

S. HRG. 107-645

REPORT OF THE NATIONAL ACADEMY OF SCIENCES ON  
THE EFFECTIVENESS AND IMPACT OF CORPORATE  
AVERAGE FUEL ECONOMY (CAFE) STANDARDS

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JOINT HEARING  
BEFORE THE  
COMMITTEE ON COMMERCE,  
SCIENCE, AND TRANSPORTATION  
AND THE  
COMMITTEE ON  
ENERGY AND NATURAL RESOURCES  
UNITED STATES SENATE  
ONE HUNDRED SEVENTH CONGRESS  
FIRST SESSION

AUGUST 2, 2001



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**THURSDAY, AUGUST 2, 2001**

U.S. SENATE, COMMITTEE ON COMMERCE, SCIENCE, AND  
TRANSPORTATION, AND THE COMMITTEE ON ENERGY  
AND NATURAL RESOURCES,

*Washington, DC.*

The Committees met, pursuant to notice, at 2:40 p.m. in room SH-216, Hart Senate Office Building, Hon. John F. Kerry presiding.

**OPENING STATEMENT OF HON. JEFF BINGAMAN,  
U.S. SENATOR FROM NEW MEXICO**

Senator BINGAMAN [presiding]. Why don't we go ahead and start the hearing. This is a joint hearing of the Commerce and Energy Committees, both of which Senator Burns is on, and so both Committees are well represented here. We are going to go ahead and start.

We just completed two days of mark-up in the Energy Committee on the Comprehensive Energy Policy Bill, on the first section. I see the focus of that bill as trying to build a 21st century energy infrastructure that contributes to our economic prosperity, gives consumers a wider range of affordable energy choices, while being responsible stewards of the environment.

In the last 2 days, we found broad bipartisan agreement in the Energy Committee on a robust research and development program. That R&D program needs to cover all aspects of energy production and energy efficiency and basic research. That is clearly an important element in finding new energy technology so that we will overcome some of the traditional obstacles and conundrums that we have in establishing our energy policy.

One of those conundrums is how to improve vehicle fuel efficiency while maintaining passenger safety. When we return in September, the Energy Committee and the Commerce Committee both will be discussing proposals for improved vehicle fuel efficiency and diversified fuel use in vehicles. The Committees have jurisdiction for separate parts of that question.

In today's hearing, both Committees have an opportunity to discuss the National Academy of Sciences report on effectiveness and impact of the corporate average fuel economy or CAFE standards,

and we have several members of the Committee that prepared this report for the National Research Council.

This comprehensive analysis provides a framework for looking at a number of issues that the CAFE standards encompass; issues like the economy, emissions, automobile safety, oil imports, and the environment. These concerns, as I am sure the Committee members will note, are very much interdependent.

I asked the staff to put up this one chart, which I have shown at several other Energy Committee hearings, because I think it points out the importance of the issue we are talking about and tries to portray both the history from 1970 until 2000 and then the period from now until 2020. It looks at petroleum consumption by different sectors of our economy. The transportation sector, as the chart amply demonstrates, is the sector of the economy that has been increasing its use of petroleum relative to other sectors, and is projected to increase its share of petroleum usage in our economy even more over the years ahead. So I think the issue of vehicle fuel efficiency is extremely important and extremely relevant as we discuss our energy future.

Let me stop with that very brief statement and call on Senator Burns for any statement he would have, and then we will hear from the panel.

**OPENING STATEMENT OF HON. CONRAD BURNS,  
U.S. SENATOR FROM MONTANA**

Senator BURNS. Thank you very much, Mr. Chairman and you know, what a difference 30 days makes, right? 30 days ago when gasoline was \$1.80 a gallon, this place you couldn't get another person in with a shoe horn, and today with gasoline at \$1.30, and I gassed up the other day in Grand Island, Nebraska for \$1.21, you know, all at once the urgency goes away for us to do something.

I want to thank you and I want to thank the Chairman of the Commerce Committee for holding this hearing, because I think we have a lot of things in common to both Committees. I think both Committees have a responsibility to look at this thing called fuel efficiency and efficiency standards, that it becomes very very important.

There's no doubt among us today that today's automobile is entirely different than the automobile even when I came to the Senate just 12 years ago, that the difference in our lifetime has been drastic. The cars, both automobiles and trucks, they run cleaner, they are safer, they are more efficient than they were, say 30 years ago.

While some would like to give the credit to the U.S. Congress for all the rules and standards that it developed, I would rather give credit where credit is due and thank the automakers, because I would say technology and competition has brought us to where we are today, and someone around the world, and of course the automobile industry is around the world business.

Coming from Montana, we look at a vehicle entirely different than say you would look at them out here on the beltway. Performance for Montana has a different meaning. We have longer distances and we have to cover those distances and we don't have a choice, because we are at the end of the freight line, so to speak.

If you look at the distance in Montana from Eureka down to Alzada, as the crow flies, and that is from the northwest corner to the southeast corner, it is further than it is from Chicago to Washington D.C.

And what we do out there with our automobiles is a little bit different than our trucks. We have to haul product to the farm and then we haul product from the farm. And of course, they would always say about agriculture, we operate under very different circumstances. We buy retail, sell wholesale, and we pay the freight both ways, and that sort of puts us in a pinch.

But number one, we look at our vehicle and at our roads for one thing, and that is reliability and will they get the product from point A to point B? So for these kinds of jobs we need reliable trucks and automobiles to get our jobs done, and the confidence that it takes to move us from one point to another. It is not for fun in our country and it is not to look cool on the expressway, it is because it is a part of our life.

Today's automakers have no choice but to build a better car and truck next year than they did this year, but I will say this. I am looking for a pickup now, prior to 1960, I think. I buy my automobiles in garage sales, I find that very economical at times, and other times it is not so economical. Nonetheless, we have to, we buy them for a different reason, but I will tell you this. The automakers keep making pickups for the urban crowd; it does not serve those of us who use pickups for the real thing, and that is to move product and then for them to stand up. I will tell you, the four-wheel drive pickups we get now do not last near as long as the old ones we had, say just 25 years ago.

I have no doubt that they will continue to do this with or without the change in CAFE standards. However, if we make changes in the standard without thinking about what our effects will be, that will be a big mistake. For example, by forcing manufacturers to pour all their resources into fuel efficiency, what do we trade for in safety and reliability that we may have achieved otherwise?

And I think that is the question that we are looking for here today, and I look forward to listening to our panels, and our experts that have studied this for a long long time. So Mr. Chairman, I would ask unanimous consent that my full statement be made part of the record, as I am looking forward to hearing the testimony.

Senator BINGAMAN. That will be the case. Since Senator Kerry is here, he will chair the rest of this hearing, and I will watch.

[The prepared statement of Senator Burns follows:]

PREPARED STATEMENT OF HON. CONRAD BURNS, U.S. SENATOR FROM MONTANA

Thank you Mr. Chairman, and thank you to our witnesses for being here today to discuss the National Research Council's report on The Effectiveness and Impact of CAFE Standards, or Corporate Average Fuel Efficiency Standards. As a member of both the Energy and Commerce Committees, this is a subject which is important to me in many different aspects.

There is no doubt among any of us that today's auto is cleaner, safer, and more efficient than those made 30 years ago. While some would like to give the credit for that to the U.S. Congress for all the rules and standards it has developed, I would rather give credit where credit is due and thank the automakers. I would say technology and competition have brought to where we are today much more than any rule has.

Coming from Montana, I have a different way of looking at cars and trucks than many of my colleagues. Performance in Montana has a much different meaning than it does on the Beltway. Yes, we have a lot of big cars and trucks to haul equipment, but remember, people are hauling a lot more than boats and RV's in Montana. We are moving livestock around, or carrying ranch or farm equipment from one place to another. And it might be 80 or 100 miles from one town to the next. For that kind of a job you need a reliable truck, and you need to have the confidence that it will get you and your merchandise without any trouble. Not for fun, or because it looks cool, but because it's your life.

Before we get too far into this, I ask my colleagues to take into consideration the different situations that drivers in different parts of the country face. Larger vehicles cannot and should not be classified into some sort of luxury status. Without the use of those vehicles at an affordable price, the American West would be a very different place than it is today. By asking that automakers place fuel efficiencies over any other goal, I fear that a big chunk of the burden will fall on the people who need these vehicles most to make a living. These are the farmers and ranchers who feed this country, but are being squeezed from every direction. They are facing higher prices for the goods they buy including fuel and fertilizer, and lower places for the goods they sell. Ranchers and farmers are interested in fuel efficiency, because that hits them in the pocketbook. But they are also dependent on a lot of other features that cars and trucks provide. By focusing purely on fuel efficiency, we are minimizing the importance of reliability, safety, and performance.

Today's automakers have no choice but to build a better car or truck next year than they did this year just to stay ahead of the competition. I have no doubt they will continue to do this with or without a change in CAFE standards. However, if we make changes in the standard without thinking about what the other effects will be that is a big mistake. For example, by forcing manufacturers to pour all their resources into fuel efficiency, what do we trade for it in safety and reliability that may have been achieved otherwise?

The report estimates that 1300 to 2600 highway fatalities in 1993 alone may be attributable to smaller, lighter cars that resulted partly from strict CAFE standards. Fuel efficiency, or any other attribute come at a cost. We need to know what those costs are.

I support the continued research and development of technologies that may not undertaken without federal support: The technology cycle can be drastically cut when we are willing to undertake this research for the public good before it is feasible in the marketplace. I would like to recommend that we focus on research before we focus on restrictions because this gives our American automakers a chance to compete in the global marketplace.

A final point I would like to make regards an assumption that is made throughout the report that greenhouse gases are decreased when fuel efficiency increases. I would like to find out further about the link between these two. I would suggest that as our cars get better mileage and it becomes less expensive to travel per mile, then people make choices accordingly. All told, people could be driving more miles today because it is cheaper to do so than it would have been otherwise. That would mean more people on the road for longer periods of time, and quite possibly emitting more carbon dioxide. CAFE standards are not, and should not be used as a tool for decreasing greenhouse gases in the atmosphere because the net effect is unknown. Better mileage may very well have the effect of increasing total carbon dioxide emissions, and I'd like to discuss this possibility with the panel and with my colleagues.

I am glad that the time and energy was put into producing this report because it answers some questions about what CAFE standards have and have not accomplished. It guides us in deciding how to make these standards more fair and effective. But it does not answer all my questions, and I am glad to have the witnesses here today to answer some of them.

**STATEMENT OF HON. JOHN F. KERRY,  
U.S. SENATOR FROM MASSACHUSETTS**

Senator KERRY [presiding]. Mr. Chairman, thank you for your cooperation in this joint hearing, and thank you for your leadership of the Energy Committee. I thank those of you who are here from the Academy and other sectors to discuss this question of the National Academy of Sciences' National Research Council's special report on CAFE standards.



As I listened to Senator Burns, I was thinking, and I say this very respectfully, how familiar the arguments I heard sound. They are almost a recap of the arguments we heard in the original discussions about CAFE standards.

Back in 1967 and 1974, we had rising oil prices and we also had declining fuel economy in the new car fleet, so the public was looking for more efficient automobiles. And in 1975, we required automobile manufactures to increase the average fuel economy in cars and light trucks, which then didn't include minivans, pickups and sport utility vehicles (SUVs).

Specifically, the Act applied a different standard to passenger cars and light trucks because of the rare use of light trucks, and limited information about light trucks. SUVs later came along and went through a definitional loophole, and qualified as trucks. Nobody anticipated the kind of widespread passenger use of SUVs the way we have it today. But we heard all the same arguments: increasing standards is going to kill the economy, if you do this it is going to hurt the country, the steel and auto industry, and so forth and so on.

I remember hearing those arguments in the Clean Air Act debate in 1990 where the projection, by the industry, was that if we mandated sulphur reductions, it was going to cost the industry \$10 billion. That was the figure floated around Congress, to which everybody said "Oh, God, how are we going to afford this?"

The Environmental Protection Agency said "No, it is going to cost \$4 billion." In fact, we put a cap and trade program for SO<sub>2</sub> in place. We have now reduced significantly the level of SO<sub>x</sub> emissions and we did it for \$2 billion. Why? Because nobody factored in sufficiently, if at all, how technology itself can reduce costs and improve efficiency, and nobody could predict with certainty what would come down the road.

What we have learned historically in this country is that when you liberate the entrepreneurial spirit of the United States of America, when you excite particular industries with a certainty of a marketplace, they fill the void. They come to it with solutions. There is, after all, no inherent public marketplace for Abrams tanks or for many of the planes we build or for missiles. There is a threat that we define, and we put a certain amount of money to the threat. Then, given that money, the private sector creates the response.

It is absolutely the same thing in the field of clean technology and environmental technology. If there is a sufficient marketplace and a guarantee of it, countless companies will fill that market. I am chairman of the Small Business Committee, and we just had a hearing yesterday, at which we heard the countless stories of small entities with hydrogen fuel cells and other alternatives that need the capacity of market, venture capital and other things to bring them to the marketplace. But the possibilities of offering alternatives to our citizens are enormous if we will dare to imagine it and to incentivize it.

