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Memorandum

U.S. Department of Transportation
National Highway Traffic Safety Administration

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Subject: ACTION: Preliminary Economic Assessment Alternative Fueled Vehicles, Extension of CAFE Option, Part 538

Date: OCT 10 2002

From: Rose McMurray
Associate Administrator
for Planning, Evaluation, and Budget

Reply to Attn. of:

To: Docket

Thru: Jacqueline Glassman
Chief Counsel

Please submit the attached copy of the "Preliminary Economic Assessment, Alternative Fueled Vehicles, Extension of CAFE Option, Part 538," December 2001, to docket #10774.

Attachment

Distribution:
Associate Administrator for Rulemaking
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Chief Counsel

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National Highway Traffic Safety Administration

PRELIMINARY ECONOMIC ASSESSMENT

ALTERNATIVE FUELED VEHICLES EXTENSION OF CAFE OPTION PART 538

Office of Regulatory Analysis and Evaluation
Plans and Policy
December 2001

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EXECUTIVE SUMMARY

NHTSA is proposing that the dual-fuel incentive program be extended four years, i.e. through the 2008 model year. The voluntary alternative fuel Corporate Average Fuel Economy (CAFE) credit program has been successful in stimulating a significant increase in the availability of alternative fuel vehicles (about 1.6 million E85 vehicles will be sold through 2001, mostly light trucks). Unfortunately, the availability and use of alternative fuels has not kept pace with vehicle production.

It appears likely that unless strong financial incentives are put into place to ensure the production, distribution and use of E85 fuel (which NHTSA does not have control over), that extending the CAFE credit incentive will increase petroleum consumption and greenhouse gas emissions. Having recommended in our Report to Congress that steps be taken to enhance the infrastructure of E85, we want to maintain the program while efforts are made to identify and implement those steps.

Alternative fuel vehicles qualify for special treatment in the calculation of their CAFE by computing the weighted average of the fuel economy while operating on gasoline or diesel fuel and when operating on the alternative fuel. The CAFE credits manufacturers garner through this program allow the manufacturers to sell some of their light vehicles with a lower fuel economy than they otherwise would be able to sell, without paying a CAFE penalty or taking other actions to meet the CAFE standards. As a result, light vehicles operate with an average fuel economy less than they would have without the credit.

Two scenarios were examined based on the MY 2001 combined fuel economy of GM, Ford, and Daimler/Chrysler light trucks of 20.07 mpg. Both scenarios assume that on average 99 percent of the fuel used by dual-fuel vehicle owners will be gasoline and one percent will be E85. Scenario 1 examined the MY 2001 credit derived from the dual-fuel vehicle credit (20.52 mpg versus 20.07 mpg). From a light truck purchaser's perspective, the lower average fuel economy will result in the vehicle consuming more fuel (on average 308 gallons) over its lifetime and costing $129 more (present discounted value) to operate in fuel over the vehicle's lifetime. Scenario 2 examined the potential credit of 0.9 mpg that could be taken during the extension years, so it compared 20.97 mpg versus 20.07 mpg. From a light truck purchaser's perspective, the lower average fuel economy will result in the vehicle consuming more fuel (on average 411 gallons) over its lifetime and costing $244 more (present discounted value) to operate in fuel over the vehicle's lifetime.

Scenario 1 could result in an additional 1.7 billion gallons of gasoline being used over the lifetime of one model year's fleet of light trucks at a present discounted value of $727 million. Scenario 2 could result in an additional 2.3 billion gallons of gasoline being used over the lifetime of one model year's fleet of light trucks at a present discounted value of $1,375 million.

Because there are a variety of ways to improve fuel economy, and our ability to collect and analyze data has been restricted under the CAFE freeze for the past six years, we are unable at this time to determine what are the benefits to the light truck purchaser to offset the increase in fuel costs. The light truck purchaser may get more choices of large light trucks and SUVs in the

market, perhaps the ability to choose a larger engine, or perhaps savings in initial vehicle prices if weight reductions due to material substitutions, or fuel economy technologies are not added to the vehicle.

This analysis of costs and benefits considers the period for which the extension is covered. Several of the analyses look at the impacts over the lifetime of one model year. Thus, if the extension lasts for two model years or four model years, the numbers get multiplied by two or four, respectively. Vehicles last for 20 to 25 years. Depending upon the rate of expansion of the infrastructure of production and distribution of E85, benefits could accrue later in the life of these vehicles.

From the manufacturer's perspective, the longer the extension, the more time they have to make adjustments to their fleet of vehicles to meet the CAFE standards without the assistance of the credit provisions.

