FINAL REGULATORY ANALYSIS

FOR

MODEL YEARS 1983-85 LIGHT TRUCK FUEL ECONOMY STANDARDS

U.S. NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

PLANS AND PROGRAMS

OFFICE OF PROGRAM AND RULEMAKING ANALYSIS

NOVEMBER 1980

TABLE OF CONTENTS

NOTICE

When the term "CONFIDENTIAL" is used in this document, it stands for "For Official Use Only - Public Availability to be Determined Under 5 U.S.C. 552."

SUMMARY

Final light truck* fuel economy standards for model years (MY) 1983-85 are established as shown below. In addition to continuing separate standards for two-wheel drive (4x2's) and four-wheel drive (4x4's) trucks, the Agency, in desiring to maximize manufacturer marketing and investment flexibility, has also established a single composite standard. Compliance may be achieved with either the 4x2 and 4x4 standards, or the single composite standard, at a manufacturer's option.

LIGHT TRUCK FUEL ECONOMY STANDARDS

Model Year	Composite Standard	or	4x2's	4x4's
1983	19.0		19.5	17.5
1984	20.0		20.3	18.5
1985	21.0		21.6	19.0

The Agency established "maximum feasible" standards for light trucks which have taken into consideration both the market uncertainties and the financial difficulties of domestic manufacturers.

*Vehicles subject to this rulemaking include pickup trucks, vans and general utility vehicles which are 8,500 pounds gross vehicle weight rating (GVWR) or less, have a curb weight of 6,000 pounds or less, and a frontal area of 45 square feet or less.

In addition, the standards have been established at the level of the least capable manufacturer, given the present financial difficulties of the domestic companies and the congressional guidance concerning potential adverse effects on the small number of domestic firms.

The effects of improved fuel efficiency for light trucks for MY's 1983-1985, as compared to the standards for MY 1982, are as follows:

<u>For All Three MY's</u>	
Lifetime Fuel Savings	10 Billion Gallons
(Memo: Cumulative Fuel Savings--1983 through year 2005	76 Billion Gallons)
Industry Investment Requirements (1980 dollars)*	$3.8 Billion
Oil import savings (@$30/barrel)	$7 Billion
<u>Comparing MY 1985 to MY 1982 Light Trucks</u>:	
Average estimated Retail Price Increase	$65 per vehicle
Present Value of Operating Cost Savings	$1250 per vehicle
Net Consumer Benefits	$1185 per vehicle

*Assumes all capital requirements are in addition to business-as-usual capital expenditures; includes launch and engineering costs.

These final rules are estimated to save 10 billion gallons over the lifetime of the MY's 1983-85 light trucks, as compared to continued fuel consumption at the level of the MY 1982 standards. In calendar year 1985 alone, these standards are estimated to save 1.1 billion gallons of gasoline and reduce the Nation's import bill by $780 million (@ $30/barrel).

Capital expenditures needed to meet the fuel economy standards are estimated to be $2.6 billion. Launch and engineering are estimated to add $1.2 billion, for a total investment of $3.8 billion for the industry.

Retail price increases are based on Agency assumptions regarding the introductory pricing of a number of new compact vehicles and the effect these new models may have on the mix of vehicles sold. In previous rulemakings, fuel economy improvements were made to existing vehicles; an improved transmission, for example. The introduction of entirely new classes of vehicles makes this analysis invalid for this rulemaking.

Operating cost savings result from the increased fuel efficiency of the 1983-85 fleets. On a discounted basis, they amount to $1250 per vehicle over its 128,000 mile life. Net consumer savings--operating cost savings less retail price increases--are nearly $1200 per vehicle. On a benefit to cost basis, these standards would have a ratio of 19 to 1. Or, the purchaser of a 1985 truck would be paying, through higher purchase prices, about 5 cents for each of the 1400 gallons that vehicle would save over its life--5 cents to save each of 1400 gallons that would otherwise have cost the purchaser about $1.50 per gallon. These standards result in a 20 percent reduction in operating costs for a MY 1985 light truck.

PART I

BACKGROUND AND INTRODUCTION

I. BACKGROUND AND INTRODUCTION

A. Background

The purpose of the Energy Policy and Conservation Act, P.L. 94-163, enacted on December 22, 1975, was to increase domestic energy supplies and availability, restrain energy demand, and aid in the planning for coping with energy emergencies. As part of its provisions for energy conservation, that Act added a new title V, Improving Automotive Efficiency, to the Motor Vehicle Information and Cost Savings Act. Title V requires the Secretary of Transportation to set annual average fuel economy standards for passenger cars and light trucks. This authority was delegated to the Administrator of the National Highway Traffic Safety Administration (NHTSA) on June 22, 1976 (41 FR 25015).

Title V provides that fuel economy standards are to be set at the maximum feasible level considering the following four criteria:

- Technological Feasibility: Requires the determination of whether fuel economy improving technology could be commercially available in time to meet a particular model year standard.
- Economic Practicability: Requires the determination of whether the standard is within the financial capability of the industry and would not cause substantial dislocations (major reductions in sales, employment or competition, for example) in the industry or the economy as a whole. The Conference Report directs the Secretary to take "industry-wide considerations" into account and not set a standard at the level of

the company "which might have the most difficulty in achieving a given level of fuel economy." At the same time the Report directs that in setting the standard, "appropriate weight" be given to "the small number of domestic automobile manufacturers that currently exist, and the possible implications for the National economy and for the reduced competition association (sic) with a severe strain on any manufacturer."

- The Effect of Other Federal Motor Vehicle Standards on Fuel Economy: requires an assessment of the potential adverse effects of Federal safety, noise, emissions, and damageability standards on fuel economy.
- The Need of the Nation to Conserve Energy: requires an assessment of the degree to which reliance on imported oil affects the balance of trade, value of the dollar, inflation, national security, etc.

Title V required the Secretary to set the first standards for light trucks beginning with model year 1979. Title V also requires that the standards be issued at least 18 months before the beginning of the applicable model year, while separate standards may be issued for different classes of such vehicles as determined by the Secretary.

The penalty for noncompliance with the fleet average standards is $5 per vehicle manufactured for each tenth of a mile that a specific manufacturer's fleet average fuel economy is below the standard.

At the Secretary's discretion, this penalty may be increased to $10 per vehicle if it is determined that an increase would result in substantial energy conservation and would not produce adverse consequences. The fleet average is based on the sales-weighted harmonic average of fuel economy (miles-per-gallon) for all vehicles produced by that manufacturer. Fuel economy values are measured according to the fuel economy test procedures established by the Environmental Protection Agency (EPA).

Noncompliance, and hence penalties associated with a standard, is determined only after taking into account credits earned in previous and subsequent years. Credits are "equal to the number of tenths of a mile per gallon by which the average fuel economy of the [vehicles] manufactured...exceeds the applicable average fuel economy standard...multiplied by the total number of passenger automobiles manufactured...during such model year" (15 U.S.C. 2008 (b)(1)(A) (i) and (ii). Credits are available for the 3 years immediately prior to and subsequent to, the model year for which a manufacturer's CAFE is below the applicable standard.

B. Previous Rulemakings

Model year (MY) 1979 was the first model year for which truck standards were established. The standards were issued in March 1977 and covered light duty vehicles with a gross vehicle weight rating (GVWR-weight of the vehicle plus its payload) of 6,000 pounds or less. Manufacturers were required to achieve a corporate average of 15.8 mpg for 4-wheel drive general utility trucks and 17.2 mpg for all other light trucks. At the same time, manufacturers were given the option of meeting a combined standard, which would apply to their entire production of light trucks, of 17.2 mpg. Captive imports (vehicles sold by a domestic manufacturer but not produced in the

United States or Canada) were allowed to be included to determine manufacturer compliance with the MY 1979 standards.

Standards for MYs 1980-81 light trucks were issued in March 1978. NHTSA exercised its discretionary authority to set the standards for vehicles with a GVWR up to and including 8,500 pounds. This was consistent with EPA's extension of the vehicle emission standards to MY 1979 light trucks with a GVWR of 8,500 pounds. This action more than doubled the number of vehicles subject to fuel economy standards and meant that both fuel economy and emission standards now applied to the same class of light trucks. The Agency also used its classification authority to account for the fact that not all light truck manufacturers produced a full line of vehicles--i.e., both two wheel drive (4x2's) and four wheel drive (4x4's) and that the four wheel drive vehicles are inherently less fuel efficient than the two wheel drive vehicles (both American Motors and International Harvester (IH) produce only 4x4's). These standards were subsequently established at 16.0 mpg for 2-wheel drive and 14.0 mpg for 4-wheel drive light trucks in MY 1980, and 18.0 and 15.5 mpg for 2-wheel and 4-wheel light trucks, respectively, in MY 1981. Captive imports were no longer permitted to be included for determining compliance, making the truck standards consistent with the treatment mandated by the Congress for passenger cars. Separate standards also were set at 14.0 mpg in MY 1980 and 15.0 mpg in MY 1981 for manufacturers whose trucks were powered exclusively by engines not used in passenger cars. To date, International Harvester (IH) is the only manufacturer to which this standard has been applicable. It was issued to accommodate any manufacturer lacking experience with passenger car emission control technology. Each of the 1981 standards were predicated on EPA's approval of the use of improved lubricants in fuel economy testing by January 1, 1980, or they would be lowered by 0.5 mpg.

In response to a petition from Chrysler Corporation, NHTSA reduced the MY 1981 2-wheel drive light truck standard to 17.2 mpg in June 1979. The 4-wheel drive light truck standard was not changed.

In December 1979, EPA announced that it would not approve the use of improved lubricants by January 1, 1980, because there would be no agreed upon means of defining such lubricants, and thus, the MY 1981 standards were futher reduced by 0.5 mpg.

In March 1980, the Agency issued a final rule for MY 1982 light trucks which set average fuel economy standards for 4x2's at 18.0 mpg and for 4x4's at 16.0 mpg.

Standards, in the form of a range for each class of vehicle for each model year, were proposed for MY's 1983-85 in December 1979.

PROPOSED FUEL ECONOMY STANDARDS FOR 1983-85 MODEL YEAR LIGHT TRUCKS

	Vehicle miles per gallon (mpg)	
Model year	2-Wheel Drive	4-Wheel Drive
1983	18.0-20.0	15.6-18.0
1984	18.8-21.4	16.1-19.3
1985	19.7-22.4	16.2-19.9

The current standards (in mpg) are:

	MY 1980	MY 1981	MY 1982
Two-wheel drive vehicles	16.0	16.7	18.0
Four-wheel drive vehicles	14.0	15.0	16.0
Limited Product Line Standards	14.0	14.5	---

C. Need of the Nation to Conserve Petroleum

The United States imported only 15% of its oil needs at a cost of $1.1 billion in 1955. In 1970, imported oil accounted for 31% of total consumption and cost the nation $3.0 billion. But, by 1975, 49% of the domestic demand for oil had to be imported at a cost of $26.3 billion. This eight fold increase in the cost of imported oil of a five year period was the result of huge OPEC price increases and increased dependence on foreign oil. This trend has continued. By 1979, imported oil, constituting 58% of petroleum consumed, cost the nation about $60 billion;* comparable import cost estimates for 1980 are $82 billion,** and at 51% of domestic petroleum consumption.

The nation has become increasingly dependent for its oil supplies on the actions and decisions of a few foreign governments. This dependence has been demonstrated in the aftermath of the revolution in Iran when that country's oil production was stopped entirely in December 1978 and, once resumed, only returned to about one-half of its former level. Although the U.S. no longer imports oil from Iran, this reduction was felt by all importers because it represented the difference between satisfying current world oil demand and a shortage of supply. OPEC, which supplied 83% of the U.S.'s imported oil in 1978, has taken advantage of the tight world oil market by more than doubling prices from $12.70 per barrel (bbl) in December 1978, to more than $30.00 per barrel as of July 1980. Currently, prices on the world "spot" market are about $35 per barrel. An increase of this magnitude has severe adverse impacts on our trade balance, inflation, economic growth, unemployment, and confidence in the dollar as an international reserve currency.

---

*Economic Report of the President, January 1980, p. 318, annualized estimate.

**NHTSA estimate based on Data Resources Inc. forecasts.

Tables I-1 and I-2 trace the increasing dependence of the U.S. on oil imports and the sharp escalation in barrel prices after the 1979 Iranian shortfall.

The rapid transition from a condition of apparent worldwide surplus in 1978, to one of shortage in 1979, to surpluses again in 1980, has shown the instability of the world oil market. Now the Iran-Iraq war may again bring worldwide shortages. Thus, the Nation's economic growth and national security, are being heavily constrained by the decisions of a few foreign countries which control world oil prices and production.

The U.S. can change this situation by increasing its domestic energy production and by reducing demand. The fuel economy standards program helps to reduce demand by motor vehicles. Light trucks account for about 7% of our total oil consumption (20 percent of motor vehicle consumption) and an improvement in their fuel efficiency, beyond the level scheduled to be achieved through the MY 1982 standards, is considered an integral part of the nation's total effort to conserve energy. Increased light truck fuel economy efficiency would contribute directly to reduced U.S. dependence on

Table I-1
Historical Petroleum Demand, Import Bill
and Crude Oil Prices
(Nominal Dollars)

Year	U.S. Demand for crude oil* MMB/DAY	Crude Oil Imports MMB/DAY	Crude Oil Import Bill ($Bil)	OPEC Marker Price for Crude oil (Saudi Arabia) ($/Barrel)	Average Domestic Wellhead ($/barrel) Price
1950	5.74	0.85	0.59	N/A	2.51
1955	7.43	1.25	1.10	N/A	2.77
1960	8.07	1.82	1.66	1.35	2.88
1965	9.04	2.47	2.15	1.71	2.86
1970	10.87	3.42	3.00	1.62	3.13
1971	11.20	3.93	3.66	1.77	3.39
1972	11.70	4.74	4.78	1.95	3.39
1973	12.43	6.26	8.13	2.81	3.89
1974	12.13	6.11	27.02	9.64	6.87
1975	12.44	6.06	26.31	10.70	7.67
1976	13.42	7.31	33.84	11.51	8.19
1977	14.60	8.81	46.62	12.40	8.57
1978	14.74	8.36	41.86	12.70	9.00
1979	14.50	8.41	60.06	17.63	12.64
1980(E)	13.80	7.00	82.00	30.00	24.00

Source: Annual Report to Congress, 1978 Dept. of Energy, Vol. 2, Energy Information Administration.

*Includes crude oil only, does not include refined petroleum products or natural gas liquids.

Table I-2
FOB Cost of Crude Oil Imports
From Selected Countries
(Dollars per bbl)

	Algeria	Iran	Saudi Arabia	Mexico	Venezuela
1976	13.05	11.61	11.69	N/A	11.32
1977	14.36	12.67	12.37	13.42	12.68
1978	14.10	12.65	12.70	13.24	12.45
1979	20.05	23.71	17.63	20.29	17.37
1980(E)	-----	-----	30.00	-----	-----

Source: Annual Report to Congress, 1978, Dept. of Energy, Vol. 2, Energy Information Administration.

foreign oil and help limit foreign oil imports to a level no greater than the amount imported in 1978--in accordance with the President's pledge.

D. Regulatory Analysis

i. Purpose: This document reflects the Agency's analysis of the effects of improving the fuel efficiency of MY 1983-1985 light trucks. It includes a discussion of the possible effects on the automobile industry, on purchasers of light trucks, and on the national economy of improving light truck fuel economy. Areas covered include the capital investments of the auto industry related to increased fuel effiency, net consumer benefits, possible retail price increases, employment impacts, and national fuel consumption reductions.

ii. Introduction: The improvements in fuel effiency related to these standards for MYs 1983-1985 light trucks can be achieved by a combination of technological improvements, weight reductions, acceleration reductions and introduction of more fuel efficient new models. In this rulemaking, a combined standard (see Part VI) is established to enhance manufacturer flexibility and the efficiency of investments in fuel economy. Separate fuel economy levels are again established for 2- and 4-wheel drive vehicles as an option. Vehicles which are not passenger automobiles, rated at 8,500 pounds Gross Vehicle Weight Rating (GVWR) or less, having a curb weight of 6,000 pounds or less, a frontal area of 45 square feet or less, and manufactured for model years 1983, 1984 and 1985 are subject to these standards. This class of vehicles includes pickup trucks, vans, and general utility vehicles.

iii. Organization: Part II of the Regulatory Analysis states the assumptions used in this analysis. These assumptions provide the basic foundation upon which the analytical framework is built. Part II also includes a discussion of the impact of other government regulations. Part III contains a discussion of the technologies and new model introductions which may be available to improve fuel economy in MY's 1983-85. Microeconomic impacts of alternative sales forecasts on individual manufacturers and consumers are assessed in Part IV. Part V contains an assessment of the impact on petroleum consumption and other macroeconomic impacts (aggregated national economic impacts) and Part VI contains the rationale for setting the final standards. Analyses of the impacts of the final standards are presented in Part VII.

PART II

ASSUMPTIONS

II. ASSUMPTIONS

The following discussion will state the assumptions used in the analysis to assess the economic and other impacts.

A. Fuel Economy Baseline

For the purposes of this analysis, determining costs and benefits, the model year 1982 standards of 18.0 mpg for 2-wheel and 16.0 mpg for 4-wheel drive light trucks are considered to be the base from which fuel economy improvements for MY's 1983-85 will be made for all manufacturers, except Chrysler. The fuel economy capability of each manufacturer was assessed by determining how the manufacturers could reach their projected MY 1982 fuel economy levels. This was done primarily by examining the manufacturers' product plans. For those manufacturers which plan to exceed the MY 1982 standards, the costs and benefits of exceeding the MY 1982 standard will be added into the MY 1983 costs and benefits. In this way costs and benefits of going from one year's standards to the next can be on a consistent basis from manufacturer to manufacturer. However, the Agency's MY 1982 analysis of costs and benefits for Chrysler, were based on the levels of 17.7 mpg for 4x2's and 15.3 mpg for 4x4's, which are below the standards. Thus, these levels (17.7 and 15.3 mpg) will serve as the baseline levels his for Chrysler, while 18.0 and 16.0 mpg will be used as the baseline levels for the other manufacturers.

B. Vehicle Miles Travelled

The vehicle miles travelled (VMT) and survival probability by vehicle age used in this analysis are the same as that used in the analysis for the proposed MY 1982-85 light truck standards*. The sources of these data are: (1) The 1972 Census of Transportation, Truck Inventory and Use Survey, by the U.S. Department of Commerce, Bureau of Census; and (2) A five year average of trucks in operation from 1972-1976 taken from R.L. Polk and Company data. NHTSA is continually trying to update this information, but has not been able to find better data.

In the 1978 National Transportation Study by the National Science Foundation, 175 light trucks were surveyed on vehicle miles travelled by age. The overall results of this survey showed vehicle miles travelled which were very similar to those currently used by the Agency over the first eleven years of the vehicle's lifetime.

In response to the Preliminary Regulatory Analysis for the proposed 1983-1985 Light Truck Fuel Economy Standards, Ford claimed that the Agency did not take into account the effect that the increase in gasoline price would have on vehicle miles travelled and that by doing so had overstated the operating cost savings by 50%. Essentially, Ford argued that as the cost of gasoline per vehicle mile driven increases (i.e., the price per gallon of gasoline increases at a faster rate than the mpg of a vehicle), the number of miles driven in that vehicle will

*Preliminary Regulatory Analysis of Light Truck Fuel Economy Standards, Model Years 1982-85, NHTSA, December 1979 decrease. Ford supplied a regression equation to show how their claim was derived. They computed the elasticity of "vehicle miles travelled to the cost of gasoline per mile driven" and found it to be -.34. That is, a 10 percent increase in the cost of gasoline per mile would result in a 3.4 percent decrease in miles driven.