That is what we are here to talk about today; the same thing happened with the CAFE standards. When they went into place, we doubled automotive fuel economy, and we significantly increased not just the capacity of our automobiles, but their safety

as well. So I think there are many things to look at here if we keep open minds. I will put the text of my own statement in the record so it can be read in full, and I ask my other colleagues if they would have any opening statements at this time. Senator Murkowski.

[The prepared statement of Senator Kerry follows:]

PREPARED STATEMENT OF HON. JOHN F. KERRY,  
U.S. SENATOR FROM MASSACHUSETTS

To begin, I want to thank our panelists for being here today and for the time, energy and effort they expended in writing the National Research Council report on CAFE.

In 1975 the nation set a goal of doubling the fuel economy of America's automobiles with the CAFE program—and in many respects we succeeded. Thanks to federal standards and innovation by the auto industry, the average passenger car on the road today is twice as efficient, safer, more reliable and a better overall product. We save roughly 3 million barrels of oil daily, save more than \$20 billion in reduced fuel purchases, and we have significantly reduced pollution that degrades the environment and public health. In this regard, I believe that CAFE has been a success.

However, in other areas, CAFE has not been as successful. The overall fleet of cars, SUVs, trucks and minivans is increasingly inefficient. In fact, the efficiency of the overall fleet has been declining since 1987 and is now at its lowest since 1980. The NRC report reveals that the regulatory framework of the CAFE program needs to be updated to reflect the modern auto industry. For example, the SUV loophole no longer makes sense as these vehicles have replaced cars in many households and now makeup more than half of the new vehicles sold. The NRC has also focused on the "2-fleet" rule that treats domestic and foreign built autos manufactured by the same company separately, the "dual fuel" rule that provides credits for vehicles that have the capability of running on ethanol but most often run on gasoline and other areas of concern. It seems that CAFE needs to be reformed.

Most of the blame for the CAFE program's current problems rests with Congress, because, year after year, the Congress enacted riders that prevented the Department of Transportation from even studying how these problems could be avoided and remedied. And the predictable result has now come to fruition, as the program is failing to meet even its most basic objective of increasing auto efficiency. I hope the NRC report and the work of the Commerce Committee and the Energy Committee will move us beyond that gridlock.

The NRC also concluded that CAFE has had a negative impact on safety in some instances. We must take that conclusion very seriously and think carefully about how a CAFE program can be structured to have no impact or a positive impact on safety, as the NRC says is possible. The most important factor seems to be providing the industry sufficient lead time to meet new standards. Doing so will allow industry to innovate with more efficient engines, new materials and safety design so that efficiency gains are not achieved through size reduction alone, which may harm safety.

In closing, I want to say that the Commerce Committee plans additional hearings on this issue and, I hope, will produce legislation that can be brought before the full Senate. My view is that such a proposal must reform the CAFE program. That might mean closing the SUV loophole, setting new standards for all vehicles and including some other proposals from the NRC and others. I hope and expect that the Committee will be inclusive and deliberative in that process, taking testimony from the automakers, autoworkers, technical experts, environmentalists and others.

My work will be guided by four principles:

- We must reverse the trend of decreasing efficiency as soon as possible.
- We must make significant efficiency gains over the coming decade.
- We must minimize any negative impact on our auto companies and workers.
- We must ensure public safety.

Hopefully we can find common ground and enact just such a proposal this Congress. I look forward to the panel, and I thank the Energy Committee for working with the Commerce Committee to organize this hearing.

Thank you.

**STATEMENT OF HON. FRANK H. MURKOWSKI,  
U.S. SENATOR FROM ALASKA**

Senator MURKOWSKI. Good morning, Senator Kerry. I appreciate the opportunity to participate as the ranking member of the Energy Committee in this joint hearing, to conduct oversight on the National Academy report on fuel economy, I want to welcome the distinguished panel today.

Many of us are focusing on the report's suggestion that we can increase fuel economy standards to 30 miles per gallon by the year 2015 or thereabouts, but I think it is important to consider some of the small print associated with that general comment. And I quote: "Raising CAFE standards would reduce future fuel consumption below what it would otherwise be. However, there are other policies that could accomplish the same end at a lower cost, providing more flexibility to manufacturers for addressing these standards than the current system." The NAS then points out several "superior" alternatives for fair consideration. I hope that you will explore these new recommendations here at this hearing.

One of these alternatives, tax incentives for fuel efficient vehicles, is contained in the comprehensive energy bill that Senator Bingaman and I are working on in the Committee. No one disagrees that improved fuel economy provides benefit to consumers, the economy and environment, but Congress should focus on the proper policies, and I emphasize policy, to foster technology innovation. I do not think we should be spending our time arguing whether the number is 27.5, 30, 40, 110, or whatever.

We should instead ask why, why the 10 most efficient vehicles on the market today for sale to the American public only comprise a little less, a little less than 1.5 percent of the automobile sales. That is a fact. Why don't consumers buy these fuel efficient vehicles? Why is fuel economy ranked 25th on a list of attributes to consumers when they are looking for purchasing new cars? That is the Norris poll.

Perhaps instead of pointing fingers at the automakers in Detroit, we should look at our own buying habits. Americans have consistently demanded vehicles with safety, improved performance, heavier weight, and more features, but consider this: if we had maintained the same weight and performance of our vehicles as in 1981, our fleet-wide fuel economy would average 36 miles per gallon. Today's cars are bigger, they are safer, with more features. Fuel economy gains have been offset by improved performance or electrical requirements. We clearly cannot legislate an arbitrary number and assume that the vehicles produced as a result will be necessarily as safe and as affordable as is desired by consumers.

And NHTSA already has the authority to review CAFE standards based on this NAS report. Why don't we let the experts do the job and get out of the way? I think we are all aware that Senators don't make very good engineers, and Congress can take to heart the recommendation contained in the NAS report when considering changes. This is clearly a part of our national energy fate.

Let me conclude with one final thought. We can mandate the manufacture of all of the fuel efficient cars and trucks in the world, but if nobody buys them, then what have we done? Does it not make sense to provide American consumers with safe, affordable,

and desirable vehicles and fuel economy as well? There is a balance as far as what we are attempting to do in terms of energy policy. We can do this if we take the recommendations of the National Academy panel to heart.

I look forward to your testimony, and I encourage you to remind us that we make decisions so often here on the rhetoric as opposed to the sound science, and you folks are here and I expect you to put your recommendations to us, and that is based on your expertise and commitment to science, because if we cannot look to you, who can we look at? We are but generalists. Thank you.

Senator KERRY. Thank you very much, Senator Murkowski.  
Senator Feinstein.

**STATEMENT OF HON. DIANNE FEINSTEIN,  
U.S. SENATOR FROM CALIFORNIA**

Senator FEINSTEIN. Thank you very much, Mr. Chairman. I want to thank you, Senator Hollings, Senator Bingaman as well as Senator Murkowski, for having this hearing, and I particularly want to thank the National Academy. I did have an opportunity to come and speak with you informally and I want you to know how much I appreciated that opportunity.

I was actually heartened by your report. As you know, Senator Snowe and I have some legislation pending which would close the SUV light truck loophole and bring the SUV from 20 miles a gallon in conformance with the sedan's 27.5 miles per gallon within the next 6 years. What I garnered from your report is that the technology is available to improve fuel efficiency, the only question is the length of time required to implement that technology, and I guess how you structure that as well. So I would like to ask you later some questions about that.

The second point that you made to me was that you refuted the argument that increasing fuel efficiency will make U.S. workers less competitive, and I very much appreciated that.

And the third point you made, which to me was important, is that you recognized the very critical role that transportation plays in reducing greenhouse gasses and foreign oil imports. Actually, I believe the transportation sector is some 30 percent of the global warming issue, and one of the things in our bill, namely closing the SUV loophole, if we have to lengthen the time to accommodate that, that certainly is acceptable to me.

I do think, though, that the savings that we get from it are important, the 240 million tons a year of carbon dioxide that we keep out of the atmosphere, the number one global warming gas, I think that is important. Reducing oil imports by 10 percent, I think that is important. Saving the consumer at the pump \$300 to \$600 a year, I think that is important. Saving a million barrels of oil a day, by closing this loophole, I think that is important.

I wrote to some of the companies asking them to do some of this voluntarily and I got a very interesting letter back from Honda, from the American Honda Company from their executive vice president, and you know, they point out to me that Honda has consistently maintained the leadership throughout the years because it's part of their corporate philosophy, and that the CAFE rating of their passenger cars and light trucks is the highest of any major

manufacturer, 31.2 miles per gallon for passenger cars and 25.4 miles per gallon for light trucks.

They also point out that the new Acura MDX sports utility vehicle achieves the best fuel economy in its class. I certainly think Honda is really to be commended on that basis. What Honda goes on to say is they don't want to continue to do things voluntarily unless everybody in the field is willing to respond in the same way.

And I have kept hearing how, well, the three big American motor companies will lose their competitive edge if they improve fuel efficiency. I don't believe that is true, I don't think you believe that is true. I think the question is, how do we get from point A to point B, and I think your report frankly has shown a lot of light on that, and I am very grateful for it, and I am hopeful that we might be able to consider our closing the SUV loophole legislation very shortly. Thank you very much, Mr. Chairman.

Senator KERRY. Thank you very much, Senator Feinstein. We have been joined by additional Senators. We didn't have this many Senators when we began the hearing, and I am not going to suggest that we do not hear them, because I think that would be unfair, but I do want to try to get to the panel. The first Senator in order will be Senator Allen.

**STATEMENT OF HON. GEORGE ALLEN,  
U.S. SENATOR FROM VIRGINIA**

Senator ALLEN. Thank you, Mr. Chairman. I will not make a long opening statement, I came here to learn and listen. I know that we ought to make decisions on sound science and whatever tax or regulatory policies we have in this Nation ought to be based on trusting our free enterprise and letting people—if Toyota has those vehicles, that is—

Senator FEINSTEIN. Honda.

Senator ALLEN. Honda, excuse me. And with Ford or General Motors or whatever, consumers can make those decisions. I look forward to listening to the testimony here and I will forego fulminations.

Senator KERRY. Thank you, Senator Allen.  
Senator Smith.

**STATEMENT OF HON. GORDON SMITH,  
U.S. SENATOR FROM OREGON**

Senator SMITH. In that spirit, Mr. Chairman, I will keep my opening statement short.

As Senator Allen just stated, a lot of us would like to be guided on science and not on politics on this. We would like to have for the American people cars that are safe but also I think the American people would appreciate a break when it comes to gas mileage and would like us to push as much as we can in public policy to get them something that is both friendly to the family budget and the environment, and I think you have done some work that helps guide us in that process, and I thank you.

Senator KERRY. Thank you, Senator Smith.

Gentlemen, thank you very much for your patience. Again, I apologize for personally being late but I was negotiating an amendment to the current bill on the floor.

We are delighted to have the members of the Committee on the Effectiveness and Impact of Corporate Average Fuel Economy Standards with us today. I think what we will do, Dr. Greene, is begin with you and just go across, unless you all have a different order. You do. Dr. Portney, you can start please.

**STATEMENT OF DRS. PAUL R. PORTNEY, CHAIR OF THE COMMITTEE ON EFFECTIVENESS AND IMPACT OF THE CORPORATE AVERAGE FUEL ECONOMY STANDARDS, NATIONAL RESEARCH COUNCIL; ACCOMPANIED BY JOHN J. WISE, PHILIP R. SHARP, ADRIAN LUND, AND DAVID L. GREENE**

Dr. PORTNEY. Mr. Chairman, thank you very much. Other members of the Commerce and Energy Committees, thank you for being here and thank you for this opportunity.

I am Paul Portney, I am president of Resources for the Future, a think tank here in Washington, but I am here in the capacity today as the chairman of the National Academy of Sciences Committee on Effectiveness and Impact of the Corporate Average Fuel Standards.

If I could, let me begin by introducing my colleagues who are here today. I will then make a very brief statement and then invite you to ask all the questions that you want. As skillfully as I can, I will direct the hard ones to my colleagues here on my Committee.

To my far right is David Greene. David is a senior research scientist at Oak Ridge National Labs. To my immediate right is Jack Wise. Jack is retired as vice president for research at Mobil. To my immediate left is Phil Sharp, professor at the Kennedy School at Harvard, probably better known to many of you as a former Member of the House of Representatives and the Energy and Commerce Committees at the time that the Energy Policy and Conservation Act was being debated in the late 1970's. And to my far left is Adrian Lund. Adrian is president and chief operating officer of the Insurance Institute for Highway safety.

The five of us, along with eight other Committee members who aren't here, have been laboring for the past 5 or 6 months to produce this report. I have noted in other forums that some people are upset with us for taking so long to do the work that we have done; there seems to be an equal number of people who were upset with us that it didn't take us 2 months longer. And so, I am sorry to everybody who is unhappy with the timing of this report. We're all very pleased to have it behind us.

I think it was Senator Murkowski who said in his statement that Senators don't make very good engineers. I don't know whether that is true or not, but I think all of the members of the CAFE Committee feel that engineers and economists and policy analysts probably don't make very good Senators either, and for that reason, I have begun all of the presentations that I have made on this CAFE Committee report by pointing out that the Committee makes no recommendation whatsoever about specific fuel economy standards for passenger cars or light duty trucks.