INTRODUCTION

The Alternative Motor Fuels Act of 1988 (AMFA), Public Law 100-94, October 14, 1988, provides CAFE credit incentives for the manufacture of vehicles that use alcohol or natural gas fuels, either exclusively or as an alternate fuel in conjunction with gasoline or diesel fuel. The primary purpose of AMFA is to encourage the widespread use of these fuels and to promote the production of alternative fuel vehicles by manufacturers.

In enacting AMFA, Congress sought to provide incentives directly to the auto makers in order to put an end to the "cause and effect" paradigm, in which auto makers had consistently argued that they would manufacture and market alternative fuel vehicles, only if a supply and distribution infrastructure were available to support an alternative fuel vehicle fleet. The fuel industry, for their part, argued that it would develop such an infrastructure, if there were significant demand for alternative fuels in the marketplace that would justify the capital expense.

Congress sought to address this situation by allowing special treatment of CAFE calculations for "dedicated" and "dual-fuel" (also referred to as flexible-fuel) vehicles. Through AMFA, Congress amended the automotive fuel efficiency provisions of Title V of the Motor Vehicle Information and Cost Savings Act by the addition of a new section that contains incentives for the manufacture of vehicles designed to operate either exclusively, or flexibly, on methanol, ethanol or natural gas. A manufacturer producing alternative fuel vehicles that meet specific energy efficiency and minimum driving range requirements is able, if the manufacturer chooses, to raise its overall fleet fuel economy average by manufacturing these vehicles.

Vehicles that operate exclusively on a 70 percent or greater methanol or ethanol concentration, or only on compressed or liquefied natural gas are recognized by AMFA to be dedicated alternative fuel vehicles. Those that have the capability to operate on either conventional gasoline or diesel fuel, or a mixture of the alternative fuel and gasoline or diesel fuel, or only on the alternative fuel, without modification to the vehicle, are considered as dual-fuel or flexible-fuel vehicles. Most vehicles produced in response to AMFA have been flexible-fuel vehicles designed to operate on E85, a mixture of 85 percent ethanol and 15 percent gasoline. Vehicles powered by electricity, liquid petroleum gasoline (LPG), and bio-diesel are not covered by AMFA.

AMFA provides that by December 31, 2001, NHTSA either extend the dual-fuel incentive program by rulemaking or issue a notice terminating it. AMFA further directs that NHTSA must evaluate the dual-fuel incentive program and provide a report to Congress analyzing the success of the incentive program and its preliminary conclusions regarding whether to extend the program beyond the 2004 model year or terminate it at the end of that model year. The program may be extended for up to 4 years through MY 2008.

The maximum CAFE benefit permitted from the addition of dual-fuel vehicles to a manufacturer's fleet is 1.2 mpg for model years 1993 through 2004. For MY 2005 through 2008, the maximum CAFE benefit permitted from the addition of dual-fuel vehicles is 0.9 mpg. The maximum CAFE benefit is applied separately to domestic passenger car, imported passenger car, and light truck fleets.

In order to obtain specific information relative to alternative fuels and alternative fuel vehicles from the private sector, NHTSA published a Federal Register notice (65 FR 26805; May 9, 2000) requesting factual information and data sources. Information supplied to the docket were used in developing the Report to Congress and this document. The Report to Congress has been completed and is the source document for most of the discussions in this Preliminary Economic Assessment.

BENEFITS

The AMFA CAFE credit program has been successful in stimulating a significant increase in the availability of alternative fuel vehicles. Nearly all of these have been flexible-fuel vehicles that can operate on gasoline or E85 fuel (a mixture of 15 percent gasoline and 85 percent ethanol). There are currently over 1.6 million of these vehicles on the road. Because manufacturers had to overcome technological challenges, nearly the entire production of these vehicles has been in the past three years.

The auto manufacturers stated that the CAFE incentive program has been a major factor in developing and manufacturing alternative fuel vehicles in high volumes. They also stated that extension of the credit provision will be a major factor in their decision to continue offering dual-fuel vehicles in volumes similar to those that are being produced today.

While the availability and use of alternative fuels has increased since the inception of the CAFE credit incentive provision, it has not nearly kept pace with the increase in the number of alternative fuel vehicles. Although there are 176,000 gasoline stations nationwide, there are only 5,236 alternative fuel refueling sites, with just 121 of these offering E85. Due to the lagging development of the alternative fuel infrastructure and the fact that E85 fuel is typically more expensive on a gasoline-equivalent basis (as of April 2000 gasoline averaged $1.52 per gallon and ethanol averaged $1.80 on a gasoline equivalent gallon), the vast majority of dual-fuel vehicles rarely, if ever, operate on alternative fuel. However, it is important to note that even if relatively few of these vehicles are actually being operated on E85, it is still valuable to be

increasing that capability throughout the fleet because it could potentially contribute to the future transition away from petroleum, could spur an increase in the number of E85 refueling sites, and could provide consumers an alternative if there are future gas shortages or gas prices increase significantly.