The Agency believes the regression equation used by Ford, which uses GNP and cost per mile driven as independent variables, is misspecified for two reasons. First, GNP should not be included in the equation, and second, typically the long-run elasticity mentioned above has been estimated by others to be about -.2.*

The addition of the GNP term to the regression equation obviously has merit in a short-run cyclical situation, where a downswing in the business cycle might cause drivers to curtail their driving somewhat. However, the addition of DRI's "trend" GNP variable with an average growth rate of over 2.5% per year out to the year 2004--and no recession years--will hardly forecast oscillations in VMT per car resulting from the "business cycle". It is precisely because 1) VMT per vehicle has been a relatively stationary series and 2) NHTSA cannot forecast recessions in the 1985-2004 period, that the Agency has used a constant lifetime VMT concept in its calculations. In addition, it

*Many studies have estimated elasticities in the -0.2 range, including the U.S.-U.S.S.R. Joint Energy Committee Report, "Methodology and Analysis of Ways on Increasing the Effectiveness of the Use of Fuel Energy Resources: Increasing Automobile Fuel Economy via Government Policy," October 1977, p. 61

is doubtful that cyclical changes in GNP will significantly reduce or increase the 128,195 average lifetime miles inherent in a light duty truck. Trucks do not necessarily last longer if GNP increases.

To determine the effect the increasing price of gas would have on VMT, a small example was worked out for the first year of vehicle ownership (14,200 miles) for 4x2's using the standards issued to date and using other assumptions in this analysis. As one can see from Table II-1, gasoline costs per mile for 4x2 trucks remained fairly level from 1975-1979 and then increased by over 20% in 1980. Gasoline costs per mile are then estimated to decrease to about 7.1 cents per mile during the period in question (MY 1983-85), or only a 6% increase over the 1975-79 period. If one then applies the -.2 elasticity, VMT would decrease by 1.2% or from 128,195 to 126,660 lifetime miles. This would mean a 1% reduction in operating cost savings, not 50% as Ford claimed.

Therefore, given these concerns and the relatively small impact that could be justified (1%), the Agency has decided to leave its VMT assumptions unchanged.

TABLE II-1

VMT Example
(1980 DOLLARS)

MY	4x2 MPG	Gallons Used (At 14,200 Miles)	$/Gallons	Total $ Gas Cost	Gas Cost Per Mile Driven (Cents)
1975-1978	13.0	1092	.87	950	6.7
1979	15.1	940	1.02	959	6.7
1980	16.0	888	1.30	1154	8.1
1981	16.7	850	1.32	1122	7.9
1982	18.0	789	1.38	1089	7.7
1983	19.5	728	1.40	1020	7.2
1984	20.3	700	1.46	1022	7.2
1985	21.6	657	1.52	999	7.0

The weighted yearly travel by age as shown in the last column of Table II-2 will be used to determine future savings in petroleum consumption and in operating costs.

C. Discount Rate, 1980 Dollars, and Gasoline Prices

A 10 percent discount rate is used to determine the present value of future costs and savings.* Manufacturing costs and other price impacts are calculated in 1980 dollars.

The average price of a gallon of unleaded gasoline was estimated based on official DOE projections and Data Resources, Inc. (DRI) forecasts. This price schedule differs substantially from the one used in the preliminary regulatory analysis. The previous schedule assumed a 3% real price increase each year through year 2010 over $1.14 in 1980 (in 1979 constant dollars). The new schedule shown in Table II-3 has an annual average real price increase of only 1.8% through 2010. The real price increases slowly in 1981, based on the assumption that gasoline is in ample supply and OPEC will not push too hard for price increases during recession times, then increases more rapidly through 1985 (average 3.2% per year between 1980-85) before slowing to a more consistent growth pattern.

*OMB Circular No. A-94, March 27, 1972.

TABLE II-2

Weighted Vehicle Miles Travelled

Vehicle Age (Years)	Vehicle Miles Travelled	Survival Probability	Weighted Yearly Travel (Miles)
1	14,200	1.000	14,200
2	14,800	.999	14,785
3	13,900	.988	13,735
4	12,200	.966	11,785
5	11,100	.946	10,500
6	9,900	.925	9,155
7	9,300	.897	8,340
8	8,800	.862	7,585
9	8,000	.825	6,600
10	7,600	.771	5,860
11	7,300	.710	5,185
12	6,900	.645	4,450
13	6,000	.573	3,440
14	6,000	.502	3,010
15	5,300	.441	2,335
16	5,000	.38	1,900
17	5,700	.32	1,825
18	5,100	.26	1,325
19	4,600	.20	920
20	4,200	.14	590
21	4,000	.08	320
22	3,700	.05	185
23	3,200	.03	95
24	2,500	.02	50
25	2,000	.01	20
		TOTAL	128,195

Table II-3

ESTIMATED AVERAGE PRICE OF UNLEADED GASOLINE
($/Gallon in 1980 Dollars)

1980	1.30
1981	1.32
1982	1.38
1983	1.40
1984	1.46
1985	1.52
1986	1.53
1987	1.54
1988	1.55
1989	1.56
1990	1.56
1991	1.58
1992	1.60
1993	1.62
1994	1.64
1995	1.67
1996	1.70
1997	1.73
1998	1.76
1999	1.79
2000	1.82
2001	1.85
2002	1.88
2003	1.91
2004	1.94
2005	1.98
2006	2.03
2007	2.08
2008	2.13
2009	2.18
2010	2.23

D. Sales Projections

Projections of light truck sales provide an estimate of the capacity needs of the manufacturers. For example, if a manufacturer is planning to introduce a new automatic transmission, and use it on 50% of its light truck fleet, then NHTSA can estimate how many transmission lines must be modified or newly built based on truck sales projections. The sales projections shown in the following tables also provide market segments or sales mix. Since corporate average fuel economy is calculated as a harmonic average, the sales mix is also very important to fuel economy projections. Because of the uncertainty in the light truck market, two base sales cases were developed by the Agency. Case A has a lower total sales volume than Case B. Case A assumes earlier introduction of the new downsized models, specifically MY's 1984 and 85. Case A projects a "leaner mix," that is, a higher percentage of compact pickups relative to standard size pickups than in Case B. These differences can most easily be examined by comparing Case A, Table 1 "Assumed product Actions" to Case B, Table 1 and by examining the various market shares of Case A and Case B shown in Table II-4. Of particular interest are the differences in total small pickups, standard pickups and small vans and buses.

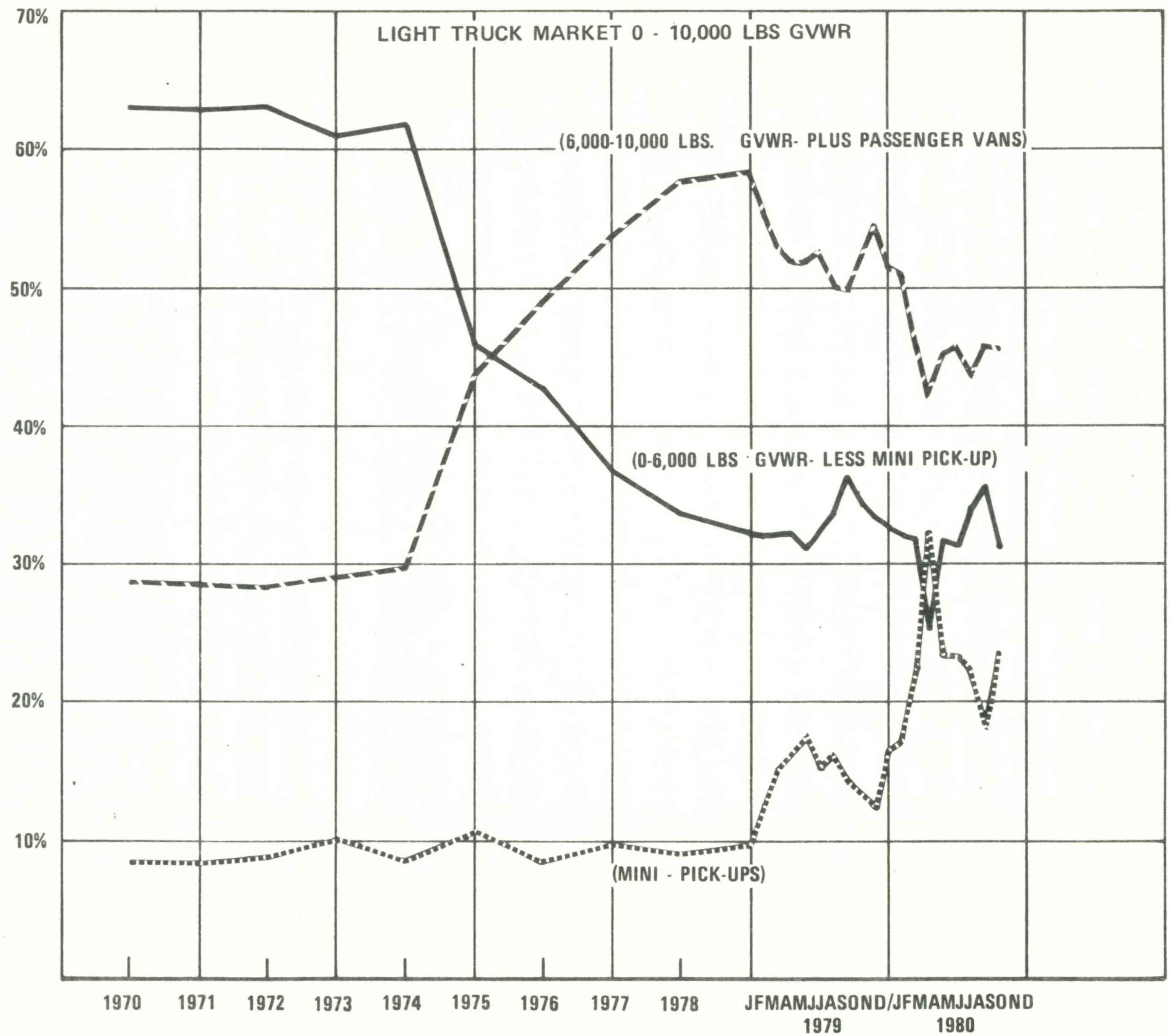
The two sales cases were developed by taking into account historical data, the manufacturers' sales projections of both total industry truck sales as well as their estimates or their own company sales, and the assumed product actions. Thus, the sales cases are not based on any one manufacturer's projections, but are a conglomeration of estimates by the various manufacturers as well as NHTSA forecasters.

No sales estimates are presented for International Harvester because of the purported sale of the Scout Line and IH's statement that it will no longer manufacture light trucks after MY 1980.

The primary assumption behind the total sales figures was that 1980 is a recession year (particularly for autos) with 1981 being only slightly better. Then there will be a slow recovery in sales from 1982-85. The new small buses and vans are anticipated to take the place of a large proportion of the mid-size and full-size station wagons. Even with this sales movement from passenger car to light truck, total truck sales are not forecasted to return to the 1978 sales peak until 1985 in case B. In case A, 1985 sales fall 300,000 units short of the 1978 level. These sales levels also take into account the assumption that with the price of gas ever increasing and disposable income not being projected to be able to make up this loss, recreational light truck sales will diminish. Another pivotal assumption is that standard size recreatonal vehicle sales will diminish as the price of gas outstrips CPI increases and inflation limits the growth in the real disposable income of consumers.

Figure 1 presents a breakdown of the light truck market between class I (0-6,000 lbs. GVWR) and class II trucks (6,000-10,000 lbs. GVWR) and the mini-pickups. As one can see, the trend in the early 1970's was broken in 1975 with the advent of EPA's emission standards for class I trucks. This led to a large "rerating" of trucks to just over 6,000 lbs. GVWR. In 1979, EPA emission standards became effective for light trucks up to and including 8500 lbs GVWR. Thus, the "advantage" (that is, lower price, different performance, use of leaded gasoline due to the absence of emission requirements) of class II trucks over class I was eliminated and class II sales started to drop off. At the same time the oil crises have greatly stimulated the sales of mini-pickups to the point where in the first half of 1980, mini-pickups made up about 23% of the 0-10,000 lbs. GVWR fleet or 26% of the 0-8,500 lbs. GVWR fleet. Table II-4 shows that in case B, small pickup sales were forecasted at between 25.7 and 29.2% of 0-8500 lbs GVWR light truck sales or slightly above the level for the first half of 1980.

Case A assumes that the small domestic pickups will steal a lot of sales from the standard pickups because their size will be somewhat between the mini-pickup and the standard size. Case A also assumes that continued increases in fuel prices and an increased alertness to fuel costs will increase market demand for small pickups.



LIGHT TRUCK MARKET 0 - 10,000 LBS GVWR
70%
60%
50%
40%
30%
20%
10%
(6,000-10,000 LBS. GVWR- PLUS PASSENGER VANS)
(0-6,000 LBS GVWR- LESS MINI PICK-UP)
(MINI - PICK-UPS)
1970
1971
1972
1973
1974
1975
1976
1977
1978
JFMAMJJASOND/JFMAMJJASOND
1979
1980

COMPANY CONFIDENTIAL:

CASE A AND B

This Agency has omitted certain Case A and B tables containing manufacturer specific information from this public version of the Regulatory Analysis. These tables enumerated NHTSA's assumptions for new model introductions and projected sales volumes. NHTSA's Case A and B new model introduction assumptions are close enough to certain manufacturer submissions to raise the question of confidentiality.

Tables excluded are:

TABLE DESCRIPTION	CASE A	CASE B
New Truck Model Introduction Dates--All Manufacturers	Table 1	Table 1
Projected GM Light Truck Sales	Table 6	Table 6
Projected Ford Light Truck Sales	Table 7	Table 7
Projected Chrysler Light Truck Sales	Table 8	Table 8
Projected AM Light Truck Sales	Table 9	Table 9
Projected Foreign Light Truck Sales	Table 10	Table 10

Tables 1A and 1B have been added to provide non-confidential summary data of manufacturer specific sales estimates.

TABLE 1A

CASE A

MANUFACTURER SPECIFIC SALES ESTIMATES

	MY 1982	MY 1983	MY 1984	MY 1985
GM	1,013	1,139	1,189	1,423
FORD	775	860	990	1,012
CHRYSLER	262	276	451	310
AM	130	135	135	135
FOREIGN MANUFACTURERS	360	330	325	325
TOTAL	2,540	2,740	3,090	3,205

TABLE 1B

CASE B

MANUFACTURER SPECIFIC SALES ESTIMATES

	MY 1982	MY 1983	MY 1984	MY 1985
GM	1,140	1,285	1,445	1,590
FORD	890	984	1,020	1,020
CHRYSLER	295	311	310	415
AM	140	140	140	150
FOREIGN MANUFACTURERS	360	280	330	325
TOTAL	2,825	3,000	3,245	3,500

CASE A

Table 2:

TOTAL TRUCK MARKET RETAIL DELIVERIES
U.S. TRUCK INDUSTRY BY SEGMENT: 1977-1986
MODEL YEAR RETAIL UNIT SALES

INDUSTRY (000 UNITS)	ACTUAL 1977	ACTUAL 1978	ACTUAL 1979	ESTIMATED 1980	FORECAST 1981	FORECAST 1982	FORECAST 1983	FORECAST 1984	FORECAST 1985
BUS--Small	24	25	17	14	15	25	30	250	400
--Standard	132	148	119	76	100	100	100	50	50
TOTAL WAGONS	156	173	135	90	115	125	130	300	450
VANS--Small	--	--	--	--	--	--	--	250	350
--Standard	555	704	571	321	350	350	350	250	200
TOTAL VANS	555	704	571	321	350	350	350	500	550
MEMO: TOTAL VANS & WAGONS	712	877	707	411	465	475	480	800	1,000
SPORT UTILITIES--Small/Domestic	--	--	--	--	--	--	130	155	132
--Standard	233	334	308	194	200	210	145	95	100
TOTAL SPORT UTILITIES	233	334	308	194	200	210	275	250	232
PICKUPS--Foreign	313	310	455	518	600	520	300	300	300
--Small/Domestic	--	--	--	--	--	400	1,005	1,015	1,023
TOTAL SMALL PICKUPS	313	310	455	518	600	920	1,305	1,315	1,323
PICKUPS--Standard	2,035	2,327	1,998	1,335	1,400	1,320	1,100	1,100	1,000
TOTAL PICKUPS	2,403	2,637	2,453	1,853	2,000	2,240	2,405	2,415	2,323
MEMO: TOTAL LIGHTS--0-10,000 GVWR	3,347	3,848	3,468	2,458	2,6 65	2,925	3,160	3,465	3,555
MEDIUM/HEAVY	322	355	381	293	300	350	350	350	350
TOTAL TRUCKS	3,669	4,204	3,848	2,751	2,965	3,275	3,510	3,815	3,905
MEMO: Total Trucks (incl. Eagle)				2,796	3,010	3,315	3,540	3,845	3,930

CASE A

Table 3: TOTAL TRUCK RETAIL DELIVERIES; 8,500 GVW OR LESS
U.S. TRUCK INDUSTRY BY SEGMENT: 1982-1985
MODEL YEAR RETAIL UNIT SALES

INDUSTRY (000 UNITS)	ACTUAL 1977	1978	1979	ESTIMATED 1980	FORECAST 1981	1982	1983	1984	1985
BUS--Small						25	30	250	400
--Standard						80	80	30	30
TOTAL WAGONS						105	110	280	430
VANS--Small						--	--	250	350
--Standard						250	250	160	110
TOTAL VANS						250	250	410	460
MEMO: TOTAL VANS & WAGONS						355	360	690	890
SPORT UTILITIES--Small/Domestic						--	130	155	132
--Standard						195	135	90	95
TOTAL SPORT UTILITIES						195	265	245	227
PICKUPS--Foreign						520	300	300	300
--Small/Domestic						400	1,005	1,015	1,023
TOTAL SMALL PICKUPS						920	1,305	1,315	1,323
PICKUPS--Standard						1,030	780	810	740
TOTAL PICKUPS						1,950	2,085	2,125	2,063
MEMO: TOTAL LIGHTS						2,500	2,710	3,060	3,180
MEDIUM/HEAVY						---	---	---	---
TOTAL TRUCKS						2,500	2,710	3,060	3,180
MEMO: Total Trucks (incl. Eagle)						2,540	2,740	3,090	3,205

CASE A

Table 4:

4x2 TRUCK RETAIL DELIVERIES; 8,500 GVW OR LESS
U.S. TRUCK INDUSTRY BY SEGMENT: 1982-1985
MODEL YEAR RETAIL UNIT SALES

INDUSTRY (000 UNITS)	ACTUAL			ESTIMATED	FORECAST				
	1977	1978	1979	1980	1981	1982	1983	1984	1985
BUS--Small						25	30	250	400
--Standard						80	80	30	30
TOTAL WAGONS						105	110	280	430
VANS--Small						--	--	250	350
--Standard						250	250	160	110
TOTAL VANS						250	250	410	460
MEMO: TOTAL VANS & WAGONS						355	360	690	890
SPORT UTILITIES--Small/Domestic						--	5	5	4
--Standard						10	5	5	5
TOTAL SPORT UTILITIES						10	10	10	9
PICKUPS--Foreign						425	255	260	260
--Small/Domestic						400	755	755	753
TOTAL SMALL PICKUPS						825	1,010	1,015	1,013
PICKUPS--Standard						700	600	620	565
TOTAL PICKUPS						1,525	1,610	1,635	1,578
MEMO: TOTAL LIGHTS						1,890	1,980	2,335	2,477
MEDIUM/HEAVY						---	---	---	---
TOTAL TRUCKS						1,890	1,980	2,335	2,477
MEMO: Total Trucks (incl. Eagle)						1,890	1,980	2,335	2,477