What we've tried to do over the past 5 or 6 months is to develop as carefully as we could, the very best information possible that will indicate to you the trade-offs, quite complicated trade-offs, that

have to be made in balancing corporate average fuel economy standards against safety, emissions, the price of a vehicle, the performance characteristics to which Senator Burns alluded, et cetera. The hope is that in the 6 months that we pulled together this information that we've pulled together that as you begin to deliberate and debate on this, you will have the kind of sound science base that I think you all want when you are making important public policy decisions.

Let me talk very briefly about what the Committee found during its deliberations and if I could, I'm going to reverse the order in which I discuss these just a little bit.

Watching on C-SPAN and in other places the debates in the House over the last couple of days, we now have seen a number of people who have purported to speak for the Committee or at least say what they think that the Committee said. We're pleased to have this opportunity to say in our own words what the Committee said.

So first let me summarize for you what our findings were about possible future improvements in fuel economy and the trade-offs that will necessitate. Then I will turn to what the Committee found about the past impacts of CAFE, both the pro and con. Then I will touch briefly on a series of recommendations we made about ways in which CAFE might be changed, having nothing to do with the specific numerical targets that are involved.

Let me start first with our prospective findings, what we see in the future. The Committee was very clear in saying if one takes a 10- to 15-year perspective, one is able to identify a series of technology packages, some based on existing technology, some on technologies that we call emerging, which in combination would make it possible to significantly improve the fuel economy of the light duty fleet in the United States, both passenger cars and trucks.

In my prepared testimony, which I hope will be entered into the record, I identified several of these technologies, and in our Committee report, we told you quite exhaustively on a drive train basis, on an aerodynamic basis, and on other technological bases the nature of these technologies, and try to indicate which vehicles they can be easily introduced into, and in some cases the pace at which these technologies can be introduced.

Now, in addition to having identified these significant improvements in fuel economy and having identified how much they will cost, we also engaged in what we called a break-even analysis and that was an effort on our part to identify a series of technology packages which when added to vehicles today, over the next decade to decade and a half, and that's important, would produce gains in fuel economy that would save enough gasoline to pay for the addition to the up-front or purchase price of the vehicle that these technologies would necessitate.

I emphasize again that there is nothing normative about the identification of these break-even technologies. We're not recommending that this is the appropriate goal, we are just identifying a package of technologies which will add enough to the purchase price of the car so that they would be offset at the margin by the last dollar of technology increase by the fuel economy savings that the motorist would get.

Now I also want to hasten to point out that does not mean that if you were to look at the fuel levels, those percentage increases by vehicle type, and say well, we're going to strive to get that goal, it would necessarily be the case that you could accomplish all of those goals without some loss of safety. And I say this for the following reason: When we look at these technology packages, we are very careful to say that these are improvements in fuel economy that are consistent with holding constant the performance, the size and the weight of the vehicles.

So that when we identify these break-even technologies, these are adding technologies that do not result in any downsizing or downweighting of the vehicle and for that reason, they should have no adverse side effects on safety.

However, if one were to choose those fuel economy goals, ask the automakers to meet those goals, they might decide to try to meet those higher fuel economy standards not by introducing those technologies, but possibly by downweighting or downsizing the car. If that's the case, the Committee is not confident in saying that there would be no adverse safety effects; in fact, there could be some adverse safety effects if the fuel economy goals were met not by adopting the technology packages that we identified, but rather through some combination of that along with downsizing and downweighting.

We are also very careful to identify the increases in the prices of cars, vehicle type by vehicle type, that would be necessitated by the additions of these technologies and in the case of what we call the 14-year horizon, where we assume the car owners are looking over the next 14 years of the life of their car when they buy it, those purchase price increases could be between \$250 and \$1,400 depending on the size of the vehicle we're talking about.

So again to summarize, looking forward, technologies exist or are in development and could be applied which would produce significant improvements in fuel economy without adverse effects on size, performance or weight. However, there are significant costs associated with this, and to speak to a point that Senator Burns made, there is no question that by requiring these improvements in fuel economy, if automakers do install these technology packages, then that's money that could not go into the development of other alternative amenities in a car that people might want to have, towing capacity, carrying capacity, et cetera. To put it bluntly, there are trade-offs, there's no question about it.

Very briefly looking backwards, we looked at the imposition of the CAFE program going back to 1978 and found that that program along with increases in gasoline prices, which also had a significant effect, because gas prices of course went up dramatically at that time, the CAFE program, increases in gasoline prices, and some downsizing and downweighting of vehicles that car makers engaged in anyway to try to take materials out of the car to reduce the purchase price of the car, played a significant role in the improvement of the fuel economy of the fleet in the United States during the period starting in 1978.

Now, in terms of the cost of those improvements in gasoline consumption, we saw reductions in greenhouse gas emissions, less dependence on foreign oil. In terms of the cost of those changes, we



found that vehicle performance declined during that period of time. And perhaps most importantly, we found that the very rapid downsizing of the vehicle fleet, particularly between 1978 and 1982, quite probably had an adverse effect on the safety of the vehicle fleet. A majority of the Committee was making the prediction, although acknowledging the uncertainties that are apparent in this, that the rapid downsizing that took place over a 4-year period probably added between 1,300 and 2,600 deaths to the annual fatality rate relative to what fatalities would have been absent that downweighting and downsizing.

Now I want to mention, if one looks at the automobile fatality rate over time, it has continued to fall. What we're saying is that it would have fallen even more had it not been for that rapid downweighting and downsizing of the fleet that was partially due to the CAFE standards.

Now, moving ahead, our congressional charge asked us to look into three things. What did CAFE do retrospectively, and I've spoken to that. Are there technologies available in the future to improve the fuel economy of the fleet and what are those costs, I've tried to briefly summarize those. We were also asked by Congress to take a look at recommendations we might have for improvements in the way the CAFE system functions quite apart from changes in the numerical standards, and here we had a number of specific recommendations.

I will turn to them in just a second but I want to speak to one of the findings of the Committee, which is that there is really a profound inconsistency between on the one hand expressing the view that our car makers ought to make cars that are more fuel efficient and on the other hand, convening congressional investigations anytime the price of gasoline goes above \$1.50 a gallon.

One of the things that is the biggest spur to fuel economy in Europe and Japan is the fact that gasoline is \$2 or \$3 per gallon more expensive there. That means that you have consumers who have a strong financial incentive to seek out fuel efficient cars, and that makes it easier for the car makers to sell those cars. Here in the United States, we prefer cheap gasoline and there are a number of benefits that are appurtenant to that but one of the adverse consequences is that through the CAFE program—even the current program, much less tightening it—we're sending the automakers a signal that they should make more fuel efficient cars, while all the signals that they get from the marketplace, and one of you read some statements to this effect earlier, is that at \$1.50 a gallon gasoline, fuel economy is not very high up the list of attributes that people look at when they purchase a new care.

Having said that, let me mention the recommendations that we made. First of all, every member of the Committee feels that the CAFE program as presently constituted or as it might be changed in the future could be dramatically improved if the CAFE credits, the fuel economy credits that can now be accumulated and used against shortfalls in future years were made tradable or sellable between companies.

And here there is a very good precedent. It was the same way in the 1990 amendments to the Clean Air Act. We both required coal powered powerplants to reduce their emissions, but at the

same time we gave them the opportunity to buy and sell emission reductions between them. That both enabled us to meet the emission reductions at least cost to society, and it has done something else very valuable. It has allowed us to observe how expensive it is to reduce sulphur dioxide emissions, because there is a market price for these emission reductions.

And if we make CAFE credits tradable, we could see if an auto-maker is buying CAFE credits at a certain price, we know that that company could have, but expensively, improved its fuel economy, because if it could, it would do that rather than buy these expensive credits. So making the credits tradable, we think would be a significant improvement in the CAFE program.

The Committee also urges that Congress and NHTSA consider what we call a look at an attribute-based CAFE or fuel economy system in which the fuel economy target that vehicles were required to meet might vary in proportion say to their weight or some other attribute of the vehicle and we sketch out in our report one particularly appealing, at least to us, one particularly appealing possible approach at creating an attribute-based fuel economy standard.

We also recommend the abolition of what's called the dual fleet requirement in CAFE. That is, that imported cars and domestic cars be averaged separately. We think that distinction has outlived its usefulness and we don't see any reason to continue it.

And perhaps more controversial than we recognize, we recommend the abolition of the dual fuel provisions which give car makers extra credits for producing cars that run on both gasoline and ethanol.

Two quick final recommendations. One has to do with research and development, which one of you mentioned earlier. We urge the Government to continue considering participation in joint industry government ventures like the Partnership for a New Generation of Vehicles. We think that partnership has turned up some interesting leads that shed light on fuel economy, and could do so in the future, and we hope that the government will remain open to that.

And finally, because of the very important and controversial role that safety plays in the fuel economy debate, we have recommended that the National Highway Traffic Safety Administration undertake a new study like that completed in 1997, using much more recent data, on traffic fatalities, which would make possible, we think, a more careful and up-to-date analysis of the links between improved fuel economy on the one hand and traffic accidents, injuries and fatalities on the other.

That concludes my prepared remarks and thank you again very much for this opportunity, and we're prepared to answer any and all questions that you may ask.

[The prepared statement of Dr. Portney follows:]

PREPARED STATEMENT OF DR. PAUL R. PORTNEY, CHAIR OF THE COMMITTEE ON EFFECTIVENESS AND IMPACT OF THE CORPORATE AVERAGE FUEL ECONOMY STANDARDS, NATIONAL RESEARCH COUNCIL

Good afternoon, Mr. Chairman and members of the Committee. I am Paul R. Portney, President of Resources for the Future and Chair of the Committee on Effectiveness and Impact of the Corporate Average Fuel Economy Standards of the National Research Council. The Research Council is the operating arm of the National

Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine, chartered by Congress in 1863 to advise the government on matters of science and technology.

It is a pleasure to be here to introduce the report on CAFE standards. That is not a pro forma statement. The last 6 months have been extremely demanding for the entire Committee as well as the NRC staff, and it is a genuine pleasure to see it end. This study was requested by Congress last year to provide assistance in its decisions related to fuel economy standards. Since we started in February 2001, the full Committee has met on a total of 17 days, and there have been an additional 11 subgroup meetings. Quite an investment of time for a group of unpaid volunteers.

I would like to provide a brief overview of the report. This is really a joint presentation. My colleagues from the Committee, John Wise, Philip Sharp, Adrian Lund, and David Greene may fill in the holes I leave in the presentation, but on almost all issues, the Committee reached unanimous conclusions. The report is complicated, and I cannot do it justice in a few minutes. Therefore I request that we include the Executive Summary as part of the record.

The Committee had a 3-part mission:

1. Determine the effect that CAFE standards have had on fuel economy, and the impact on the industry, consumers, safety, and other issues;
2. Estimate the impact that changes to CAFE standards might have in the future; and
3. Evaluate the structure of the CAFE program and recommend potential improvements.

#### *Review of the Current CAFE Program*

Our review of past and current impacts of CAFE standards convinced us that the program has significantly reduced fuel consumption. Other factors also have been important, especially the reaction of consumers and the automotive industry to higher fuel prices in the 1970s and early 1980s. The Committee could not apportion responsibility among these factors, but notes that CAFE was clearly important. In recent years, CAFE indisputably played an important role in maintaining higher fuel economy than would have resulted from the lower fuel prices that prevailed for most of this period.

There have been adverse consequences as well. Safety is most important. The majority of the Committee concludes that the downsizing and downweighting that occurred in the 1970s and 80s (partially in response to CAFE) resulted in an additional 1,300 to 2,600 fatalities in 1993. While fatalities were declining in this period, most Committee members believe that they would have declined this much more had the downweighting and downsizing not occurred. Two members of the Committee dissent from this view. They believe that the data does not support this conclusion, and that the net effect on highway fatalities of the increases in fuel economy may have been zero. David Greene, one of the authors of the dissent in the report, may elaborate on that conclusion.

An additional impact, although one we were unable to quantify, may have been restrictions on consumer choice. Requiring automotive manufacturers to focus on fuel economy diverted their resources from improving other attributes valued by consumers, such as acceleration and carrying capacity.

#### *Impact of Higher Standards*

First let me note that the Committee does not recommend whether or by how much the government should raise standards. We believe that that is a decision belonging to Congress, the President, and appointed officials because it involves tradeoffs among factors very important to the people of this country—the costs of driving, the environment, national security, consumer choice, safety, and others. In so far as possible, the Committee identifies these tradeoffs, but a full analysis was not possible within the short time allotted to this study.

The Committee believes that it is incumbent on decisionmakers to understand why they want to increase fuel economy and to ensure that the costs of the increases are consistent with the motivation. The two main factors the Committee considered are oil imports and global climate change. Analysts assign a wide variety of costs to these externalities. The Committee considered this range, and ultimately chose values which, in total, are equivalent to about 30 cents/gallon of fuel. I mention this figure not because the Committee endorses it (indeed other analysts might choose values much higher or lower), but because it helps to understand how hard one can push on fuel economy.

With that as context, the Committee concludes that significant improvements in fuel economy are quite possible at reasonable cost. A variety of technologies to im-

prove fuel economy are available for cars and light trucks. Many have been developed and are being implemented in Europe and Japan where fuel prices are much higher than here. Variable valve lift and timing can reduce fuel consumption by 3-8%. Continuously variable transmissions can achieve another 4-8%. Other technologies are under development and will be available for wide scale use within 15 years. Fuel economy can be raised more for heavier vehicles than for light ones, and the resulting fuel savings will be much higher for the heavier vehicles also. For example, a midsize SUV might see a 34% increase (from 18 to 28 miles per gallon). Over the lifetime of the vehicle, these improvements would save nearly 2,000 gallons, which would more than pay for the incremental cost.