Availability of Alternative Fuel Vehicles

The CAFE incentives have had a clear impact on the development of new alternative fuel vehicle technologies. For instance, E85 vehicle technology has been developed significantly, to the point where these vehicles are being produced in large numbers at no incremental cost to the consumer.

The number of dual-fuel alternative fuel vehicles has increased to over 1.6 million vehicles. The vast majority of these vehicles are light trucks. Through MY 2001, those vehicles using E85 as an alternative fuel include 217,000 passenger cars and 1,446,000 light trucks. Recent increases (MY 1998 through MY 2000) have been dramatic. In 1997, there were no dual-fuel light trucks. By 2000, close to 8 percent of all light trucks produced were dual-fueled vehicles. About 1.4 percent of passenger cars produced in MY 2000 were dual-fueled vehicles (compared to .025 percent in 1993). The number of dual-fueled vehicles decreased in MY 2001 compared to MY 2000.

The number and percentage of vehicles manufactured (annually & aggregate) since the beginning of MY 1993 with dedicated and dual-fuel capacity is shown in Table 1 below.

Table 1
Passenger Cars

Year	Total Car Production (Thousands)	Dedicated Fuel Cars (Thousands)	Flexible-fuel Cars (Thousands)	Flexible-fuel Percent of Total
1993	8040.8		2.0	.025
1994	8544.0		2.4	.028
1995	9497.1		2.0	.021
1996	7922.7		5.3	.067
1997	8043.2	2.3	5.1	.063
1998	8267.4	0.3	3.5	.042
1999	8773.9	0.8	4.8	.055
2000	8962.9	0.4	126.2	1.408
2001	8377.1	0.6	66.0	.788
TOTAL	76429.1	4.4	217.3	.284

Light Trucks

Year	Total Light Trucks Production (Thousands)	Dedicated Fuel Light Trucks (Thousands)	Flexible-fuel Light Trucks (Thousands)	Flexible-fuel Percent of Total
1993	4788.4	0.2		
1994	5470.7	1.5		
1995	5677.7			
1996	5241.7	0.7		
1997	6118.7	0.7		
1998	6499.7	1.9	147.2	2.265
1999	6748.9	1.6	420.1	6.225
2000	7228.1	1.0	546.7	7.564
2001	7209.4	19.3	332.0	4.605
TOTAL	54983.3	26.9	1446.0	2.630

Note: Data based on Mid-Model Year data supplied by the manufacturers to NHTSA.

Availability of Alternative Fuels

While there are an estimated 176,000 conventional fuel refueling stations nationwide, the National Renewable Energy Laboratory (NREL) reports that there are 5,236 alternative fuel refueling sites as of May, 2001, with alternative fuel refueling sites in all 50 states. In comparison, there were 4,676 alternative fuel refueling sites in the U.S. in 1995. Unfortunately, while ethanol is the alternative fuel that most of the dual-fuel vehicles that have been produced can operate on, less than three percent of the alternative fuel refueling sites offer ethanol. The vast majority of alternative refueling sites (3,270) offer liquefied petroleum gas (LPG), while 558 offer electricity, and 4 offer biodiesel.

Ethanol: There are 121 ethanol (E85) refueling sites in the U.S., up from 37 in 1995. Ethanol refueling sites can be found predominantly in the Midwest, close to the major supplies of ethanol. Efforts by DOE are underway in Minnesota to help construct a number of ethanol refueling sites. As seen with CNG, fuel suppliers can rise to meet the demand by developing the necessary infrastructure. Although the trend in alternative fuels is in the direction of E85 use, the infrastructure has been slow to develop because these vehicles can use conventional fuel. Further, studies have shown that refueling stations need at least 200 steady customers for any single grade in order to make profitable use of the facilities. Though large numbers of flexible-fuel vehicles are being sold, they are spread out over the entire nation, and achieving a critical mass of 200 that use a single refueling station is still difficult to achieve. The small number of outlets available today points out the need to vastly expand the E85 refueling infrastructure. In addition, it is safe to say that many people who have purchased flexible-fuel vehicles do not

know they could use E85. Additional public education in areas where E85 refueling stations exist is needed to inform people so that they are aware of where to obtain E85 and that their vehicles may be capable of operating on E85.