CASE A

Table 5:

4x4 TRUCK RETAIL DELIVERIES; 8,500 GVW OR LESS
U.S. TRUCK INDUSTRY BY SEGMENT: 1982-1985
MODEL YEAR RETAIL UNIT SALES

	ACTUAL			ESTIMATED	FORECAST				
INDUSTRY (000 UNITS)	1977	1978	1979	1980	1981	1982	1983	1984	1985
BUS--Small						--	--	--	--
--Standard						--	--	--	--
TOTAL WAGONS						--	--	--	--
VANS--Small						--	--	--	--
--Standard						--	--	--	--
TOTAL VANS						--	--	--	--
MEMO: TOTAL VANS & WAGONS						--	--	--	--
SPORT UTILITIES--Small/Domestic						--	125	150	128
--Standard						200	140	90	95
TOTAL SPORT UTILITIES						200	265	240	223
PICKUPS--Foreign						95	45	40	40
--Small/Domestic						-	250	260	270
TOTAL SMALL PICKUPS						95	295	300	310
PICKUPS--Standard						330	180	190	175
TOTAL PICKUPS						425	475	490	485
MEMO: TOTAL LIGHTS						625	740	730	708
MEDIUM/HEAVY						---	---	---	---
TOTAL TRUCKS						625	740	730	708
MEMO: Total Trucks (incl. Eagle)						665	770	760	733

CONFIDENTIAL

CONFIDENTIAL

CONFIDENTIAL

CONFIDENTIAL

CONFIDENTIAL

CONFIDENTIAL

CASE B

Table 2:

TOTAL TRUCK RETAIL DELIVERIES
U.S. TRUCK INDUSTRY BY SEGMENT: 1982-1985
MODEL YEAR RETAIL UNIT SALES

INDUSTRY (000 UNITS)	ACTUAL 1977	1978	1979	ESTIMATED 1980	FORECAST 1981	1982	1983	1984	1985
BUS--Small						25	30	30	215
--Standard						128	150	169	120
TOTAL WAGONS						153	180	199	335
VANS--Small						--	--	--	75
--Standard						445	485	500	400
TOTAL VANS						445	485	500	475
MEMO: TOTAL VANS & WAGONS						598	665	699	810
SPORT UTILITIES--Small/Domestic						--	125	175	185
--Standard						247	161	151	155
TOTAL SPORT UTILITIES						247	286	326	340
PICKUPS--Foreign						500	250	300	300
--Small/Domestic						340	630	610	600
TOTAL SMALL PICKUPS						840	880	910	900
PICKUPS--Standard						1,525	1,589	1,685	1,800
TOTAL PICKUPS						2,365	2,469	2,595	2,700
MEMO: TOTAL LIGHTS--0-10,000 GVWR						3,210	3,420	3,620	3,850
MEDIUM/HEAVY						350	350	350	350
TOTAL TRUCKS						3,560	3,770	3,970	4,200
MEMO: Total Trucks (incl. Eagle)						3,600	3,800	4,000	4,225

CASE B

Table 3:

TOTAL TRUCK RETAIL DELIVERIES; 8,500 GVW OR LESS
U.S. TRUCK INDUSTRY BY SEGMENT: 1982-1985
MODEL YEAR RETAIL UNIT SALES

INDUSTRY (000 UNITS)	ACTUAL 1977	ACTUAL 1978	ACTUAL 1979	ESTIMATED 1980	FORECAST 1981	FORECAST 1982	FORECAST 1983	FORECAST 1984	FORECAST 1985
BUS--Small						25	30	30	215
--Standard						108	130	149	100
TOTAL WAGONS						133	160	179	315
VANS--Small						--	--	--	75
--Standard						345	385	410	310
TOTAL VANS						345	385	410	385
MEMO: TOTAL VANS & WAGONS						478	545	589	700
SPORT UTILITIES--Small/Domestic						--	125	175	185
--Standard						232	151	146	150
TOTAL SPORT UTILITIES						232	276	321	335
PICKUPS--Foreign						500	250	300	300
--Small/Domestic						340	630	610	600
TOTAL SMALL PICKUPS						840	880	910	900
PICKUPS--Standard						1,235	1,269	1,395	1,540
TOTAL PICKUPS						2,075	2,149	2,305	2,440
MEMO: TOTAL LIGHTS						2,785	2,970	3,215	3,475
MEDIUM/HEAVY						---	---	---	---
TOTAL TRUCKS						2,785	2,970	3,215	3,475
MEMO: Total Trucks (incl. Eagle)						2,825	3,000	3,245	3,500

CASE B

Table 4: 4x2 TRUCK RETAIL DELIVERIES: 8,500 GVW OR LESS
U.S. TRUCK INDUSTRY BY SEGMENT: 1982-1985
MODEL YEAR RETAIL UNIT SALES

INDUSTRY (000 UNITS)	ACTUAL			ESTIMATED	FORECAST				
	1977	1978	1979	1980	1981	1982	1983	1984	1985
BUS--Small						25	30	30	215
--Standard						108	130	149	100
TOTAL WAGONS						133	160	179	315
VANS--Small						--	--	--	75
--Standard						345	385	410	310
TOTAL VANS						345	385	410	385
MEMO: TOTAL VANS & WAGONS						478	545	589	700
SPORT UTILITIES--Small/Domestic						-	5	5	5
--Standard						12	6	6	5
TOTAL SPORT UTILITIES						12	11	11	10
PICKUPS--Foreign						405	205	260	260
--Small/Domestic						340	500	495	500
TOTAL SMALL PICKUPS						745	705	755	760
PICKUPS--Standard						900	1,015	1,116	1,255
TOTAL PICKUPS						1,645	1,720	1,871	2,015
MEMO: TOTAL LIGHTS						2,135	2,276	2,471	2,725
MEDIUM/HEAVY						---	---	---	---
TOTAL TRUCKS						2,135	2,276	2,471	2,725
MEMO: Total Trucks (incl. Eagle)						2,135	2,276	2,471	2,725

CASE B

Table 5: 4x4 TRUCK RETAIL DELIVERIES: 8,500 GVW OR LESS
U.S. TRUCK INDUSTRY BY SEGMENT: 1982-1985
MODEL YEAR RETAIL UNIT SALES

INDUSTRY (000 UNITS)	ACTUAL			ESTIMATED	FORECAST				
	1977	1978	1979	1980	1981	1982	1983	1984	1985
BUS--Small						--	--	--	--
--Standard						--	--	--	--
TOTAL WAGONS						--	--	--	--
VANS--Small						--	--	--	--
--Standard						--	--	--	--
TOTAL VANS						--	--	--	--
MEMO: TOTAL VANS & WAGONS						--	--	--	--
SPORT UTILITIES--Small/Domestic						--	120	170	180
--Standard						235	155	145	150
TOTAL SPORT UTILITIES						235	275	315	330
PICKUPS--Foreign						95	45	40	40
--Small/Domestic						--	130	115	100
TOTAL SMALL PICKUPS						95	175	155	140
PICKUPS--Standard						335	254	279	285
TOTAL PICKUPS						430	429	434	425
MEMO: TOTAL LIGHTS						665	704	749	755
MEDIUM/HEAVY						---	---	---	---
TOTAL TRUCKS						665	704	749	755
MEMO: Total Trucks (incl. Eagle)						705	734	779	780

CONFIDENTIAL

CONFIDENTIAL

CONFIDENTIAL

CONFIDENTIAL

CONFIDENTIAL

TABLE II-4

COMPARISON OF CASE A TO CASE B
Market Share of Retail Deliveries; 8500 GVW or Less
U.S. Truck Industy by Segment: MY 1983-85
(%)

	1983		Differences	1984		Differences	1985		Differences
	Case A	Case B	Case B-Case A	Case A	Case B	Case B-Case A	Case A	Case B	Case B- Case A
BUS--Small	1.1	1.0	(0.1)	8.1	0.9	(7.2)	12.5	6.1	(6.4)
--Standard	2.9	4.3	1.4	1.0	4.6	3.6	.9	2.9	2.0
TOTAL WAGONS	4.0	5.3	1.3	9.1	5.5	(3.6)	13.4	9.0	(4.4)
VANS--Small	---	---	---	8.1	----	(8.1)	10.9	2.1	(8.8)
--Standard	9.1	12.8	3.7	5.1	12.6	7.5	3.4	8.9	5.3
TOTAL VANS	9.1	12.8	3.7	13.2	12.6	(0.6)	14.3	11.0	(3.3)
MEMO: TOTAL VANS AND WAGONS	13.1	18.1	5.0	22.3	18.1	(4.2)	27.7	20.0	(7.7)
SPORT UTILITIES--Small/Domestic	4.7	4.2	(0.5)	5.0	5.4	.4	4.1	5.3	1.2
--Standard	5.3	5.3	---	3.0	4.7	1.7	3.1	4.4	1.3
TOTAL SPORT UTILITIES	10.0	9.5	(0.5)	8.0	10.1	2.1	7.2	9.7	2.5
PICKUPS--Foreign	10.9	8.3	(2.6)	9.7	9.2	(.5)	9.3	8.6	(0.7)
--Small/Domestic	36.5	20.9	(15.6)	32.8	18.8	(14.0)	31.9	17.1	(14.8)
TOTAL SMALL PICKUPS	47.4	29.2	(18.2)	42.5	28.0	(14.5)	41.2	25.7	(15.5)
PICKUPS--Standard	28.4	42.2	13.8	26.2	42.9	16.7	23.1	43.9	20.8
TOTAL PICKUPS	75.8	71.4	(4.4)	68.7	70.9	2.2	64.3	69.6	5.3
EAGLES	1.1	1.0	(0.1)	1.0	0.9	(0.1)	0.8	0.7	(0.1)
TOTAL	100.0	100.0		100.0	100.0	---	100.0	100.0	----
MEMO TOTAL LIGHTS (000 Units including Eagle)	2750	3010	260	3095	3250	155	3210	3505	295

E. Truck Usage and Economics:

As Figure 1 shows, mini-pickups have dramatically increased their percentage of new light trucks sales from 9% in 1978 to about 15% in 1979 to almost 23% in the first half of 1980. This raises a number of interesting questions:

1) Does the high percentage of 1980 sales being mini-pickups reflect the result of the recession? That is, have heavier truck buyers (many business related) decided to stay out of the market until after the recession?

2) Have increasing gas prices forced truck buyers into smaller vehicles?

3) Are small pickups and vans capable of doing the work routinely required by a large percentage of truck buyers?

4) Are mini-pickups merely a fad or a west coast phenomenon which may die out at some later date?

All of these questions relate to one of the major issues in this rule making--what percent of the market will small pickups and small vans be in MY's 1983-85.

In trying to answer these questions, economic analysis and market surveys were performed. The first approach is to examine the market data. Mini-pickup sales data show that the mini-pickup increases in the percentage of the market were not merely the result of the falloff in standard size truck sales. In a plummeting truck market, mini-pickup sales have grown in absolute units, not just in market mix. Mini-pickup sales are often conquest sales in head-to-head competition with standard size trucks. Mini-pickup sales increased from 236,000 in 1976, to 334,000 in 1978, to 465,000 in 1979, and to an annualized rate of 568,000 in 1980 (using results from the first six months).

Figure 2 presents the results of another analysis which divided the assumed real price of gasoline in 1980 dollars by estimates of new light truck mpg for different types of light trucks. This results in real gasoline costs per mile. The two large gas price increases in 1974 and 1979-80 are easily discernible. The message brought about by Figure 1 is that if the standard pickup or van owners want to preserve the same gas cost per mile as through the 1960's and 1970's, i.e. between 6 and 7 cents per mile, they would have to switch to a

FIGURE 2


REAL GAS COST PER MILE (BY MODEL YEAR)
FOR NEW LIGHT DUTY TRUCKS
(EXPRESSED IN CENTS($1980)/MILE)
REAL CENTS/MILE
10
9
8
7
6
5
4
3
MY/1967
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
STANDARD VAN
STANDARD PICK-UP
SMALL VAN
DOMESTIC SMALL PICK-UP
IMPORT PICK-UP

downsized pickup or a small van. If they assume future gas price increases, then they may have to switch to a domestic small pickup to keep gas cost per mile in the 6 to 7 cents range. However, gas cost is only one of many variables which go into the purchasing decision. Also important are the size of the bed, the load carrying ability (heavy and/or bulky), trailer pulling ability, the purchase price, etc.

Light trucks are purchsed with load carrying needs and plans even though these intentions may never fully be implemented and the load carrying needs may be overestimated. In December 1977 and January 1978, Ford conducted a study of 1,080 purchasers of 1973 and 1974 model year pickups in an effort to determine how often these vehicles were operated with a load. Table II-5 shows the results for vehicles which are now (not then) subject to fuel economy standards. If one looks only at payload, the F 100/150 (1/2 ton) pickup was typically used by 76 percent of the buyers to carry less than 1,000 pounds. Similarly, 55 percent of buyers of the F 250 (3/4 ton) pickup--more likely to be commercial or farm users--typically used their truck to carry less than 1,000 pounds. In other words, it is possible that a small pickup truck may be able to satisfy the load carrying needs of a large number of the standard size pickup buyers.

Another survey done by Ford in 1976 found that 55% of 3,000 Ford 1/2 ton van owners carried a maximum weight of 900 pounds or less, two or

TABLE II-5

Load Carrying Usage by Weight
For Ford Pickups

Maximum Weight Carried at Least Once or Twice a Week (lbs)	1973/74 Ford Pickups F 100/150 4x2/4x4 (%)	1973/74 Ford Pickups F 250 4x2/4x4 (%)
Up to 499	62	42
500-999	14	13
1000-1499	13	16
1500 - 1999	2	4
2000 and over	9	25
	100	100

three times a month. A small van with a 1,000 pound payload could be a suitable replacement.

A focus group* of van owners discussed the concept of a downsized van. While the numerical specifications seemed acceptable, many in the group remained skeptical that the interior size could be maintained. Obviously, interior size is important to van owners. But if most of the interior size can be maintained, the small van with good gas mileage should appeal not only to current van owners, who do not appear to need all the present carrying capacity, but also to current large station wagon owners.

In summary, NHTSA anticipates the demand for more fuel efficient compact pickups, utilities and vans to rise as more realistic assessments of load carrying needs and rising fuel prices are incorporated into consumers' buying decisions. However, there are many more decision variables than just these two. While recent sales data show that import pickups are being accepted in the market, and thus there is a good chance that the small domestic pickups will also be

*"A study of consumer behavior towards fuel efficient vehicles" Task H Interim Report, by Market Facts-Washington, July 1980.

well accepted, the demand for the downsized van is still uncertain. Case B has a low introduction of downsized vans by 1985--only 8.2%, while Case A assumes very good acceptance with downsized vans getting 23.4% or the market.

F. Impact of Other Government Regulations

The act requires that fuel economy standards be set at the maximum feasible levels after taking into account the following criteria: technological feasibility, economic practicability, the impact of other Federal regulations and the need of the nation to conserve energy. The following discussion pertains to the impact of other government regulations.

(i) Safety Standards

At this time there are two safety rulemakings planned which would have a weight impact on MY 1983-85 light trucks. These are FMVSS 208, Automatic Occupant Restraints and FMVSS 214, Side Impact Protection.

The estimated incremental weight effect of these rulemakings are 25 pounds for FMVSS 208 and 40 pounds for FMVSS 214. While FMVSS 208 would probably be applicable to all light trucks, FMVSS 214 would probably only be applicable to those light trucks whose drivers' seating position was similar to passenger cars, e.g., the smaller pickups. While these rulemakings may be effective by MY 1985, the combined weight effect of 65 pounds is not considered great enough, on average, to push the vehicles into a higher weight class. Consequently, the actual on-road mileage would slightly decrease as a result of the additional weight, but EPA test mileage may not change.

(ii) Emission Standards

The Environmental Protection Agency (EPA) has issued revised emission standards for MY 1984 light trucks. These are 0.8 HC/10.0 CO/2.3 NOx, in comparison to the MY 1979-83 standards of 1.7 HC/18.0 CO/2.3 NOx. The new standards also provide for a revised definition of useful life and revised acceptable quality levels. The effect that these standards have on fuel economy is dependent upon the type of emission control system used by the manufacturers.

EPA believes that with an average price increase per vehicle of under $100 for electronic controls such as spark advance and EGR, there need not be any fuel economy penalty in meeting the emission standards. It has been argued that with a fully interactive electronic engine control unit, a fuel economy gain could perhaps be realized. However, the fuel economy improvement, if any, is still unknown. The manufacturers argue that without stricter emission standards the cost of using this type of electronic engine control system is unjustified. Based on the confidential cost estimates of various manufacturers, the fully interacting electronic engine controls would have to improve fuel economy by 5% for the consumer to break even over the vehicle's lifetime. Because the question of improvement is as yet unresolved, the Agency agrees with the EPA position that the MY 1984 light truck emissions standards can be met without any fuel economy penalty, provided the "moderately complex" electronic controls assumed by EPA are used by the manufacturers.

In 1985, more stringent NOx requirements are planned. However, EPA has yet to take any formal action in tis regard. Therefore, the Agency will consider the effects, if any, of a revised NOx standard on light truck fuel economy, after EPA takes action.

A diesel particulate standard of 0.26 grams per mile will become effective for light trucks in MY 1985. For comparison, effective MY 1982, the diesel particulate standard will be 0.6 grams per mile. Since the fuel economy benefit of diesel engines is not used by the agency in this rulemaking, the effect this particulate standard will have on diesel fuel economy is not an issue.

(iii) Noise Standards

The agency is not aware of any proposed or planned noise standards which would be applicable to light trucks for MY's 1983-85.

PART III

FUEL ECONOMY IMPROVEMENT CAPABILITIES

III. Fuel Economy Improvement Capabilities

This section of the Regulatory Analysis identifies the technologies available to improve light truck fuel economy in MY's 1983-85 and the new models which could be introduced in this timeframe to improve fuel economy.

Unlike previous light truck fuel economy rulemakings, which involved primarily technology improvements, this rulemaking involves mainly new models with only two technology improvements being seen as economically practicable. These are improved lubricants and improved radial tires, which can be utilized by all the manufacturers. The schedule of when these technologies enter the manufacturers' fleets and the resulting improvement in mpg is provided in the Rulemaking Support Paper. A few other technology items which could improve fuel economy, such as various accessory improvements or aero- dynamic improvements on models which would soon be replaced, were determined to be too expensive for a small or short-lived fuel economy improvement.

The major fuel economy improvements in this rulemaking are due to new model introductions, the smaller displacement engines which can be used to power the smaller new models, and in one instance a new smaller transmission. Table III-1 provides a list of the new models, new engines, and new transmission assumed in each case in this rulemaking. Many of the engines will already be in use in passenger cars prior to their introduction to light trucks. (Table III-1 was deleted for reasons of confidentiality.)

CONFIDENTIAL

CONFIDENTIAL

Table III-2 provides the Agency's estimate of the fuel economy of each type of vehicle in the manufacturers' fleets. These mpg numbers are harmonic averages of the variety of axles, transmissions, engines, and models, available on that type of vehicle. For example, the standard pickup for Ford includes F100's, F150's; and F250's.

Table III-2 also includes the corporate average fuel economies (CAFE) for each manufacturer for Case A and Case B. One will notice that Case B, with fewer or in some cases later new model introductions and a smaller mix of compact pickups and vans, has a lower mpg than Case A by typically 1 to 2 mpg. (Table III-2 was deleted for reasons of confidentiality.)

