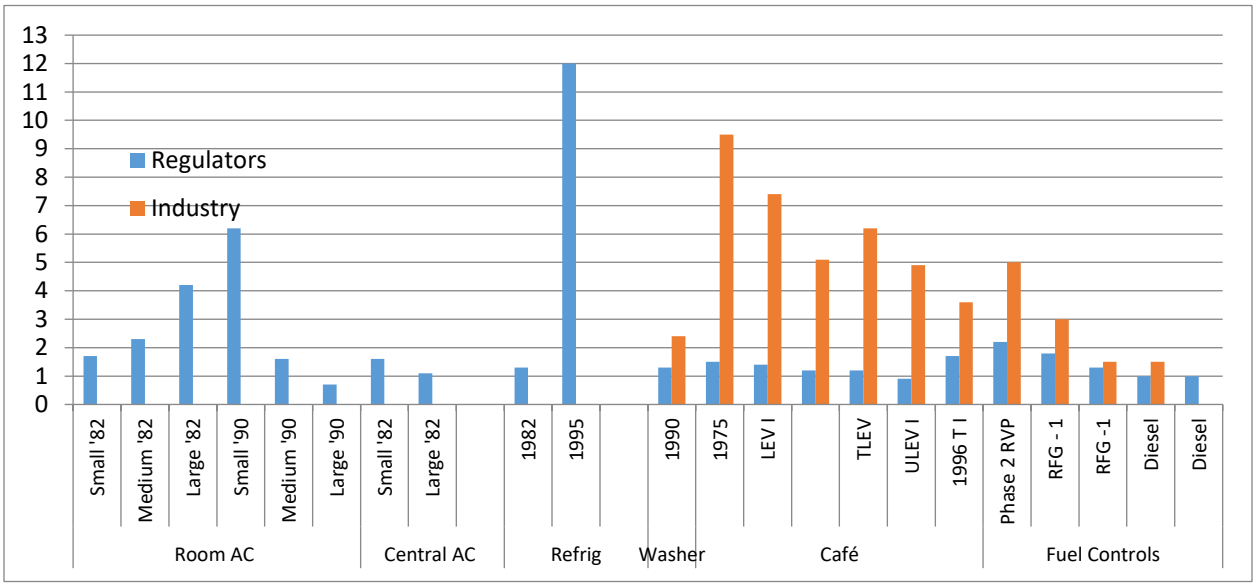
The European car industry is highly dynamic and innovative. Its R&D expenditures are well above average in Europe's manufacturing sector. Among the most important drivers of innovation are consumer demand (for comfort, safety and fuel economy), international competition, and environmental objectives 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…

[11] Dale, et. al., 2009, p. 1.
[12] Sperling, et al., 2004, p.p. 10-15.

> 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….
> 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.[13]

Exhibit III-4, 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 father off the mark, running three times higher for auto technologies.[14] 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."[15]

EXHIBIT III-4: 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 compliance under an assumption that there is no possibility of technological progress or strategic

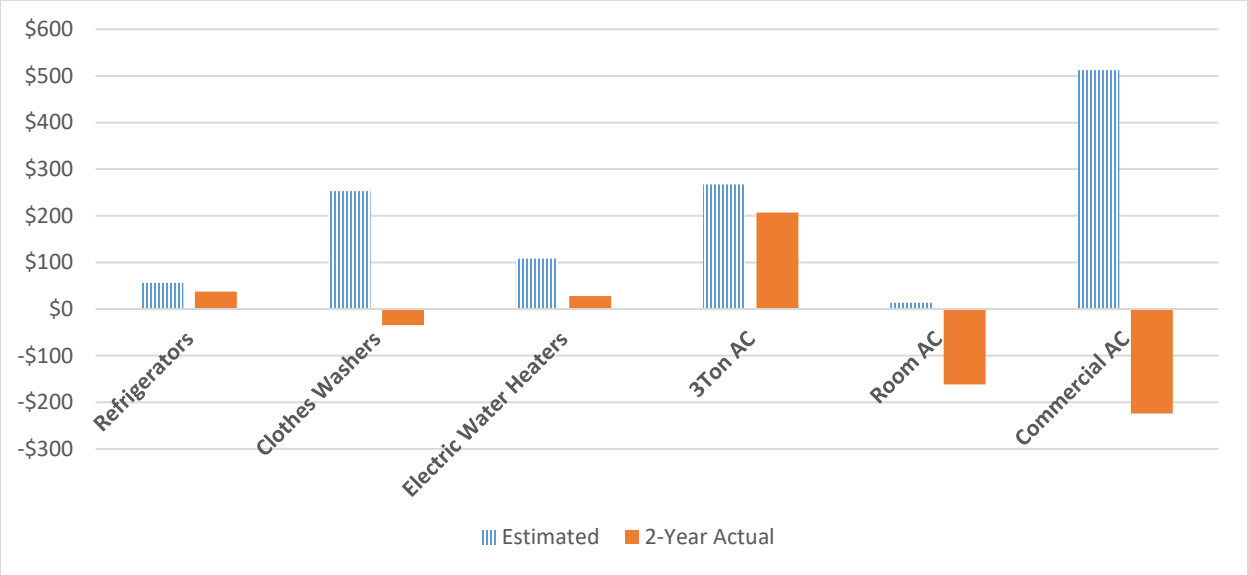
[13] Kuik, 2006,
[14] Hwang, and Peak, 2006.
[15] Harrington, 2006, p. 3.

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.[16]

A recent analysis of major appliance standards adopted after the turn of the century shows a similar and even stronger pattern (see Exhibit III-5). Estimated cost increases are far too high. 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.

EXHIBIT III-5: ESTIMATED AND ACTUAL COST INCREASES ASSOCIATED WITH RECENT STANDARDS FOR MAJOR APPLIANCES



Source: Steven Nadel and Andrew Delaski, *Appliance Stnadards: Comparing Predicted and Observed Prices,* American Council for an Energy Efficient Economy and Appliance Standards Awareness Project, July 2013.

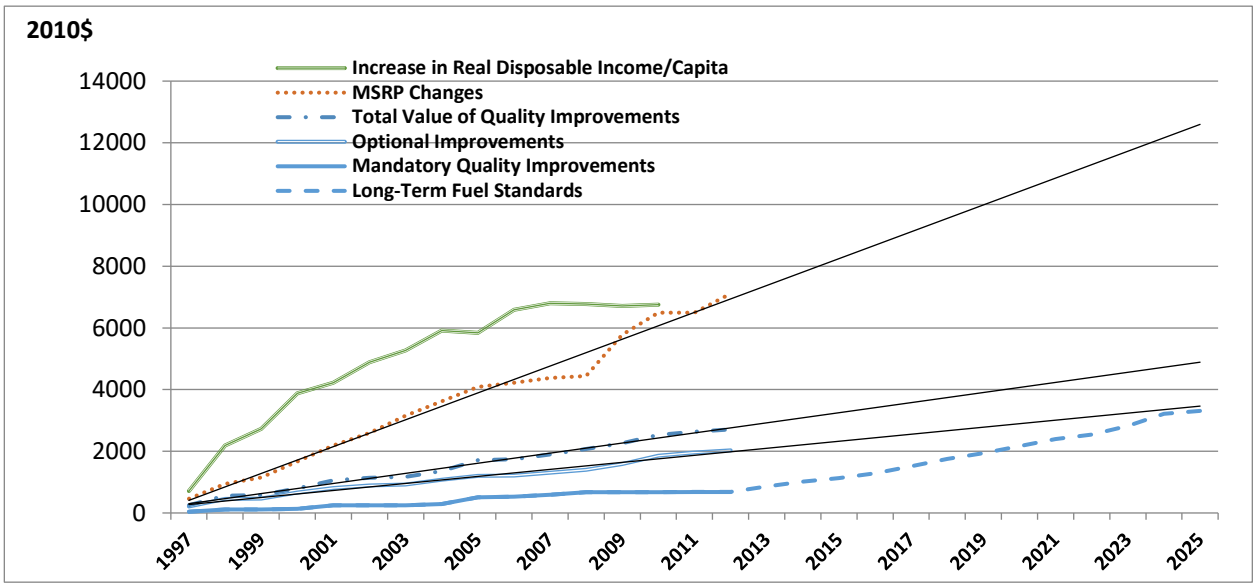
As shown in Exhibit III-6, in comments on the light duty truck and auto standards, CFA presented a historical analysis of cost increases associated with mandates that reflects the ability and strategy of producers to keep cost increases within the broad limits of industry practices.

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

[16] Whitefoot, et al., 2012, pp. 1…5.

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.

EXHIBIT III-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 data base; Sources: Office of Regulatory Analysis and Evaluation, *Regulatory Impact Analysis, Corporate Average Fuel Economy,* 2011, 2012-2016, 2017-2025.

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.[17]

[17] Worrell, et al., 2003, p. 1081.

Joint Comments of the Consumer Federation of America, National Consumer Law Center, Massachusetts Union of Public Housing Tenants and Texas Ratepayers' Organization to Save Energy, before the U.S. Department of Energy Building Technologies Program, RE: Notice of Proposed Rulemaking for Energy Conservation Standards for Residential Furnaces,J uly 10, 2015, PP. 26-31

D. THE TRACK RECORD OF APPLIANCE ENERGY PERFORMANCE STANDARDS

1. Impact on Efficiency

The track record of efficiency standards for household consumer durables is excellent and the performance of the furnace market is quite deficient with respect to energy efficiency. Exhibit 11 shows the record of five consumer durables since the late 1980s. Data on the efficiency of these devices has been compiled since then and it covers the period in which natural gas prices were deregulated. Efficiency is measured as the decline in energy use compared to the base year, which is set equal to 1.

Examining the trends for individual consumer durables in Exhibit 11 suggests three important observations.

First, the implementation of standards improved the efficiency of the consumer durables.

Second, furnaces have been far less efficient than they should have been, since, as we have noted, DOE has set weak standards.

Third, after the initial implementation of a standard, the improvement levels off, suggesting that if engineering-economic analysis indicates that improvements in efficiency would benefit consumers, the standards should be strengthened on an ongoing basis.

Exhibit 12 shows the results of econometric analysis of the data underlying Exhibit 11. It shows that what is obvious to the naked eye in the bivariate relationships in Exhibit 11 (stricter standards as set by DOE lead to measurable improvements in appliance efficiency) are statistically valid when rigorous controls are introduced into multivariate regression analysis.