Methanol: There are only 2 methanol (M85) refueling sites in the U.S., significantly down from 88 in 1995. Both of these sites can be found in California. The total number of methanol (M85) refueling stations has been dropping in the past few years, due to the lack of M85-capable flexible-fuel vehicles.

Natural Gas: There are currently 1,237 compressed natural gas (CNG) refueling sites and 44 liquefied natural gas (LNG) refueling sites in the U.S., up from 1,065 CNG refueling sites in 1995. Natural gas refueling stations are usually located in urban areas near the major concentrations of natural gas vehicles, and are frequently constructed on a company's site to serve its fleet vehicles. Dedicated CNG vehicles, both heavy duty and for industrial use, have been in the market place for some time, thus the larger number of refueling sites compared to E85. The cost to retrofit an existing refueling station's or retail outlet's gasoline/tank for E85 range from $5,000 to $30,000. For a new, underground tank and pump, the price ranges from $50,000 to $70,000. For LNG, the installation cost of a new outlet is $25,000 to $40,000. For CNG, the installation cost for an initial outlet is $250,000 to $500,000.

Since ethanol is the alternative fuel that most dual-fuel vehicles are capable of operating on, it is important to note the current water quality concerns regarding Methyl Tertiary-Butyl Ether

(MTBE), an additive used to increase the oxygen content of gasoline. If MTBE is banned as a gasoline additive and fuel producers replace MTBE with ethanol, it is uncertain if there will be enough refinery capacity to both replace MTBE and to fuel flexible-fuel vehicles a substantial portion of the time with E85. Because of this situation, along with the small number of ethanol refueling stations nationwide, coupled with the growing number of vehicles capable of using ethanol entering the market place, some special incentives to spur the development of an E85 refueling supply and distribution network might be warranted.

Use of Alternative Fuels

While alternative fuel use in alternative fuel vehicles in the U.S. has been rising over the past decade, it still represents a very small portion of total highway fuel use. In 1992, the Energy Information Administration estimated that a total of 230 million gasoline gallon equivalents of alternative fuel were used in alternative fuel vehicles. For 2000, the estimated number is 368 million gasoline gallon equivalents, or an increase of roughly 6 percent per year. In comparison, the highway use of gasoline and diesel was about 133 billion gallons in 1992, and that number is estimated to be about 159 billion gallons in 2000. Thus, alternative fuel use only accounts for 0.23 percent of total highway fuel use.

It is estimated that only one percent of the fuel used by dual-fueled vehicles on the road today is E85 and that 99 percent of the fuel used is gasoline. Until the availability of E85 refueling stations increases, this percentage is not likely to increase much.

Impact of Flexible-fuel Vehicles on CAFE

An analysis was performed to determine the impact of flexible-fuel cars and light trucks on CAFE. The analysis consisted of identifying the flexible-fuel vehicles in each model year and comparing the CAFE computed using the flexible-fuel credits for these vehicles, indicated in Table 2 by CAFE with FFV Credit, with the CAFE computed using normal fuel economy values.

In MY 1993, the Ford Taurus FFV was the only flexible-fuel car which earned additional credits due to the fuel incentive program. The Ford Taurus FFV had a fuel economy of 42.4 mpg and an estimated mid-model year production of 2,000. This produced a Ford domestic CAFE of 27.95 mpg based on mid-model year data. However, if this particular Taurus had a normal fuel economy of 28.0 mpg (for a 3.0 Liter Taurus), then the Ford domestic CAFE would have been 27.94 mpg, or 0.01 mpg less.

To date, the Ford Taurus was the only flexible-fuel car with measurable (at least 0.1 thousand) production. As seen in the accompanying table, the inclusion of the Taurus flexible-fuel vehicle fuel economy credits produced a benefit of no more than 0.03 mpg in the Ford domestic CAFE until MY 2000 when Ford made flexible fuel a standard feature on the 3.3L Taurus. The resultant sales increased of the vehicles resulted in a CAFE credit increase of 0.87 mpg. Sales of the flexible-fuel Taurus declined in MY 2001, and the CAFE credit decreased to 0.60 mpg.