Since tecnhological improvements supply only a small increase in mpg in this rulemaking, the model year in which new models can be introduced and the market share which these new models can achieve are the two most important factors in determining the level of the standards. Unfortunately, there are very big questions surrounding when new models can be introduced, due to current financial conditions, and also big questions surrounding market demand for these new models given the recent wide mix shifts in sales. Case A and Case B were developed to provide two different projections of the future and will serve as starting points for this analysis.

PART IV

MICROECONOMIC ANALYSIS

IV. Microeconomic Analysis

While the last section of the regulatory analysis identified the technologies and new models available to improve each manufacturer's fleet fuel economy, this section examines the costs and benefits to the consumer of the mile per gallon improvement possibilities. In addition, the capital requirements which can be allocated to MYs 1983-85 light trucks are estimated, as well as the impact that these capital requirements will have on the manufacturers' cash flow situation.

Comments on economic analyses presented in the Preliminary Regulatory Analysis were received from Ford, American Motors, and the Regulatory Analysis Review Group (RARG). The comments from Ford and American Motors were aimed at specific capital cost estimates and the financial analyses and will be discussed in these sections. The RARG comments were more general -- focusing on the cost/benefit methodology, and will be discussed in Appendix C.

A) Capital Requirements

Capital requirements, estimated in this section, are associated with the fuel economy improvements made to the new light truck fleets for MY's 1983-85. Table IV-1 shows the estimated capital requirements for light trucks for the three model years. The capital requirements have no business-as-usual (i.e., "normal" or "historical") capital investments subtracted from them. That is, they reflect the total investment necessary to achieve the fuel efficiency improvements. Included are the costs of plants, property, and equipment for the major changes in power trains and new models. Table IV-1 also excludes engineering and launch costs, which are discussed in the next section.

Table IV-1
Capital Requirements* For
Case A and B for Light Trucks -- MY's 1983-85
(Millions of constant 1980 Dollars)

	Case A	Case B
GM	$2,475	$1,830
FORD	1,035	445
CHRYSLER	970	970
AMERICAN MOTORS	315	280
TOTAL	$4,795	$3,525

*No adjustments have been made to these numbers to reflect business-as-usual.

Capital requirements for new models and engines were estimated by using a data base developed by the Transportation Systems Center (TSC), an arm of the Research and Special Programs Administration in DOT. TSC has developed a "surrogate plant" analysis which provides estimates of the capital requirements to build various types of plants (assembly, stamping, engine, transmission, etc.) from the ground up, to convert a plant from one model to another new model, and to add capacity to a plant. These capital requirement estimates are based on the knowledge of the type of machinery needed in a "typical" plant and the cost of that machinery, historical costs of plants as found in the news media and other sources, plant site visits, and contracts with consultants and industry specialists.

Appendix A presents the details of the capital costing exercise. The costs developed by using the surrogate plant analysis were compared to the confidential submissions of the manufacturers and were found in most cases to be within plus or minus 10%. Thus, the surrogate plant analysis results will be used in this regulatory analysis, so as not to divulge confidential information.

Capital costs for engines were determined by using a capacity check of all the various engine sizes to be used by light trucks. The starting point in this analysis was the Agency's "plants and lines data base" which provided estimated capacities of each engine and estimated passenger car usage of each engine. By adding in estimated light truck usage by engine type, it can easily be determined if extra capacity is needed. This extra capacity then becomes a cost item for this rulemaking. In some cases additional capacity for a particular engine is already needed for passenger cars and light trucks only add to the capacity needs. In this case, the capital costs are allocated between cars and light trucks based on a straight sales weighting, and only that portion allocated to light trucks becomes a cost item for this rulemaking.

A number of things should be noted about Table IV-1. First, the estimated capital investments in Table IV-1 are those necessary to achieve the mpg levels for each manufacturer for Cases A and B. Second, since Ford's introduction of a mini-pickup was not included in the MY 1982 fuel economy analysis, the costs and benefits are included in MY 1983. Third, $250 million of capital investment was included in the cost of meeting the MY 1982 standards for GM's mini-pickup. These have been subtracted from the total cost of these new models in MY 1983. Fourth, capital costs are allocated between 4x2's and 4x4's based upon a straight MY 1985 sales weighting of the affected vehicles for the appropriate Case--A or B. The results of Table IV-1 are that Case A's capital requirements are about $1.3 billion more than Case B.

B. Engineering and Launch Costs

Engineering and launch costs (launch costs being preproduction setup costs) are expensed items (that is, they are considered expenses and written off in the year they occur), as opposed to capital requirements which are written off over a period of three to five years for special tools or ten to fifteen years for machinery, etc. Thus, they do not have long term effects on amortization or depreciation. The Agency has analyzed the manufacturers' various submissions in a attempt to determine the magnitude of engineering and launch costs for each manufacturer, the relationship between capital requirements and launch and engineering costs, and the timing of these costs. From this analysis, launch and engineering costs were estimated to be between 25% and 70% of capital requirements, depending on the manufacturer. Table IV-2 shows the total estimated launch and engineering costs for MY 1983-85 light trucks.

Table IV-2
LAUNCH AND ENGINEERING COST
FOR LIGHT TRUCKS
(MILLIONS OF 1980 DOLLARS)

	CASE A	CASE B
AM	CONFIDENTIAL	
CHRYSLER		
FORD		
GM		
TOTAL	1980	1460

C. Total Investment Costs

Total investment costs are defined simply as the addition of capital requirements and launch and engineering costs. Table IV-3 presents these results for MY's 1983-85 for each manufacturer. The total difference between the two cases is $1.8 billion.

Table IV-3
TOTAL INVESTMENT COSTS
($ MILLIONS)

	CASE A	CASE B
AM	CONFIDENTIAL	
CHRYSLER		
FORD		
GM		
TOTAL	6775	4985

D. Potential Retail Price Changes

Theoretically, retail price increases would be estimated by determining the variable cost (direct materials, direct labor, and variable burden) of a certain improvement over and above the variable cost of the equipment it replaces and adding to this a return on the capital investment needed for that particular improvement. In the Preliminary Regulatory Analysis, the following equation was postulated as a means of determining potential retail price changes:

$$RP = (1+D)\ [(GR \times CE) + VC]$$

where:

RP = Change in retail price of a car
D = Dealer and manufacturer margin; assumed to be 25 percent
GR = Gross rate of return on stockholder's equity (established at 27 percent)
CE = Change in capital expenditures per unit of annual capacity
VC = Change in variable manufacturing cost per car

The equation postulates that a change in the retail price of an average vehicle is a function of changes both in capital expenditures and variable manufacturing cost per vehicle.

While this methodology is used for the technological items which improve fuel economy on existing vehicles, namely improved radial tires which are estimated to increase the retail price of the average vehicle by $10 ($5 per model year for MY 1984 and 85,), it has proven impossible to use this methodology for new models. The reasons why this methodology is not useful for new models are: 1) it was designed for the costing of add-on items, not new models; 2) no seemingly reasonable approach for determining how a 1,000 pound weight reduction in a van affected variable cost and thus the vehicle's retail price could be found; and 3) it is not easy to determine which existing vehicle a new vehicle should be compared to--e.g., should a new mini-pickup be compared to a standard size pickup or an imported mini-pickup?

For these reasons, a new method for estimating retail price changes was deemed necessary. Since there are so many new models projected to enter the fleet, it was decided that the most reasonable method for estimating the impact on average light truck retail price would be to postulate a base vehicle (no options) retail price for each type of vehicle in the fleet and then sales weight these estimates and see how the average retail price changes each year. The starting point for this analysis was the Automotive Invoice Services' New Car Cost Guide, which provides MY 1980 base vehicle suggested list prices.

Table IV-4 presents selected vehicle prices. The vehicles selected are the highest volume sales models of their type for each manufacturer. However, no options or accesories were included. In this way the average retail price presented is not a true average, but rather, is a simplified average for analytical purposes. Since this is a point estimate in time, the relationship between manufacturers' comparable models may not be typical.
But the purpose of the exercise is to approximate how the new models may affect the average retail price over time; thus, the actual numbers on Table IV-4 are not that important, only how they change from year to year.

Table IV-5 presents the base vehicle retail price estimates for Case A and Case B. This table was developed using the following assumptions.

1) The retail price in MY 1982 for vehicles now on the market is the projected sales weighted average of their current prices from Table IV-4.

2) The average price of each vehicle increases $5 per year in MY 1984 and 85 to account for improved radial tires which are estimated to total $10 by MY 1985.

3) New vehicle retail prices for compact pickups and vans were assumed to be less than the standard size vehicles they would replace. In order for the manufacturers to keep revenue per vehicle (price) in line with MY 1982 and previous years, the difference in price between the compact and standard size vehicles can not be large. As has been seen in the passenger car market recently, the mix "lean out" (from large cars to small cars) has forced the manufacturers to increase the price of the small cars in order to make a profit to finance capital spending. This may also occur in the truck market.

TABLE IV-4
SELECTED NEW VEHICLE MY 1980 BASE PRICES*
(As of 7/28/80)

4x2's

Type of vehicle	Company and model	Suggested price
Mini-pickup	GM-LUV	$ 4840
	Ford Courier	5130
	Chry. D-50	4870
	Datsun	4940
	Toyota	5000
	Average	4950
Std. Pickup	GM C-10	5415
	C-20	6035
	Ford F-100	5680
	F-150	5775
	F-250	6340
	Chry. D-150	5360
	D-200	6050
	Average	5670
Std. Van	GM G-10	5750
	G-20	6060
	Ford E-100	5945
	E-150	6265
	E-250	6790
	Chry. B-100	5645
	B-200	5970
	Average	6015

4x4's

Type of vehicle	Company and model	Suggested price
Mini-pickup	GM-LUV	$ 6700
	Toyota	6650
	Average	6675
Std. Pickup	GM K-10	7125
	K-20	7800
	Ford F-150	7685
	F-250	8030
	Chry. W-150	7265
	W-200	7855
	AM J-10	7320
	AM J-20	8350
	Average	7580
Std. Utility	GM Blazer	7760
	Ford Bronco	8345
	Chry. AW-100	8300
	AM Cherokee	8430
	Wagoneer	9980
	AM CJ-5	6650
	Average	7845

TABLE IV-4 Continued
SELECTED NEW VEHICLE MY 1980 BASE PRICES
(As of 7/28/80)

4x2's			4x4's		
Type of vehicle	Company and model	Suggested price	Type of vehicle	Company and model	Suggested price
Std. Bus	GM G-10	$ 6780		AM Eagle	$ 7535
	G-20	6925			
	Ford E-100	6970			
	E-150	7400			
	E-250	7850			
	Chry B-100	6735			
	B-200	7050			
	Average	6940			
Std. Utility	GM Blazer	6350			
	Dodge AD-100	6795			
	Average	6440			

*Suggested list retail price for base vehicle, excludes freight, options, or accessories, or the increase in imported light truck tax from 4% to 25%.

TABLE IV-5
BASE VEHICLE RETAIL ESTIMATES FOR CASE A AND B
(Constant 1980 Dollars)

	MY 1982		MY 1983		MY 1984		MY 1985	
	4x2	4x4	4x2	4x4	4x2	4x4	4x2	4x4
Imported Mini-pickup	4950	6675	4950	6675	4955	6680	4960	6685
Standard Pickup	5670	7580	5670	7580	5675	7585	5680	7590
Standard Utility	6440	7845	6440	7845	6445	7850	6450	7855
Standard Van	6015	----	6015	----	6020	----	6025	----
Standard Bus	6940	----	6940	----	6945	----	6950	----
Domestic Compact Pickup	5600	----	5600	7400	5605	7405	5610	7410
CONFIDENTIAL								
Compact Utility	----	----	6300	7700	6305	7705	6310	7710
Compact Van	----	----	----	----	5950	----	5955	----
Compact Bus	----	----	----	----	6850	----	6855	----
AM Eagle	----	7535	----	7535	----	7540	----	7545
Case A average	5615	7530	5670	7535	5770	7530	5845	7530
Case A combined	6115		6190		6202		6230	
Case B average	5660	7545	5740	7570	5740	7520	5790	7600
Case B combined	6110		6185		6170		6195	

4)

CONFIDENTIAL

5) The impact of the increased tariff on imported light trucks from 4% to 25% is not included. If the total increase was passed through, the price would increase about $1,000 to $5,950 for 4x2's. This would affect the whole retail pricing structure for pickups and maybe for the whole market. Since the Agency can not predict how much of the increased tariff will be passed through to the consumer, and is only interested in the impact the fuel economy rules may have on retail prices, the impact of the tariff is not included.

The results of this analysis are that the average vehicle retail price will increase $115 in Case A and $85 in Case B. It is interesting to note that the 4x4's price hardly changes and all of the increase appears in 4x2's. This occurs because the reduction in sales in the low priced imported mini-pickup 4x4 is offset by the change from standard to compact vehicles. For 4x2's, the price increase is due to the increase in industry mix of vans, which are higher priced than pickups, and the decrease in the sales of low priced imported mini-pickups.

Table IV-6 presents the estimated average base vehicle retail price by manufacturer. As one can see, between 1982 and 1985 the price changes range from a decrease of $15 for Ford in Case B to a $320 increase for Chrysler in Case A. The difference here are in the mix of the manufacturers' fleets. Chrysler's retail price increases $100, in MY 1983, due to the change from imported mini-pickups to domestic compact pickups; and, by MY 1985, the retail price increases another $200 due to the change in the mix of vehicles assumed by the Agency.

In summary, by averaging the increases in Case A and Case B, the average light truck retail price would increase $100. However, this does not mean the same thing as in previous rulemaking where fuel economy improvements were made to the same or similar vehicles. Here, we are talking about a completely different mix of vehicles and it is the mix effect, brought about by the introduction of new models, which changes the retail price.

In essence then, the price changes postulated in the analysis are simply the result of newer, smaller and lighter vehicles being produced than are now being marketed by the domestic manufacturers. Since the majority of the domestic fleet is changing, it is simply impossible to predict the effects of this regulation, absent market pressures.

E. Operating Cost Savings

Operating cost savings are defined as the present value of dollar savings in gasoline that the vehicle owner would realize over the life of the 1983-85 vehicles. The factors used to derive the operating cost savings, besides the mpg values, are the weighted yearly travel by vehicle age (from Table II-2), the price of gasoline (from Table II-3),

TABLE IV-6
ESTIMATED AVERAGE BASE VEHICLE
RETAIL PRICE BY MANUFACTURER
(Constant 1980 Dollars)

CASE A	MY 1982	MY 1983	MY 1984	MY 1985	CHANGE IN RETAIL PRICE (MY 1985 MINUS MY 1982)
GM	6160	6220	6285	6300	140
FORD	6160	6210	6260	6255	95
CHRYSLER	5960	6060	6190	6280	320
AM	7580	7720	7680	7695	115
CASE B					
GM	6125	6160	6200	6240	115
FORD	6215	6245	6250	6200	-15
CHRYSLER	6005	6030	6030	6250	245
AM	7735	7730	7730	7745	10

and a 10 percent discount rate. In addition, a multiplier is used to take into account the difference between the EPA estimated mpg and actual on-road fuel economy. For passenger cars it has been estimated that actual on-road fuel economy is 11 percent less than the EPA estimated mpg. Since light trucks are tested unloaded, and are used partially or fully loaded only some of the time, it is felt that the actual on-road fuel economy of light trucks will be at least 11 percent below EPA estimates.* Thus, 0.89 is multiplied by the baseline fuel economy levels as well as the achievable fuel economies for each manufacturer before applying the previously mentioned factors. The operating cost savings, shown in Table IV-7, are based on the harmonic average of all manufacturers' fuel economies in Cases A and B. Imports are assumed to stay at 28 mpg (EPA estimate) in MY's 1983-85. The MY 1982 baseline was derived by harmonically averaging the MY 1982 standards for GM, Ford and AM and Chrysler's previously projected mpg levels of 17.7 mpg for 4x2's and 15.3 mpg for 4x4's. The MY 1982 harmonic average mpg for all trucks used in the MY 1982 final rule was 17.8 mpg (EPA estimates). The big jump in mpg between the MY 1982 standards and the mpg levels the manufacturers are projected to meet by MY 1983 provide operating cost savings of $1,050 to $1,452 in Cases A and B.

While comparing the final rules from standard level to standard level is appropriate, it is interesting to note that the manufacturers' 1980 mid-model year reports showed a harmonically averaged level of 18.4 mpg, which is higher than the MY 1982 standards. One could use the 18.4 mpg as the baseline mpg to determine the benefits of the MY 1983-85 light truck

*NHTSA is currently awaiting approval to launch an on-road fuel economy survey which will yield the actual mpg obtained by passenger cars and light trucks. This will serve the needs of several Agencies.

TABLE IV-7
LIFETIME OPERATING COST SAVINGS
($/VEHICLE)

	Harmonic average (on-road mpg)	Present value of operating cost savings over previous model year ($ 1980 dollars)	Cumulative present value of operating cost savings over MY 1982 ($ 1980 dollars)
CASE A			
MY 1982	15.84	--------	-------
MY 1983	19.85	1452	1452
MY 1984	20.53	193	1645
MY 1985	21.05	141	1786
CASE B			
MY 1982	15.84	-------	-------
MY 1983	18.55	1050	1050
MY 1984	18.89	113	1163
MY 1985	19.75	271	1434

standards. If one used 18.4 mpg instead of 17.8 mpg, the operating cost savings in both Cases A and B would be reduced by $237 in 1983 and also for the cumulative effect in MY 1984 and 1985.

Table IV-8 presents individual manufacturer's operating cost savings assuming a baseline in which the manufacturers' fleets just meet the 1982 standards -- 17.5 mpg for GM and Ford, 16.0 mpg for AM (the 4x4 standard) and a harmonic average of 17.3 mpg for Chrysler, based on their estimated 1982 capability.

TABLE IV-8

MANUFACTURER SPECIFIC

OPERATING COST SAVINGS

OVER PREVIOUS MODEL YEAR

($/vehicle)

CASE A	1983	1984	1985	TOTAL*
GM	1671	76	99	1846
FORD	1038	408	0	1446
CHRYSLER	1181	637	877	2695
AM	1694	412	165	2271
AVERAGE	1452	193	141	1786
CASE B				
GM	1330	29	198	1557
FORD	436	108	36	580
CHRYSLER	1092	32	1334	2458
AM	1663	304	87	2054
AVERAGE	1050	113	271	1434

*MY 1985 vehicles compared to MY 1982 vehicles.

F. Net Consumer Savings

Net consumer savings are simply the addition of retail price increases and operating cost savings. When looking at the whole industry, it is obvious that the average price increase of $100 is easily outweighed by fuel savings of over $1,400 per vehicle. Table IV-9 presents the net consumer savings by manufacturer and shows the marginal cost and benefits to consumers.

The conclusions which can be drawn from this analysis are that purchasers of the new models, which get better fuel economy than the standard size models, will save substantial amounts on gasoline and may pay less for a compact model than a standard size one. The tradeoffs the purchaser will make to achieve these savings are in the size and weight of the load which could be carried.

G. Other Manufacturers

Up to this point, the Regulatory Analysis has only discussed the impacts on the domestic manufacturers of light trucks. However, there are four foreign manufacturers of light trucks which must also meet the fuel economy standards. A study of Datsun's, Mazda's, Toyota's, and VW's mid-model year 1980 fuel economy reports show that these manufacturers already exceed the MY 1985 standard. Since the foreign manufacturers already exceed the standards, there will be no costs or benefits attributable to these standards for these manufacturers.