As with the current CAFE program, raising standards will have other consequences as well, with safety again being the most contentious. Any increase in fatalities will depend on how manufacturers meet higher standards. While the technologies examined by the Committee generally appear to be more cost-effective than weight reduction, CAFE standards as currently structured do not preclude any methods. Thus some manufacturers might include some weight reduction, which the majority of the Committee believes would involve some safety consequences. However, it is also possible that weight reductions could be concentrated in the heavier vehicles. This would reduce the weight disparity in the fleet, which would have beneficial consequences for safety. This could occur because the greater risk for the occupants of the downsized vehicles would be more than balanced by the lessened risk for other road users.

Again it should be noted that increased fuel economy is not a high priority for most consumers. If manufacturers have to meet higher standards, they will have to have to neglect other attributes that consumers might find preferable.

*Recommendations on the Structure of the CAFE Program*

First, I would like to point out that there is a marked inconsistency between raising fuel economy standards while keeping fuel taxes low. The Committee certainly does not recommend raising taxes to the level of European countries (or to any specific level for that matter), but the members believe that efforts to raise fuel economy would work much better if consumers had more motivation from higher fuel prices.

The Committee recommends that a tradable credit program be part of any regulatory program on fuel economy. Even if the current structure is maintained and the standards not raised, the program can be made more efficient and effective with tradable credits. All manufacturers would have incentive to raise the economy of all their vehicles, and the results are likely to be less costly than the current approach of treating each manufacture separately. Tradable credits have worked well in reducing the costs of sulfur dioxide emissions from coal-fired power plants, and the Committee believes that will work as well on fuel economy.

An attribute-based system should be considered for the regulatory standard. The partially weight-based system we call "Enhanced CAFE" is particularly intriguing. Lighter vehicles (up to 3,500 or 4,000 pounds) would be on a standard inversely proportional to their weight. Heavier vehicles would all have the same standard. This system would avoid any incentive for manufacturers to reduce the weight of light vehicles, but would encourage lightening the heavier vehicles, with advantages in safety as I noted earlier.

The Committee recommends abolishing the foreign-domestic distinction. Given the global nature of the auto industry, this distinction makes no sense now.

The Committee also recommends abolishing the credit for dual-fuel vehicles. There may be valid policy reasons for encouraging alcohol fuels, but CAFE is not a good way to do it. Owners of these vehicles essentially never buy alcohol fuel because it is expensive and difficult to find, but the credit lowers the fuel economy of the entire fleet.

The government should continue cooperative programs with industry to improve fuel economy. The Partnership for a New Generation Vehicle (PNGV) is the most prominent of these programs.

Finally, the National Highway Traffic Safety Administration should update its analysis of the relationship between safety and fuel economy improvements.

Thank you Mr. Chairman, that concludes my comments. My colleagues and I would be happy to take any questions you may have.

EFFECTIVENESS AND IMPACT OF CORPORATE AVERAGE FUEL ECONOMY (CAFE)  
STANDARDS

(Prepublication-Unedited Proof)

## EXECUTIVE SUMMARY

In the wake of the 1973 oil crisis, the U.S. Congress passed the Energy Policy and Conservation Act of 1975 with the goal of reducing the country's dependence on foreign oil. Among other things, the act established the Corporate Average Fuel Economy (CAFE) program, which required automobile manufacturers to increase the salesweighted average fuel economy of the passenger car and light-duty truck fleets sold in the United States. Today, these include minivans, pickups, and sport utility vehicles. Congress itself set the standards for passenger cars, which rose from 18 miles per gallon (mpg) in automobile model year (MY) 1978 to 27.5 mpg by MY 1985. As authorized by the Act, the Department of Transportation (DOT) set standards for light trucks for model years 1979 through 2002. The standards are currently 27.5 mpg for passenger cars and 20.7 mpg for light trucks. Provisions in DOT's annual appropriations bills since fiscal year 1996 have prohibited the agency from changing or even studying CAFE standards.

In legislation for fiscal year 2001, Congress requested that the National Academy of Sciences, in consultation with the Department of Transportation, conduct a study to evaluate the effectiveness and impacts of CAFE standards.<sup>1</sup> In particular, it asked that the study examine, among other factors:

- (1) the statutory criteria (economic practicability, technological feasibility, need for the U.S. to conserve energy, the classification definitions used to distinguish passenger cars from light trucks, and the effect of other regulations);
- (2) the impact of CAFE standards on motor vehicle safety;
- (3) disparate impacts on the U.S. automotive sector;
- (4) the effect on U.S. employment in the automotive sector;
- (5) the effect on the automotive consumer; and
- (6) the effect of requiring separate CAFE calculations for domestic and non-domestic fleets.

In consultation with the U.S. Department of Transportation, a statement of work for the Committee was developed (see Appendix C) [NRC Report]. The emphasis of the Committee's work was to be directed toward recent experience with CAFE standards, the impact of possible changes, as well as the stringency and/or structure of the CAFE program in future years. The National Research Council established the Committee on Impact and Effectiveness of Corporate Average Fuel Economy Standards, which had its first meeting in early February 2001. In effect, since the congressional appropriations language asked for the report by July 1, 2001, the Committee had less than 5 months (from February to late June) to complete its analysis and prepare a report for the National Research Council's external report review process. In its findings and recommendations, the Committee has noted where analysis is limited and further study is needed.

The CAFE program has been controversial since its inception. Rather sharp disagreements exist regarding the effects of the program on: the fuel economy of the U.S. vehicle fleet; the current mix of vehicles in that fleet; the overall safety of passenger vehicles; the health of the domestic automobile industry; employment in that industry; and the well-being of consumers. It is this set of concerns that the Committee was asked to address.

These concerns are also very much dependent on one another. For example, if fuel economy standards were raised, the manner in which automotive manufacturers would respond would affect the purchase price, attributes, and performance of their vehicles. For this reason, the mix of vehicles that a given manufacturer sold could change, perhaps resulting in a greater proportion of smaller and lighter vehicles; this in turn could have safety implications, depending on the eventual mix of vehicles that ended up on the road. If consumers were not satisfied with the more fuel-efficient vehicles, that would in turn affect vehicle sales, profits, and employment in the industry. Future effects would also depend greatly on the real price of gasoline; if it were low, consumers would have little interest in fuel-efficient vehicles. High fuel prices would have just the opposite effect. In addition, depending on the level at which fuel economy targets were set, and the time frame the companies would have to implement changes, differential impacts across manufacturers would

<sup>1</sup> Conference Report on H.R. 4475, Department of Transportation and Related Agencies Appropriations Act, 2001. Report 106-940, as published in the Congressional Record, October 5, 2000, pp. H8892-H-9004.

likely occur depending on the types of vehicles that they sell and their competitive position in the marketplace. Thus, understanding the impact of potential changes to CAFE standards is, indeed, a difficult and complex task.

In addition to the requirement that companies meet separate fleet averages for automobiles and light-duty trucks they sell, there are other provisions of the CAFE program that affect manufacturers' decisions. For example, a manufacturer must meet the automobile CAFE standard separately for both its import and its domestic fleet ("2-fleet rule"), where a domestic vehicle is defined as one for which at least 75 percent of its parts are manufactured in the United States. Also, CAFE credits can be earned by manufacturers who produce "flexible-fuel" vehicles that can run on both gasoline and alternative fuels, such as ethanol.

Why care about fuel economy at all? It is tempting to say that improvements in vehicle fuel economy will save money for the vehicle owner in reduced expenditures for gasoline. The extent of the annual savings will depend on the improvements in the fuel economy (in miles per gallon of gasoline), the price of gasoline, and the miles traveled per year, as well as the higher cost of the vehicle resulting from the fuel economy improvement. While a strong argument can be made that such savings or costs are economically relevant, that is not by itself a strong basis for public policy intervention. Consumers have a wide variety of opportunities to exercise their preference for a fuel-efficient vehicle if that is an important attribute to them. Thus, according to this logic, there is no good reason for the government to intervene in the market and require new light-duty vehicles to achieve higher miles per gallon, or to take other policy measures designed to improve the fuel economy of the fleet.

There are, however, other reasons for the nation to consider policy interventions of some sort to increase fuel economy. The most important of these, the Committee believes, is concern about the accumulation in the atmosphere of so-called greenhouse gases, principally carbon dioxide. Continued increases in carbon dioxide emissions are likely to further global warming. Concerns like those about climate change are not ones normally reflected in the market for new vehicles. Few consumers take into account the environmental costs that the use of their vehicle may occasion; in the parlance of economics, this is a classic "negative externality."

A second concern is that petroleum imports have been steadily rising because of the nation's increasing demand for petroleum without a corresponding increase in domestic supply. This has meant a steadily increasing reliance on imported oil. The demand for gasoline has been exacerbated by the increasing sales of light trucks, which have lower fuel economy levels than those of automobiles. High costs of imports can both put downward pressure on the strength of the dollar (which would drive up the costs of goods that Americans import) and, possibly, increase U.S. vulnerability to macroeconomic "shocks" that cost the economy considerable real output. Some experts argue that these vulnerabilities are another form of externality that vehicle purchasers do not factor into their decisions, but that can represent a true and significant cost to society. Other experts take a more skeptical view, arguing instead that the macroeconomic difficulties of the 1970s (high unemployment coupled with very high inflation and interest rates) were due more to unenlightened monetary policy than to the inherent difficulties associated with high oil prices. Either way, no one could deny that reducing our nation's oil import bill would have favorable effects on the terms of trade, and that these are valid considerations in deliberations about fuel economy.

The Committee believes it is critically important to be clear about the reasons for considering improved fuel economy. Moreover, and to the extent possible, it is useful to try to think about how much it is worth to society in dollar terms to reduce emissions of greenhouse gases (by one ton, say) and reduce dependence on imported oil (say, by one barrel). If it is possible to assign dollar values to these favorable effects (no mean feat, the Committee acknowledges), it becomes possible to make at least crude comparisons between the beneficial effects of measures to improve fuel economy on the one hand, and the costs (both out-of-pocket and more subtle) on the other.

In conducting its study, the Committee first assessed the impact of the current CAFE system on reductions in fuel consumption, on emissions of greenhouse gases, on safety and on impacts on the industry (see Chapters 1 and 2) [NRC Report]. To assess potential impacts of modified standards, the Committee examined opportunities through the application of existing (production intent) or emerging technologies, estimated the costs of such improvements, and examined the lead times that would typically be required to introduce such vehicle changes (see Chapter 3) [NRC Report]. The Committee reviewed many sources of information on technologies and costs for improvements in fuel economy, which included presentations at its meetings and information available from studies and reports. It also used consultants under its direction to facilitate its work under the tight time constraints of the

study. Some of the consultants' work provided analyses and information that helped the Committee better understand the nature of previous fuel economy analyses. In the end, however, the Committee conducted its own analyses, informed by the work of consultants, the technical literature, and presentations at its meetings, as well as the expertise and judgment of the Committee members, to arrive at its own range of estimates of fuel economy improvements and associated costs. Based on these analyses, the implications of modified CAFE standards are presented in Chapter 4 [NRC Report], along with an analysis of what the Committee calls break-even fuel economy levels. The Committee also examined the stringency and structure of the current CAFE system, and it assessed possible modifications to it, as well as alternative approaches to achieving higher fuel economy for passenger vehicles, which resulted in recommendations for improved policy instruments (see Chapter 5) [NRC Report].

#### FINDINGS

##### *Finding 1*

The CAFE program has clearly contributed to increased fuel economy of the nation's light-duty vehicle fleet during the past 22 years. During the 1970s, high fuel prices and a desire on the part of automakers to reduce costs by reducing the weight of vehicles contributed to improved fuel economy. CAFE standards reinforced this effect. Moreover, the CAFE program has been particularly effective in keeping fuel economy above the levels to which it might have fallen when real gasoline prices began their long decline in the early 1980s. Improved fuel economy has reduced dependence on imported oil, improved the nation's terms of trade, and reduced emissions of carbon dioxide, a principal greenhouse gas, relative to what they otherwise would have been. If fuel economy had not improved, gasoline consumption (and crude oil imports) would be about 2.8 million barrels per day higher than it is, or about 14 percent of today's consumption.

##### *Finding 2*

Past improvements in the overall fuel economy of the nation's light-duty vehicle fleet have entailed very real, albeit indirect, costs. In particular, all but two members of the Committee concluded that the downweighting and downsizing that occurred in the late 1970s and early 1980s, some of which was due to CAFE standards, probably resulted in an additional 1,300 to 2,600 traffic fatalities in 1993.<sup>2</sup> In addition, the diversion of carmakers' efforts to improve fuel economy deprived new-car buyers of some amenities they clearly value, such as faster acceleration, greater carrying or towing capacity, or reliability.