There were no dual-fuel light trucks produced from MY 1993 through MY 1997. In MY 1998 and MY 1999 there were over 300,000 Caravan/Voyager and Town and Country flexible-fuel

vans produced by Chrysler/DaimlerChrysler. Ford estimated almost 200,000 Ranger flexible-fuel sales in its MY 1999 fuel economy report. The increase in light truck CAFE due to the flexible-fuel vehicle credits, i.e., CAFE with FFV Credit - CAFE Normal, for MY 2001 were 0.82 for Daimler/Chrysler, 0.16 mpg for Ford and 0.41 mpg for General Motors. Table 2 shows these impacts on CAFE, GM data is shown below the table.

General Motors had about 98,000 E85 flexible fuel light truck sales in MY 2000. For MY 2001, they are anticipating selling about 91,600 light trucks and sport utility vehicles with dual-fueled (E85) capability. The CAFE difference between their normal fleet (20.04 mpg) and their CAFE fleet with the flexible fuel credit (20.45) is 0.41 mpg.

While dedicated alternative fuel vehicles played an important role during the process of technological developments for dual-fuel alternative fuel vehicles, their presence in the market place has been too small to have any impact on the CAFE of manufacturers.

Table 2

MY 1993-1999 CORPORATE AVERAGE FUEL ECONOMY USING FLEXIBLE-FUEL ECONOMY CREDITS COMPARED TO A NORMAL CAFE

	Ford Domestic Cars		Chrysler/DaimlerChrysler Domestic Trucks		Ford Domestic Trucks	
MY	MMY CAFE with FFV Credit	MMY CAFE Normal	MMY CAFE with FFV Credit	MMY CAFE Normal	MMY CAFE with FFV Credit	MMY CAFE Normal
1993	27.95	27.94	*	*	*	*
1994	27.37	27.35	*	*	*	*
1995	27.45	27.44	*	*	*	*
1996	26.61	26.59	*	*	*	*
1997	27.09	27.06	*	*	*	*
1998	27.34	27.31	20.54	19.93	*	*
1999	26.94	26.91	20.74	19.80	20.41	19.84
2000	27.81	26.94	21.33	20.37	20.89	20.21
2001	27.24	26.64	20.67	19.85	20.45	20.29

* No flexible-fuel vehicles produced in these years.

Note: Mid-Model Year (MMY) CAFE level is typically different from EPA final year- end totals.

Note: GM domestic truck totals for MY 2001 are:
MMY CAFE with FFV Credit = 20.45 mpg
MMY CAFE Normal = 20.04 mpg

COSTS

The use of alternative fuels can reduce petroleum use and reduce greenhouse gas emissions. However, to the extent that vehicle manufacturers take advantage of the alternative fuel vehicle CAFE credit incentive to relax the effect of the CAFE standard on the rest of their fleet, the average fuel economy of the fleet falls. Other than producing alternative fuel vehicles, manufacturers must use other means (weight reductions, advanced technology, pricing, and/or marketing, etc.) to meet the CAFE standards or pay civil penalties for not meeting the standard.

If it is assumed that the manufacturers would have taken other actions to meet the CAFE standards rather than pay civil penalties, it can be concluded that the CAFE credit incentive provision has actually increased petroleum consumption and greenhouse gases. Further, given the slow rate of growth in the alternative fuel infrastructure, it does not appear likely that any energy conservation and environmental benefits will be realized through the period that is being considered for extension of this provision (2008) unless strong financial incentives are put in place to ensure the production, distribution, and use of E85 fuel. On the other hand, if the manufacturers of dual-fuel vehicles had chosen to pay CAFE civil penalties instead, petroleum consumption and greenhouse gases would still have increased, but there would be far fewer alternative fuel vehicles on the road today.

For several reasons, these flexible-fuel vehicles are operating almost exclusively on gasoline. It is estimated that only one percent of the fuel used by flexible-fuel vehicles is alternative fuel. At the same time, the CAFE credits manufacturers garner through AMFA allow them to sell some

of their light vehicles with a lower fuel economy than they otherwise would be able to sell, without paying a CAFE penalty or taking other actions to meet the CAFE standards. As a result, light vehicles operate with an average fuel economy less than they would have without the AMFA credit.