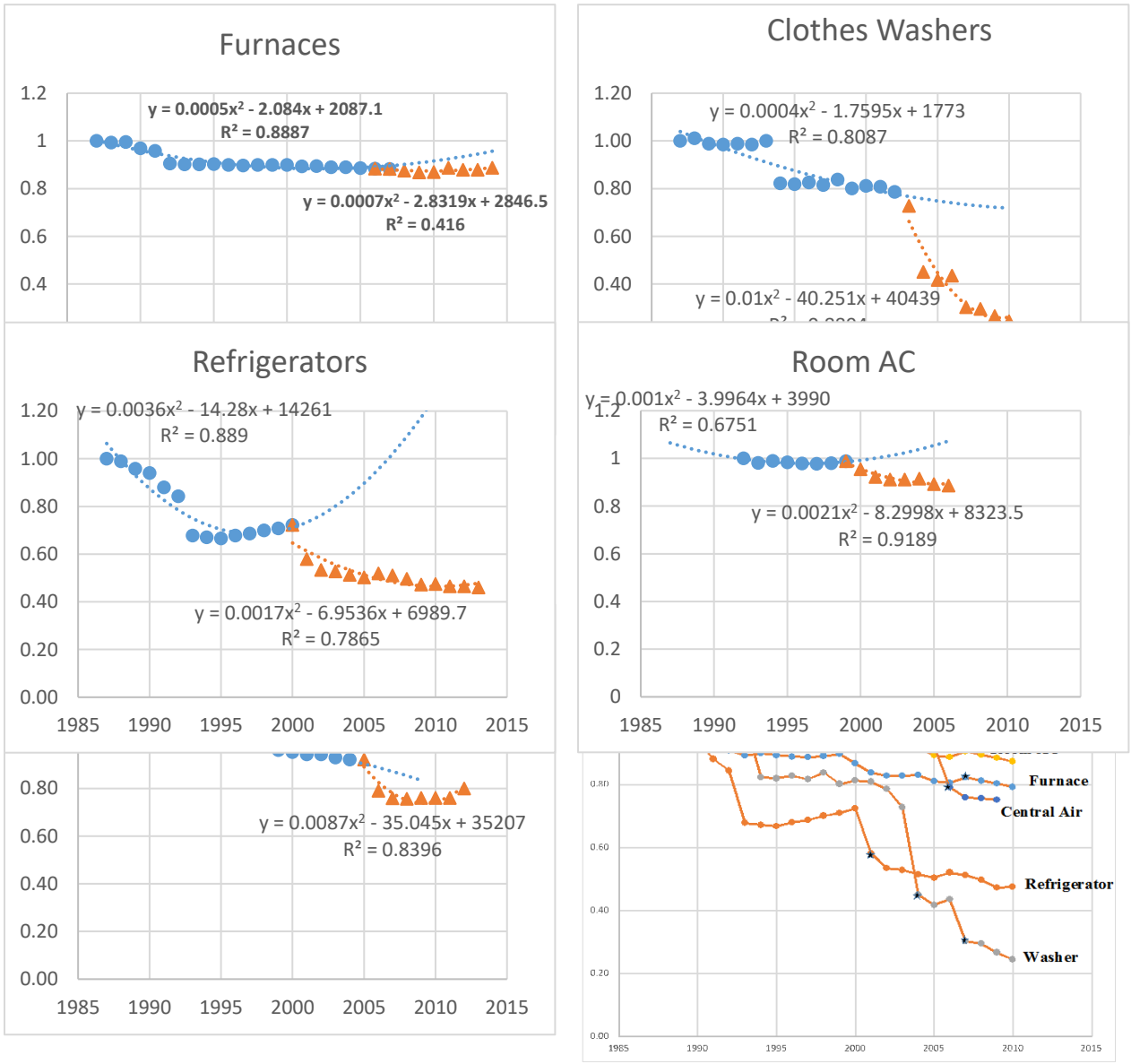
We have built this analysis in the typical way that multivariate regression analysis is conducted. The dependent variable is energy consumption with the base year set equal to 1. Later years had lower values.

We measure the trend of efficiency improvements (the market driven year-by-year improvements) by including the year as trend term.

We introduce a variable to represent the adoption of a standard. This variable (known as a dummy variable) takes the value of 1 in every year when the standard was in place and a value of zero when it was not. A negative number means that the years in which the standard was in force had lower levels of energy consumption.

Similarly, the difference between appliances is handled with dummy variables. We include each appliance except furnaces, which shows how the other appliances performed compared to furnaces. Again, a negative number means that the other appliances had lower levels of energy consumption.

EXHIBIT 11: APPLIANCE EFFICIENCY STANDARDS AND TRENDS (BASE YEAR EFFICIENCY = 1; ▲ = NEW STANDARD)



Source: Nadel, Steven and Andrew deLaski, *Appliance Standards: Comparing Predicted and Observed Prices*, American Council for An Energy Efficient Economy, July 2013; Nadel, Steven, Neal Elliott, and Therese Langer *Energy Efficiency in the United States:35 Years and Counting*, June 2015

EXHIBIT 12: MULTIVARIATE ANALYSIS OF STANDARDS

Variable	Statistic	5-years before/after			All Year			
		1	2	3	4	5	6	
Standard	β	-.1637	-.1386	-.1086	-.2260	-.1079	-.0803	-
	Std. Err.	(..0485)	(.0587)	(.0382)	(.0366)	(.0414)	(.0227)	
	p <	.000	.023	.007	.000	.010	.001	
Trend	β	NA	-.0053	-.0111	NA	- .0107	-.0135	
	Std. Err.		(.0081)	(.008)		(.0026)	(.0019)	
	p <		.51	.176		.000	.000	
Refrig	β	NA	NA	-.2775	NA	NA	-.2242	
	Std. Err.			(.0382)			(.0289)	
	p <			.000			.000	
Washer	β	NA	NA	-.2889	NA	NA	-.2144	
	Std. Err.			(.0561)			(.0391)	
	p <			.000			.000	
RoomAC	β	NA	NA	.0478	NA	NA	-.0895	
	Std. Err.			(.0642)			(.0321)	
	p <			.383			.009	
CAC	β	NA	NA	-.0050	NA	NA	.0383	
	Std. Err.			(.0292)			(.0260)	
	p <			.864			.143	
R^2	.20	.21		.85	.29	.36	.75	

Statistics Beta coefficient and robust standard errors.

The impact of standards is statistically significant and quantitatively meaningful in all cases. The coefficient in column 6 (All Years, All Variables) indicates that the standard lowers the energy consumption by about 8%. This finding is highly statistically significant, with a probability level less than .0001. There is a very high probability that the effect observed is real.

The underlying trend is also statistically significant, suggesting that the efficiency of these consumer durables was improving at the rate of 1.35% per year. Given that the engineering-economic analysis had justified the adoption of standards and that standards were effective in lowering energy consumption, this means the market trend was not sufficient to drive investment in efficiency to the optimal level.

Comparing the models with shorter terms to the all year models is consistent with the earlier observation. The impact of the standard is greater (almost 11% in column 3) because we have eliminated the out years where the effect of the standard has worn off. The impact of the

trend is slightly smaller (1.1% per year) but the statistical significance is greatly affected by shortening the period because we truncate the trend.

2. Price

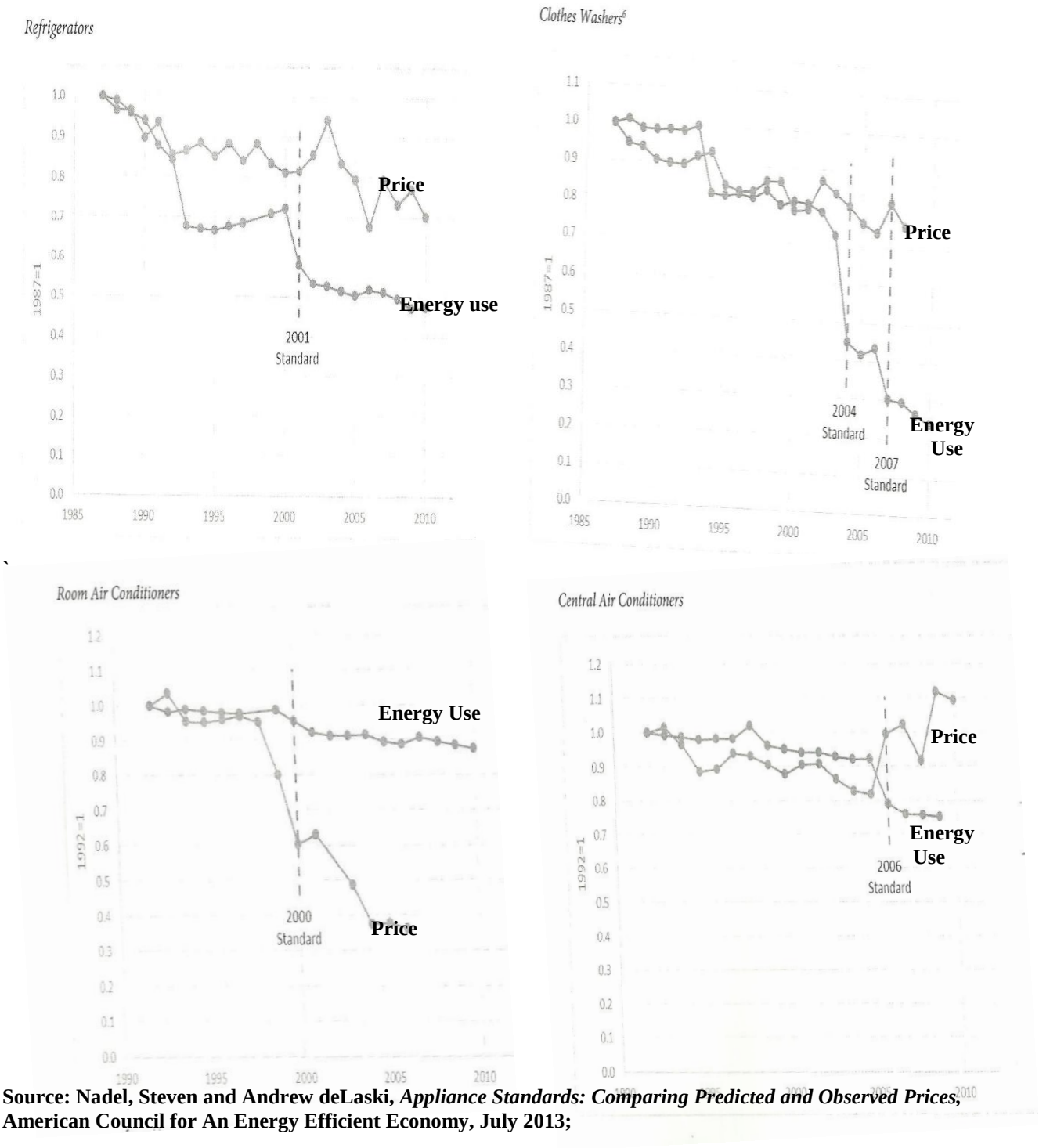
The engineering-economic analysis indicates that although the standards may increase the cost of the consumer durable, the reduction in energy expenditures is larger, resulting in a net benefit to consumers. We have also pointed to evidence that the costs of energy saving technologies tends to be smaller than the *ex ante* analysis suggests because competition and other factors lower the cost. The experience of the implementation of standards for the household consumer durables is consistent with this interpretation.

While the efficiency was increasing, the cost of the durables was not, as shown in Exhibit 13. There are five standards introduce for the four appliances in Exhibit 13. In three of the cases – refrigerators, clothes dryers (second standard) and room air conditioners – there was a slight increase with the implementation of the standard, then a return to pre-standard downward trend. In one case – clothes dryers (first standard) – there was no apparent change in the pricing pattern. In one case (central air conditioners) there was an upward trend, which may be explained by a surge in metal prices during that period.

We do not mean to suggest that the price increase was too big, compared to the engineering-economic analysis or that the standards lowered costs, although there are theories that would support such a suggestion, (i.e. suppliers take the opportunity of having to upgrade energy efficiency through redesign to make other changes that they might not have made). However, this does indicate that the standards can be implemented without having a major, negative impact on the market. The analysis of consumer durables also shows that there was no reduction in the quality or traits of the products. The functionalities were preserved while efficiency was enhanced at modest cost.[18]

[18] Nadel, Steven and Andrew deLaski, *Appliance Standards: Comparing Predicted and Observed Prices,* American Council for An Energy Efficient Economy, July 2013; Consumer Federation of America, Performance Standards.