##### *Finding 3*

Certain aspects of the CAFE program have not functioned as intended:

- The distinction between a car for personal use and a truck for work use/cargo transport has broken down, initially with minivans, and more recently with sport utility vehicles and "cross-over" vehicles. The car/truck distinction has been stretched well beyond the original purpose.
- The Committee could find no evidence that the "2-fleet rule" distinguishing between domestic and foreign content has had any perceptible effect on total employment in the U.S. automotive industry.
- The provision creating extra credits for multi-fuel vehicles has had, if any, a negative effect on fuel economy, petroleum consumption, greenhouse gas emissions, and cost. These vehicles seldom use any fuel other than gasoline, yet enable automakers to increase their production of less fuel efficient vehicles.

##### *Finding 4*

In the period since 1975, manufacturers have made considerable improvements in the basic efficiency of engines, drive trains, and vehicle aerodynamics. These improvements could have been used to improve fuel economy and/or performance. Looking at the entire light-duty fleet, cars and trucks, between 1975 and 1984 the technology improvements were concentrated on fuel-economy; it improved by 62 percent without any loss of performance as measured by 0-60 mph acceleration times. By 1985, light-duty vehicles had improved enough to meet CAFE standards. Thereafter, technology improvements were concentrated principally on performance and

<sup>2</sup>A dissent by Committee members David Greene and Maryann Keller on the impact of downweighting and downsizing is contained in Appendix A [NRC Report]. They believe that the level of uncertainty is much higher than stated and that the change in the fatality rate due to efforts to improve fuel economy may have been zero. Their dissent is limited to the safety issue alone.

other vehicle attributes (including improved occupant protection). Fuel economy remained essentially unchanged while vehicles became 20 percent heavier and 0-60 acceleration times became, on average, 25 percent faster.

*Finding 5*

Technologies exist that, if applied to passenger cars and light-duty trucks, would significantly reduce fuel consumption within 15 years. Auto manufacturers are already offering or introducing many of these technologies in other markets (Europe and Japan, for example) where much higher fuel prices (\$4-5/gal) have justified their development. However, economic, regulatory, safety and consumer preference-related issues will influence the extent to which these technologies will be applied in the United States.

Several new technologies such as advanced lean exhaust gas after-treatment systems for high-speed diesels and direct-injection gasoline engines, which are currently under development, are expected to offer even greater potential for reductions in fuel consumption. However, their development cycles as well as future regulatory requirements will influence if and when these technologies will penetrate deeply into the U.S. market.

The Committee has conducted a detailed assessment of the technological potential for improving the fuel efficiency of 10 different classes of vehicles, ranging from subcompact and compact cars to sport utility vehicles (SUVs), pickups and minivans. In addition, the Committee has estimated the range in incremental costs to the consumer that would be attributable to the application of these engine, transmission and vehicle-related technologies.

Chapter 3 presents the results of these analyses as curves that represent the incremental benefit in fuel consumption versus the incremental cost increase over a defined baseline vehicle technology. Ranges in both fuel consumption benefits and incremental costs are estimated to reflect anticipated uncertainties. Three potential development paths are chosen as examples of possible product improvement approaches, which illustrate the trade-offs auto manufacturers may consider in future efforts to improve fuel efficiency.

Assessment of currently offered product technologies suggests that light-duty trucks, including SUVs, pickups and minivans, offer the greatest potential to reduce fuel consumption, on a total-gallons-saved basis.

*Finding 6*

In an attempt to evaluate the economic trade-offs associated with the introduction of existing and emerging technologies to improve fuel economy, the Committee conducted what it called "break-even" analysis. That is, the Committee identified packages of existing and emerging technologies that could be introduced over the next 10 to 15 years that would result in fuel economy improvement up to the point where further increases in fuel economy would not be reimbursed by fuel savings. Size, weight and performance characteristics of the vehicles were held constant. The technologies, fuel consumption estimates, and cost projections described in Chapter 3 were used as inputs to this break-even analysis.

These break-even calculations depend critically on the assumptions one makes about a variety of parameters. For the purpose of calculation, the Committee has assumed that: (1) gasoline is priced at \$1.50/gal; (2) a car is driven 15,600 miles in its first year, after which miles driven decline at 4.5 percent annually; (3) on-the-road fuel economy is 15 percent less than the Environmental Protection Agency's test rating; and (4) the added weight of equipment required for future safety and emission regulations will exact a 3.5 percent fuel economy penalty.

One other assumption is required to ascertain break-even technology packages—the horizon over which fuel economy gains ought to be counted. Under one view, car purchasers consider fuel economy over the entire life of a new vehicle; even if they intend to sell it after five years, say, they care about fuel economy because it will affect the price they will receive for their used car. Alternatively, consumers may take a shorter-term perspective, not looking beyond, say, three years. This latter view, of course, will affect the identification of break-even packages because there will be many fewer years of fuel economy savings to offset the initial purchase price.

The full results of this analysis are presented in Chapter 4. To provide one illustration, however, consider a mid-size sport utility vehicle. The current sales-weighted fleet fuel economy average for this class of vehicle is 21 mpg. If consumers consider only a 3-year payback period, fuel economy of 24 mpg would represent the break-even level. If, on the other hand, consumers consider the full 14-year average life of a vehicle as their horizon, the break-even level increases to 28 mpg (with fuel savings discounted at 12 percent). The longer the consumer's planning horizon; in



other words, the greater are the fuel economy savings against which to balance the higher initial costs of fuel saving technologies.

The Committee cannot emphasize strongly enough that the break-even fuel economy levels identified in Tables 4-2 and 4-3 in Chapter 4 [NRC Report] are NOT recommended fuel economy goals. Rather, they are reflections of technological possibilities, economic realities and assumptions about parameter values and consumer behavior. Given the choice, consumers might well spend the money on other vehicle amenities, such as greater acceleration or towing capacity, rather than on the fuel economy break-even technology packages.

*Finding 7*

There is a marked inconsistency between pressing automotive manufacturers for improved fuel economy from new vehicles on the one hand and insisting on low real gasoline prices on the other. Higher real prices for gasoline, for instance, through increased gasoline taxes-would create both a demand for fuel-efficient new vehicles and an incentive for owners of existing vehicles to drive them less.

*Finding 8*

The Committee identified externalities of about \$0.30 per gallon of gasoline, associated with the combined impacts of fuel consumption on greenhouse gas emissions and on world oil market conditions. These externalities are not necessarily taken into account when consumers purchase new vehicles. Other analysts might produce lower or higher estimates of externalities.

*Finding 9*

There are significant uncertainties concerning the societal costs and benefits of raising fuel economy standards for the light-duty fleet. Uncertainties include the cost of implementing existing technologies or developing new ones; the future price of gasoline; the nature of consumer preferences for vehicle types, performance, and other features; and potential safety consequences of altered standards. The higher the target for average fuel economy, the greater the uncertainty about the cost of reaching that target.

*Finding 10*

Raising CAFE standards would reduce future fuel consumption below what it otherwise would be; however, other policies could accomplish the same end at lower cost, provide more flexibility to manufacturers, or address inequities arising from the present system. Possible alternatives that appear to the Committee to be superior to the current CAFE structure include tradable credits for fuel economy improvements, feebates,<sup>3</sup> higher fuel taxes, standards based on vehicle attributes (for example, vehicle weight, size, or payload), or some combination of these.

*Finding 11*

Changing the current CAFE system to one featuring tradable fuel economy credits and a "cap" on the price of these credits appears to be particularly attractive. It would provide incentives for all manufacturers, including those that exceed the fuel economy targets, to continually increase fuel economy, while allowing manufacturers flexibility to meet consumer preferences. Such a system would also limit costs imposed on manufacturers and consumers if standards turn out to be more difficult to meet than expected. It would also reveal information about the costs of fuel economy improvements and thus promote better-informed policy decisions.

*Finding 12*

The CAFE program might be improved significantly by converting it to a system in which fuel economy targets depend on vehicle attributes. One such system would make the fuel economy target dependent on vehicle weight, with lower fuel consumption targets set for lighter vehicles and higher targets-for heavier vehicles, up to some maximum weight, above which the target would be weight-independent. Such a system would create incentives to reduce the variance in vehicle weights between large and small vehicles, thus providing for overall vehicle safety. It has the potential to increase fuel economy with fewer negative effects on both safety and consumer choice.

Above the maximum weight, vehicles would need additional advanced fuel economy technology to meet the targets. The Committee believes that such a change is promising, but requires more investigation than was possible in this study.

<sup>3</sup>Feebates are taxes on vehicles achieving less than the average fuel economy coupled with rebates to vehicles achieving better than average fuel economy.

*Finding 13*

If an increase in fuel economy is effected by a system that encourages either downweighting or the production and sale of more small cars, some additional traffic fatalities would be expected. However, the actual effects would be uncertain and any adverse safety impact could be minimized, or even reversed, if weight and size reductions were limited to heavier vehicles (particularly those over 4,000 lb). Larger vehicles would then be less damaging (aggressive) in crashes with all other vehicles and thus pose less risk to other drivers on the road.

*Finding 14*

Advanced technologies—including direct-injection lean-burn gasoline engines, direct-injection compression-ignition (diesel) engines, and hybrid electric vehicles—have the potential to improve vehicle fuel economy by 20 to 40 percent or more, although at a significantly higher cost. However, lean-burn gasoline engines and diesel engines, the latter of which are already producing large fuel economy gains in Europe, face significant technical challenges to meet the Tier 2 emission standards established by the Environmental Protection Agency under the 1990 amendments to the Clean Air Act, and the California low emission vehicle (LEV II) standards. The major problems are the Tier 2 emissions standards for nitrogen oxides and particulates and the requirement that emission control systems be certified for a 120,000-mile lifetime. If direct-injection gasoline and diesel engines are to be used extensively to improve light-duty vehicle fuel economy, significant technical developments concerning emissions control will have to occur or some adjustments to the Tier 2 emissions standards will have to be made. Hybrid electric vehicles face significant cost hurdles, and fuel-cell vehicles face significant technological, economic, and fueling infrastructure barriers.

*Finding 15*

Technology changes require very long lead times to be introduced into the manufacturers' product lines. Any policy that is implemented too aggressively (that is, in too short a period of time) has the potential to adversely affect manufacturers, their suppliers, their employees, and consumers. Little can be done to improve the fuel economy of the new vehicle fleet for several years because production plans already are in place. The widespread penetration of even existing technologies will likely require 4 to 8 years. For emerging technologies that require additional research and development, this time lag can be considerably longer. In addition, considerably more time is required to replace the existing vehicle fleet (on the order of 200 million vehicles) with new, more efficient vehicles. Thus, while there would be incremental gains each year as improved vehicles enter the fleet, major changes in the transportation sector fuel consumption will require decades.

## RECOMMENDATIONS

*Recommendation 1*

Because of concerns about greenhouse gas emissions and the level of oil imports, it is appropriate for the federal government to ensure fuel economy levels beyond those expected to result from market forces alone. Selection of fuel economy targets will require uncertain and difficult trade-offs among environmental benefits, vehicle safety, cost, oil import dependence, and consumer preferences—trade-offs the Committee believes rightfully reside with elected officials.

*Recommendation 2*

The CAFE system, or any alternative regulatory system, should include broad trading of fuel economy "credits." The committee believes a trading system would be less costly than the current CAFE system; provide more flexibility and options to the automotive companies; give better information on the cost of fuel economy changes to the private sector, public interest groups, and regulators; and provide incentives to all manufacturers to improve fuel economy. Importantly, trading of fuel economy credits would allow for more ambitious fuel economy goals than exist under the current CAFE system, while simultaneously reducing the economic cost of the program.

*Recommendation 3*

Consideration should be given to designing and evaluating an approach with fuel economy targets that are dependent on vehicle attributes, such as vehicle weight, that inherently influence fuel use. Any such system should be designed to have minimal adverse safety consequences.

*Recommendation 4*

Under any system of fuel economy targets, the 2-fleet rule for domestic and foreign content should be eliminated.

*Recommendation 5*

CAFE credits for dual-fuel vehicles should be eliminated, with a long enough lead-time to limit adverse financial impacts on the automotive industry.

*Recommendation 6*

To promote the development of longer-range, breakthrough technologies, the government should continue to fund, in cooperation with the automotive industry, pre-competitive research aimed at technologies to improve vehicle fuel economy, safety, and emissions. It is only through such breakthrough technologies that dramatic increases in fuel economy will become possible.

*Recommendation 7*

Because of its importance in the fuel economy debate, it is desirable to clarify the relationship between fuel economy and safety. The Committee urges the National Highway Traffic Safety Administration to undertake additional research on this subject, including (but not limited to) a replication using current field data of its 1997 analysis of the relationship between vehicle size and fatality risk.

Senator KERRY. Well, Chairman Portney, thank you very much for that statement, and I want to thank you particularly for the work of you and your committee in helping us to have a framework from which to begin to grapple with this issue.

Without objection, your full comments will be placed in the record and I thank you for that, and any subsequent text or additions you would like to submit also will be included.

I want to have adequate time, and I know 5 minutes is always a squeeze, but we will limit ourselves to 5 minutes each for the first round of questions.

Chairman Portney, you talked a little bit about this, but I want to come back at it. The report cites a finding that the distinction between passenger cars and light trucks as defined in the current provisions has broken down, and I wonder, are you making a recommendation to us? Should we merge those categories?