TABLE IV-9

NET CONSUMER SAVINGS

BY MANUFACTURER

OVER PREVIOUS MODEL YEAR

CASE A	1983	1984	1985	TOTAL*
GM	1611	11	84	1706
FORD	988	358	5	1357
CHRYSLER	1081	507	787	2375
AM	1554	452	150	2156
AVERAGE	1377	181	113	1671

CASE B	1983	1984	1985	TOTAL*
GM	1295	-11	158	1442
FORD	406	103	86	595
CHRYSLER	1067	32	1314	2413
AM	1668	304	72	2044
AVERAGE	975	128	246	1349

*MY 1985 vehicles compared to MY 1982 vehicles.

H. Cash Flow Analysis

The Agency has done a number of cash flow analyses for GM and Ford in an attempt to determine the capabilities of these manufacturers to finance the new models, new engines, and new transmissions which would improve their light truck fleet fuel economy. No analysis was performed for either Chrysler or American Motors. A Chrysler analysis was not performed because the Treasury Department had done a cash flow analysis on Chrysler at the time that the loan guarantees for Chrysler were being proposed. These Treasury Department analyses included most of the same new model introductions for Chrysler as in this analysis, and they concluded that these new models could be financed. Since the Treasury Department had much more information available to it concerning Chrysler's finances, it seems appropriate for NHTSA to accept their analysis. No analysis was performed for American Motors because the Agency did not feel that it could predict, with any reasonable accuracy, how AM's financial agreements with Renault would effect its cash flow.

The interested reader is referred to Appendix B for the detailed cash flow assumptions.

1) Capital Requirements

Basically, the cash flow analysis was done using two different approaches to determine the capital requirements. The first approach was to take GM's and Ford's claims as to the amount of capital they would spend in North America. Since these public statements were given as a total amount over a number of years, the annual expenditures had to be divided equally over the period. The second approach was to take the Agency's estimates of the capital costs of all the capital spending events (new models, engines, transmissions, etc.) for both passenger cars and trucks for each year. This provides one with the total capital spending for fuel economy. Subsequent discussions with Ford representatives led the Agency to believe that total expenditures for Ford would be about 40% higher than just fuel economy expenditures. Thus, each year's expenditures were multiplied by 1.4. A comparision of GM's publicized capital expenditures to the Agency's estimated fuel economy expenditures showed GM's numbers to be 38% higher than the Agency's. This is comparable to Ford 's claims and a 1.38 factor was used for GM. The advantages of the second approach is that it provides the peak and valley in the capital spending pattern and can identify problem years.

Five separate cash flow analyses were developed for both GM and Ford. Four of these analyses were run using Case A sales levels. These differ only in capital spending, and are:

a) A straight line estimate of the manufacturers' public projections.
b) No light truck capital spending starting in calendar year 1980; passenger car capital spending only. This is a "do nothing," approach, and therefore, the most conservative approach.

c) Case A light truck spending and passenger car capital spending.

d) Case B light truck spending and passenger car capital spending.

e) Case B light truck spending and passenger car capital spending and Case B sales (Case B has higher total sales levels than Case A).

Table IV-10 presents the capital spending estimates which went into the cash flow analyses for GM and Ford. A number of notes and observations about Table IV-10 are in order:

a) The Ford analysis No. 1 does not appear to be a straight line of capital spending. This occurs because the Ford public statements were given in nominal dollars and had to be deflated to constant dollars.*

b) Comparing light truck capital expenditures to total expenditures of Case A and Case B show that for GM light trucks make up 16% of Case A and 13% of Case B total GM expenditures. For Ford the numbers are 20% of Case A and 13% of Case B. This means that in Case A, Ford has to spend a higher percentage of their capital on light trucks than GM.

c) The peak spending years for GM are 1982 and 1983. For Ford the peak years are 1980, 1982 and 1984.

*Refer to Table B-1 in Appendix B.

TABLE IV-10

CAPITAL SPENDING ESTIMATES

USED IN THE CASH FLOW ANALYSES

(millions of constant 1980 dollars)

GM ANALYSIS	CALENDAR YEARS 1980	1981	1982	1983	1984	1985
1 (GM)	5300	5300	5300	5300	5300	5300
2 (No LT)	3687	5103	6044	4147	3153	1318
3 (Case A)	4644	6486	6442	5185	3777	1368
4 (Case B)	4597	6322	6220	4536	3914	1423
5 (Case B with B Sales)	4597	6322	6220	4536	3914	1423

FORD ANALYSIS	1980	1981	1982	1983	1984	1985
1 (FORD)	2100	1918	1750	1614	1495	1385
2 (No LT)	2071	828	1121	1110	1791	1278
3 (Case A)	2457	1217	1847	1573	1835	1278
4 (Case B)	2457	1161	1530	1163	1791	1278
5 (Case B with B sales)	2457	1161	1530	1163	1791	1278

d) The differences between Case A and Case B capital spending show up through the time frame in question with 1983 showing the biggest differences between the two cases for both GM and Ford. This occurs because MY's 1984 and 85 are the years in which there are changes in introduction dates between the two cases.

e) Capital spending for 1985 in analyses #2 through #5 will be understated because the Agency has not made capital expenditure estimates past MY 1986 for passenger cars or past MY 1985 for light trucks. Expenditures for models past these dates will be made in calendar year 1985, thus 1985 capital spending will be understated.

2) Profits

One of the calculations of the cash flow analysis is the expected profits of the manufacturers. Profits are a general indicator of a company's well being. However, in these heavy capital investment years, it is not uncommon for a firm to earn profits and yet not be able to generate sufficient internal cash to finance desired investments. For example, though Chrysler earned profits in CY 1977 and 1976, Chrysler was unable to finance the new product actions required to remain competitive from internally generated funds. In this case, the firm must borrow money or in some other way generate the capital, or forego the investment. It should be noted that the banking community is reluctant to loan money to firms which are losing money in a depressed industry. Table IV-11 shows the profits and losses for GM and Ford for the five analyses. The results for 1985 are not included because of the previously mentioned problem that total capital expenditures are understated and profits for 1985 are greatly overstated.

TABLE IV-11

ESTIMATED PROFITS AFTER TAXES

(millions of constant 1980 dollars)

GM ANALYSIS	CALENDAR YEARS 1980	1981	1982	1983	1984	5 YEAR TOTAL
1 (GM)	-503	1443	2089	2579	2980	8588
2 (No LT)	-162	1643	2174	2677	3303	9626
3 (Case A)	-364	1373	1894	2370	3051	8324
4 (Case B)	-354	1397	1941	2485	3127	8596
5 (Case B with B Sales)	-354	1397	2084	2651	3418	9196

FORD ANALYSIS	1980	1981	1982	1983	1984	5 YEAR TOTAL
1 (Ford)	-2606	-1102	-3901	48	542	-3508
2 (No LT)	-2600	-893	-87	248	630	-2702
3 (Case A)	-2672	-1030	-345	95	509	-3443
4 (Case B)	-2672	-1020	-276	171	580	-3217
5 (Case B with B Sales)	-2672	-1020	-100	273	580	-2939

Known problems with these analyses are:

a) No debt repayments for future borrowings were assumed. This causes profits and cash flow to be somewhat overstated, and,

b) Taxes in profitable years after losing years (for example 1981 for GM and 1984 for Ford) are not offset by the previous year's losses. As Ford pointed out correctly, this tends to understate profits, after taxes and cash flow, in a recovery period.

c) The cash flow analysis implicitly assumes that negative cash flows are always offset by external sources of funds -- borrowing or equity financing. Quite properly, Ford has criticized this simplifying assumption in the analysis. In the real world, there certainly are limits to how leveraged* a firm can be in its debt. The inability of Chrysler to borrow sufficient funds to finance a competitive product plan demonstrates this point. However, this simplifying assumption is routinely made in cash flow models of this type in order to indicate the magnitude, not the precise level of potential cash flow problems.

The cash flow problems of certain industries, among them the auto industry, have been recognized by the Carter Administration. Proposals for accelerated depreciation and refundable investment tax credit (ITC) have been made by the Administration.

---

*The percent of debt to total capital.

Making the ITC refundable will ease the cash flow problems, particularly in the auto industry. The recent losses in this industry have precluded these companies from the benefits of the ITC. During a period of major auto investments, the refundability provision will allow the auto industry to earn tax credits, despite their losses, and offset some of their negative cash flows with refunds. While the Administration has proposed "targeted" ITC's for specific industries, the depressed auto and steel industries were announced as top priorities. Relief measures include the proposed liberalization of HUD and EDA programs to provide assistance in the modernization and rebuilding of auto plants. Because these specific tax law proposals have, to date, not been enacted into law, they have not been included in the analyses.

Comparing the analyses for GM brings out the following points:

a) Most of the analyses are very close in magnitude. One of the major reasons is that light trucks only make up 13 to 16% of capital expenditures.

b) The difference in profits between #2 (No light truck spending) and #3 (Case A) averages $260 million per year. But analysis #2 assumes that GM's sales would remain the same even with no new models. This would probably not be the case.

c) The best analysis and most useful comparison is between #3 (Case A) and (Case B). By introducing more new models in Case A, if sales remain the same, GM, loses an average of $55 million per year in profits. However, by introducing more new models in Case A they also stand to gain some market share and enhance their sales volumes. As analysis #5 shows, a higher sales level has a fairly large effect on profits.

For Ford, the same comparisons also apply. The average difference between no light truck spending and Case A are $150 million per year in profits. Again, this assumes Ford could sell as many light trucks without new models. The difference between Case A and Case B shows a loss in profits of about $70 million per year in 1982, 1983 and 1984. The only real difference between Case A and Case B the assumption of a new model. The Case B sales only differ from Case A in 1982 and 1983 and here one can see the significant impact of higher sales. Thus, if Ford thinks it can hold or improve market share by introducing a new model, it will be in Ford's long range interest (in terms of profitability) to do so.

3) Cash Flow

The net cash flow results show large cash drains from operations for both GM and Ford. Table IV-12 shows these results. While GM starts to get some positive cash flows in 1983 and large positive cash flows in 1984, Ford's cash flows remains negative throughout the five year period. This means that in order to keep all the planned programs at GM and Ford, either sales must increase, retail prices must be raised and profits increased, or substantial amounts of borrowing must occur over the time period. Over the five year period, Ford is in a worse cash flow position than GM and Ford does not have the borrowing capability of the much larger GM. For both GM and Ford the difference in total cash flow between Case A and Case B is $700 million.

The Ford cash flow problem, in particular, concerns the Agency as to the possibility of Ford delaying new model van introduction The uncertainty associated with Ford's ability to finance a new model will be discussed in Part VI.

TABLE IV-12

NET CASH FLOW

(millions of constant 1980 dollars)

GM			CALENDAR YEARS			5 YEARS
ANALYSIS	1980	1981	1982	1983	1984	TOTAL
1 (GM)	-3031	-841	-1049	-457	14	-5364
2 (No LT)	-1418	-800	-1862	616	1896	-1568
3 (Case A)	-2375	-1970	-2031	-170	1479	-5067
4 (Case B)	-2328	-1825	-1848	384	1279	-4338
5 (Case B with B Sales)	-2328	-1825	-1705	551	1569	-3738

FORD						
ANALYSIS						
1 (Ford)	-3579	-1805	-1134	-608	-21	-7165
2 (No LT)	-3568	-715	-505	-268	-389	-5445
3 (Case A)	-3954	-1104	-1231	-605	-334	-7228
4 (Case B)	-3954	-1048	-914	-257	-348	-6521
5 (Case B with B Sales)	-3954	-1048	-738	-155	-348	-6243

PART V

MACROECONOMIC ANALYSIS

V. Macroeconomic Analysis

This section of the analysis discusses the comparative impact that Case A and Case B are anticipated to have on the overall U.S. economy, not just on the specific automobile manufacturers or on the purchasers of these vehicles. It discusses the impact on petroleum consumption, consumption of other materials (steel, aluminum, plastics), the balance of trade, and urban/regional and employment impacts.

A. Effect on Petroleum Consumption

The effect that Case A and Case B would have on petroleum consumption will be examined in two different ways. First, the lifetime consumption of gasoline of the MY 1983-85 light trucks will be analyzed. Second, the yearly effects that Case A and Case B would have on gasoline consumption will be examined.

In order to estimate the actual gasoline savings in each of these cases, the total domestic and imported 0-8,500 lbs. GVWR light truck fleet is analyzed. The basis for comparing the fuel savings of Cases A and B is that no improvements in fuel economy would be made over the MY 1982 standards. As was done in the Operating Cost Savings section, an adjustment was made to the EPA estimated mpg to account for the difference between that and actual on-road fuel economy of light trucks. Again, 0.89 was multiplied by the sales weighted EPA test data estimates to provide the fuel economy mpg values in Table V-1.

Total gasoline consumption is calculated by dividing the total lifetime mileage of 128,195 by the estimated on-road mpg of Table V-1 to get fuel consumed per vehicle and then multiplying this by total 0-8,500 lbs. GVWR sales (projected in Cases A and B). This provides the total gasoline consumption figures shown in Table V-2. Over the lifetime of the MY 1983-85 light trucks, if all the manufacturers met the Agency's fuel economy projections in Cases A and B, the lifetime fuel savings are 15.6 billion gallons for Case A and 13.4 billion gallons for Case B, when compare to the MY 1982 standards.*

TABLE V-1

0-8,500 LBS. GVWR LIGHT TRUCK

ESTIMATED ON-ROAD FUEL ECONOMY OF NEW MODEL FLEET

(MPG)

	Case A	Case B
1982	15.84	15.84
1983	19.85	18.55
1984	20.53	18.89
1985	21.05	19.75

* As was mentioned in the Operating Cost Savings section, one could use as a baseline for comparison the projected MY 1980 harmonic average of 18.4 mpg (EPA estimate) instead of the MY 1982 standards of 17.8 (EPA estimate). If 18.4 is used, Case A total savings are reduced 2.4 billion gallons to 14.2 billion gallons, and Case B savings are reduced 2.6 billion gallons to 10.8 billion gallons.

TABLE V-2

TOTAL NEW LIGHT TRUCK LIFETIME GASOLINE CONSUMPTION

(128,195 MILES TRAVELED)

(BILLION GALLONS)

	MY	GASOLINE CONSUMPTION	MEETING THE MY 1982 STANDARDS	GAS SAVINGS
CASE A	1983	17.7	22.2	4.5
	1984	19.3	25.0	5.7
	1985	19.5	25.9	6.4
		TOTAL		16.6
CASE B	1983	20.7	24.3	3.6
	1984	22.0	26.3	4.3
	1985	22.7	28.3	5.6
		TOTAL		13.5

The difference in lifetime fuel consumption between the two cases is 3.1 billion gallons or 75 million barrels. Case A's fuel savings are about 23% higher than Case B's.

A sensitivity analysis was done on fuel savings using a composite standard (that is, a harmonic average of 4x2's and 4x4's) and assuming that all domestic manufacturers just meet the level of the composite standard and none exceed it. Using Case A sales, the results of the sensitivity analysis were that, regardless of the model year, a 1.0 mpg improvement in the composite mpg results in approximately a 1.0 billion gallon savings in fuel over the lifetime of that model year truck fleet.

The second way of examining petroleum consumption is by calendar year. Table V-3 shows fuel consumption for light trucks, assuming a baseline of no improvement in 0-8,500 lbs. GVWR new fleet fuel economy over MY 1982 standards, and the change that meeting Case A and Case B projected fuel economies will have on light truck fuel consumption.*

Table V-3 shows that the fuel savings reach about 1.8 billion gallons in 1985 for Case A and 1.4 billion gallons in Case B. By the year 2005, Case A fuel savings reach 6.5 billion gallons. One can compare these to total U.S. demand for crude oil in 1979 of 222.3 billion gallons--1985 savings would be 0.6 - 0.8% of U.S. demand, while in 2005, the savings would be between 2.5% (Case B) and 2.9% (Case A). One must remember that these savings are for three model years. Comparing the fuel savings to 1979 imports of 128.9 billion gallons shows a savings of 1.1 - 1.4% in 1985 and 4.3 - 5.0% in 2005.

* Once again, one could use the projected MY 1980 average fuel economy as the baseline for measuring fuel savings. In this case, the fuel savings would be less than those shown in Table V-3 by 0.1 billion gallons in 1983, 0.3 billion gallons in 1985, 0.5 billion gallons in 1990, and increasing to a high of 0.9 billion gallons in the year 2000.

TABLE V-3

LIGHT TRUCK FLEET FUEL CONSUMPTION BY CALENDAR YEAR

(BILLIONS OF GALLONS)

CALENDAR YEAR	FUEL CONSUMPTION ASSUMING NO MPG IMPROVEMENTS OVER MY 1982 STANDARDS USING CASE A SALES	CASE A FUEL CONSUMPTION	CASE A FUEL SAVINGS	FUEL CONSUMPTION ASSUMING NO MPG IMPROVEMENTS OVER MY 1982 STANDARDS USING CASE B SALES	CASE B FUEL CONSUMPTION	CASE B FUEL SAVINGS
1981	24.3	24.3	----	24.3	24.3	----
1982	23.9	23.9	----	24.1	24.1	
1983	23.9	23.4	.5	24.2	23.8	.4
1984	24.1	22.9	1.2	24.5	23.7	.8
1985	24.3	22.5	1.8	25.0	23.6	1.4
1990	25.7	21.3	4.4	26.6	22.9	3.7
1995	26.2	20.3	5.9	27.4	22.5	4.9
2000	26.4	19.9	6.5	27.8	22.4	5.4
2005	26.4	19.9	6.5	28.0	22.4	5.6

B. IMPACT ON THE U.S. BALANCE OF TRADE

The U.S. balance of trade is comprised of the value of all goods and services exported and imported. There are two major items involved with this rulemaking which will affect the balance of trade. First, is the change in captive import sales of light trucks. Between MY 1982 and 1983 about 175,000 captive imports could be replaced by domestic production. If the import price of these vehicles averages $4,000, U.S. imports could be reduced by $700 million in 1983.

Second, the petroleum savings brought about by these standards will result in a direct reduction in imported oil. For example, 1985 fuel savings of 1.4 to 1.8 billion gallons could result in reduced imports of $1 to 1.3 billion (at the 1980 estimated cost of $30 per barrel). In 2005, imports would be reduced by $4.0 to $4.6 billion.

C. IMPACT ON MATERIAL CONSUMPTION AND PRODUCTION ENERGY

The impact on material consumption results from the introduction of new models which weigh less than their predecessors. Weight reductions also occur from a small substitution of aluminum and plastics for steel and a moderate substitution of high strength steel for steel. The Agency has estimated the change in weight per average vehicle based on its own estimates of average weight for each vehicle type, and a sales weighting based on Case A and Case B sales projections.

Table V-4 shows the projected changes in materials per vehicle. It also shows the production energy changes per vehicle, which will be discussed later. Table V-5 shows the projected 1982 baseline average vehicle broken down by material type. Since the average MY 1982 vehicle breakdown was almost identical for both Case A and Case B sales, only one is presented--Case A.

Table V-6 shows a comparison of the effect the changing mix of materials and decrease in average vehicle weight will have on national annual consumption of materials. In this analysis, total domestic sales from Case A are used throughout. The second and third columns "MY 1982 baseline usage of materials" and "MY 1985 usage assuming baseline MY 1982 materials mix" show the effect sales alone have on total materials usage, since they all use the same mix of materials, as shown on Table V-5. The other columns show the effect Case A and Case B have on national consumption of the various materials.

For cast iron and steel, the impact that sales have on annual material consumption is greater than the mix of materials or the decrease in average vehicle weight in either Case A or Case B. Thus, while in 1985 the mix in materials and reduction in weight causes a 0.7% decrease in national consumption of cast iron and steel, total consumption of these materials still increases over MY 1982. All in all, the impact on steel is less than 1% of national consumption.