EXHIBIT 13: PRICE TRENDS AND STANDARDS



Source: Nadel, Steven and Andrew deLaski, *Appliance Standards: Comparing Predicted and Observed Prices*, American Council for An Energy Efficient Economy, July 2013;

APPENDIX E
DISCOUNT RATES AND PAYBACK PERIODS AS MARKET OUTCOMES

***Comments and Technical Appendices of the Consumer Federation of America,* Re: National Highway Traffic Safety Administration Notice of Proposed Rulemaking; Docket No. NHTSA 2008-0089, RIN 2127-AK29; Average Fuel Economy Standards, Passenger Cars and Light Trucks; Model Years 2011-2015, July 1, 2008**

While the calculation of payback periods is a frequent measure of the economics of an investment, it is only one measure of the consumer impact and it suffers from significant limitations, particularly when it is interpreted as a constraint on behavior.

NHTSA discovers that there are fuel savings technologies that pay for themselves, but have not been moved into the vehicle fleet. Since this cannot be explained by the externalities market failure, there must be other market failures operating.

> *If some fraction of fuel economy improvements (as perceived and valued by vehicle purchasers) is large enough to exceed the increased vehicle cost (and result in an increase in vehicle sales), then what would be the nature of the market failure such that those levels of fuel economy would not exist but for a CAFE mandate? To better understand this issue, NHTSA seeks comment on the following question: What evidence or data exists that indicate the extent to which consumers undervalue fuel economy improvement? Under what circumstances is it reasonable to expect that a mandated increase in fuel economy would lead to an increase in sales?*

NHTSA's pro-industry view of the world blames the market failure on the consumer, when, in fact, the problem is the automakers. This is one of several reasons that NHTSA's reliance on auto industry plans and data and the extreme efforts to which it goes to "protect" the automakers from discomfort are misplaced.

The cars that are sold in the marketplace reflect not only what consumers want to but also, what automakers want to sell. Automakers spend millions on advertising and promotions to move the metal that makes the most profit for them. It is simply wrong to claim that all the advertising and marketing has no effect (see Exhibit A-5).

Failing to recognize the imperfections on the supply-side leads NHTSA to an over reliance on automaker product plans. Thus, it is a much better representation of reality to say that the auto market undervalues fuel economy. The problem is not just the consumer. Indeed, the automakers may be a bigger part of the problem. If automakers are required to produce and sell more fuel efficient vehicles, they will have to change their advertising and marketing focus. With the automaker resistance to more fuel efficient vehicles dampened, the apparent market valuation of fuel economy will rise quickly. It is the automakers who have been at least as large a drag on fuel economy as consumers.

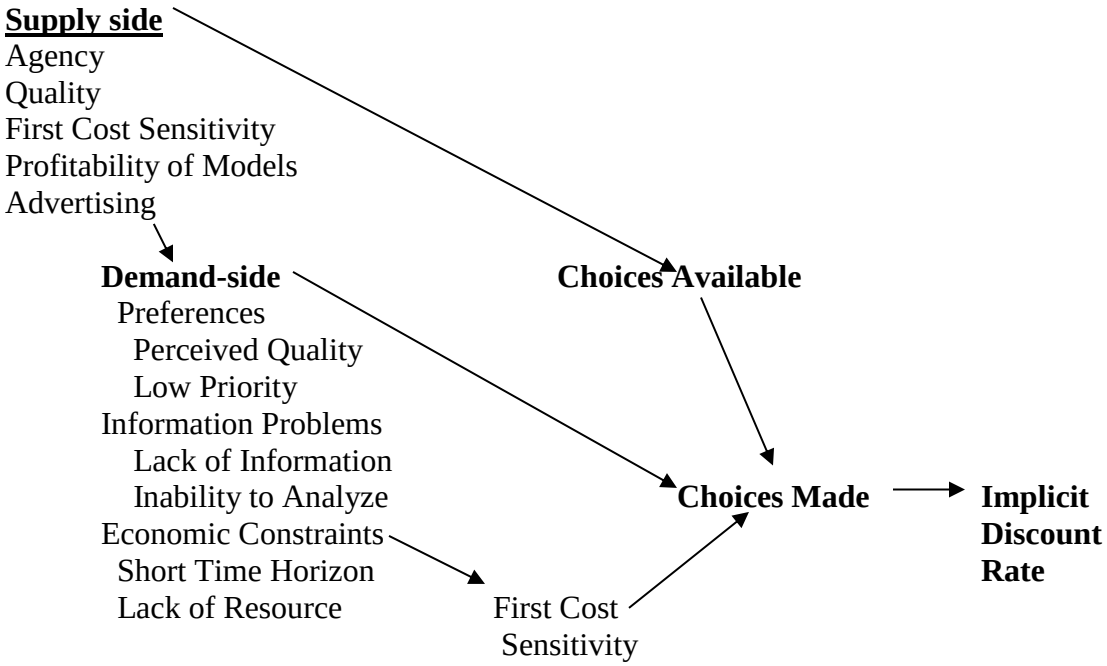
Auto makers prefer to sell certain models because they are more profitable. They prefer simple technologies that are less demanding to produce and maintain. They have a first cost

bias, seeking to keep the sticker price low. They seek to influence the public to purchase the vehicles that best suit their interests.

On the supply-side there is an agency problem – a separation between the builder or purchaser of buildings and appliances and the user. Suppliers may not choose to manufacture or stock efficient vehicles if they are less profitable, hoping that advertising and showroom persuasion can point consumers in the direction the manufacturers want them to go.

Consumers are influenced by advertising and my not perceive quality properly. The priorities afforded to any particular attribute are difficult to discern in a multi-attribute product. They lack the information necessary to make informed choices. The life cycle cost calculation is difficult, particularly when projections about future gasoline prices and vehicle use are necessary.

Exhibit A-5:
Imperfections in the Auto Market



Even when they do consider efficiency investments, they may not find the more efficient vehicles to be available in the marketplace.

We view the apparent high discount rate attributed to consumers as the result of other factors not the root cause of the demand-side problem. We do not accept the claim that consumers are expressing irrational preferences for high returns on efficiency investments; irrational because they appear to be a return that is so much higher than they can get on other investments they routinely have available. Rather, we view the implicit discount rate as a

reflection of the fact that the marketplace has offered an inadequate range of options to consumers who are ill-informed and unprepared to conduct the appropriate analysis and who lack the resources necessary to make the correct actions.

There are two implications for NHTSA's analysis. First, CAFE standards correct market failures and therefore can result in economically beneficial outcomes (increases in sales). Second, CAFE standards address important supply-side market imperfections. They counter the tendency to want to produce low cost, energy inefficient vehicles that generate higher rates of profit. CAFE standards also give automakers an incentive to advertise and market more fuel-efficient vehicles. NHTSA's framework needs to fully reflect this alternative, more realistic view of the auto market.

***Energy Efficiency Performance Standards: The Cornerstone of Consumer-Friendly Energy Policy,* October 2013**

The Discount Rate

The market exhibits a high "implicit" discount rate for energy efficiency, which we interpret as the result of the many barriers and imperfections that retard investment in efficiency enhancing technology.[19] There are several aspects of the high discount rate that deserve separate attention. In a sense, the discount rate is the centerpiece of the market fundamentalist objection to performance standards, but it is based on a view that ignores all the market imperfections that inflate the discount rate. In other word, the claim boils down to the belief that whatever the implicit discount rate the market puts on a decision must be right. Therefore, regulators must be wrong to apply a lower discount rate to justify policy, which implies an economic loss from failing to adopt an energy saving technology to justify policy. Analysis of market imperfections explains the implicitly high discount rate as the result of market imperfections, not consumer preferences.

The empirical evidence on consumer rationality in the literature paints a picture that bears little resemblance to the rational maximizer of neoclassical, market fundamentalist economics. We find a risk averse,[20] procrastinating consumer,[21] who responds to average, not marginal prices.[22] The consumer is heavily influenced by social pressures,[23] with discount rates that vary depending on a number of factors[24] and has difficulty making calculations.[25] To make matters more complicated, the consumer does not have control over key decisions. The decision of which energy consuming durable to purchase is made by someone else, like the landlord (i.e. the

[19] In one recent example, Mon, 2014, finds an implicit discount rate for light bulbs of 100%
[20] See e.g., Arbuthnott, Dolter, 2013, p.7; Qui, Colson and Grebitus, 2014, p. 216,
[21] See e.g., Lilemo, 2014, The effect of procrastination
[22] See e.g., Ito, 2014, p. 537,
[23] See e.g., Axsen, Orlebar and Skippon, 2013, 96,
[24] See e.g., While the sensitivity to a range of socio-economic factors is to be expected, other variation is surprising (e.g. Enzler and Meir, 2014), Andersson, Henrik, et al., 2013, 437.
[25] See e.g., Kurani and Turrentine, 2004, p. 1,

agency problem).[26] Bundles of attributes are decided by producers in circumstances in which the consumer cannot disentangle attributes (the shrouded attributes problem.)[27]

Firms suffer similar problems. We find organizational structure matters a great deal[28] in routine bound,[29] resource strapped organizations[30] confronted with conflicting incentives[31] and a great deal of uncertainty about market formation for new technologies.[32] Knowledge and skill to implement new technologies is lacking[33] and firms have little incentive to create it because of the difficulty of capturing the full value.[34] Public policy efforts to address these problems have been weak and inconsistent.[35] The supply-side does not escape these factors and it exhibits the added problem of powerful vested interests and institutional structures that are resistant, if not adverse to change.[36]

[26] See e.g., Davis, 2010, p. 1; Lutzenheiser, et al., 2001, cited in Blumstein, 2013, p. viii,
[27] Bundles and Shrouded attributes xx
[28] See e.g., Inoue, 2013, 162, our finding shows that the organisational and managerial factors of firms are important in examining environmental R&D.
[29] See e.g., Montaveloalo, 2007, A11
[30] See e.g., Sorrel, Mallet and Nye, 2011, p. iii,
[31] Sardianou, 2007, p. 1417,
[32] See e.g., Montaveloalo, 2007, p. A10,.
[33] See e.g., Horbach, 2007, p. 172,
[34] See e.g., de Cian and Massimo, 2011, p. 123, Jamasb and Nicita, (2007, p 8
[35] See e.g., Sorrel, Mallet and Nye, 2011, p. 67, Sardianou, 2007, p. 1402,
[36] See e.g., Fuss and Szolgayosva, 2010, p.2938,