Alternative fuel vehicles qualify for special treatment in the calculation of their CAFE by computing the weighted average of the fuel economy while operating on gasoline or diesel fuel and when operating on the alternative fuel. Because the overwhelming majority of flexible fuel vehicles produced by manufacturers operate on ethanol, this analysis will focus on ethanol. Determining the CAFE credit for a dual-fueled vehicle is a two-step process. First, the fuel economy for a dedicated alcohol vehicle is calculated. This figure is then inserted into the second calculation to determine the average fuel economy for a dual-fueled vehicle. The following example shows these steps:

1) The alcohol fuel economy is divided by a factor of 0.15, under the decision that a dedicated alternative fuel vehicles is considered to contain 15 percent of a gallon of gasoline on an energy equivalent basis. As an example, a dedicated alternative fuel vehicle that would achieve 15 mpg fuel economy while operating on alcohol would have a CAFE calculated as follows:
FE = (1/0.15)(15) = 100 miles per gallon.
2) For alternative dual-fuel vehicles, an assumption is made that the vehicles would operate 50% of the time on the alternative fuel and 50% of the time on conventional fuel, resulting in a fuel economy that is based on a harmonic average of alternative fuel and conventional fuel. The fuel

economy for an alternative dual-fuel model is calculated by dividing 1.0 by the sum of 0.5 divided by the fuel economy as measured on the conventional fuel and 0.5 divided by the fuel economy as measured on the alternative fuel, using the 0.15 volumetric conversion factor. For example, for an alternative dual-fuel model that achieves 15 miles per gallon operating on an alcohol fuel (which translates into 100 mpg as shown in step one above) and 25 mpg on the conventional fuel, the resulting CAFE would be:

$FE = 1/((0.5/25) + (0.5/100) = 40$ miles per gallon

Thus, one can imagine the incentive for the manufacturers to sell dual-fueled light trucks. These vehicles' high mpg can be used to offset the sales mix of low-mpg vehicles, which are increasingly being comprised of larger SUV's, which currently have higher profit margins. With the fuel economy level of GM, Ford, and Daimler/Chrysler around the level of the CAFE standard, there appears to be enough incentive for the manufacturers to invest in selling a dual-fueled light truck to offset the low-mpg vehicles and help them meet the 20.7 mpg CAFE standard for light trucks. The point of this analysis is not to try to estimate the manufacturers' costs for alternative fuel vehicles, nor to try to estimate the marginal profit realized by the manufacturer by utilizing this strategy, but to estimate the potential effects on fuel economy and petroleum consumption if they take advantage of the extension of the credit.[1] There is believed to be sufficient incentive for the manufacturers to produce dual-fueled vehicles and that incentive is expected to continue through the extension period being considered.

[1] For further information on estimates of these costs see "An Analysis of Alternative Fuel Credit Provision of US Automotive Fuel Economy Standards", by Rubin and Leiby, February 16, 2000.

Other Impacts

One of the commenters to our request for information was concerned that termination of the credit program could result in the price of dual-fuel vehicles to rise. This is a concern for governmental entities that are required to use alternative fuel vehicles. It is true that manufacturers have offered the dual-fuel vehicles at the same price as gasoline powered vehicles even though they cost more to produce. Thus, without the availability of the credit, manufacturers might charge more for the dual-fuel vehicles or might stop producing them. The latter case might have more of an impact on governmental entities that are required to use alternative fuel vehicles, because their choices would be limited to dedicated alternative fuel vehicles or electric vehicles.

Analyses in the Report to Congress

Estimates were made of both conventional and alternative fuel use, total motor fuel consumption, and greenhouse gas emissions using the Department of Energy's GREET 1.5a Transportation Fuel-Cycle Model (1999). The results of this analysis, as shown in the Report to Congress pages 38 to 40, indicate that cumulatively, through the year 2000, the AMFA CAFE incentives policy has resulted in a total increase in alternative fuel use of about 26 million gallons, a total increase in gasoline consumption of about 772 million gallons, and an increase in greenhouse gas emissions of about 2.4 million metric tons carbon equivalent (MMTCE).

The effects beyond 2000 will depend almost entirely on the amount of E85 fuel used by flexible-fuel vehicles. Based on current forecasts of E85 availability, price, and infrastructure, as well as

other factors, it appears unlikely that flexible-fuel vehicle owners will increase their use of E85 to the 50 percent rate assumed in the Act. Nevertheless, in the Report to Congress, we evaluated the effects of extending the CAFE credit to 2008. We considered different production rates for flexible-fuel vehicles (one based on a maximum benefit of 0.9) and different amounts of E85 fuel used by the flexible-fuel vehicles (one based on the current rate of about 1 percent and one based on a steady increase in use from the current 1 percent to 50 percent in 2008) in an attempt to bound the range of potential outcomes.

The results of the analysis with the current use of E85 fuels at 1 percent, compared to a baseline case of no alternative fuel vehicles, were:

If manufacturers produced enough E85 vehicles to garner 0.9 mpg CAFE credit and alternative fuel use continued at one percent and gasoline use at 99 percent for these vehicles, then during the calendar years of 2001 to 2008, we expect there to be:

- An increase in alternative fuel use of about 0.5 billion gallons
- An increase in petroleum consumption of about 14 billion gallons
- An increase in greenhouse gas emissions of about 42 MMTCE.[2]

In all scenarios analyzed in the Report to Congress , the amount of petroleum used and the amount of greenhouse gases produced increase when the credit is extended to 2008 compared to the option of allowing the program to expire in 2004.