Table V-4

WEIGHT AND ENERGY CHANGES PER VEHICLE AS

COMPARED WITH 1982

Case A

	1983	1984	1985
Material: Wt, lb.			
Cast Iron & Steel	-236	-477	-649
High Strength Steel	- 42	61	173
Aluminum	- 6	13	31
Plastics	- 16	- 14	- 8
Other	- 93	-121	-128
Total	-393	-538	-581
Energy: BTU, 10^6	- 8.6	- 8.6	- 6.6

Case B

	1983	1984	1985
Material: Wt, lb.			
Cast Iron & Steel	- 73	-267	-481
High Strength Steel	- 15	115	232
Aluminum	- 2	25	48
Plastics	- 5	4	11
Other	- 31	- 26	- 36
Total	-126	-149	-226
Energy: BTU, 10^6	- 2.8	0.6	2.5

TABLE V-5

PROJECTED MY 1982 AVERAGE VEHICLE

MATERIAL COMPOSITION BREAKDOWN

(lbs.)

Cast Iron and Steel	2,876
High Strength Steel	111
Aluminum	64
Plastics	94
Other	601
	3,746

TABLE V-6

TOTAL LIGHT TRUCK USAGE OF MATERIALS

(BILLIONS OF POUNDS)

	National Annual Consumption of Materials	MY 1982 Baseline Usage of Materials	MY 1985 Usage Assuming Baseline MY '82 Material Mix	% of National Con-sumption	Case A MY 1985 Material Con-sumption	% of National Con-sumption	Case B MY 1985 Material Con-sumption	% of National Con-sumption
Cast Iron and Steel	280	5.81	8.35	3.0	6.47	2.3	6.96	2.5
High Strength Steel	Included Above	.22	.32	0.1	.83	.3	1.00	0.4
Total Steel	280	6.03	8.67	3.1	7.30	2.6	7.96	2.9
Aluminum	13	.13	.19	1.5	.28	2.2	.33	2.5
Plastics	38	.19	.27	0.7	.25	0.7	.31	0.8

For aluminum, national consumption could increase by up to 1%. The impact on plastics is insignificant.

Table V-4 also presented the energy needed to produce an average vehicle. In Case A, the energy needed to produce an average vehicle by 1985 is reduced by 6.6 million BTU. Since the energy content of a barrel of oil is 5.8 million BTU's, the production of the smaller vehicles would save the energy equivalent of 1.1 barrels of oil per vehicle. In Case B in 1985, the energy needed to produce an average vehicle would increase by 2.5 million BTU or 0.43 barrels of oil per vehicle in energy equivalency. This is due mainly to the increased use of plastics and aluminum. These numbers are based on the following assumptions of the BTU's needed to produce 1 pound of the following materials: cast iron and steel--17,000 BTU's, high strength steel--25,000 BTU's, aluminum--110,000 BTU's, plastics--42,000 BTU's, and a combination of other materials 23,000 BTU's.

For MY 1985, Table V-7 compares the energy consumption impacts for Case A (energy savings) and Case B (energy losses) to the lifetime energy savings of all MY 1985 light trucks. Put in this perspective, the production energy impacts of the two cases are quite insignificant. Case A adds 2.3% to the gasoline savings expected for MY 1985 vehicles over their MY 1982 counterparts; Case B increased energy consumption by 1.1%.

Since the production energy impacts are so slight when compared to lifetime operating energy savings, they have not been included as a cost or a benefit in calculating the cost/benefit ratios or in oil import savings.

TABLE V-7
PROJECTED AVERAGE LIGHT TRUCK WEIGHT PRODUCTION ENERGY SAVINGS (LOSSES)
MY 1985 COMPARED TO MY 1982

ITEM	UNITS	CASE A	CASE B
o Weight Reduction Per Vehicle	Pounds	-581	-266
o Production Energy per Average Vehicle	Million BTU's	6.6	2.5
o Production Energy Per Average Vehicle	Equiv. Barrels of Oil	1.1	(0.43)
o Production Energy Per Average Vehicle	Equiv. Gallons of Gasoline	46	(18)
o Production Energy For all Light Truck MY 1985 Sales	Million Gallons of Gasoline	147	(63)
o Lifetime Operating Gasoline Savings For MY 1985 Light Trucks	Billion Gallons of Gasoline	6.4	5.6
o Production Energy for MY 1985 as a Percent of Lifetime Operating Gasoline Savings, for MY 1985	Percent	2.3%	(1.1%)

D. URBAN/REGIONAL AND EMPLOYMENT IMPACTS*

MY 1983-85 product plan submissions from the domestic manufacturers detail significant changes in both automobile and light truck offerings. The advent of front-wheel drive and diesels, coupled with the downsizing from V-8 to L-4 engines, has wrought a revolution in the fabrication of powertrain components. Based on these product plans and on the manufacturers' capacity planning actions in the last year, the Agency believes that new plants will be built and that some older plants will close. While the Agency is aware of certain marginal plants, it is impossible for the Agency to predict exactly which plants are likely to close -- or even how many plants. For example, ascertaining which of its several engine plants that Ford might close is a function of financial, market, technical and legal considerations which are beyond the purview of this Agency. Determining how many new plants will be built to replace those closed -- and where they will be built -- is also pure speculation.

Regarding light truck production, any attempt to predict community impacts is complicated by the following factors:

1. The present turmoil in the light truck market due to the rapid rise in fuel prices;
2. The on-again/off-again decisions of foreign manufacturers to construct truck assembly plants in the U.S.;

*In accordance with OMB Circular A-116, Preparation of Urban and Community Impact Analyses, August 16, 1978.

3. The recent tariff charges on imported light trucks, as well as new initiatives now being considered by Congress; and

4. The apparent reluctance of some new truck buyers to compromise on the payload size and weight carrying aspects of large trucks in order to achieve improved fuel economy.

The Agency has identified more than forty (40) passenger car and light truck plants for the domestic manufacturers which were vulnerable to closing, conversion to warehouse or sale. The vulnerability of these plants was typically a function of plant age, outdated production methods or changing auto technologies and parts. One-third (1/3) of the employees of these vulnerable plants live in the Detroit metropolitan area. Almost all of these plants are located in the economically depressed Great Lakes (North Central) Region (primarily Michigan and Ohio). Downsizing, material substitution, and lower sales have also resulted in reduced demand for steel mill products. Steel industry plants, concerned with auto production, have experienced significant workforce reductions; they are located primarily in Pennsylvania and the Great Lakes States. Because of the switch from bias ply to radial tires, many tire plants, located mainly in the Great Lakes Region, have been closed. New tire plants, located primarily in the south, are more automated, employing fewer workers. Thus, the concentrated impact of another round of major plant closings, not offset by new plant construction in this area of the country could result in devastating regional economic dislocations. The Agency is in the process of gathering and assimilating plant-by-plant production and employment data for the manufacturers and the major suppliers, to better understand the dimensions of this complex regional problem. The Carter Administration has taken a number of steps to help ameliorate this problem. Trade Readjustment Act assistance and extended unemployment compensation payments to workers laid off because of the plight of the domestic manufacturers has provided an income floor for these families. Refundable investment tax credits and "targeted" investment tax credits were proposed primarily in response to the huge capital generating problems of the domestic steel and auto industries. The Administration has, also, proposed other Federal programs to aid this "distressed area."

After the current recession is over, total car and truck industry sales volumes are projected to return close to historical trend levels (unit sales of about 11 million for cars and 4 million for trucks). If the U.S. domestic manufacturers regain their market share of, say, MY 1975, employment will increase. However, at the same time, employment will be decreasing because of productivity improvements (automation) and the market shift to a greater percent of small car sales (small car fabrication requires less labor input). New and modernized plants are being highly automated. While employment is expected to rise over the current depressed levels, a recovery in domestic car and truck sales will not generate as great an employment gain as in the past, because car and truck production is becoming less labor intensive as productivity increases. The Agency is working to quantify these productivity and mix effects.

In any event, the plant closings, and construction of new plants, will not occur as a direct result of the fuel economy standards. Competitive pressures from the marketplace for more fuel efficient vehicles, due to rising gas prices, are expected to be a greater driving force on the manufacturers than the light truck fuel economy standards. A company's need to modernize its plant and equipment and close obsolete plants to offer new products and stave off foreign competition is quite independent of regulation. The standards established in this rulemaking do not force the manufacturers to make investments beyond their own product plans.

PART VI

DEVELOPMENT OF THE STANDARDS

VI. DEVELOPMENT OF THE STANDARDS

A. COMPOSITE AND SEPARATE STANDARDS: BACKGROUND

Section 502 (b) of the Energy Policy and Conservation Act authorizes the Agency to set separate fuel economy standards for different classes of nonpassenger automobiles (light trucks). The legislative history of the Act allowed separate classification of light trucks with different "functional characteristics or other factors." In previous rulemaking, the Agency has used this authority several times to distinguish between different classifications.

For model year 1979, the first year light trucks were subject to fuel economy standards, the Agency promulgated separate fuel economy standards for each of two classes of nonpassenger automobiles less than 6001 pounds GVW. One class was four wheel drive, utility-type vehicles, for which the average fuel economy was fixed at 15.8 mpg. The other was a general nonpassenger automobile class (essentially 2-wheel drive) for which the fuel economy standard was set at 17.2 mpg. Manufacturers of utility-type 4-wheel drive vehicles were given the option of counting their vehicles in the special class or in the general class of other nonpassenger vehicles. In addition, light trucks in the 6-8500 pound range were first subject to "light duty truck" emission standards in MY 79.

For model years 80 and 81, separate two wheel drive (4X2) and four-wheel drive (4X4) standards were established because some manufacturers' fleets were composed entirely of 4X4's. Those vehicles generally have lower fuel economy than 4X2 vehicles (due to the need to meet off-road requirements), and caused AMC, for example, to have a lower projected average fuel economy than others. Also, the Agency created a separate class for captive import light trucks.

This classification is intended to encourage the domestic production of the fuel efficient, compact trucks which are currently imported. Section 503 (b) (1) of the Act requires separate classifications of automobiles manufactured here and overseas. The purpose of that provision was to remove any incentive to comply with fuel economy standards by importing more small foreign-produced automobiles, thereby decreasing U.S. employment. Although the law does not specify procedures for this issue in calculating light truck fuel economy standards, the legislative history states that a similar computation should be established as was done in the statute for passenger automobiles.

A separate class and standard was also established for "limited product line light trucks," or those manufactured by companies whose light truck fleet is powered exclusively by basic engines which are not also used in passenger automobiles. The "limited product line" standard was designed to permit manufacturers who had no previous experience in complying with the more stringent emission standards applicable to passenger automobiles, to develop technology to meet the emission standards set in MY 79 for light trucks without major adverse fuel economy impacts. The limited product line class applies to the International Harvester Company (IH) only.

Ford, in comments to the Agency on the proposed standards for MY 80-81, proposed that manufacturers be given the option of complying with a combined standard applying to all light trucks or with the proposed separate 4X2 and 4X4 standards. The Agency declined to approve the proposal and cited possible anti-competitive effects to smaller, single-line manufacturers. Although noting the increased flexibility for manufacturers to meet the fuel economy standards without compromising energy conservation, the Agency was concerned that a multi-fleet class manufacturer could avoid making changes to one class while single class manufacturers would have to undertake product changes in that same class (spend capital) to meet their fuel economy standard. This could increase the price of their vehicles compared to the vehicles of the large manufacturer, placing them at a competitive disadvantage.

For Model Year 82, the Agency retained the separate classifications for 4X2 and 4X4 vehicles, and the separation of the domestically manufactured light trucks versus captive imports. In doing this, the Agency reaffirmed the position it established for the MY 80-81 fuel economy standards relative to domestically produced vs. captive import light trucks.

With respect to the special limited product class established for IH, the Agency declined to extend the special classification beyond 1981. The original purpose of the special classification was to promote maximum fuel savings without placing an undue economic burden on IH. IH indicated that it could meet EPA emission requirements and maintain fuel economy on a par with other manufacturers of 4-wheel drive vehicles. Thus, it was no longer necessary to maintain the special classification. Recently, IH announced that it would no longer produce light trucks after MY 1980.

On December 31, 1979, the Agency published an NPRM that proposed fuel economy standards for light trucks manufactured in MY 83-85. The fuel economy range for MY-83 was 15.6-18.0 mpg 4X4's and 18.0-20 mpg 4X2's. For MY-84 the range was 16.1-19.3 mpg 4X4's and 18.8-21.4 mpg 4X2's, and MY-85 the range was 16.2-19.9 mpg 4X4's and 19.7-22.4 mpg 4X2's.

One of the commenters on the notice was the Regulatory Analysis Review Group. The Regulatory Analysis Review Group (RARG) is an organization within the

Executive Office of the President and consists of representatives from the Council on Wage and Price Stability, Council of Economic Advisors and the Office of Management and Budget, with rotating members from other Executive Branch agencies. Annually, they select a number of regulatory actions to analyze and comment upon which will have a significant impact upon the country. In their analysis of the proposed MY 83-85 fuel economy standards, they recommended the Agency consider a single, mandatory composite standard <u>for each manufacturer</u>. Their rationale used to support a composite standard was that a manufacturer would have the greatest flexibility to meet the standard at the lowest cost. RARG argued that establishing separate standards for different classes would be logical only if two conditions were satisfied: achievable fuel economy levels differ substantially between classes, and the classes make up different fractions of the various manufacturers' fleets. Although RARG agreed that the 4X2 and 4X4 fleets met these criteria, they also believed that a single standard should be considered by the Agency so as to improve the efficiency of manufacturer investments.

Their proposal for a composite standard involves setting fuel economy targets for different truck categories, and using a pre-determined fleet mix for each manufacturer to convert the targets into a composite standard. The example below for the manufacturers illustrates this:

	4x2		4x4		composite
	MPG	FRACTION	MPG	FRACTION	STD
GM	18.0	.70	15.6	.30	17.21
FORD	18.0	.74	15.6	.26	17.31
CHRYSLER	18.0	.74	15.6	.26	17.31
AMC	18.0	--	15.6	1.00	15.60
IH	18.0	--	15.6	1.00	15.60

RARG has maintained this provides to the manufacturer the greatest flexibility to meet the fuel economy objective - conservation of the nation's energy reserves, at the lowest cost. This flexibility may lower cost for three reasons: first, the manufacturer may acquire better information about the cost effectiveness of fuel saving options than is available to NHTSA at the time the standards are set. Second, the least cost mix of improvements may vary from one manufacturer to the next, making it difficult for the Agency to set class-specific standards that are optimal for every manufacturer. Third, composite standards allow manufacturers to improve fuel economy by substituting more fuel-efficient classes of trucks for less fuel efficient classes.

RARG recommended the Agency consider a composite standard for each truck manufacturer. Briefly, it could involve using fuel economy targets for the two truck classifications, and a pre-determined mix for each manufacturer to convert into one composite standard for each company. For example, if one manufacturer's achievable fuel economy was 22 mpg for two wheel drive and 18.5 mph for four wheel drive vehicles, and the vehicle mix was 75% two wheel drive and 25% four wheel drive, the composite standard would be 21 mpg as shown below. A composite fuel economy standard is the harmonically weighted average of the separate fuel economies of the 4X2 and 4X4 fleets. Mathematically, it is expressed as:

$$\text{Composite fuel economy} = \frac{1}{\frac{\%\ 4X2}{\text{mpg } 4X2} + \frac{\%\ 4X4}{\text{mpg } 4X4}}$$

In the example,

$$\text{Composite fuel economy} = \frac{1}{\frac{.75}{22.0} + \frac{.25}{18.5}} = \frac{1}{0.0341 + .0135}$$

$$= \frac{1}{0.0476} = 21.0 \text{ mpg}$$

One criticism of this approach is that it places single vehicle line manufacturers (i.e., those that do not produce large volumes of both 4X2's and 4X4's) such as AMC at a competitive disadvantage, because they lack the flexibility to increase production in a more fuel-efficient class to offset the less fuel-efficient line. In order to meet a composite standard, AM might have to increase capital spending and thus be forced to raise the base price of the vehicle. Other manufacturers who made capital improvements in other more fuel-efficient vehicle lines(e.g., 4x2's) could be at a financial advantage in selling their less fuel-efficient vehicles in the market place, as compared to AMC.

THE INDUSTRY RESPONDS

As a result of the RARG proposal, the Agency extended the comment period of the NPRM to allow additional time to respond to the proposal for a composite standard.

GM supported the concept of a combined standard because it would give manufacturers greater product mix and investment flexibility. However, they noted that a combined standard increases risk of not complying if the 4x4 mix increases. They suggested that each manufacturer have the option of choosing either separate CAFE standards for two and four wheel drive vehicles or a single combined standard calculated by merging the separate standards with a predetermined industry-wide fleet mix. They were opposed to a RARG suggestion to set different standards for each manufacturer by using a different fleet mix for each manufacturer. In their view, all competitors must be treated equally to preserve the free market system.

Ford adopted a similar position by supporting either an optional combined standard or separate, class standards. They, like GM, were opposed to separate standards for each manufacturer. But unlike GM, they supported establishment of a fleet mix percentage for 4X2 and 4X4 vehicles calculated by combining each manufacturer's production mix with the separate standards and comparing that to the manufacturer's tested fuel economy for 4x2 and 4x4 vehicles to determine compliance. They were opposed to using historical model mix data (lagged fleet mix) to set composite standards because the uncertainties in the market place over the past several years cannot be relied on to estimate future fleet mixes. AMC also opposed separate composite standards for each manufacturer based on individual manufacturers' vehicle mix. They stated it would discriminate against one manufacturer in favor of another. However, they argued similarly to GM's arguments in supporting an industry-wide composite standard that applied equally to all manufacturers. Chrysler supported the RARG suggestion but wanted to use the actual production mix to set the composite standard.

ADVANTAGES OF A COMBINED STANDARD

RARG suggests that the fuel savings of a composite standard would be similar to the separate standards. However, the manufacturer has greater flexibility to meet a composite standard by replacing the less fuel-efficient four wheel drive vehicles with two wheel drive vehicles. It is the flexibility to make shifts in the manufacturer's product lines while meeting fuel economy standards at the lowest cost, that is the main advantage of the composite standard.

For example, having to meet separate 4x2 and 4x4 standards requires each manufacturer to improve the fuel efficiency of each fleet, each year. However, because of planned new product actions and the redesign of models, it may be more efficient, financially, for a company to significantly exceed a standard for one of its fleets (e.g., 4X2's) and not improve its other fleet at all while still retaining the same overall corporate fuel economy. In essence, a combined standard would result in no degradation of fuel savings but could result in a more effective allocation of corporate resources with its attendant lowering of industry capital investments and consumer price increases.

RARG also indicated that the statute allows this approach even though it prohibits separate standards for individual manufacturers. They argue that since separate classes are authorized that would of themselves have varying effects on manufacturers, it is unlikely that composite standards, having a similar varying effect, would be forbidden. They further state that the agency, in rejecting Ford's request for a single standard in MY 80-81, did not suggest it was illegal; rather, it was denied based on the anti-competitive effects on single vehicle line manufacturers.

DISADVANTAGES OF A COMBINED STANDARD

One criticism of a single composite standard is that it requires the establishment of fleet mix prior to the model year. As proposed by RARG, the composite standard would be established numerically, in advance, and separately for each manufacturer, by specifying the mix of 4X2's and 4X4's. RARG suggested that an historical average of percent 4X2's and 4X4's was one way to derive the mix. That is, the basis for a standard would be a "lagged" fleet mix, which would use the actual vehicle mix in previous years as the weighted mix in years hence. But projecting a fleet mix is difficult to do with any accuracy, especially in a market place which responds to variables (e.g., price of gasoline) which cannot be predicted.