APPENDIX F
THE INTERSECTION OF MARKET FAILURE AND MASSIVE EXTERNALITIES

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,

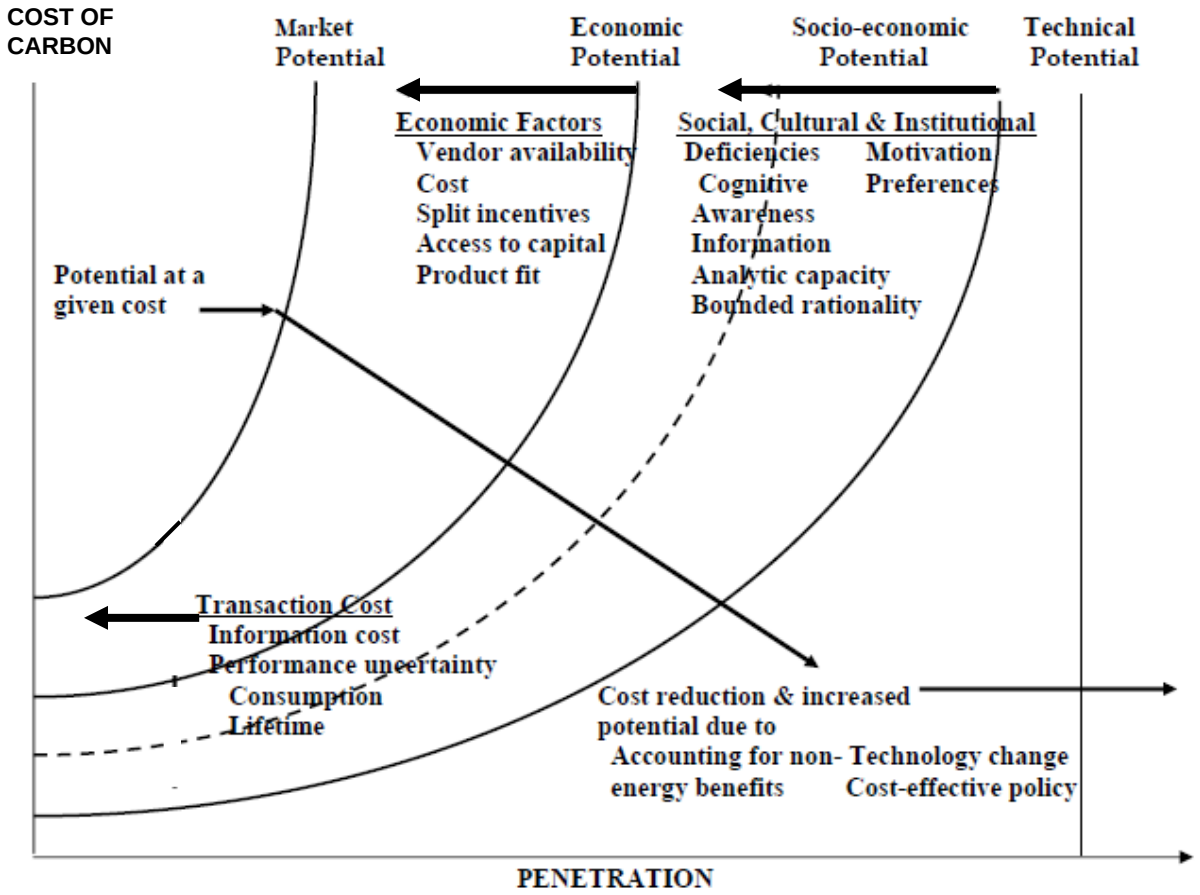
The LBL Framework

A 2004 report to the California Energy Commission from Lawrence Berkeley laboratory captures much of the above discussion of market failure in the form of technology penetration frontiers (See Exhibit III-3). The output variable is the reduction of greenhouse gas emissions, which is certainly appropriate for the current proceeding, from the EPA point of view and, since there is a direct physical relationship between tailpipe emissions and gasoline consumption, it fits the NHTSA purpose as well. We have preserved the labels from the original, but added in some of the specific factors the analysis cites in its case studies. The graph shows the penetration of energy efficiency technologies along the X-axis and cost of carbon along the Y-axis.

At the extreme right is the maximum technical potential reduction in carbon achievable with the penetration of available technology. In the 2008 rulemaking, NHTSA calculated this limit as the "technology Exhaust" scenario. The level of reduction in carbon that is achieved in the marketplace is lower because several factors keep the technologies from penetrating the market. The exhibit identifies all of the major categories of market imperfections, barriers, obstacles, etc. discussed above – behavioral factors (social, cultural & institutional), economic factors and transaction costs – each of which establishes a different frontier. Technological change, and public policy play an important role in determining where the market will settle along a given frontier as well as influencing where the technological limit is. Thus, this presentation arrays the market structure analysis presented in Exhibit III-1 in a technology investment framework.

We add a distinction within the Social/Cultural/Institutional category between what we call deficiencies, i.e. behavioral characteristics and processes that lead consumers to under invest in efficiency even though they are interested in doing so, and motivational factors, i.e. consumer preferences that lead to under investment in efficiency because they do not value it. This distinction is important in the current context because the agencies have assumed no change in product attributes. The goal is to achieve efficiency without changing the attributes of the vehicles. As the literature review shows, given constant preferences, there are numerous behavioral factors that reduce the amount consumers choose to invest in energy efficiency. Another set of factors moves consumer along the frontiers. A higher price on carbon, or a lower cost to reduce carbon would move investment up the frontier.

EXHIBIT III-6: PENETRATION OF MITIGATION TECHNOLOGIES: A CONCEPTUAL FRAMEWORK



Source: Jayant Sathaye and Scott Murtishaw, *Market Failures, Consumer Preferences, and Transaction Costs in Energy Efficiency Purchase Decisions* (California Energy Commission, November 2004), consultant report, p. 11.

***Energy Efficiency Performance Standards: The Cornerstone of Consumer-Friendly Energy Policy*, October 2013, pp. 60-64.**

D. CONCLUSION: THE INCREASING URGENCY OF CLOSING THE EFFICIENCY GAP

The efficiency gap analysis and debate are not about externalities, although the environmental, national security and macroeconomic impacts of energy consumption stimulated interest in the value of reducing consumption, particularly after the oil price shocks and subsequent

economic recessions of the 1970s. Although externalities like these attract attention, these are not the underlying cause of the efficiency gap. Because they are externalities, they are not priced into the market transactions, and we would not expect market behavior to reflect their value. The efficiency gap arises from the failure of market transactions to reflect the costs of energy that are reflected in its price.

To the extent that there are externalities associated with energy consumption, they magnify the concern about market barriers and imperfections, if only because they would make efforts to respond to externalities more difficult. If climate change is recognized as an external cost of energy consumption, it may magnify the importance and social cost of failing to address the efficiency gap. This is where the efficiency gap and climate change analysis intersect.

The climate change debate reinforces the lessons of the efficiency gap and innovation diffusion literatures in another way. The climate change literature has squarely confronted the problem of market barriers and imperfections that affect innovation and diffusion of new technologies. In order to induce rapid change in economic activities, policy must overcome the inertia created by established investment and behavior patterns built up over decades. The set of factors that underlies the inertia to respond to climate change are similar to the market barriers and imperfections that underlie the efficiency gap. Targeted innovations and induced technological change are advocated.

Thus, the debate among economists grappling with the analysis of climate change replicates and parallels the efficiency gap debate. The conceptual and empirical analysis of climate change adds a great deal of evidence to reinforce the conclusions about the barriers and imperfections that affect energy markets. Because the potential external costs are so large, climate change puts a spotlight on technological innovation. The growing concern over adjustment leads to concern over an "innovation gap."[37]

Thus, over the course of the last decade, the climate change analysis has come to highlight the question of the extent to which market processes through the reaction to price increases can be relied upon, or policies that seek to direct, target and accelerate technological innovation and diffusion are needed. The evidence suggests that the cost of inertia is quite large, whereas targeted approaches lower costs and speed the transition.[38]

At a high level, the most important implication of this broadening of the framework to include large externalities is to underscore the need for vigorous policy action to address a problem that is now seen as larger and more complex than it was in the past. It is the combination of substantial market imperfections and large externalities that demonstrates there is an urgent need for vigorous policy action, as suggested by Exhibit V-5.

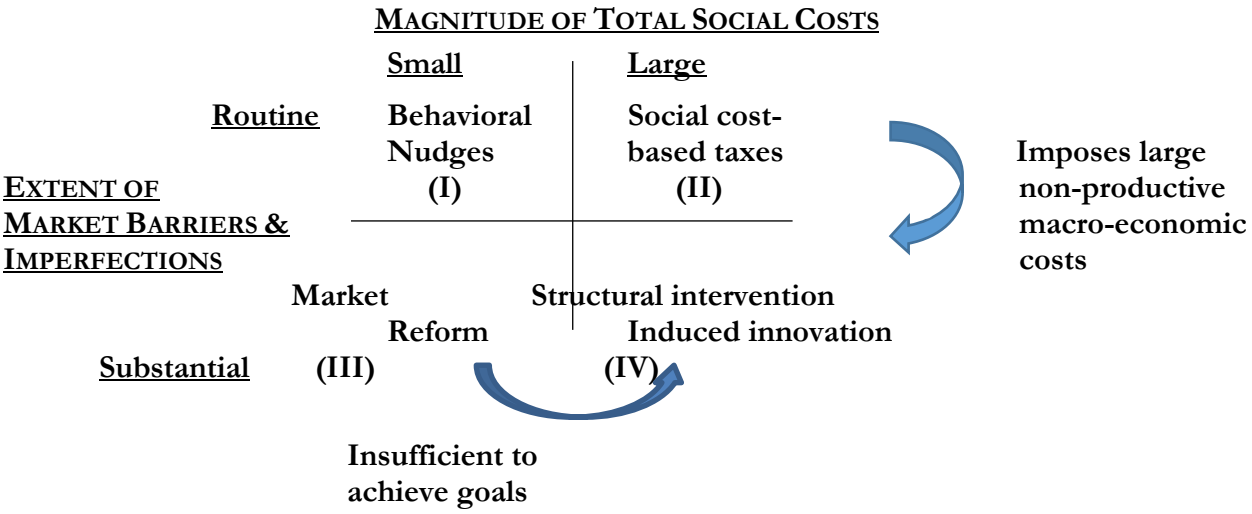
If market imperfections are routine and the social costs of poor market performance are small (cell I), modest policies like behavioral nudges may be an adequate response. If market imperfections are small and costs are large (cell II), then price signals might be sufficient to deal with the externalities. If market imperfections are substantial but costs are small, market reform would be an appropriate response (cell III), since the slow response and long time needed to overcome inertia does not impose substantial costs. If both market imperfections and social costs are large (cell IV), more aggressive interventions are in order. The challenge is to choose policies that reduce the market barriers in an effective (swift, low cost) manner.

We believe the energy consumption of consumer durables has been located in cell IV for decades. Reducing the energy consumption of consumer durables has had the potential for

[37] Gross, et al., 012.
[38] Acemoglu, et al, 2012, pp. 132.

substantial consumer pocketbook benefits and significant national security, energy policy and macroeconomic benefits. The existence of these potential benefits reflected significant market barriers, imperfections and failures. The current context of concern about climate change merely increases the urgency for taking action by adding major environmental costs to the calculation.

EXHIBIT V-5: TYPOLOGY OF POLICY CHALLENGES AND RESPONSES



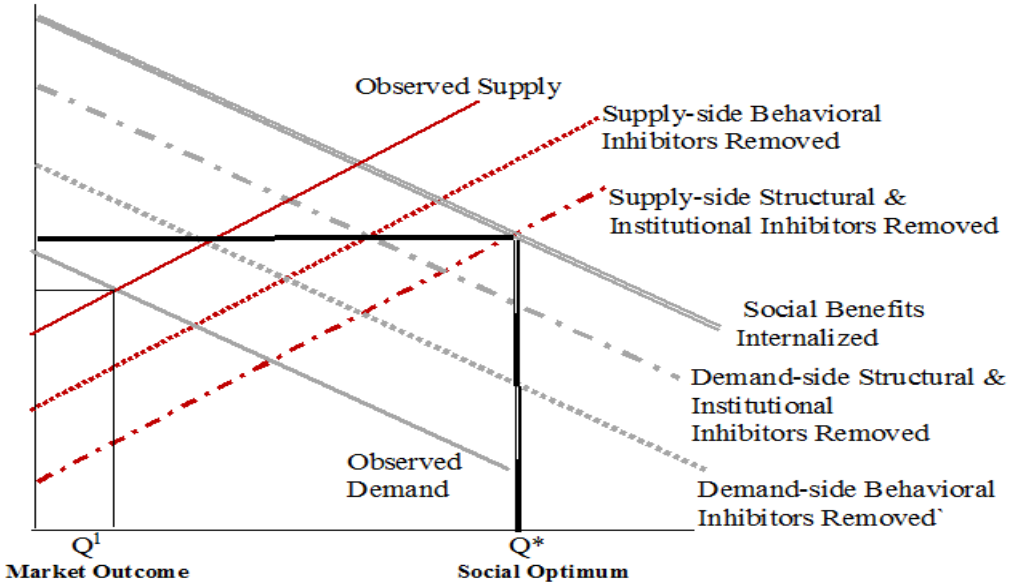
THE WELFARE ECONOMICS OF VIGOROUS POLICY ACTION (UPDATE)

The following presents a welfare economic view of the implementation of vigorous policies enhances social welfare. It provides a useful starting point to summarize the welfare economics of our argument because she starts by identifying the benefit of capturing positive externalities, the opposite of the typical approach that launches from negative externalities. She models behavioral barriers that reduce consumer purchases of a good that has a positive externality, i.e. the efficiency gap problem. In the upper graph of Figure IX-1, we add market structural and new institutional barriers to the behavioral factors that drive consumer purchases farther from the social optimum. We have constructed the graph to generally reflect the magnitude of effects suggested by the earlier economic analysis and literature.