Dr. PORTNEY. No. And again, when I conclude here, I would like to give my fellow members an opportunity to speak to this, but no, we are not necessarily urging that the distinction be abolished altogether. What we are saying, it was quite understandable back in the mid-1970's when this distinction was created, because I think people in Congress, you and your colleagues tended to think of a certain class of vehicles as being used as passenger vehicles and other vehicles, vans, being used by plumbers and electricians and workmen and women, and the same thing was true with pickup trucks.

At that time, I don't think anybody envisioned that vehicles would begin to be built on truck frames that would essentially become passenger vehicles that would be used the same way cars were used in the past, not as work vehicle, just bigger lines of cars. And the fact that a separate standard was established at that time, I don't think the committee necessarily feels caused the shift to SUVs, but at that time there began to be a demand for large, more family friendly vehicles, and I think what happened was the SUV sort of arose as a natural consequence of that decision, and because they have become so overwhelmingly popular because of the multiplicity of uses that they make possible, what has happened obviously is now that they have become half of all vehicles sold in the

United States as they will be this year for the first time, we have so many more vehicles that have to meet the lower standard.

Senator KERRY. Would you agree that there is a loophole, and somehow we need to create a definition that works to either improve its coverage or put some sort of restraint in the definition with respect to passenger use? Do we need some equation here?

Dr. PORTNEY. Sure. Loophole sounds pejorative. There is a distinction and an attempt, at least one counterproductive objective, but let me let my fellow members comment.

Senator KERRY. Dr. Wise, did you want to be heard?

Dr. WISE. I would just like to mention the weight based standard that we talked about that we think might be desirable to look seriously at because that distinction goes over a range from cars to trucks, and we didn't have time to fully explore that, but I think the committee would not support the idea of making one number a standard for both cars and trucks.

Senator KERRY. Understood. We were intrigued by the weight based concept. I think it has certain merit, and I am sure my colleagues may pursue that more. Dr. Greene, did you want to add something?

Dr. GREENE. I just wanted to add that we do say that the distinction is broken down, and if you look at the concept of fuel economy improvement estimates that we see based on technologies, there are far greater potentials for improving the fuel economy of light trucks than of cars, and in part this may be due to the different treatment they have received under the current law.

Senator KERRY. Do you want to share with us some of the ways in which you think that could be most easily achieved?

Dr. GREENE. Improving the fuel economy of trucks?

Senator KERRY. Yes.

Dr. GREENE. Well, we have tables in Chapter 3 which list a whole variety of technologies. Most of these have to do with improving the efficiency of engines and transmissions, going to six-speed transmissions, use of continuously variable transitions on smaller trucks, various kinds of valve train technology including automated valve timing technology. Also cylinder deactivation for larger engines, the kind of engines that are found in trucks can be very effective in fuel economy. Most of the time the vehicle does not require anywhere near all of the maximum horsepower that it has.

Senator KERRY. Let me just ask quickly, while that's true of so many vehicles we make, and we have vehicles capable of going 120 miles an hour while the speed limit is half of that or somewhere close, but that again appears to be a consumer-driven phenomenon or preference.

You focused on improvements in fuel economy that can pay for themselves in fuel savings over the life of the vehicle. I thought it was interesting because, as in any model, that analysis depends on the assumptions. You considered only certain technologies, and there were some other limitations. I am particularly concerned about the time assumption that you put down. The report says that the results are very sensitive to what we assume the consumer's payback period is on a car.

Can you say why the panel developed the break-even fuel economy model? It seemed a little strange that anyone should expect pay back in 3 years? Dr. Lund, do you want to start with that?

Dr. LUND. Well, I can certainly start, I can give you my interpretation of that. The issue here has to do with how people will respond to the price of the new technology. If they really take a 14-year horizon, then you have 14 years to sort of amortize the initial investment they are making in the new technology. People don't think that far ahead, maybe they only think 2 or 3 years ahead, then they have much less time to amortize that cost and they say, oh, a thousand bucks, I need to recover that in three years.

So we said, this has to do with the acceptability of this technology to the consumer and whether they will buy it if it's made available.

Senator KERRY. Dr. Greene, and then my time is up.

Dr. GREENE. Thank you, Senator. I would like to say something about this because I think this is the single most misunderstood aspect of our study. I have read a lot of news reports on it and I have yet to read any newspaper that got this break-even analysis right, and that must be our fault because they couldn't possibly all get it wrong.

Every news report interprets the break-even analysis as the point at which the fuel economy level produces savings over the life of the vehicle that exactly equals the price, additional price of the fuel economy technology, and that's not correct. For every fuel economy increase shown in our Table 4-2 and 4-3, the value of the fuel savings over the life of the vehicle far exceeds the increase in vehicle price, and often by twice as much. At the break-even point, it is the point where the price increase of the last increment of fuel economy equals the fuel savings produced by that last increment of fuel economy.

Senator KERRY. In other words, it's a curve, and there is a specific point in the curve you are referring to, but the curve summarizes the entire gain. Is that what you are referring to?

Dr. GREENE. You are essentially accumulating a number of fuel economy technologies when you arrive at that point for which the value of the savings exceeds the price.

Senator KERRY. Does it continue beyond that, in terms of savings?

Dr. GREENE. Well, no, you don't. You stop there in our break-even analysis. I brought versions of examples 4-3 and 4-2 that show the value of fuel savings alongside the costs. For example, increasing the fuel economy of a mid-size SUV by 34 percent costs a little over \$1,000, but the estimated value of lifetime fuel savings is a little over \$2,000.

And additionally, while we identified in our report values for greenhouse gas emissions and values for release of local chemicals, we did not include those values in this table.

Senator KERRY. Thank you.

Dr. Wise.

Dr. WISE. Can I explain it further?

Senator KERRY. Take just a minute, because I am trying to stay on our limits here.

Dr. WISE. The way you look at this is the very first increment of technology you add adds more value than the costs to put it in, and then it successfully gets proportionately less and less until you get to the break-even point where the cost exactly equals what you saved. So it sort of accumulated first increments of technology that were worth so much, that is the reason why total savings is greater than the cost.

Senator KERRY. Thank you very much. We're going to go just in the order of Senator Bingaman, Senator Burns, Senator Murkowski, Senator Feinstein, and then Senators Allen, Smith and Craig.

Senator BINGAMAN. Thank you all very much for all your work on this report. One of the suggestions I have heard by some is that the way to increase fuel efficiency standards is to take each manufacturer essentially and require a percentage improvement in their overall fleet. Any of you have a reaction to that, whether that would be a logical approach or illogical?

Dr. PORTNEY. I think the Committee was fairly unanimous and I hope the report is clear in saying that a so-called uniform percentage increase approach would be very unfair and much less good than other ways to do this and the reason is that it would require the biggest additional percentage increase on the companies that already have the best fuel economy, so in a sense it is sort of punishing the innocent and for that reason, we think that while it may have some logic in terms of simplicity, what's required for everybody to do the same percentage amount, I think we all think it would be quite inequitable and in a sense one of the least preferred approaches to improving the fuel economy of the fleet.

Senator BINGAMAN. Let me follow up and ask about the tradable credit that you're proposing, and how that would work. Who would you start by giving credits to? On what basis? Do you give credits to companies? I guess where I'm headed in this question is, does this tradable credit program wind up doing exactly what you said you don't think would be fair? Do you wind up giving credits out on the basis of who has already made progress and who has not?

Dr. PORTNEY. No. In fact, Senator Bingaman, I think we probably think it would have opposite effect for the following reason: If it turns out that those auto companies that produce cars currently that are well above their CAFE standard, either in the passenger car or the light duty truck segment, it's probably because they are very clever technologically.

One problem with the current system is that you have no incentive to improve the fuel efficiency of your vehicles if you're already above the standard. However, under a credit system, if you were to improve your fuel economy still further, even though you were above the system, you now have something that you can sell to companies that may be struggling to bring their fleet up, if they are below the standard, that are struggling to bring their fleet up to that standard.

So one of the real advantages is it would reward the technologically superior companies because they would have an incentive to continue to innovate.

Senator BINGAMAN. Okay. Let me ask Dr. Green, you just said that in this first appendix on the report, you dissent from the view which was described. I gather the majority view on the Committee is that fatalities would have declined much more had the downweighting and downsizing not occurred.

Dr. GREENE. Correct.

Senator BINGAMAN. Could you just describe your point of view on that?

Dr. GREENE. Actually, Maryann Keller and I found it necessary to write a dissent, because we think that the evidence of a link between improving overall fuel economy and traffic fatalities doesn't stand up to a robust analysis.

First of all, there is no correlation between the overall fuel economy of passenger cars and light trucks, and highway fatalities. Considering the entire period of time from before the fuel economy standards were put in place, say in 1967, to 1999, there is no statistically significant relationship between actual light duty fuel economy and annual traffic fatalities. I have been doing statistical analysis for 25 years, and I can tell you that those two factors are about as uncorrelated as they could possibly be.

However, several studies have found relationships between vehicle size and weight and traffic fatalities, including the one used by the majority to make its impact estimates. These studies suffer from two fundamental flaws that are explained in greater detail in the dissent than I can do here.

First, none of the studies relates changes in weight and size that actually occurred as a result of fuel economy improvements to traffic fatalities. Instead, they rely on the assumption that the variation of the size and weight in an existing fleet of vehicles represents the changes that would occur over time if fuel economy were improved, but that's not correct.

The assumption implies that as mass is reduced or capacity is reduced, a six-passenger car would become a five-passenger care, a subcompact would become a two-seater, a large van would become a minivan and so on, but that's not what happened. Instead, antiquated technologies like chassis on the frame was replaced by a unibody construction, rear-wheel drive was replaced by front-wheel drive, cast iron engines by aluminum blocks, low strength steel was replaced by high strength steel and so on. The vehicles didn't just shrink, their designs changed in important ways.

Second, studies based on statistical analysis show that fatality data are highly susceptible to spurious correlations. One cannot be sure whether the fatalities associated with smaller lighter vehicles are truly the result of the size and weight of the vehicles or of the behavior of the people who drive them at the places and times they are driven. It is notoriously difficult to control for such factors in safety analyses and we think that most safety experts would agree that the exposure data you would need to do that are far from adequate.

My final point. A 1996 National Academy Committee of safety and statistical experts convened to review the very methods that the majority used to predict the impacts of vehicle size and weight on traffic fatalities, and specifically warned against what the majority has done because of uncertainties and methodological flaws.

The 1996 Committee also explicitly stated that they believed the defects in the methods and data were not correctable.

There is no fundamental scientific reason why increasing fuel economy should be deadly compensated. We are saying, therefore, because increasing fuel economy does mean completely redefining vehicles in major increases, and whenever you do that, safety is always a concern, so vigilance and caution are required.

I thank you for the opportunity to state that.

Senator BINGAMAN. Thank you.

Senator KERRY. Thank you.

Senator Burns.

Senator BURNS. Thank you, Mr. Chairman. I just have a couple questions here and I want to get into the report a little deeper. One of the findings of the report is that raising CAFE standards would reduce fuel consumption. However, other policies could achieve the same end at a lower cost. Could you give me some examples of those alternative ways?

Dr. PORTNEY. Sure. I will give you an example of one that I am sure you all would be crazy about, higher gasoline taxes. And the reason I say that is that increases in gasoline prices not only create an inducement for new car buyers to buy more fuel efficient cars and an inducement for new car purchasers to buy more fuel efficient cars, we also create a strong incentive for people who have existing cars on the road. And remember, 212 million vehicles on the road now, only 16 million new vehicles sold each year, so that's one of the effects of higher gasoline prices.

Now look, some of my fellow Committee members were born at night, but not last night, and we understand full well what the downside is to higher gasoline prices. That's the reason that the CAFE program is really at best the second best program, but it's another effort to try to address this issue of fuel consumption without touching the price of gasoline, which obviously is politically quite controversial.

Senator BURNS. Anyone else want to comment on any other alternative ways other than just higher taxes or higher prices?

Dr. GREENE. There are several. The tradable credit system we recommend, in theory would be less costly. Also, we don't talk about the rebate systems, but those have been proposed where essentially inefficient vehicles are taxed and efficient vehicles are subsidized. Those are other possibilities.

Senator BURNS. You found that CAFE standards and fuel prices combined contributed to the increase in fuel efficiency of vehicles between 1970 and 1992. Can you tell me whether the efficiency is due to the fact that fuel prices went up or the CAFE standards, or at least which part can be attributed to which effect?

Dr. GREENE. Well, the Committee said that both were responsible, and we did not try to apportion exact amounts.

Dr. PORTNEY. And Senator Burns?

Senator BURNS. Yes?

Dr. PORTNEY. In the same way we felt both contributed to improvements in the fuel economy, both also contributed to a pretty rapid downsizing and downweighting, which the majority of the Committee felt pretty comfortable in saying had these adverse ef-



fects on safety too. We couldn't parcel out those effect on either the pro side or the con side.

Senator BURNS. Just a follow-up question. Does the National Highway Safety and Transportation Administration have the authority under existing law to set CAFE standards?

Dr. PORTNEY. My understanding is they have the authority to set CAFE standards for trucks. CAFE standards for cars were set by Congress in the Energy Policy and Conservation Act, and I think that authority still resides with Congress for passenger cars. NHTSA has the authority for light duty trucks.

Senator BURNS. Thank you very much.

Senator KERRY. Thank you, Senator Burns.

Senator Feinstein.