One other criticism is that it may place single class manufacturers (AMC) at a competitive disadvantage because they do not have the advantage of improving the fuel economy of one vehicle class to offset a less fuel efficient class. Thus, they would be forced to meet a composite standard with their single, less fuel efficient, 4X4 vehicles.

However, recent market changes have forced AMC to improve the fuel economy of their 4X4 fleet in response to consumer demand for more fuel efficient light trucks. AMC has plans to improve the fuel economy of their 4X4 fleet to a point where they compete favorably with the combined fleets of other manufacturers. Analysis of AMC's current capablility, based in part on data supplied by them, now indicates that they would not be placed at a competitive disadvantage with a composite standard. AMC has already supported a proposal for an industry-wide standard.

ALTERNATIVES

The concept of a single combined fuel economy standard has much merit. Surely, it offers additional flexibility to manufacturers over the existing separate two and four wheel drive standards. It provides this increased flexibility by permitting a manufacturer to schedule its fuel efficiency improvements such that the greatest oil savings per dollar invested are obtained. For example, by not making expensive technical improvements to some 4X4 vehicles, because they are scheduled for redesign the next year, but instead using those funds to achieve greater fuel improvement in 4X2's, greater efficiency may be realized. Unlike the existing system, which requires incremental improvements in all fleets, a combined standard could result in more efficient investments.

However, manufacturer flexibility is only one criterion upon which to judge whether a single fuel efficiency standard is more advantageous than separate 4X2 and 4X4 standards. Energy savings, for instance, must take precedence, according to the statute, over industry flexibility. If a single standard were deemed to save less fuel than separate standards, it could not be accepted. If a single standard were neutral in terms of fuel savings, then of course it would be advantageous.

In addition, other criteria must be considered. The potential competitive effects of single vs. separate standards were discussed previously. Concern also must be given to the certainty such standards provide manufacturers so as to facilitate their long-range planing.

In examining this issue, the Agency has studied the potential effects of four alternative combined standards. These are described below, and the pros and cons of each are discussed. This section ends with a summary discussion - and the decison of the Agency in this regard.

1. RARG ALTERNATIVE

As stated earlier, the attributes of the RARG alternative are as follows:

- Mandatory single truck standard
- Separate composite standards for each company
- Standards to be based on a predetermined mix of 4X2's and 4X4's -- a different mix for each company.

An example follows:

F.E. CAPABILITIES (MPG)

	4X2	4X4	%4X2
Co. A	18.0	16.0	75
Co. B	18.5	15.5	70
Co. C	18.5	15.0	75

Assuming, for simplicity, that standards would be set at the level of the least capable company, then the separate 4X2 and 4X4 standards would be:

4X2 - 18.0 mpg
4X4 - 15.0 mpg

Using these numbers, the RARG alternative results in the following composite standards:

	4X2		4X4		STD
	MPG	%	MPG	%	
Co. A	18.0	75	15.0	25	17.14
Co. B	18.0	70	15.0	30	16.98
Co. C	18.0	75	15.0	25	17.14

ADVANTAGES

A composite standard setting process such as that discussed by RARG, offers the following advantages as discussed in their comments on the NHTSA NPRM. The fundamental advantage of composite standards is that they give manufacturers greater flexibility to meet given fuel-economy objectives at lowest cost. Manufacturers have greater discretion to choose which classes of vehicles to improve, and whether to increase production of the more fuel-efficient classes. This flexibility may lower costs for three major reasons. First, the manufacturers may later acquire better information about the costs and effectiveness of fuel-saving options than is available to NHTSA at the time the standards are set. Second, the least cost mix of improvements may vary from manufacturer to manufacturer, making it impossible for NHTSA to set class-specific standards that are optimal for every manufacturer. Third, composite standards allow manufacturers to improve fuel economy by substituting more fuel-efficient classes of trucks for less fuel-efficient classes.

DISADVANTAGES

The RARG suggestion requires selecting a future fleet mix, which can be difficult to predict with any certainty. Alternately, a lagged fleet mix (sales experience of previous years) could be used. But this is also risky because previous mixes are not necessarily a valid precussor of mixes in future years. For example, in MY 80, the fuel economy standards were 16 mpg for 4X2 and 14 mpg for 4X4 fleet mixes. The Agency estimated the overall vehicle fleet mix in that year would be .74 4X2's and .26 4X4's, or a composite standard of 15.4 mpg. The actual fleet mix for the first 7 months of 1980 was .79 4x2's and .21 4x4's which would result in a composite standard of 15.5 mpg. Thus, if a combined standard would have been established instead of the 2 separate ones, based on the predicted mixes, it would have been 0.1 mpg low, when compared to the actual mixes. The situation could just as easily have been reversed, with a pre-determined fleet mix resulting in a higher standard than could be achieved based on the market mix for a particular model year.

Another potentially disadvantageous feature of the RARG proposal is establishing different standards for each manufacturer, based on its individual fleet mix. The EPCA is very clear about setting different standards for vehicle classes, not manufacturers. This feature of the RARG proposal is also opposed by the manufacturers who insist on equitable treatment for all. As illustrated by the manufacturers' comments, they all believe -- including AM, who opposed any form of a combined standard previously -- that separate standards for individual manufacturers would result in separate and unequal treatment which is inherently unfair to someone. Thus, they all favor equal treatment for all manufacturers.

2. INDUSTRY-WIDE COMPOSITE STANDARD

Under this alternative, the disadvantage of having separate standards for each company is avoided. It involves taking a sales-weighted mix for each manufacturer, calculating each company's composite capability based on its mix and capability, and then setting a uniform (among manufacturers) composite standard. It has the following features:

- o Mandatory single truck standard
- o The same composite standard for each company
- o Standards to be based on a predetermined mix of 4X2's and 4X4's -- a different mix for each company

Using the same example as before, the composite capabilities of each company would be:

	4X2		4X4		COMPOSITE
	MPG	%	MPG	%	
Co. A	18.0	75	16.0	25	17.45
Co. B	18.5	70	15.5	30	17.48
Co. C	18.5	75	15.0	25	17.48

Using the same criteria of setting the standard at the level of the least capable company, but applying this criteria to the composite instead of the separate 4X2 and 4X4 capabilities, would result in a standard of 17.4 mpg.

ADVANTAGES

The same advantages as under the RARG alternative apply here. An additional advantage is that it avoids the inherent disadvantage of setting different standards for different companies. Furthermore, it would result in substantially more energy savings, as shown in the example, by setting an industry-wide standard of 17.4 mpg instead of separate company standards ranging from 17.0-17.1 mpg.

DISADVANTAGES

These are the same as listed under alternative 1 except as noted above. In addition, it has the potential disadvantage of either penalizing companies which only produce 4X4's (the least fuel efficient vehicles) or setting a low composite standard based on the capabilities of such companies. As with all such composite standards, it has the disadvantage of potentially "forcing" the mix of 4x2's and 4x4's beyond market projections, resulting in the product limitations.

3. OPTIONAL COMPOSITE STANDARD

This alternative recommends a compromise between a class-specific and a composite standard by giving each manufacturer the option of meeting either one or the other. It gives manufacturers the greatest flexibility without sacrificing energy conservation.

There are two types of optional-composite standards to be considered. Both are similar in that a decision is made to comply with separate standards for 4x2's and 4x4's or a single standard computed by combining the vehicle mix and fuel economy for each class to determine a single standard. An optional-composite standard is advantageous to the manufacturers in several ways. First, it gives them added flexibility in meeting CAFE standards. They can make adjustments in their vehicle mix according to market demand and still comply with a standard (s). This is especially true in their investment strategy. By not obligating large sums of money to improve fuel economy in a less efficient vehicle class, they can achieve similar energy savings by producing more fuel efficient vehicles to offset the other class. This is especially important to a manufacturer which does not plan to produce a vehicle line beyond that model year. By committing resources to another vehicle line to improve its fuel economy (and thereby offsetting the phased-out vehicle line), the energy savings is the same plus the public will benefit in years hence from an improved vehicle line the manufacturer will continue to produce.

An optional-composite standard is also advantageous to manufacturers which only produce one vehicle class. In a single composite standard scenario, that manufacturer would not have the flexibility afforded the multi-line manufacturer. Instead, it would have to comply with a combined standard that is partially based on vehicle classes not produced by it. But the optional-composite standard would permit the company to choose a separate-class standard as a means of compliance.

Both of the optional-composite standard approaches offer these advantages. However, they differ substantially as to how each is computed. The following discussion outlines the advantages and disadvantages of both approaches.

<u>OPTIONAL INDUSTRY-WIDE STANDARD</u>

It has the following attributes:

- <u>Optional</u> compliance with either separate 4x2 and 4x4 standards or an industry-wide standard (alternative 2).

Using the previous examples, the separate 4x2 and 4x4 standards would be:

4x2 - 18.0

4x4 - 15.0

The composite standard would be 17.4 (based on the least capable manufacturer of alternative 2).

ADVANTAGES

The main advantage as discussed previously is the flexibility of the manufacturers to achieve fuel economy goals without any subsequent loss in energy conservation. The level of the composite standard is also high (compared to the composite standard proposed by RARG), thus resulting in more energy savings. A single vehicle line manufacturer could also opt for the separate class standard to comply instead of facing a potential noncompliance situation.

It is also an option most closely identifed with previous agency rulemaking. For MY-79, the agency promulgated separate-class standards for two wheel or four wheel drive, utility type vehicles or, at the manufacturers option, counting the utility-type vehicles in the two-wheel drive class. A composite standard is a similar concept except that it weights each vehicle class according to the mix.

For example, using the numbers in the previous chart, all manufacturers would comply with either the separate standards or one composite standard. The single line manufacturer, however, would only be in compliance by using the separate

4x4 standard.

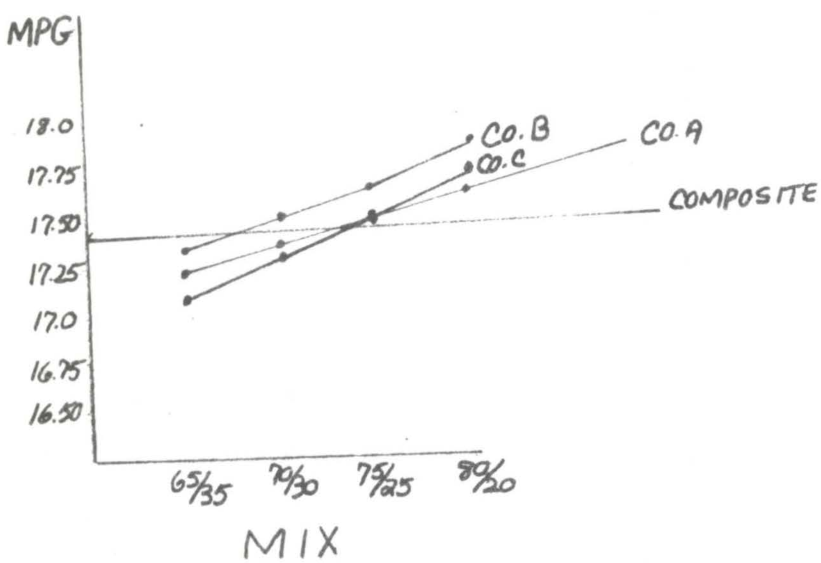
	4x2=18.0		4x4=15.0		
	MPG	%	MPG	%	COMPOSITE
Co. A	18.0	.75	16.0	.25	17.45
Co. B	18.5	.70	15.5	.30	17.48
Co. C	18.5	.75	15.0	.25	17.48
Co. D	-	-	16.0	1.00	16.00

The flexibility of this optional approach is also shown if there are market shifts and a subsequent change in the vehicle mix. If there was a 5% shift to the less fuel-efficient 4x4's, for example, no manufacturer would meet the composite standard of 17.4. Each, however, would comply with the separate 4x2 and 4x4 standards.

	4x2	%	4x4	%	COMPOSITE
Co. A	18.0	.70	16.0	.30	17.35
Co. B	18.5	.65	15.5	.35	17.35
Co. C	18.5	.70	15.0	.30	17.29
Co. D	-	-	16.0	1.00	16.00

MIX UNCERTAINTY

The graph below shows the effect that a changing mix has upon the composite standard.



% 4X2

	65	70	75	80
A.	17.24	17.38	17.45	17.56
B.	17.30	17.48	17.64	17.81
C.	17.10	17.28	17.48	17.67

A 5% change toward the less efficient 4x4 fleet (except for Co. D) would result in all manufacturers not meeting the composite standard. However, an improvement of one tenth of a gallon would offset a mix shift of 5% toward the 4x4 fleet.

In other words, improving the fuel economy of the more efficient 4x2 class by one tenth of a gallon would offset the 5% shift toward the 4x4 class.

Admittedly a composite standard in the example shown would not be a significant factor because all manufacturers would meet the separate class standards. However, it would be significant if a manufacturer did not meet a class standard for one of its fleet.

	4x2	%	4X4	%	COMPOSITE
Co. A	17.9	80	16.0	20	17.48
Co. C	18.5	80	14.5	20	17.50

In the above example, both Co. A and Co. C failed to meet the 4x2 or 4x4 standards, respectively. But a shift toward the more efficient 4x2 fleet mix allows both to meet the composite standard.

DISADVANTAGES

The main disadvantage of this option is that it requires preselection of a fleet mix for years hence. The difficulty of predicting a mix with any certainty is the result of dynamic factors which influence the mix (inflation, fuel costs). However, as shown, the difficulty is mitigated by increasing the fuel economy one tenth of a gallon for every 5% difference in the fleet mix. In an historical perspective, the market share of the four wheel drive fleet has not shifted that significantly in the past several years. A shift of 2-3% would require very little fuel economy improvement on the manufacturers part to offset it. It is also likely that in a market where fuel prices will continue to rise, sales of the more efficient class (4x2's) are more likely to increase.

One other potential difficulty lies with the single-line manufacturer. If a producer of 4x4 vehicles (AMC) calculated that its investment in research and development would put its CAFE at the level (or higher) of the composite standard for a given year, there would be no incentive for it to continue improving fuel economy because it could choose to comply with a lower class standard. Conversely, a manufacturer which produced only 4x2 vehicles and opted to comply with a composite standard (lower than a separate class standard) would not have any incentive to improve fuel economy beyond that level. However, the potential for this occurring must be balanced against the greater flexibility it offers the majority of the manufacturers. While energy savings is paramount, the economic practicability for manufacturers to produce fuel-efficient vehicles must also be considered.

Production Mix Composite Standard

This sub-option has the following attributes:

- o Optional compliance with either separate 4X2 and 4X4 standards or a composite standard

- o Optional composite standard to be based on actual production mix (thus, it would not be determined in advance of the end of the model year).

Using the same example as the optional industry-wide standard, the separate 4X2 and 4X4 standards would be:

4X2 - 18.0
4X4 - 15.0

and the optional composite standards would be:

Co. A - 17.14
Co. B - 16.98
Co. C - 17.14

ADVANTAGES

In addition to the flexibility advantages inherent in a composite standard, the optional composite standard avoids the difficulty of having to pre-select a fleet mix several years in advance and thus provides the flexibility to the manufacturers in terms of making the most cost-efficient investments. By not basing a standard on a "fixed" mix, manufacturers are better able to respond to market shifts and thus are not locked into a predetermined split of 4X2's and 4X4's. Also, it eliminates the potential problem in the optional industry-wide standard of setting too low (or too high) a standard based on the capabilities of less than full-line (4x2 and 4x4) manufacturers.

Using the example in the previous discussion where the mixes of companies A-C were actually 5 percent higher for 4X4's, their actual CAFE's would be:

	NEW MIX 4X2 MPG	MIX	4X4 MPG	MIX	Old Std	Actual Capability
Co. A	18.0	.70	16.0	.30	17.45	17.35
Co. B	18.5	.65	15.5	.35	17.48	17.35
Co. C	18.5	.70	15.0	.30	17.48	17.29

As shown, each company would be at least 0.1 mpg below the established standard (assuming it were set at 17.4 mpg) due to an unforeseen mix shift. However, under this alternative, this potential penalty situation is avoided. Thus, the fuel consumption of the fleets is identical regardless of the standards, but in this alternative penalties are avoided since each company could still meet the separate 4X2 and 4X4 standards.

But the greatest benefit of this alternative comes from its investment flexibility. Suppose, for example, for reasons of minimizing capital investments, the capabilities of the companies are not as estimated by the Agency but instead are as shown below:

	4X2 MPG	MIX	4X4 MPG	MIX	Composite Capability
Co. A	17.5	.75	17.0	.25	17.37
Co. B	19.0	.65	15.0	.35	17.38
Co. C	19.0	.70	14.5	.30	17.38

As can be seen, each company's fleet achieves the identical mpg, or level of consumption. However, under the existing concept of only separate 4X2 and 4X4 standards, companies A and C would be in penalty situations for noncompliance with the 4X2 (18.0 mpg) and 4X4 (15.0) standards, respectively. Under the industry-wide composite standard, Companies A + C would be in a non-compliance situation. Yet under this alternative, Company B could achieve the separate 4X2 and 4X4 standards, while companies A and C would comply with the optional composite standards shown below:

$$\text{Optional Composite Standard for company A} = \frac{1}{\frac{.75}{18.0} + \frac{.25}{15.0}} = 17.14$$

Co. A's actual CAFE = 17.37

$$\text{Co. C. composite standard} = \frac{1}{\frac{.70}{18.0} + \frac{.30}{15.0}} = 16.98$$

Co. C's actual CAFE = 17.38

Thus, this alternative eliminates potential penalties when corporate fuel economies among companies are identical. It thus provides greater investment and marketing flexibility for equal energy conservation efforts in comparison to the separate 4x2 and 4x4 standards.

DISADVANTAGES

Compared to the optional industry-wide standard, this option may result in less energy conservation and possibly separate standards for different companies, if all companies chose to meet the optional combined standard and had different mixes. The example shows that this option could result in an average standard about .3 mpg lower than the optional industry-wide standard, or about 350 million gallons over the 12 year life of a 3 million fleet.

Although the example shown results in an average standard about 0.3 mpg lower for this alternative, this need not always be the case.

	18 mpg		15 mpg		
	4x2	%	4x4	%	COMPOSITE
Co. A	18.0	75	15.0	25	17.14
Co. B	18.5	75	15.5	25	17.64
Co. C	18.5	70	16.0	30	17.67

In the example, Company A has the lowest capability for both its 4X4 and 4X2 fleets. If the standards were set at the level of the least capable manufacturer, the optional industry-wide standard would result in the same level of energy conservation, assuming all companies just met the standards.

However, although the composite standards for each manufacturer are based on the same class standards, this option may be inconsistent with the section 502 (b) of EPCA, which states that different standards may be established for certain classes of vehicles, but not manufacturers. A major point is the probability that different numerical requirements would be imposed on members of the same group. This would raise questions of arbitrariness and discriminatory impacts.

Further, this option could also reduce the incentive for a manufacturer to sell more 4x2's as a means of improving fuel economy. As more 4x2's are sold, not only does the manufacturer's CAFE increase but the composite fuel economy standard increases as well. Conversely, the more fuel inefficient 4x4's sold, the lower the composite standard becomes.

SELECTION

The Agency believes that an optional standard compared to separate 4x2 and 4x4 standards is clearly superior. Although the production mix composite standard offers the greatest flexibility for manufacturers to meet fuel economy standards, its lower energy conservation under certain conditions plus the questionable legality as provided for in the EPCA pose serious questions as to its further consideration. The optional Industry-Wide composite standard is only slightly less flexible in its approach, and results in slightly higher energy savings, the most important consideration. It is also not a striking departure from previous agency rulemaking. It does not require manufacturers to master a different rulemaking process since historical continuity is preserved. Also, it recognizes that single line manufacturers (such as AMC) might be at a disadvantage with the establishment of only a composite standard.