- Behavioral factors are a modest part of the problem and they affect both consumers and producers.
- Structural and new institutional factors are at least as important as behavioral and they affect both the supply and the demand sides.
- The supply side is at least as important as the demand side.
- The externality market failure is a significant cause of the underinvestment, although smaller than the market structure, institutional and behavioral barriers.
- The increase in price at the social optimum would be modest because technological progress lowers the supply-side cost, while demand side policies reduce the shift in demand.

FIGURE IX-1: TWO VIEWS OF MARKET IMPERFECTIONS AND POLICY RESPONSES

Welfare Economics: Induced Supply and Demand Shift to Increase Social Welfare



In the large distance between the actual equilibrium and the equilibrium that reflects the removal of all barriers, the lower graph of Figure IX-1 also reflects the fact that climate change possesses two characteristics that make it a particularly difficult challenge for traditional neoclassical analysis as it has come to be practiced in the U.S. Climate change involves very large impacts and a great deal of uncertainty, in part due to the very long time frame of analysis. This raises a host of questions about the discount rate, as discussed below. These characteristics interact to argue for a precautionary principle that supports greater reduction in emissions and the adoption of overlapping policy instruments.

APPENDIX G
RECONCILING THE INSTITUTIONAL AND LEGAL DIFFERENCES OF A COMPLEX ECONOMIC AND ENVIRONMENTAL CHALLENGE

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

E. Establishing a Long-Term Vision for Enhanced Fuel Economy

In recognition of the vehicle product cycle, the statute requires NHTSA to promulgate rules at least 18 months in advance of the model year to which the standard applies, but the redesign and refresh cycle of the industry where significant modifications can be made in the fuel economy of vehicles requires more lead time than that. At the same time, NHTSA cannot set standards for more than five years. In contrast to this narrow window through which Congress allows NHTSA to set fuel economy, the Congress is considering very long term time frames for legislating climate change policy – setting 10, 20 and 40 year targets.

Tailpipe Emission Standards Should be the Focal Point of Policy

From a policy perspective, it is critically important that the Clean Air Act's framing of the standard envisions, which allows EPA to take a long term view and a technology-forcing role, is being joined to the NHTSA approach. It must shake the standard setting process out of its lethargy. The decision to join NHTSA and EPA creates the opportunity for a major improvement in the regulation of automobiles because the Clean Air Act allows EPA to take a longer term view with greater flexibility. Moreover, the lengthy discussion of the failure of the market to yield an efficient outcome with respect to energy efficiency presented in Section II has two critical purposes in these comments and the process of standard setting for both fuel economy and tailpipe emissions.

First, the explanation of why the vehicle fleet is less efficient than it should be is critical to understanding why fuel economy standards are the right policy to address the problem and how those standards should be set. The explanation of the "efficiency gap" (the gap between the optimal level of efficiency and the level the marketplace yields) involves a host of market imperfections, barriers and obstacles on both the supply and the demand side. Our analysis shows that setting fuel economy standards is an ideal approach to addressing the market imperfections, barriers, flaws and obstacles that underlie the market failure.

Second, and more importantly, the law and practice of setting fuel economy standards at NHTSA under the Energy Policy Conservation Act have severely restricted the ability of the agency to set fuel economy standards in the public interest (see Exhibit I-13).

Standards are the right policy instrument, and EPA is the right agency to take the lead for a variety of reasons

First, NHTSA is required to achieve only a 35-mile per gallon standard by 2020, but beyond that there is no mandate to achieve higher levels of fuel economy. In contrast, as a result

of a recent Supreme Court ruling, EPA is obligated under the Clean Air Act (CAA) to regulate tailpipe emissions of pollutants, such as carbon dioxide.

Second, NHTSA is severely constrained in the time frame for which it can set standards. It must give the automakers at least 18 months advance notice of what the standard will be and it cannot set standards more than 5 years in advance. This narrow window for standard setting is too short for effective long term planning. The rulemaking period barely covers a full product design cycle. NHTSA has repeatedly said that the time frame is too short to ask the industry to do too much. The short time horizon shortchanges the public. EPA is not under this time constraint. Therefore, it can give the industry a long-term trajectory that promotes energy efficiency and environmental clean-up. In other words, NHTSA has neither the legal mandate nor the ability to take a long-term view of fuel economy, but EPA has the ability to do so for tailpipe emissions.

EXHIBIT I-13: INSTITUTIONAL REASONS TO SHIFT THE FOCUS OF STANDARD SETTING TO EPA

Institutional Context of standard Setting	**NHTSA (under the Energy Policy Conservation Act)**	**EPA (under the Clean Air Act)**
Mandate	**Permissive above 35 mpg, maximum feasible subject to constraints**	**Obligatory: to protect the Public health and welfare**
Time Frame	**Limited to a short 18-60 month period**	**Unlimited**
Economic Constraint	**Practicable, restricted by industry capacity**	**Costs considered**
Technological Innovation	**Restrained by industry Plans**	**Technology forcing**
Implementation	**Existing regulatory apparatus** **No responsibility for measurement**	**Existing regulatory apparatus** **Responsibility for** measurement

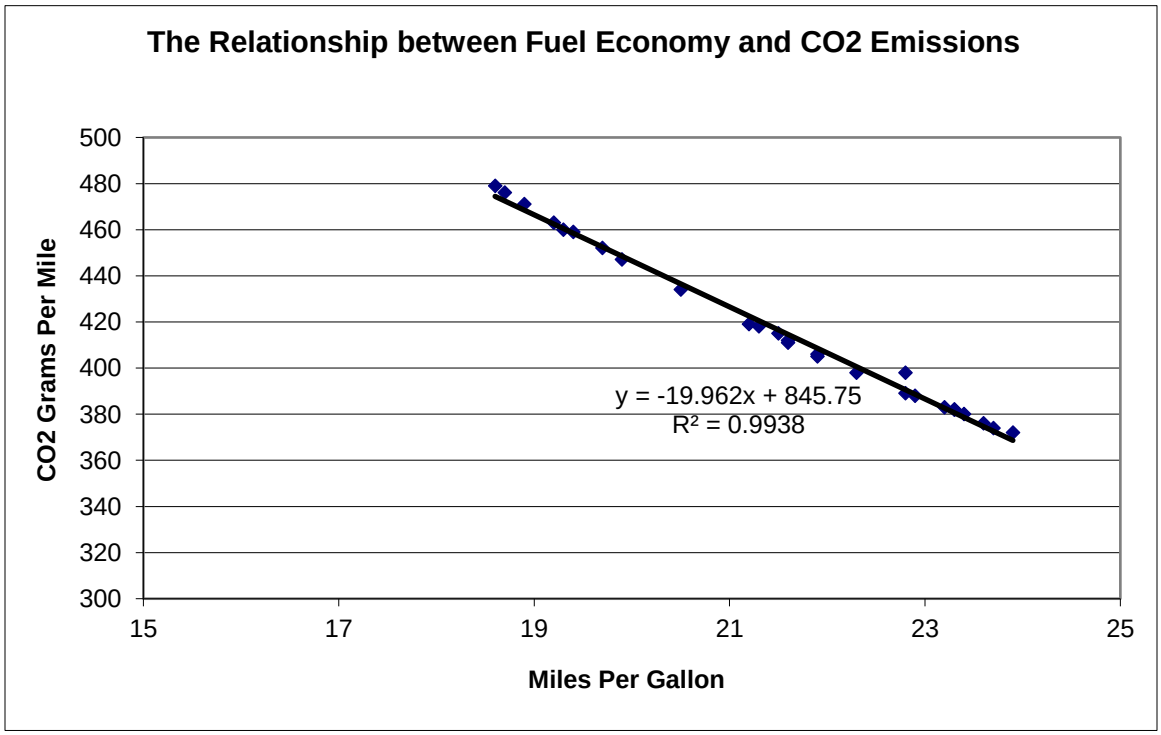
Third, the economic constraint under which NHTSA operates is more restrictive than EPA's. NHTSA is bound to do what is "economically practicable," while EPA must consider cost. NHTSA has interpreted its mandate under the statute to be largely constrained by what the industry's capabilities are. It hesitates to be technology forcing, repeatedly finding that the industry has not planned and therefore cannot make significant changes. What the industry "can" do is largely a function of what it "wants" to do, not what is in the public interest. The result is the behavior and plans of the automakers play a prominent role in determining the outcome. Because the concept of economic practicability has been interpreted to rest substantially on the contemporary capabilities of the industry, it sets the primary constraints on progress. To the extent that automakers are deficient economic actors and market structures are imperfect, the reliance on the outputs of these two governing what can be done undermines the ability of the agency to write rules that are in the public interest. Poor performance by the industry becomes a self-fulfilling prophecy, and in light of recent developments, a self-inflicted wound, in the setting of lax standards, and thus allows the industry to continue with its poor performance. EPA is not bound by this practice.

Fifth, NHTSA has chosen to assume that vehicle attributes remain constant. In recent years, consumers have proven to be willing to change their preferences, a shift that caught automakers by surprise. EPA has more flexibility to envision and promote changes in vehicle attributes in response to emissions standards.

Finally, because there is a direct physical relationship between the amount of greenhouse gasses a vehicle emits and the amount of gasoline it uses, by fulfilling its obligation to protect the public health and welfare under the Clean Air Act, EPA will also be effectively establishing fuel economy standards. In fact, EPA has had the responsibility for measuring the fuel economy of vehicles since the Energy Policy Conservation Act (EPCA) established the Corporate Average Fuel Economy (CAFE) standards. Ironically, in order to measure fuel economy, EPA actually measures the tailpipe emissions of carbon dioxide and converts that to the number of gallons fuel consumed.

Exhibit I-14 shows data on fuel economy and greenhouse gas emissions for autos sold in the U.S. in 2006-2009. These are adjusted, sales weighted data by manufacturer. There is a near perfect linear relationship between carbon dioxide emissions and fuel economy. Thus, there is no doubt that by regulating tailpipe carbon dioxide emissions, EPA can accomplish the goal of promoting energy conservation through higher fuel economy.

EXHIBIT I-14: THE RELATIONSHIP BETWEEN FUEL ECONOMY AND CARBON DIOXIDE EMISSIONS



Source: Environmental Protection Agency, *Light Duty Automotive Technology: Carbon Dioxide Emission, and Fuel Economy Trends: 1975 Through 2009* November 2009, p. vii.