Senator FEINSTEIN. Thanks, Mr. Chairman. In reading your written text, you point out in the paragraph that begins with, "the Committee concludes that significant improvements in fuel economy are quite possible at reasonable costs," and then go on to detail the variable valve lift and timing, and actually get an 8 percent reduction with continuous variable transmissions, 4 to 8 percent, and mention that other technologies will be available for wide scale use within 15 years.

If you look at Senator Snowe's and my legislation to close the SUV light truck loophole, with the technology that is here in a reasonable and cost effective way, what is the length of time that you would advise that we provide in that legislation?

Dr. PORTNEY. That's a very good question and I'm not trying to hedge my answer, it's a little—if we had had more time and perhaps more resources, I think we might not only have been able to say here's the break-even fuel economy level and what it would cost, we might have been able to sort of show how much you could get at various stages along the way. But the problem was, you had us on a pretty short time leash to complete this report and in addition to looking at those technological issues we had safety issues to look at, a variety of concerns about employment impacts and other things and frankly, we just weren't able to say how much of it could you get at what stages along the way to this break-even level.

Senator FEINSTEIN. Would I be right in assuming that 15 years is the out-year limit?

Dr. PORTNEY. Yes, I think we're within 15 years, and I think every member of the Committee would agree that it would be possible to get some improvements in fuel economy probably beginning 3 or 4 years from now. If I could, and I hope I'm speaking for my Committee members here, the really important thing, Senator Feinstein and to the rest of you as well is, if you look back at the original CAFE program, it calls for a 33 percent improvement in a 4-year period of time, and that's simply woefully inadequate to bring on the kinds of technology that need to be brought on.

And that's one reason why to meet those standards, downsizing and downweighting was really the only strategy in a short period of time, with the attendant safety effects that a majority of the Committee thought. The longer the car makers have to consider this, the more they can use technology rather than quick

downweighting as the preferred way of improving fuel economy and the easier it becomes and the less expensive.

Senator FEINSTEIN. From reading your report and from reading the draft report, I really came to the conclusion that if 6 years is too little, it could well be done between 8 and 10 years. Would you respond to that?

Dr. PORTNEY. That's, in my opinion, that's sort of, that's being pretty optimistic. You certainly could get something done in 8 to 10 years, I don't think there is any question about that. Whether you could get close to the break-even levels that we talk about here, I'm personally skeptical about but I guess my fellow panelists ought to speak to that as well.

Senator FEINSTEIN. Dr. Greene.

Dr. GREENE. Yes, Senator. You really can't expect the manufacturers to change the fundamental design plans of the vehicles until about 2004. In between, the designs are all locked in place; beginning in that year they could begin to implement new technologies.

After that, it's a question of how rapidly they have to replace their production lines, the equipment they use to manufacture engines and so on.

Senator FEINSTEIN. Can I just inject in this, then why have they already pledged a 25 percent increase by 2005?

Dr. GREENE. Some manufacturers already have plans in place to improve their fuel economy and I think Ford announced voluntarily that they would improve the fuel economy of their sport utility vehicles by 25 percent. So you could expect that that company has taken a leadership position and they want to be out in front of anything that you do, but others perhaps are not in the same position.

And so, if you're looking across the whole industry, 2004 is really the first time you could expect someone to change their plans. Now they may already have plans to improve but if you want them to change direction and move towards fuel economy, they need to have about 3 years lead time, then after that, it's about 8 years per model design, let's say, and with engine lines, manufacturing equipment and so on, generally lasts for 8 to 12 years in a normal process of capital turnover.

So this bounding range of 10 to 15 years is a fuzzy way of saying that they need enough time to change all their production plans, completely redesign all their vehicles and implement those changes in an orderly fashion so they don't have to scrap productive equipment before its useful life is up.

Senator FEINSTEIN. Could I conclude from those comments of Dr. Greene, to the other gentlemen then, that 10 to 15 years would be the prudent number?

Dr. WISE. Yes. And the numbers that we quote for cost in here make that assumption, that costs would be much higher if you try to cram the capital stock into a much shorter time frame.

Senator FEINSTEIN. Could I ask a question on the tradable credits? I don't understand how they would work unless we close the loophole, because why should a company get a 2-mile credit for a 22.7 mile per gallon SUV, while another company is penalized 2 miles for a 25.5 mile per gallon car?

Dr. PORTNEY. I guess I would want to—I'm not sure that the credit system would work that way. It would work by either work-

ing off of the current base or possibly by raising the fuel economy goals for both cars and light duty trucks, in other words, tightening the standard, requiring greater fuel economy.

Senator FEINSTEIN. Then build in the tradable credits?

Dr. PORTNEY. Right, in the same way that the SO<sub>2</sub> trading program was driven by overall reductions in SO<sub>2</sub> emissions. Then you said that while companies had to reduce their emissions, if they wanted to reduce less they could buy an even greater emission reduction from someone else. Here if somebody had to reduce their, or increase their mileage, they could pay somebody else to have an even bigger increase in mileage.

Senator FEINSTEIN. You also say—I'm sorry. I heard that, I will cease and desist.

Senator KERRY. We will give you another round in a moment.

Senator FEINSTEIN. Thank you.

Senator KERRY. Senator Allen.

Senator ALLEN. Thank you, Mr. Chairman, and thanks to these gentlemen and all those who worked on this very important issue. There are a variety of issues and concerns and values involved.

There are two areas I would like to talk to and try to get answers from you in 5 minutes. One, I would like to hear an elaboration generally on the improvements in technology; you are talking about engine design materials and so forth, which I think are important. I also would like to hear some views on say fuel cells or other energy sources, whether natural gas, electric vehicles, or fuel cells, looking beyond the way we look at automobiles right now and looking beyond making them plastic, or aluminum versus steel, and so forth. All that's fine. But rather than these absurd out-of-touch, harmful, punishing ideas such as raising gas taxes just for the heck of social engineering. You are all very astute individuals but in the real world that's just flat ignorant as far as I am concerned and a terrible idea.

But rather than punish people, what if you provide incentives? Have you considered incentives for people who might have the more fuel efficient vehicles? I know you want to get rid of the distinction on the ethanol versus the gasoline, but what if you did have incentives that get to the values that we all have here: concern for air quality, less dependence on foreign oil while not harming safety, and the choice of an individual to be in a larger vehicle for capacity, for towing or for the safety of themselves and their children.

Dr. SHARP. First of all, I don't know in terms of how much you're willing to deplete the Treasury of the U.S. Government, but you can certainly provide purchase incentives for all kinds of technologies that you might try to encourage people to buy, and that could be reinforced if you combined it with the CAFE standards, a sort of double punch in the economy.

But basically, I think the Committee came to the conclusion that in terms of widespread use of these new technologies as an example, or even with the use of an engine that's being driven and proven in the European markets, that it was not going to be something that you could get in a cost effective way in the near term in the U.S. market, even though there is a lot of promising talk about it and a lot of promising action.

And so, the Committee generally took the view that the longer-term things ought to keep the Government engaged in them through the PNGV or some similar program, a research program for those. What it focused on was what is the near term availability of real world technologies that might be encouraged in the marketplace. But certainly, we could have purchase incentives that will help advance this if you wish, but defining what those are, administering that and making that effective without bankrupting the U.S. Government will take some skill.

Senator ALLEN. Well, one would have to determine the value of that. If there is a value in cleaner air and greater fuel efficiency while not harming safety, there is a value. Yes, sir, Dr. Wise?

Dr. WISE. Making cars more fuel efficient doesn't really change the emissions from the cars, because the emission standards are set on grams per mile driven, so changing fuel efficiency is only a secondary effect. What it does affect, however, are the greenhouse gas emissions, because that's directly related to the carbon burn.

Senator ALLEN. Thank you for that distinction.

Dr. WISE. You're welcome.

Senator ALLEN. Now Dr. Greene had his dissenting exposition on safety, and I can understand what Dr. Greene is saying, because per 100,000 miles driven, people, there are fewer fatalities year after year after year. Some of it is for a variety of reasons, including—I remember hearing these arguments amid the speed limit increases and so forth. If speed limits go up, then the safety decreases.

Dr. LUND, real quickly, since you are with the Insurance Institute of Highway Safety, rather than talking about theory, you all have actual experiences. You have to pay claims. You insure vehicles based, or insurance companies do it, based upon experiences that actually happen. Could you share with us from those who have to assess this risk that is actually based on actual data, the property damage, personal injury, death of occupants for example, in vehicles based on their size and weight, could you share with us your findings in those areas?

Dr. LUND. Thank you, Senator, I would be happy to. I think, as you noted, Dr. Greene said that one cannot be sure of what the safety effects have been. One cannot be sure of a number of things in this world. You know, we're sitting here talking today about a five mile per gallon increase in fuel economy and the effect that it will have on the climate 50 to 100 years from now. There is certainly some uncertainty around this as well.

The Committee has expressed its conclusions in that regard, we have also expressed our conclusions in regard to safety. The fact is that there is a lot of data, all of which points to the increasing risk of serious injury and fatality as vehicles get smaller. It is extraordinary to believe that you could take vehicles that, and take say 3 or 400 hundred pounds out of one, and that that would not affect your safety. It affects your interactions with larger trucks on the highway, it affects the likelihood that you suffer damage and in a single vehicle accident these are straightforward laws of physics.

There are many studies which have looked at the relationship between car size, car weight and the risk of serious injury or fatality. Without exception, those studies find that as you decrease the size

of a vehicle, you increase the risk of injury. This is one of the best known facts in highway safety.

It is true that the fatality rate has come down year after year after year. Pardon the pun, that is no accident. We have taken, as a country, a lot of steps to assure that the safety of our cars, that the safety of our roadways is improving year after year. We are removing drunk drivers from the road, we are increasing seat belt use; all these things are improving safety.

Now, repealing the speed limit goes the other way, as our data also show, but nevertheless, overall, the positive things that we've done for safety are outweighing the negatives.

Senator ALLEN. Thank you, Dr. Lund, and thank you, Mr. Chairman.

Senator KERRY. Thank you, Senator Allen.

Senator Smith.

Senator SMITH. Picking up where Senator Allen left off, you stated in your report, I believe, that if fuel economy regulations were structured in such a way as to encourage the sale of smaller vehicles, that we can expect more fatalities. Is that accurate?

Dr. LUND. That's correct.

Senator SMITH. And what motivated the change in this view from 1992 when the last report was put out, that said that the impacts on safety were ambiguous? Is it just we have more experience now? We have gathered more data?

Dr. LUND. In actuality, the report in 1992 concluded that in all likelihood, all other things being equal, there would be an adverse safety effect if vehicles were downweighted. However, they noted that there were a number of uncertainties. In particular, they were concerned about the increasing population of light duty trucks on the road, they were concerned that the overall societal impacts of downsizing hadn't been fully accounted for.

That is, if you downsize a very heavy truck, you increase the risk of that truck's occupants but on the other hand, you decrease the risk to occupants of other vehicles with whom that truck might interact. So they noted these uncertainties.

In 1997, the National Highway Travel and Safety Administration released a new report which was designed to answer many of the very uncertainties that the 1992 report identified, and the majority of this Committee thinks that they did a pretty good job.

There was a review by a TRB Committee of a draft report of the NHTSA study, which suggested that the study needed to do a better job of expressing the uncertainty around its estimates. And in fact, the author of that study, Chuck Gahain, went back and he did exactly what he had been asked. He looked at the sensitivity of the study, the various assumptions, and he specified the degree of the statistical uncertainty in his estimates, and I think that is a good job.

Senator SMITH. Do you believe that NHTSA has sufficient authority and expertise to weigh the impacts, for example, on safety of vehicle technology and consumer preferences, market economics, all of those things? Are they in a better position than we to make these judgments?

Dr. LUND. Well, in this case speaking obviously personally, I think it would be good were the Agency to be given the authority

to look very closely at the issues of improving fuel economy, how manufacturers are likely to respond to increased fuel economy, what kinds of strategies they will follow, and to look at how, to the extent that there is downsizing and downweighting, that would affect the final safety issues as well as fuel economy.

Senator SMITH. In your recommendations, did you weigh these factors in applying technologies, safety, consumer preferences? In making your recommendations, were those things that you accounted for?

Dr. LUND. Well, I should let Dr. Portney probably speak again for the Committee, but in my view, we have made no recommendations for the level of fuel economy increases. We have tried to set some, put forward some information about what kind of fuel economy is available to be had without altering the basic structure and function of vehicles and their performance, and we captured that in the so-called break-even analysis.

We have also tried to review what might be the attendant costs if fuel economy targets are raised and if they are raised too rapidly, which may increase downsizing and downweighting.

Senator SMITH. I feel like we are being put in the position of Solomon. We are being asked to choose a requirement that bears on family economies and frankly, family safety, and consumer preference, and this is a hard baby to split. Well, baby, that is the wrong metaphor, but we are really making life and death kinds of decisions here in the name of the environment, but a lot of human lives could be affected.

And that is, frankly, why I am asking the question. While we clearly have the authority to make law and set policy, I wonder if NHTSA is in a better position to be making these decisions administratively? And my question is: Do they have the authority currently to do this and to keep pushing the envelope on fuel economy without sacrificing human life?