[2] MMTCE = million metric tons carbon equivalent

It should be noted that this analysis assumes that in the absence of the CAFE credit incentive for dual-fuel vehicles, manufacturers would have used other means (weight reduction, different engine technology, pricing, etc.) to meet the CAFE standards, rather than pay civil penalties for non-compliance. If the manufacturers had chosen to pay civil penalties rather than modify the vehicles, it can be concluded that not only would there have been a negative impact on petroleum use and the environment, but there would also be many fewer alternative fuel vehicles on the road today.

Additional Analyses for this PEA

It appears that there is a large incentive for producing dual-fuel light trucks at this time. With only Ford producing dual-fuel Ford Taurus passenger cars, the overall impact on fuel economy for passenger cars is minor, (although there is the potential for it to be more substantial if the manufacturers decide to produce a large enough quantity of dual-fuel passenger cars to garner the 0.9 mpg CAFE credit). Thus, this analysis will focus on the light truck production of GM, Ford, and Daimler/Chrysler and the difference in fuel economy between the average fleet of vehicles run on gasoline at their currently predicted MY 2001 CAFE level (Scenario 1), and what would be allowed under the proposal to extend the dual-fuel vehicle exemption (Scenario 2). Theoretically, with the light truck CAFE standard set at 20.7 mpg, the total fleet average with the dual-fuel vehicles could get 19.8 mpg (20.7 – 0.9 mpg). However, none of the manufacturers are at the exact level of 20.7 mpg, so we will use their predicted levels in the analysis.

This analysis examines the impact of the dual-fuel credit using two scenarios. First, is a status-quo scenario, if the MY 2001 predicted dual-fuel vehicle volumes were held constant in the years of the extension of the credits, what would be the impact on the gallons of gasoline consumed by those light trucks over their lifetime and the present discounted value of the additional fuel used. The second scenario assumes that GM, Ford, and Daimler/Chrysler would take full advantage of the 0.9 mpg limit on how much can be counted towards CAFE for light trucks and examine those impacts.

Table 3 presents the weighted lifetime vehicle miles traveled by year, the predicted price of gasoline and the present discount value factor. These estimated factors are used in predicting the impact on gasoline used and the presented discounted value of gasoline purchases over the lifetime of a light truck.

Table 4 presents the estimated number of alternative fuel light truck sales under the two scenarios and the average fuel economy. Under Scenario 1 the average fuel economy of the fleet (GM, Ford, and Daimler/Chrysler) without considering the CAFE credit would be 20.07 mpg; with the CAFE credit it would be 20.52 mpg. Under Scenario 2, the average light truck of GM, Ford, and Daimler/Chrysler without considering the CAFE credit would be 20.07 mpg; with the CAFE credit it would be 20.97 mpg.

Table 5 presents the results of analyzing the two scenarios over the lifetime of one model year. If the credit is extended by two model years or four model years, the total numbers in this table would be multiplied by a factor of two or four. This analysis assumes that gasoline would be

used 99 percent of the time by the purchaser of the dual-fuel vehicle and E85 would be used one percent of the time. The E85 calculations are based on gasoline equivalent gallons. For the average light truck owner under Scenario 1, over the lifetime of the truck, the dual-fuel credit could result in the increased use of 308 gallons of gasoline at a present discounted value of $129. Under Scenario 2, over the lifetime of the truck, the dual-fuel credit could result in the increased use of 411 gallons of gasoline at a present discounted value of $244.

Scenario 1 could result in an additional 1.7 billion gallons of gasoline being used over the lifetime of one model year's fleet of light trucks at a present discounted value of $727 million. Scenario 2 could result in an additional 2.3 billion gallons of gasoline being used over the lifetime of one model year's fleet of light trucks at a present discounted value of $1,375 million.

Thus, unless the production, distribution, and use of E85 increases in the future, this proposal will result in additional petroleum consumption and greenhouse gas emissions.