APPENDIX H:
MACROECONOMIC STIMULUS EFFECTS OF FUEL ECONOMY IMPROVEMENTS

Mark Cooper, Jack Gillis. Comments of the Consumer Federation of America, before the Environmental Protection Agency, Department of Transportation, National Highway Traffic Safety Administration, Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium and Phase 2; Proposed Rule, 40 CFR Parts 9, 22, 85, et al 49 CFR Parts 512, 523, 534, et al., October 1, 2015, Technical Appendix, p. 21

The macroeconomic impact of energy policy has taken on great significance in the current round of decision making. Every policy is evaluated for its ability to stimulate growth and create jobs. Assessing the macroeconomic impact of policy choice generally relies on complex models of the economy. Economically beneficial energy efficiency investments yield net savings; the reduction in energy costs exceeds the increase in technology costs. Such investments, in this case, have two effects from the point of view of the economy. The increase in economic activity resulting from spending on new technology and the increase in consumer disposable income flows through the economy, raising the income of the producers of the additional products that are purchased and increasing employment.

- The inclusion of energy efficient technologies in energy-using durables increases the output of the firms that produce the technology.

- To the extent that the energy-using products are consumer durables, they increase the disposable income that households have to do other things, such as buy other goods and services.

***Energy Efficiency Performance Standards: The Cornerstone of Consumer-Friendly Energy Policy,* October 2013, pp. 34-37.**

D. MACROECONOMIC BENEFITS OF PERFORMANCE STANDARDS

These discussions of the non-energy benefits are framed in terms of the benefits to the individual. Another significant potential benefit is in the macroeconomic multiplier effect of reduced energy expenditures. Expenditures are shifted from purchasing energy to purchasing technology, which has a larger multiplier. The decrease in energy expenditures is substantially larger than the increase in technology costs, resulting in an increase in the disposable income of individuals to spend on other things.

The macroeconomic impact of energy policy has taken on great significance in the current round of decision making for two reasons.

- With the economy mired in recession, every policy is evaluated for its ability to stimulate growth and create jobs.
- Because climate policy requires a demand shift in economic activity, its impact on growth and job is extremely important.

Assessing the macroeconomic impact of policy choice generally relies on complex models of the economy. Economically beneficial energy efficiency investments yield net savings; the reduction in energy costs exceeds the increase in technology costs. Such investments have three economic effects from the point of view of the economy.

- The inclusion of energy efficient technologies in energy using durables increases the output of the firms that produce the technology.
- To the extent that the energy using products are consumer durables, they increase the disposable income that households have to do other things, such as buy other goods and services.
- To the extent that the energy using products are utilized as inputs in the production of other goods and service, like trucks used to deliver packages or vegetables, they lower the cost of those goods and services. In competitive markets, those costs are passed on to the consumer in the form of lower prices. This also increases the disposable income of the household to buy other goods and services.

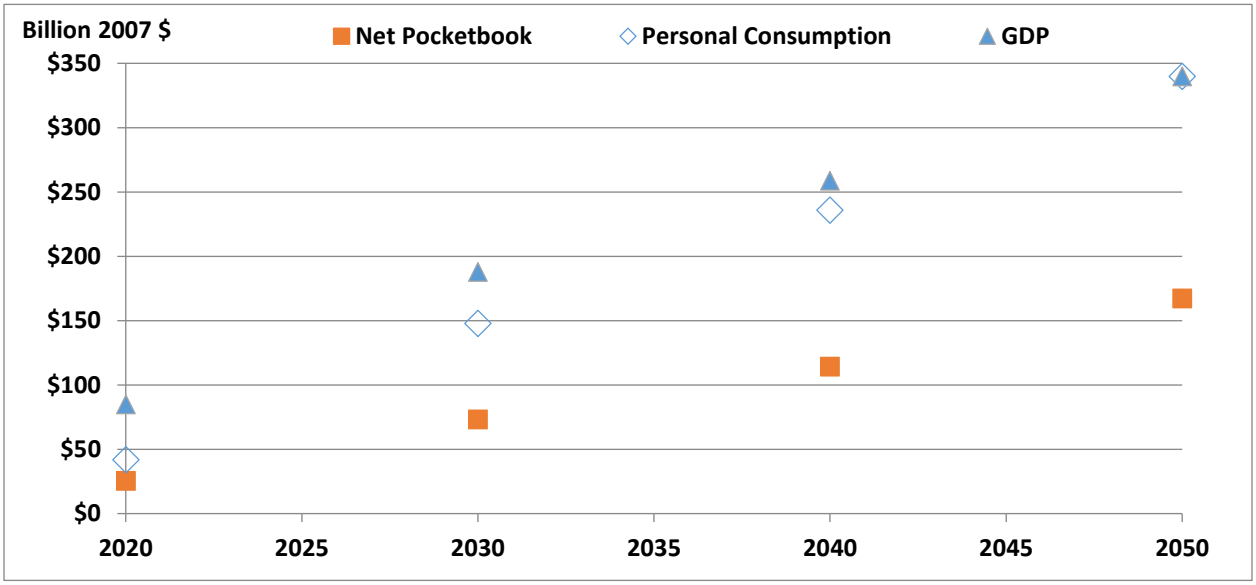
The increase in economic activity resulting from spending on new technology and the increase in consumer disposable income flows through the economy, raising the income of the producers of the additional products that are purchased and increasing employment.

> Higher vehicle costs are projected to reduce household consumption slightly in the first few years of the rule implementation. Over time, fuel savings increase and the price of world oil decreases, which leads to lower prices economy-wide. As a result, household consumption increases over the long term.
> 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 purchase of investment goods, which, in turn, lead to a larger capital stock. These price reductions also allow higher levels of 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.[39]

For example, in the recent regulatory proceeding that finalized the long-term fuel economy standard of 54.5 miles per gallon for 2025, the standard was projected to increase the size of the economy by over $100 billion, in 2010 dollars. This indirect benefit was equal to the direct consumer pocketbook benefit of the standard (see Exhibit II-9).

[39] U.S. EPA, 2010, pp. 3-4.

EXHIBIT III-9: IMPACTS OF THE 2012-2016 CORPORATE AVERAGE FUEL ECONOMY RULE: SAVINGS AND INCREASE S IN ECONOMIC ACTIVITY



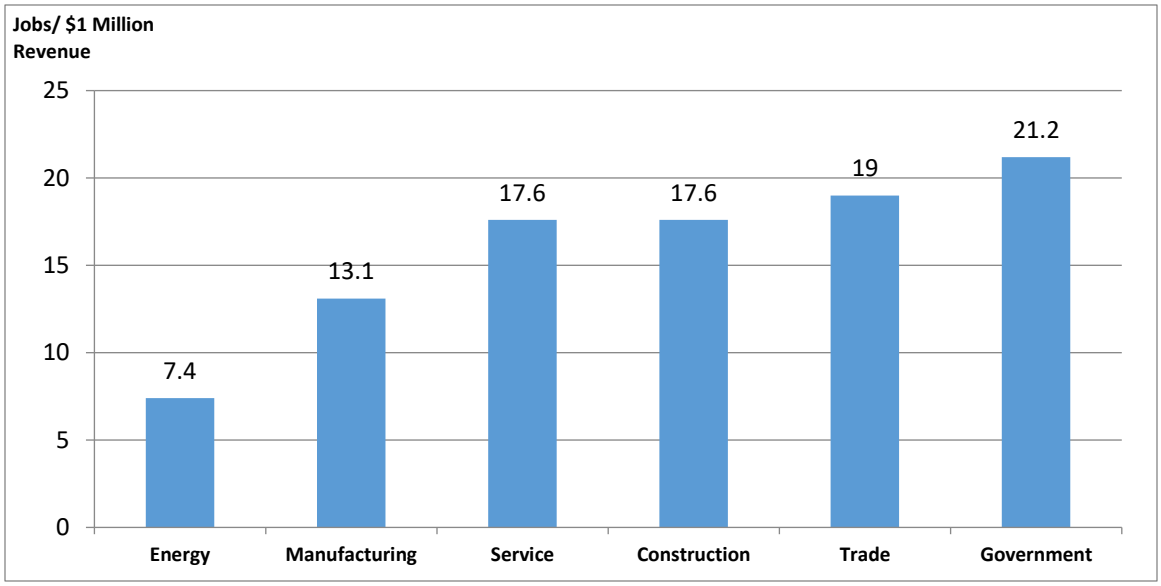
Source: Assessment and Standards Division Office of Transportation and Air Quality U.S. Environmental Protection Agency, Final Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average: Regulatory Impact Analysis, EPA-420-R-10-009, April 2010, Table 6-18. Docket EPA-HQ-OAR-2009-0472, *Memorandum: Economy Wide Impacts of Greenhouse Gas Tailpipe Standards,* March 4, 2012, Tables 1 and 2.

Exhibit III-9 shows the relationship between the net pocketbook savings, increases in consumption and increases in GDP. Although the figure was estimated using standard econometric models of the economy, it was not included in the final published cost benefit analysis.[40] Another popular measure is to estimate jobs per dollar invested. In the electricity space, a comparative analysis of efficiency compared to generation found that efficiency created twice as many jobs per dollar spent on nuclear power and 50% more jobs than coal and gas generation.[41]

These large increases in economic activity lead to increases in employment. The effect is magnified by the fact that the non-energy sectors of the economy are substantially more labor intensive than energy production. As shown in Exhibit III-10, the energy sector is less than half as labor intensive as the rest of the economy. This effect is compounded where energy is imported (as in the transportation sector). As consumers substitute away from energy, the goods and services they purchase stimulate economic and disproportionately large job growth.

[40] Cooper, 2011a, CFA, 2012, pp. 53-54.
[41] Wei, Patadia and Kammen, 2010; Anair, and Hall, 2010; Gold, et al., 2011; Roland-Holst, 2008.

EXHIBIT III-10: LABOR INTENSITY OF KEY ECONOMIC SECTOR IN THE U.S.



Source: Rachel Gold, et al., *Appliance and Equipment Efficiency Standards: A Money Maker and Job Creator,* American Council for an Energy Efficient Economy, January 2011, p. 9, based on the IMPLAN Model, 2009.

These efforts to model the economic impact of energy efficiency have proliferated with different models[42] being applied to different geographic units, including states[43] and nations.[44] The results differ across studies because the models are different, the impact varies according to the size of the geographic unit studied and because the assumptions about the level and cost of energy savings differ. These differences are not an indication that the approach is wrong. On the contrary, all of the analyses conclude that there will be increases in economic activity and employment. Given that there are different regions and different policies being evaluated, we should expect different results.

[42] For example, EPA, 2010, IGEM; Gold, 2011, IMPLAN, Howland and Murrow and NYSERDA 2011, REMI),

[43] For example, New York (NYSERDA, 2011), New England (Howland and Murrow), California (Roalnd Holst, 2008)

[44] For example, U.S. (Gold,, 2011, EPA, 2010, Warr, Ayres and Williams, 2009) and UK (Cambridge Center, 2006). Warr, Ayres and Williams, 2009, note recent studies on Asian economies, Korea, Canada and Spain,

APPENDIX I
CFA SURVEYS AND ANALYSES DEALING WITH ELECTRIC VEHICLES

KNOWLEDGE AFFECTS CONSUMER INTEREST IN EVS, NEW EV GUIDE TO ADDRESS INFO GAP

Washington, DC October 2015 --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, *The Car Book* and the new *Snapshot Guide to Electric Vehicles* (see more below).

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* available on the ConsumerFed.org website for no charge.