Dr. PORTNEY. If I could respond, I think all the members of this Committee and all of the members of your respective Committees here would love to live in a world where we can get much better fuel economy, lower emissions, cheaper vehicles, bigger vehicles, et cetera, et cetera. That's not the world that the members of this Committee feel like we live in, though, and that's why we felt like the best service we could do for you is to give you some indication of what we thought the trade-offs were.

And again, to go to something I said at the start, we have never been elected, with the exception of Phil Sharp, a former Congressman, the rest of the members of the Committee have never been elected to anything, and I really feel like that's why you fellows run for Congress and it's to make these difficult decisions. You are the representatives of the people and you are their voice when these kind of trade-offs have to be made.

Senator SMITH. I know my time is up, but did you find in your evaluations anything that could be done to the cars currently on the road that will probably be on the road for another 20 or 30 years? Anything that we can do to increase their mileage now? Are there any technological fixes out there that we could get to in the short run?

Dr. PORTNEY. Well, other than Senator Allen's favorite, the gasoline tax, no. I mean, less facetiously, the kind of inspections that they have to go through now that are part of the annual emissions tests. I mean, if a car is in better tune, which it sometimes has to be to pass the emissions tests, then it's going to get better fuel economy, there is no question about that.

So more frequent tune-ups, again, and recognizing our naivete, I hope not ignorance, I hope our naivete, if gasoline prices are higher, then people have an incentive to keep their cars in better tune as well as to search for more fuel efficient cars. But I mean, that's not a recommendation on our part, it's just an observation.

Senator KERRY. Thank you, Senator Smith. I can see the headlines tomorrow, "Virginia Senator calls Europeans ignorant," or maybe worse than that.

[Laughter.]

I wonder if we are making too much of this. Let me phrase this very carefully. Safety is paramount. We are all concerned about safety, and we need to make some judgments about it. But we doubled the efficiency of our automobiles in going up to 27 miles per gallon and no one has made a judgment, as a whole, that we are not safer. So I would say to my colleague that when you are talking about closing the light truck loophole, and the light trucks are already the heavier vehicles on the road which are causing problems for the others that are moving to the higher standard, it is hard to envision that you are going to make the light trucks less safe than the other folks on the road by asking them to meet the same standard. So a proposal that suggests closing the loophole, it seems to me, is not enough to bring you down in safety. Is that a fair judgment?

Dr. PORTNEY. Well, with all due respect, let me repeat the very first point I made about our Committee's recommendation, because some Senators have come in since then and I want to be very clear about this. These break-even fuel economy levels that we have identified would be significant increases in the fuel economies enjoyed now by the vehicles that we look at, and we make it very clear that these are improvements that are possible holding size, performance and weight constant. Actually we have seen a little bit of increase in weight. So that, it's technologically possible to get these significant improvements in fuel economy in both the passenger fleet and even more so in the light duty truck fleet, without downsizing and downweighting. So it's a technological possibility, no safety penalty.

Senator KERRY. So we do not have to make the Solomon's choice the Senator referred to in achieving that? Are you saying yes, Dr. Sharp?

Dr. SHARP. I think you are absolutely correct. If you were to go to the extreme and go through this aggressively fast, then you would increase the risk of downsizing.

Senator KERRY. But if you do what we are currently talking about, Dr. Greene, you agree to that?

Dr. GREENE. Yes. I think there's nothing in our report that contradicts that.

Senator KERRY. Let me come back. Even if you accepted the downsizing, I want you to do this not as a matter of what you said

before, but just follow with me in a different line of thinking. It is the trucks and heavier vehicles that crash into a lighter vehicle that has become the new motivation for people to go out and buy larger vehicles. We have a counter-incentive in the marketplace today, folks. We are driving people towards buying heavier, more fuel-inefficient vehicles because they feel threatened by the big ones and the theory is, well, I have to have a big one too, so I feel safer.

Dr. PORTNEY. That's correct.

Senator KERRY. Now if in fact we are requiring the light truck vehicles, the trucks that have become passenger cars, to act more like passenger cars, you are not going to be putting those light passenger cars at risk. You are equalizing what happens.

Dr. GREENE. The Committee agrees with that principle.

Senator KERRY. I just want to establish this very clearly for the record so I am not confused when approaching this point. Let me go a step further.

Is there an analysis with respect to the European experience and the Japanese experience, where they have both smaller trucks and smaller vehicles, as to what the relative safety is between them and us?

Dr. LUND. We have done no analysis for this particular report.

Senator KERRY. Don't you think it would be interesting to understand? I mean, they seem to be doing pretty well with smaller vehicles, lighter vehicles and with much greater fuel efficiency available to them.

Dr. LUND. It is quite difficult to make comparisons across different cultures, because there are many differences between say the average German motorist and vehicle and the average American. The fact is that when you have similar types of roadways, say interstate and highways for comparison, we find that the fatality rates in the United States are in fact lower than they are in those countries.

If you try to compare without having some fairly standard units, you run into problems with that group. Europeans don't license their youngsters until they are older, 17, even 18. It can be very expensive to get a license, which slows licensure down even further. They have 95 percent belt use; we are struggling to exceed 70 percent belt use.

So there are a lot of problems in making these kinds of cross-cultural comparisons, but when we do look at them at things that we think are comparable, we find that the United States is doing a good job and our vehicles are safer.

Senator KERRY. Well, I just thought it was important to try to understand where we are with respect to what information is available to us in terms of safety issues. So yes indeed, if we went too far too fast, I do not think we want to push that envelope. But I think what we are talking about now remains well within the realm of reasonableness.

In the July 17 *New York Times*, it reported the findings of your draft report, and according to the *Times*, you then suggested that it would be possible to raise fuel economy by 8 to 11 miles per gallon within 6 to 10 years, but the final report then moves it back to 15 years, which was about a 33 to 50 percent longer time range.



What was the basis for suddenly expanding the time frame between the draft report and your final report?

Dr. PORTNEY. Actually, I'm glad you asked, because that's a question that's come up a lot, as you know. The way I want to explain this is the following. Imagine that you were working with 12 other of your colleagues to draft something and it was very important, and you farmed it out so that each of you were going to do one-thirteenth of this report. And 2 weeks before the big report was due, everybody came together and for the first time had an opportunity to read what everybody else had written, and at the same time you had comments from nine of your other colleagues who wanted also to comment on this, and then you had 2 weeks to put the final report into place.

Under those kind of circumstances, I'm sure you could understand that some mistakes would be made. People saw for the first time what other parts of the report looked like, and it was literally the day that that story leaked in the *New York Times* that we came together for the first time having all read what was in that report, and having had the benefit of nine outside anonymous reviewers' comments. And so under that set of circumstances, I think it's understandable that things were changed from the draft that got leaked in a number of respects, and that's the reason why.

Frankly, there were mistakes in there because we were rushing to finish under a lot of pressure, hurry up and get this out.

Senator KERRY. There were no telephone calls from any industry or their representatives specifically weighing in?

Let me just say also, so I establish the rules here for myself and others, there is a vote that just started, they have two votes now, and I think we should try to get through the second round of questions, and then probably because of the interference of the voting, wrap it up. So if you can just quickly answer it and then I will close.

Dr. SHARP. Senator, just to indicate, there was no dispute in the Committee about the change in the report on that. Several people in different groups met and agreed that it was a mistake the way it was originally made, and that is a summary statement that is not reflected in the final report.

Senator KERRY. That is fine, I accept that. I was just curious and wanted to clear it up and I appreciate the answer. Senator Bingaman.

Senator BINGAMAN. I just have one other question. There is a chart you have in here, Figure 2-4, on page 2-6 of your report. It is entitled Passenger and Light Truck Fuel Economy, 1965 through 2000. Now as I read that, it has the two top lines there, one for new cars, one for new light trucks, and those lines go up substantially between the period 1978 through about 1989 or '88, something like that and then they level off, the way I read this chart.

I would conclude just from the little I know about this subject, that fuel economy in passenger and new cars and new light trucks during that period was improving, because we had mandated improvements, and that as soon as the mandates for improvements stopped and the Federal law on the issue froze, improvements quit. Is that a fair reading of that chart?

Dr. PORTNEY. With one amendment. During that same early period where you see the line going up from left to right most steeply, remember that not only did you have CAFE standards in place for the first time, but you had very very significant gasoline price increases, and that clearly was providing a market signal to get better fuel economy.

But the Committee I think was pretty unanimous in saying that subsequent to that, when the real price of gasoline began its long dramatic slide, we think, although there is not proof for this, but we are pretty confident that fuel economy would have sunk below the level of the standards had the CAFE program not been put into place.

Senator BINGAMAN. Thank you very much.

Senator KERRY. Senator Feinstein.

Senator FEINSTEIN. Thanks very much. Gentlemen, you did not quite answer Senator Kerry's question. He asked if there had been any phone calls about the initial draft report.

Dr. PORTNEY. Sure, and again, I will let my fellow Committee members speak to that. I got phone calls from people in the auto industry, I got phone calls from the people in the environmental advocacy community, I got phone calls from academics who had studied this and written about it. And not one of those phone calls, Senator Feinstein, was of the nature: "you have to change this or you better do that." It was first of all: "Paul, you told us that we wouldn't be reading about this in the paper until the Committee had concluded its report," and two, "Did the report that Keith Brashear published in the *New York Times* accurately reflect the status of the executive summary at that time?" It was purely informational.

I think you will recall that that table was not exactly self explanatory. All the calls I got were: "Help me understand this, what is this break-even analysis," or "What does cost effectiveness analysis mean?"

Senator FEINSTEIN. Let me just ask about one sentence that was deleted that was in the draft report, again carried in the *New York Times*. And the quote is: "Significant fuel economy gains in all vehicles can be achieved with minimal or no weight reduction and therefore minimal negative safety implications." Why was that sentence deleted?

Dr. PORTNEY. I can't for the life of me tell you. Jeff, do you recall?

Dr. WISE. That was because we believed it could be done but we didn't know whether manufacturers would do it. In other words, if it was—we believed based on our data that it's possible technically to do it, and it would be the most cost effective way to do it. But we can't guarantee that if you raise the fuel economy standards that manufacturers will necessarily do it that way.

Senator FEINSTEIN. That is not what the draft report said. It said that the economy gains can be achieved, it does not say that the automobile companies will do that, it is just a scientific statement that based on the science these gains can be made.

Dr. SHARP. I think whether the sentence is the same or not, the content is the same and the content is exactly as you stated, it is quite possible for them to do this with the technology without

downsizing and downweighting. CAFE does not guarantee what strategy they might take, that was the concern of some members, that that would be confused, but the content was very very clear, significant gains could be made with current technologies without downweighting or downsizing, given enough time.

Senator KERRY. How much is enough time?

Dr. PORTNEY. 10 to 15 years in the view of the Committee. Some things are achievable before then, but to implement the whole suite of technologies that would make possible the fuel economy gains at the cost we identified, within 15 years.

Senator FEINSTEIN. And if I may, that is what has changed. I mean, the original report said that this was all possible in 6 or 10 years and then the final report deleted that fuel economy gains with minimal or no downweighting, and changed the length of time up to 10 to 15 years from 6 to 10 years. So, to me, in reading the report, what that said is oh, somebody got to them and said we cannot do it in this time, or we are not going to do it in this time, and you yielded to that. I am not saying you did, I am saying that was just the implication.

Dr. GREENE. I think there was a problem we discussed, and although I didn't agree personally with the other changes, I do agree with the 6 to 10-year change.

Senator KERRY. We just have one minute for our vote. We have a little grace period, but as you know, it is not that long, if they will hold it.

Senator FEINSTEIN. Thank you very much. I will conclude and I just want to thank you very much.

Senator KERRY. On the table currently are discussions about bringing light truck vehicles up to the 27.5 miles per gallon standard applicable to passenger cars. You have indicated you think that is achievable. There is also discussion of taking passenger vehicles up to anywhere from 30, 35 or 40 mpg—40 is I think the highest number. Is 40 mpg achievable reasonably? Is 35 achievable? I know you have not recommended a level, but I am asking you if that is within the realm of possibility in the judgment of the Committee.

Dr. PORTNEY. Well, I would say anything is within the realm of the technical, or technologically achievable. 40 miles per gallon is 100 percent increase in fuel economy for SUVs and a 45 percent for cars, and there is certainly nothing in our report that would suggest that that's possible even within a 15-year period, and I think we would all agree that that's overly ambitious in the time frame that we looked at.

Senator KERRY. Fair enough.

Dr. GREENE. We don't consider all the technologies, so there may be new technologies coming in to speed that up.

Senator KERRY. Agreed. I opened the hearing up very clearly saying that until you push the curve, you may not know how fast you can achieve it. I would rather be in the position as a Senator—if I'm still here in 10 years—of making the judgment, recognizing if we are not able to make it, perhaps rolling it back. But we at least must set a target and try, rather than folding our hand early, and it seems to me that we must try to push the curve. We have seen what has happened in almost every other field when we have done that.

I want to thank you. The last thing you need are some of these headaches. Your public service is much appreciated, and we are very grateful to you for this. We are going to digest it, work through it. Our Committee, the Commerce Committee hopes to proceed forward and mark something up in September when we get back, and so we may even get back to you individually.

I intend to leave the record open for a week in order to allow colleagues to submit any questions they may have or for any further inquiries of staff.

Thank you very much. We stand adjourned.

[Whereupon, at 4:21 p.m., the hearing was adjourned.]

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