Table 3
Light Trucks Vehicle Miles Traveled

Vehicle Age (years)	Vehicle Miles Traveled	Survival Probability	Weighted Vehicle Miles Traveled	Price of Gasoline, Excluding Taxes	7 Percent Mid-Year Discount Factor
1	12,885	0.998	12,859	$0.96	0.9667
2	12,469	0.995	12,407	0.95	0.9035
3	12,067	0.989	11,934	0.96	0.8444
4	11,678	0.980	11,444	0.97	0.7891
5	11,302	0.967	10,929	0.98	0.7375
6	10,938	0.949	10,380	0.98	0.6893
7	10,585	0.924	9,781	0.99	0.6442
8	10,244	0.894	9,158	0.98	0.602
9	9,914	0.857	8,496	0.98	0.5626
10	9,594	0.816	7,829	0.97	0.5258
11	9,285	0.795	7,382	0.97	0.4914
12	8,985	0.734	6,595	0.97	0.4593
13	8,696	0.669	5,818	0.96	0.4292
14	8,415	0.604	5,083	0.96	0.4012
15	8,144	0.539	4,390	0.96	0.3749
16	7,882	0.476	3,752	0.96	0.3504
17	7,628	0.418	3,189	0.96	0.3275
18	7,382	0.364	2,687	0.96	0.326
19	7,144	0.315	2,250	0.95	0.286
20	6,913	0.217	1,500	0.95	0.2673
21	6,691	0.232	1,552	0.95	0.2498
22	6,475	0.196	1,269	0.95	0.2335
23	6,266	0.169	1,059	0.95	0.2182
24	6,064	0.143	867	0.95	0.2039
25	5,869	0.121	710	0.94	0.1906
			153,319		

Table 4
Assumptions for the Scenario Analysis

	Average FE with dual-fuel vehicles	Average FE without dual-fuel vehicles	Number of dual-fuel light trucks	Total light truck sales
Scenario 1				
GM	20.45	20.04	91,600	1,851,000
Ford	20.45	20.29	42,200	1,997,300
Daimler/Chrysler	20.67	19.85	198,200	1,781,000
Weighted Average	20.52	20.07		
Total			332,000	5,629,300
Scenario 2				
GM	20.94	20.04	201,073	1,851,000
Ford	21.19	20.29	237,375	1,997,300
Daimler/Chrysler	20.75	19.85	217,537	1,781,000
Weighted Average	20.97	20.07		
Total			655,985	5,629,300

Table 5

Impacts of Scenario Analysis
Over the Lifetime of One Model Year of Light Trucks

	With Dual-Fuel Vehicle Credit*	Without Dual-Fuel Vehicle Credit	Difference
Scenario 1			
Average CAFE	20.52 mpg	20.07 mpg	0.45 mpg
Fuel used per Vehicle over its Lifetime	8,703 gallons	9,011 gallons	307 gallons
Fleet fuel Used over its Lifetime	49.0 billion gallons	50.7 billion gallons	1.7 billion gallons
Cost of Fuel Used over its Lifetime	$5,378	$5,508	$129
Total Cost of Fuel Used			$727 million
Scenario 2			
Average CAFE	20.97 mpg	20.07 mpg	0.90 mpg
Fuel used per Vehicle over its Lifetime	8,600 gallons	9,011 gallons	411 gallons
Fleet fuel Used over its Lifetime	48.4 billion gallons	50.7 billion gallons	2.3 billion gallons
Cost of Fuel Used over its Lifetime	$5,263	$5,508	$244
Total Cost of Fuel Used			$1,375 million

* The calculations for fuel use and cost of fuel for the dual-fuel vehicles reflect 99 percent gasoline use and one percent E85 use and are based on gasoline equivalent gallons and gasoline equivalent fuel pricing when E85 is used.

SMALL BUSINESS IMPACTS

A. Regulatory Flexibility Act

The Regulatory Flexibility Act of 1980 (5 U.S.C. §601 et seq.) requires agencies to evaluate the potential effects of their proposed and final rules on small businesses, small organizations and small governmental jurisdictions. The agency does not believe that any of the vehicle manufacturers making dual-fuel vehicles or any of the companies making E85 are small businesses.

B. Unfunded Mandates Reform Act

The Unfunded Mandates Reform Act of 1995 (Public Law 104-4) requires agencies to prepare a written assessment of the costs, benefits, and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditures by State, local or tribal governments, in the aggregate, or by the private sector, of more than $100 million annually (adjusted annually for inflation with base year of 1995). Adjusting this amount by the implicit gross domestic product price deflator for the year 2000 results in $109 million (106.99/98.11 = 1.09). The assessment may be included in conjunction with other assessments, as it is here.

This proposal is not estimated to result in expenditures by State, local or tribal governments of more than $109 million annually. Furthermore, it is not a Federal mandate, but allows an option for automobile manufacturers.