"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*

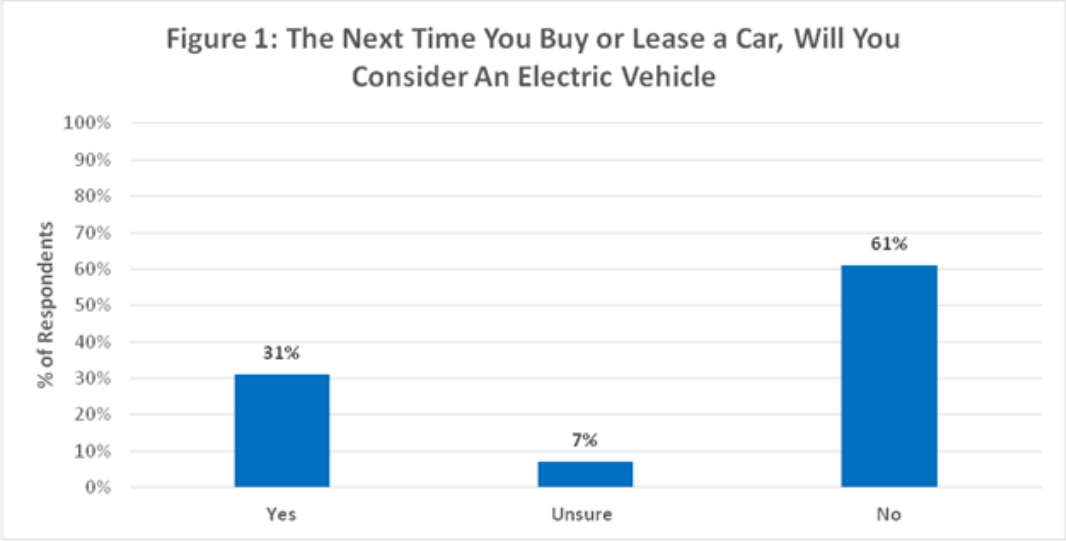
provides an overview of the key features of the 2016 model EVs allowing consumers to readily compare the mileage, range, and charging types available among the new models. The guide is designed to improve consumer knowledge and understanding of EVs as well as provide a comparative road map to the choices available for 2016. The free guide is available online 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.

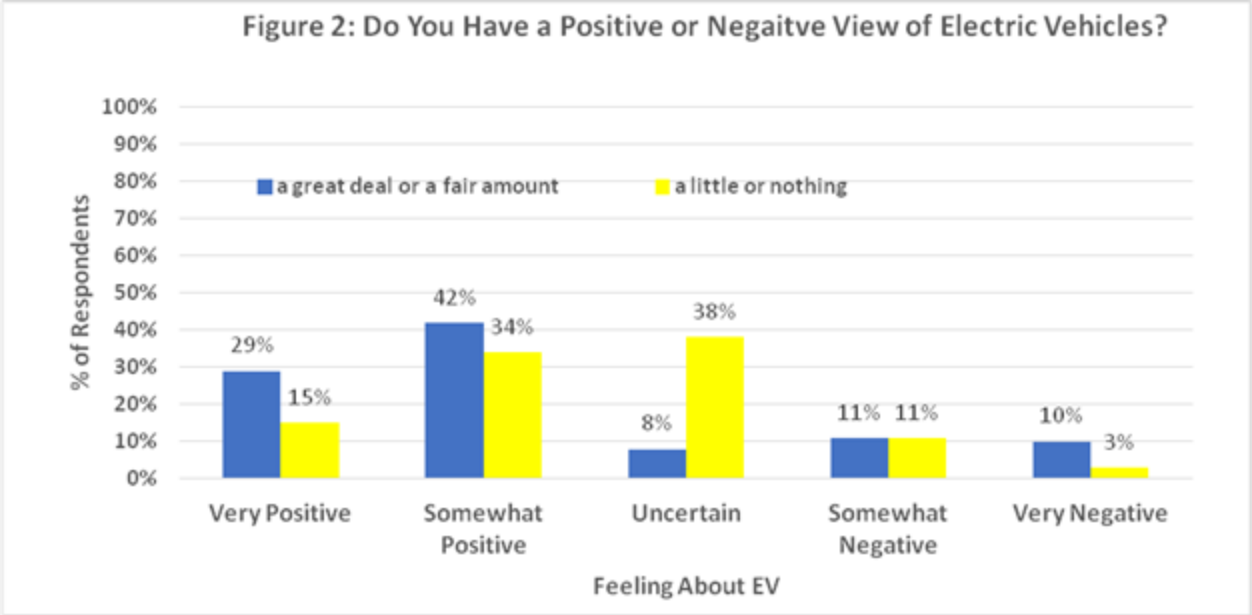
Overall Interest in Purchasing an EV

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.



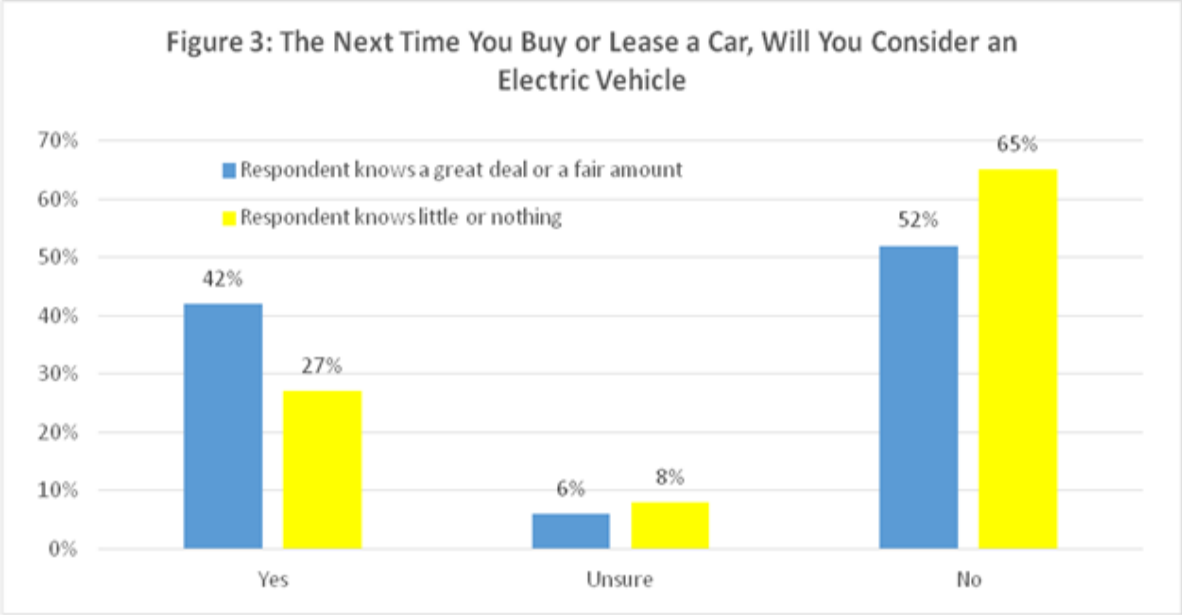
How Does Knowledge about EVs Affect Attitudes Towards Them?

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.



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

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)[i] and Tesla Model 3 ($27,500)[ii] 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

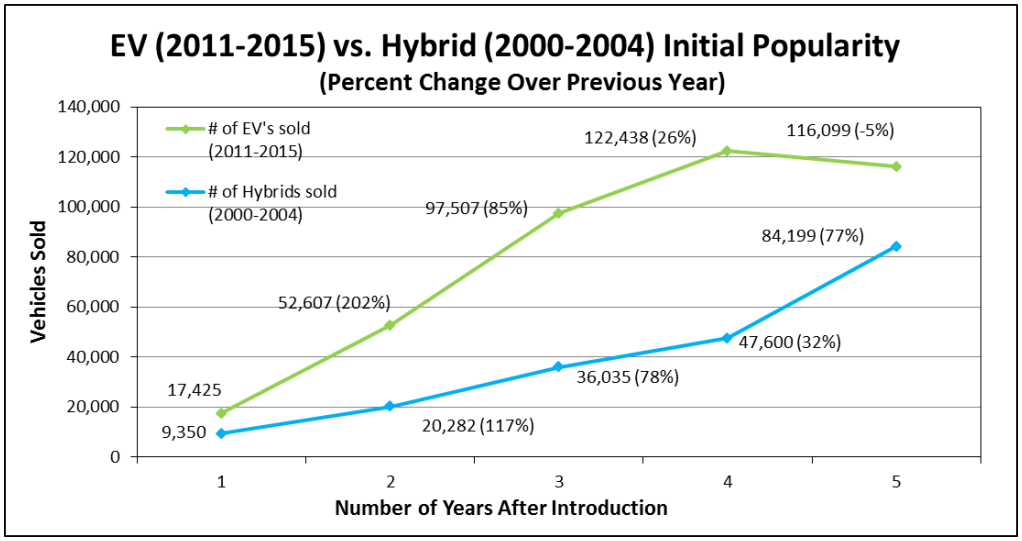
Because research demonstrates a correlation of interest in EVs with knowledge of EVs, CFA has updated its EV guide in order to improve consumer understanding of EVs. *The Car Book's Snapshot Guide to Electric Vehicles* is available for free on the ConsumerFed.org website.

"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.

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, [iii] with an average price of $33,560[iv]. 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.

Table 3: Cost Comparison of EV's to Their Gas Powered Counterpart			
Manufacturer	**Vehicle**	**Price (MSRP)[v] [vi]**	**Annual Cost for Fuel[vii] [viii]**
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**

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.

[i] Includes $7,500 tax credit.
[ii] 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.
[iii] J.D. Power and LMC Automotive
[iv] Kelley Blue Book
[v] Prices from the New Car Cost Guide
[vi] 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.
[vii]Based on typical driving of 15,000 miles per year.
[viii] 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).

Consumer Federation of America's

Submission to the Environmental Protection Agency

Docket No. EPA-HQ-OAR-2015-0827

Attachment G

Testimony of Dr. Mark Cooper: Midterm Review and an Update on the Corporate Average Fuel Economy Program and Greenhouse Gas Emissions Standards for Motor Vehicles

September 22, 2016

Consumer Federation of America

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

MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE

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 consumer durables, ranging from automobiles to heavy duty trucks, air conditioners, furnaces, water heaters, computers, and lightbulbs.[2] 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. We will submit our full agency comments for the hearing record and look forward to working with the committees to develop the most effective, consumer-friendly fuel economy and transportation sector greenhouse gas reduction program possible.

Our technical expertise is not in the design and construction of these consumer durables, it is in the design and implementation of minimum energy standards.[3] 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. Although we do not claim expertise in the technical design of consumer durables, we do review the technical economic studies, prepared by others, and evidence on the market performance of to determine whether there are significant potential consumer savings that would result from a higher standard.

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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. The NCLC website (http://www.nclc.org/issues/appliance-efficiency-standards.html) lists a dozen comments, letters and lawsuits involving appliance efficiency standards.

[3] Mark Cooper, "Energy Efficiency Performance Standards: Driving Consumer and Energy Savings in California," presentation to the *California Energy Academy*, February 20, 2014); *Energy Efficiency Performance Standards: The Cornerstone of Consumer-Friendly Energy Policy*, October 2013.

SUMMARY OF TESTIMONY

In my testimony today I will briefly discuss seven points that will be examined in detail in our comments to be filed in response to the release of the Technical Assessment Review.

1) Consumers are the big winners, with total benefits well over five 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.

2) Low income consumers benefit more than the average consumer because operating expenses are much more important in their total cost of driving.

3) The benefits of the National Program are stills so strong, in spite of declining gasoline prices, because the minimum performance standards were extremely well designed. They are what I call a "command but not control" approach to regulation. They address numerous market imperfections and do so in a manner that harnesses the power of capitalism and markets to meet the standard in the least cost manner possible. This is not your grandfather's CAFÉ program; it 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. They are over-complying and costs are coming down. Innovation is roaring.

5) Our analysis shows that the industry complaints about the standards are the typical handwringing, which has proven to be wrong time and again in the past. The current round of complaints overestimates the costs by a factor of five, misrepresents what consumers want and ignores how much the billions of dollars they spend on advertising influences consumer behavior. The direct attack of the Alliance's on the National Program is based on a mixture of

self-serving, unsubstantiated assumptions, false choices and misrepresentation of what consumers want.

6) The indirect attack on the National Program, through a think tank funded by the automakers is equally unconvincing. Six months ago their report identified a dozen things the Technical Assessment Review should do. Having read through all 1200 pages, it is clear that the agencies have done all these things and still find a strongly positive outcome.

7) 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. At this stage, the problem is overstated and the two agencies that support the current standard (or stronger) have a much stronger case

EXPLANATION OF WHY THE NATIONAL PLAN HAS BEEN SO SUCCESSFUL

1. CONSUMER BENEFITS OF THE STANDARD

The topline results of the launch and early implementation of the National Program are quite simply, a very positive bottom line.

Consumer Pocketbook Benefits

- In spite of a significant decline in the current and projected price of gasoline, the benefits of the program far exceed the costs.
- The consumer pocket benefits continue to exceed the consumer pocketbook costs by a substantial amount, with a benefit cost ratio of approximately over 3 to one.
- The payback period is about five years, or less than half the life of the vehicle.
- Consumer pocketbook benefits still constitute the bulk of the total national benefits (about two-thirds).
- One way to summarize this outcome, recognized by NHTSA 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, a bargain no consumer in his or her right mind would pass up.

Additional National Benefits

- Environmental and public health benefits are slightly larger than the cost of the technology.

- The macroeconomic benefits of increasing consumer purchasing power should also be included, although EPA and NHTSA have chosen not to. In 2012, EPA ran an econometric model which showed that the macroeconomic multiplier effect almost doubled the economic benefit. Our comments in the heavy duty truck rule show that this order of magnitude is correct. Thus, the macroeconomic benefits are twice the cost.

Total National Benefits

- Combining all benefits, the total benefit is close to six times the cost.

- To put this in other word, The National Program could more than pays for itself in consumer pocketbook saving alone, or environmental public health savings, or macroeconomic stimulus. Taken together the National Program delivers a huge benefit in terms of consumer and total social surplus.

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 Technically Assessment Review. They found them to be spot on.[4]

First, low income households make up a much smaller part of the new vehicle market than their share in the overall population, about one-tenth. 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.

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.

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

Third, low income households are likely to be disproportionate beneficiaries of the indirect benefits. Low income households are 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 benefits from policies that strengthen it. Therefore, they are likely to benefit most from reductions in those impacts.

Fourth, while one can debate whether the standards will increase vehicle sales and accelerate scrappage, by 2022, which is the focal point of the mid-term evaluation, the vast majority of cars available on the used car market will have been built under the fuel economy standards rebooted by the Energy Independence and Security Act of 2007. Low income households will be buying more fuel efficient vehicles as a result of the standards program.

3. WELL-CRAFTED STANDARDS

We approach the setting of standards from a uniquely consumer point of view, always starting from three basic questions:[5]

- 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?

When we conclude that a standard is appropriate, we turn our attention to the design

- How can the standard be best designed to achieve the goal of lowering consumer cost?

In a number of regulatory proceedings and academic articles we have argued and demonstrated that performance standards are among the most effective and powerful tools of energy policy. We have applied this framework to evaluate a range of energy consuming

[5] Adapted from Mark Cooper, "Energy Efficiency Performance Standards: Driving Consumer and Energy Savings in California, February 20, 2014); *Energy Efficiency Performance Standards: The Cornerstone of Consumer-Friendly Energy Policy*, October 2013).

durables, including, in addition to light duty vehicles, gas furnaces, computers and heavy duty trucks. 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.

IMPERFECTIONS POTENTIALLY ADDRESSED BY STANDARDS[6]

Societal Failures[7]	Structural Problems[8]	Endemic Flaws	Transaction Costs	Behavioral[9]
Externalities[10]	Scale[11]	Agency[12]	Sunk Costs, Risk[13]	Motivation[14]
Information[15]	Bundling[16]	Asymmetric Information	Risk & Uncertainty[17]	Perception[18]
	Cost Structure[19]	Moral Hazard	Imperfect Information[20]	Calculation[21]
	Product Cycle Availability[23]			Execution[22]
	Produce differentiation[24]			
	Incrementalism [25]			

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

[6] 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."

[7] P. 6-7, the nature of technological invention and innovation.

[8] 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.

[9] P. 6-5, behaviors on the part of consumers and/or firms that appear not be in their own best interest (behavioral anomalies).

[10] 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.

[11] P. 6-8, the structure of the automobile industry may inefficiently allocate car attributes.

[12] P. 6-7, product differentiation carves out corners of the market for different automobile brands.

[13] P. 6-6, Consumers may be accounting for uncertainty in future fuel savings

[14] P. 6-6, Consumers may... not optimize (instead satisficing).

[15] P. 6-5 lack of perfect information.

[16] P. 6-6 Fuel-saving technologies may impose hidden costs.

[17] P. 6-6, Consumers might be especially averse to short-term loses….relative to long term gains.

[18] 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.

[19] 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."

[20] P. 6-6, consumers might lack the information necessary,

[21] P. 6-6, consumers might... not have a full understanding of this information.

[22] P. 6-6, selecting a vehicle is a complex undertaking... consumers may use simplified decision rules.

[23] P. 6-7, the role of business strategies.

[24] P. 6-7, separating product into different market segment… may reduce competition.

[25] P. 6-8, Automakers are likely to invest in small improvements upon existing technologies.

First, and foremost, as the following table shows, they 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

Second, and of equal importance, "command but not control" performance standards work best when they embody six principles,[26] which are clearly at the core of the National Program.

- **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.

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

4. The Industry Response to Well-Crafted Performance Standards

These 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.

- 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.

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 speed 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.

5) Misleading Analysis for the Automakers

The AAM analysis makes a remarkable serious of erroneous assumptions and misleading comparisons and claims.

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)

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.

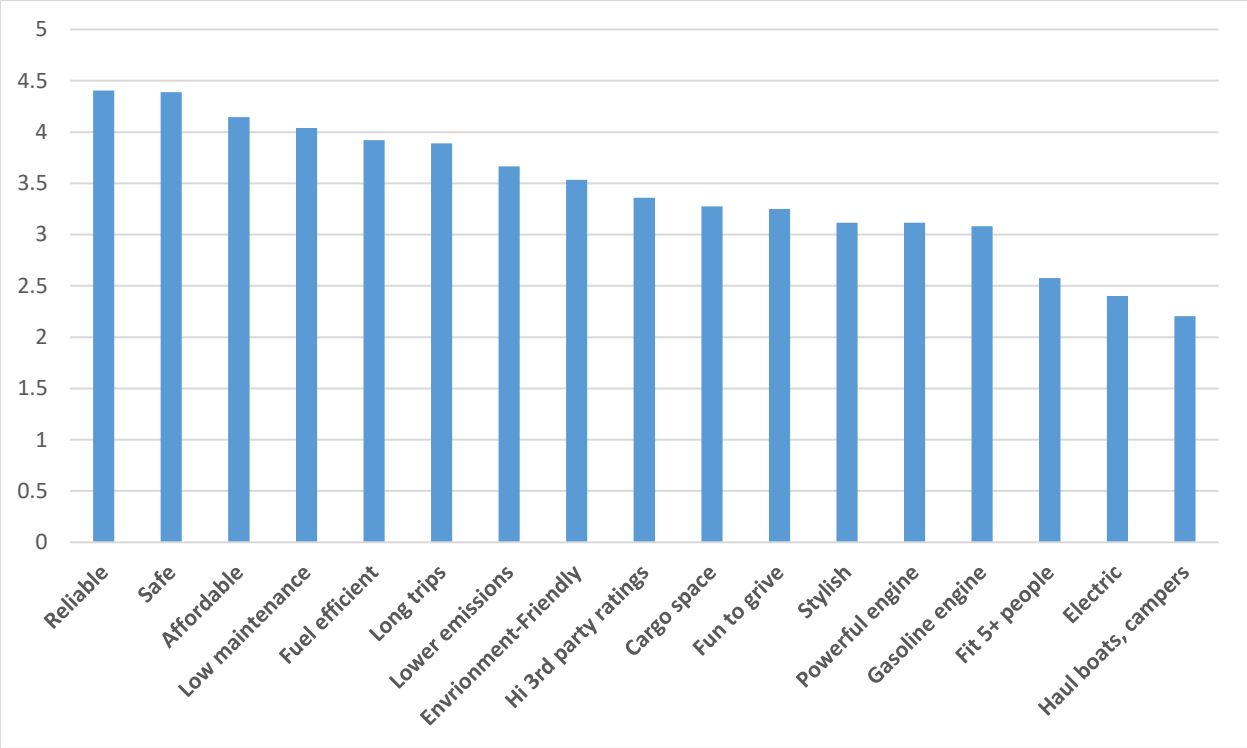
Even when they present a bogus choice (p. 7) that assumes the global threat of climate change "requires government regulations… that raised the price on new cars… pricing new cars out of the reach of many American families," more respondents opt for more regulation (42% to 41%). Similarly (p. 8), they 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 public is not as enamored of gasoline powered muscle cars and truck as the automakers claim

If an EV and gasoline vehicle were matched on cost and travel length (p. 9), more (48% to 43%) would prefer the electric vehicles and a clear majority (57%) are willing to pay more for an electric vehicle.

As the following table 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 the automakers are working feverishly to ensure that they do so.

ALLIANCE OF AUTOMOBILE MANUFACTURERS, VEHICLE ATTRIBUTE SURVEY, AUGUST 2016



Source and Notes: 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)

Moreover, 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 (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.

6. INDIRECT ATTACKS BY THE AUTOMAKERS ALSO MISS THE MARK BY A WIDE MARGIN

While a 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 following Table shows, the report should carry no weight with policymakers on procedural and substantive grounds.

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.

We doubt that the answers given by the agencies will end the debate, so it is important to note that the thrust of much of the analysis and recommendations in the framing of the questions is fundamentally flawed. There is no evidence that the impacts on consumers that they fret about have occurred under the National Program or are on the horizon. The absence of these effects flow from two fundamentally incorrect approaches that the authors take and real world facts they ignore.

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.

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 on unfounded

and incorrect assumptions. It analyses are properly treated by EPA as a "sensitivity" case. NHTSA has some heavy lifting to do if its approach is to be accepted as the primary approach.

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. 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 vehicle 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.

In conclusion, our review of the Technical Assessment Report for the mid-term review for the Corporate Average Fuel Economy Program and Greenhouse Gas Emissions Standards for Motor Vehicles finds that consumers are the big winners, with total benefits well over five times the costs. Low income consumers benefit more than the average consumer because operating expenses are much more important in their total cost of driving. The benefits of the National

Program remain very strong, in spite of declining gasoline prices as the minimum performance standards were extremely well designed. It is a "command but NOT control" approach to regulation. Automakers have done an excellent job with the freedom they have. They are over-complying and costs are coming down. Industry is doing an excellent job of complying with the standards and in fact, exceeding them. Many of their concerns are based on of erroneous assumptions and misleading comparisons and claims. NHTSA, EPA and CARB have done a good job of coordinating and collaborating in this effort—there is no need for a unified National Program which potentially could unnecessarily weaken the standards. This program is clearly on the right road for consumers, the environment and our economy.

I thank the Subcommittees for the opportunity to present the Consumer Federation's views on this vital issue.