To preserve continuity with the MY 1980-82 rulemakings and to respond to RARG and industry comments, the Agency will retain as an option separate 4x2 and 4x4 standards for each model year. As noted above, the manufacturers and RARG expressed concern that flexibility should be provided to permit increased 4x4 sales. Further, this optional approach would provide some stability in the year-to-year structure of the Agency's light truck standards. It also should provide relief in the post-1985 period if manufacturers of 4x4's (AM) should not be able to make sufficient fuel economy improvements to their exclusively 4x4 new trucks fleets to meet a combined standard.

For reasons discussed above, the Agency selected the industry-wide composite standard (with a predetermined mix) as one option available to the manufacturers, and separate 4x2 and 4x4 standards as the other option.

To summarize, a manufacturer in the MY 1983-85 period can be in compliance by either meeting the composite standard, or by electing to meet the separate 4x2 and 4x4 standards.

B. FORD AS "LEAST CAPABLE."

Section 502(b) of the Motor Vehicle Information and Cost Savings Act requires that average fuel economy standards for light trucks be established for each model year at the "maximum feasible average fuel economy level." In determining that level, the Agency is directed to consider technological feasibility, economic practicability, the need of the Nation to conserve energy, and the effect of other Federal Motor Vehicle Standards on fuel economy. Put simply, the "need of the Nation to conserve" oil in setting the standards at a "maximum feasible" level is to be tempered by other national goals, such as the viability of the domestic manufacturers' and auto industry revitalization. As demonstrated in Cases A and B, discussed previously, the CAFE will be primarily a function of the domestic manufacturers' ability to offer and sell new compact pickups and vans. Our cash flow analyses for GM and Ford, Part IV above, indicate the severe economic pressures (negative cash flows) confronting the auto industry. Consequently, in setting the standards, the Agency must balance fuel savings against the economic capabilities of the manufacturers. Setting fuel economy standards at a level that forces one or more of the cash poor manufacturers to make investments that they can ill afford in order to avoid the fuel economy penalty, hardly serves the national interest. Recent experience suggests that pressures to exceed the standards set by the Agency could be expected to come from the marketplace. In view of the present uncertainties, this appears to be the wisest course.

In the Conference Report, of the Energy Policy and Conservation Act, the Agency is advised to "take industrywide considerations into account," when determining the standards. . . . (M)aximum feasible average fuel economy should not be keyed to the single manufacturer which might have the most difficulty achieving a given level of average fuel economy." CAFE standards need not be set at the

the level of the least capable manufacturer. For example, the 4x4 light truck standard for MY 1982 was set above the projected capability of Chrysler. Even though Chrysler was the least capable manufacturer, the Agency did not use Chrysler's capability as its sole basis in setting 4x4 standards in that rulemaking. While the Agency is not limited to setting the "maximum feasible" standards at the level of the least capable manufacturer, it is directed, nevertheless, to ". . . weigh the benefits to the nation of a higher average fuel economy standard against the difficulties of individual automobile manufacturers." Since there are only a few domestic manufacturers, the Agency is admonished not to place a "severe strain on any manufacturer" that might lead to "reduced competition" or have other serious "possible implications for the national economy."

According to independent analyses by the Agency and the manufacturer, Ford's composite CAFE is significantly lower than the other manufacturers' (refer to Table VI-1). From the perspective of the separate standards, Ford's 4x2 CAFE is significantly lower than that of its competitors. For 4x4's, Chrysler, as noted above, is the least capable in terms of CAFE. However, under the composite standard, Chrysler's CAFE exceeds that of Ford by a considerable amount. Since the combined standard option is now available to Chrysler, Ford's 4x4 CAFE was chosen to represent the least capable manufacturer. If Chrysler's CAFE was included, it would understate dramatically overall 4x4 fuel economy capability.

TABLE VI-1
NHTSA's PROJECTED CAFE'S FOR LIGHT DUTY TRUCKS (0-8,500 GVWR)
MY 1983-1985
(Ford as Least Capable)

MANUFACTURER	COMMENT	NHTSA CASE A 1983	NHTSA CASE A 1984	NHTSA CASE A 1985	NHTSA CASE B 1983	NHTSA CASE B 1984	NHTSA CASE B 1985
COMBINED STANDARD							
AM	4x4's only	20.3	21.7	22.3	20.2	21.2	21.5
CHRYSLER		20.6	22.9	27.0	20.3	20.4	25.7
FORD	*L.C.	20.4	21.8	21.8	19.0	19.3	19.4
GM		22.7	23.2	23.5	21.1	21.2	22.0
4x2's							
AM	N/A			CONFIDENTIAL			
CHRYSLER							
FORD	*L.C.						
GM							
4x4's							
AM				CONFIDENTIAL			
CHRYSLER							
FORD	*L.C.						
GM							

*L.C. = LEAST CAPABLE

Given Ford's current financial condition, there can be little doubt that Ford is in the most precarious situation relative to financing new model introductions. (Since Chrysler's loans are guaranteed by the Federal Government). The pace of new compact truck model introductions by Ford will determine Ford's competitiveness in the truck market, as well as its CAFE. Thus, Ford's large negative cash flow led the Agency to project no major capital expenditures for the purposes of this rulemaking, that might exceed the company's plans. This fuel economy level for Ford was chosen as the "maximum feasible" level attainable by the "least capable" manufacturer. That is, fuel economy standards set significantly higher than Ford's capabilities to introduce and sell new models could "severely strain" Ford's finances, and would ignore the "economic practicability" and "reduced competition" criteria.

Since Ford accounts for more than one-third of all light truck sales, their capability is an important enough factor to influence industrywide market considerations. For this additional reason, the Agency believes that setting standards at Ford's level meets the statutory requirements for "maximum feasibility."

Based on its analysis of Ford's economic and fuel economy capabilities, the Agency believes that the risk of setting standards significantly higher than Ford's capability might result in potential harm to the industry and the economy. This outweighs the benefits of any possible additional fuel savings.

These risks and the fuel savings that might be lost will be discussed below.

C. UNCERTAINTY

Every rulemaking action is clearly fraught with uncertainty. Yet the uncertainty associated with this rulemaking is certainly greater than in previous ones. The reason for this is that the vast majority of the potential increased fuel economy between MY's 1982-85 results from the introduction of new models. While laboratory tests and field demonstrations can show the fuel economy benefits of technological items such as different transmissions, axle ratio changes, or improved lubricants, the fuel economy benefits of this rulemaking are dependent on the miles per gallon ratings of vehicles which are predominantly not yet designed, let alone built or tested. Although the new compact trucks to be produced by the domestic manufacturers can theoretically attain extremely high fuel economy (up to 30 mpg), their actual efficiency will result from a combination of the manufacturers' perceptions of consumers' functional, aesthetic, and efficiency desires and of actual consumer demand for the vehicles produced. These, of course, can only be estimated at this time.

In previous chapters, the Agency has attempted to clearly state its assumptions upon which its estimate of manufacturer fuel economy capabilities were based. For the most part, these were single, point estimates of many of the variables affecting the level of manufacturer CAFE. Yet it is recognized that although these point estimates (e.g., sales volumes by manufacturer by vehicle class) represent our best judgment at this time, there is a range of uncertainty surrounding each of these numbers.

Attempting to place confidence intervals around each number would be an exercise in statistical futility. There simply is no historical or any other basis upon which to derive these limits. Instead, we have attempted to use our judgment, coupled with manufacturer and other expert forecasts, to determine what the future may bring.

Recognizing the uncertainty surrounding many of the assumptions and derived numbers presented earlier, we now examine the sensitivity of our results (i.e., manufacturer CAFE) to changes in several of the most important variables. Discussed in the following sections are the changes in company CAFE resulting from uncertainty associated with:

- The sales mix of 4x2's and 4x4's
- The mpg estimates for the new models
- The sales of the new models
- The inability to finance new model introductions

CAFE Sensitivity to Sales Mix of 4x2's and 4x4's

The percentage of light truck sales which have been four-wheel drive has been changing over time. During the light truck sales boom in the mid to late 1970's, 4x4's began to increase as a percentage of 0-8500 lbs GVWR light truck sales, increasing from 11.2% in 1970 to 28.9% in 1978. Because of this, the Agency, in June 1979, in its amendment to the 1981 truck standard, projected 4x4 sales to be 32 and 33 percent of total truck sales for MY's 1980 and 1981, respectively. In December 1979, for the NPRM, a constant 33 percent of MY 1982-85 sales was projected for 4x4's. This projection was retained until March 1980 when the MY 1982 final rule was promulgated.

However, with the drastic decline in truck sales during the latter part of 1979 and throughout 1980, 4x4 sales have fallen as a percent of the truck market. Accounting for 25.6 percent of Class I and II truck sales for the first 7 months of 1979, they have only amounted to 20.7 percent for the same period in 1980 (see Table VI-2).

Obviously, the mix of 4x2's and 4x4's will be dependent not only on their attributes, including fuel efficiency, but also on consumers' perceptions of gasoline supply and price. With such a dramatic reversal in 4x4 sales over the last few months, projections of mix 4-5 years hence must be viewed skeptically. Yet the importance of this mix to the estimating of CAFE and the setting of standards mandates that it be done. Our best guesses were shown in Part II, for Cases A and B. There, the mix ranged from 71/29 to 77/23 (see Table VI-3).

But as can be seen from the Table, although the Agency estimates of total sales in Cases A and B very closely bracket the industry's own estimates, the projections of 4x4 sales are low compared to the industry's. Although one company's projections of 4x4 sales account for most of this difference, it was decided to investigate the sensitivity of the CAFE's to mix changes.

In this sensitivity analysis, it was assumed that the Agency's estimates of both the mpg's and sales volumes of the domestic new compact trucks were accurate. The only variable which was allowed to change was the mix of 4x2's and 4x4's. In Table VI-4, a 5 percentage point mix shift was used (e.g., 75%/25% to 70%/30%). Thus, the mpg's of the 4x4's and 4x2's were assumed to be constant. The results of this analysis are shown in Table VI-4.

TABLE VI-2

Percent 4x4 Light Truck Sales

Company	January-July 1979	January-July 1980
AMC	100.0	100.0
Chrysler	19.3	12.8
Ford	25.0	19.8
GM	23.3	21.8
Other	9.0	5.6
TOTAL	25.6	20.7

TABLE VI-3

Projections of Mix

Estimate	Total Sales (000's)	Percent 4x4
MY 1983		
NHTSA A	2,374	29
NHTSA B	2,720	25
Industry Estimate*	2,535	32
MY 1984		
NHTSA A	2,765	26
NHTSA B	2,915	25
Industry Estimate*	2,910	29
MY 1985		
NHTSA A	2,880	24
NHTSA B	3,175	23
Industry Estimate*	3,016	30

*Individual manufacturer numbers are confidential.

TABLE VI-4

CAFE SENSITIVITY TO SALES MIX
(MPG CHANGE FOR A 5 PERCENTAGE POINT SHIFT IN MIX)

	Delta MPG		
MY 1983	GM	Ford	Chyrsler
Case A	0.05	0.14	0.26
Case B	0.05	0.11	0.24
Mfr. Estimate	0.08	0.10	0.30
MY 1984			
Case A	0.08	0.16	0.38
Case B	0.06	0.06	0.24
Mfr. Estimate	0.10	0.10	0.56
MY 1985			
Case A	0.10	0.16	0.55
Case B	0.08	0.08	0.50
Mfr. Estimate	0.10	0.14	0.85

The Table shows the following results:

- o Everything else being equal, there are measurable CAFE differences with reasonable variations in mix.
- o CAFE sensitivity to 4x2 and 4x4 mix is greater in the later years (e.g., 1985) than earlier.
- o Sensitivity to mix is greater for the smaller companies than for the larger ones.

In essence, GM's CAFE is not very sensitive to mix change. For any case for any year, a 5 percentage point mix change produces less than 0.1 mpg shift in CAFE.* The reason for this lack of sensitivity is that the difference in GM's 4x2 and 4x4 fleet mpg's is not great -- generally about 1.0 - 1.5 mpg.

Ford's sensitivity tends to be about twice GM's and Chrysler's about 2-4 times Ford's. Chrysler's CAFE is extremely sensitive to mix shifts because the gap between its 4x2 and 4x4 fleets is 4-9 mpg. In addition, the extremely low volume of Chrysler 4x4's affects the calculations. Although Chrysler's composite CAFE is the most sensitive to mix changes, this need only be of concern for MY 1983. In this MY, Chrysler's composite CAFE is close to Ford's -- in all other years, because of the very high fuel efficiency of its 4x2 fleet, Chrysler's estimated overall CAFE is the highest of all companies. However, under the Case B scenario, a switch of 20,000 4x2 sales to 4x4 sales would result in Chrysler having the lowest CAFE.

*On a composite (4x2 and 4x4) basis

Ford's CAFE changes by 0.1 to 0.2 mpg for a 5 percentage point (e.g., 75%/25% to 70%/30%) mix change. Because Ford estimated the highest 4x4 sales percentages and because Ford is the least capable company in this analysis, this is important. If Ford's 4x4's account for 5-10 percent more of its sales mix than the Agency's projections, then NHTSA has overestimated Ford's composite CAFE by 0.1-0.2 mpg, everything else being equal.

CAFE Sensitivity to MPG Estimates of New Models

The main increase in fuel efficiency beyond MY 1982 is estimated to come from the introduction of new, domestically produced, compact trucks. These would replace the less fuel efficient pickups, vans, buses, and utility vehicles that are now being produced. Since many of these vehicles have not progressed beyond the drawing board stage, their actual mileage efficiency is somewhat speculative. While in most cases, there are not large differences between the Agency's and the manufacturers' mpg projections, there are variations of as much as 1.0 mpg. To determine how differences in the mpg's of just the new compact trucks would affect CAFE, the effects of a 1 percent difference from the Agency's estimate were analyzed. Thus, if a new utility vehicle was projected to attain 22.0 mpg., the CAFE would be recalculated, for example, with this vehicle attaining only 21.8 mpg (1 percent less than 22.0 mpg).

In this analysis, only the mpg's of the newly introduced, domestically produced, compact pickups were varied. All variations were from the base mpg's calculated by the Agency. For the "manufacturer estimates" numbers, the Agency base mpg's were used -- along with the manufacturer's sales estimates. Table VI-5 shows the results of this analysis. Because Ford was estimated to be the company with the lowest projected CAFE, the sensitivity analysis is shown only for them.

As shown in the Table, CAFE is much more sensitive to new vehicle mph changes than it was for mix shifts. Therefore, the Case A CAFE's, which include the largest proportion of new vehicles -- 66 percent -- show the greatest change. Conversely, in Case B, where the new trucks are estimated to account for less than 25 percent of Ford's fleet, the CAFE sensitivities are least. Finally, the change in CAFE for a 1 percent shift in new truck MPG increases over time because the percent of new trucks in the fleet increases.

What is important to note is a 1 percent change in estimated new truck MPG accounts for nearly the same change in CAFE as does a 5 percentage point change in the 4x2 and 4x4 mix. Thus, it is much more crucial to be concerned with the former in the standard setting process.

CAFE Sensitivity to Sales Estimates of New Trucks

Of less certainty than the actual mileage of the new compact trucks is how many of them will be produced. Given the current instability in the truck market, it is difficult to predict with certainty the level of sales of these particular

TABLE VI-5

Sensitivity of CAFE to a 1 Percent Change in New Truck MPG
(For Ford Only)

Case	Change in CAFE (mpg) Model Year 1983	1984	1985
NHTSA A	0.07	0.12	0.13
NHTSA B	0.03	0.04	0.04
Mfr. Sales Estimates	0.05	0.08	0.09

vehicles. Future gasoline prices and supply, price, styling, and competitors' products will all determine the magnitude of sales.

In addition, truck buyers often purchase trucks for functional or utilitarian reasons. Truck purchasers often have certain load size (bed size) and weight carrying requirements that are beyond the capabilities of the new, domestic compact trucks. Others require a certain level of ground clearance or hauling performance for off-road, hill climbing, or work site activities. Market surveys commissioned by NHTSA indicated that truck buyers' major objections to compact trucks were:

- Loss of payload volume
- Loss of payload weight
- Loss of power
- Loss of vehicle weight
- Shortening of wheelbase

According to the same survey the advantages of the compact size trucks were:

- Improved fuel economy
- Adequate payload size

There was significant doubt among truck buyers whether the fuel economy savings were worth the payload compromises. Most truckers were disappointed that the bed of compact size pickups and vans could not accommodate the standard 4' x 8' sheet of paneling or dry wall, to satisfy home improvement needs.

Despite the reluctance of some consumers to accept compact trucks, real energy price increases (as noted in Part II) will force many consumers to make payload comprises. The product plans and forecasts of the manufacturers reinforce this view. In setting the 1983-1985 standards, NHTSA assumes that these small, domestic compact trucks will be well accepted. Case A assumes the compact share to be 60%, Case B, 31%.

Earlier, it was shown that the Agency total sales projections were generally within $\pm$ 5 percent of the industry's forecasts (although all of us could be wrong, of course). When these estimates were subdivided into 4x2's and 4x4's, the differences between the industry and NHTSA began to increase (e.g., NHTSA estimate of 23 percent 4x4's in 1985 vs. 30 percent projection by the manufacturers). Subdividing the 4x2 and 4x4 fleets even further into sales estimates for individual trucks increases the uncertainty inherent in such forecasts.

Because of this expected greater uncertainty, the sensitivity of CAFE to changes in the sales only of the new vehicles was examined. In this case, the estimated percent sales of only the new vehicles was varied by 1 percentage point -- not by 1 percent of its volume. For instance, if a new lightweight truck was estimated to account for 29.0 percent of a company's total sales, a new CAFE was calculated based on this percentage being only 28.0 percent. The loss in sales of the new vehicles was assumed to be offset by increased sales of the highest mpg vehicle it was estimated to replace. Thus, total sales were kept constant.

Table VI-6 shows the results of this sensitivity analysis. Again Ford is used for illustrative purposes.

The most important point shown by the Table is that small shifts in sales -- as low as 30,000 units -- from the new models to older ones -- have a 0.2 - 0.3 mpg effect on CAFE. This is the most sensitive of all the variables analyzed in this section. And, again, in the later years, where the greatest uncertainty over actual mpg's and sales lie, the sensitivity is the largest.

TABLE VI-6

CAFE Sensivity to a 1 Percentage Point Change in the Sale of New Models (Ford)

Case	CAFE Sensitivity (mpg) Model Year 1983	1984	1985
NHTSA A	0.21	0.23	0.28
NHTSA B	0.18	0.16	0.17
Mfr. Estimates	0.19	0.26	0.29

Inability to Finance New Model Introductions.

Ford, GM, and Chrysler have publicly announced their intentions to produce and sell new domestic compact pickups by the end of MY 1983. Capital expenditures--mostly engineering and tooling--for these programs have already begun. These programs are not in question. However, there is some risk whether other planned LDT programs will be able to be financed by the manufacturers. Our cash flow analyses for GM and Ford show the difficult financial position of these competitors. Given that car programs are of greater import than truck programs, it is doubtful that any planned capital expenditures for such programs as a new compact truck for Chrysler, GM or Ford in MY 1984-85, are locked in stone. If Ford, for example, had made plans for a compact truck, any delay in its introduction date in order to minimize its cashflow drain, could cause Ford's composite CAFE to fall a full mpg. That is, if Ford's composite CAFE was 21 mpg with the new compact truck included, Ford's CAFE could fall to 20 mpg without the new truck, everything else being equal.

SUMMARY

This section presented the results of an analysis of CAFE sensitivity to changes in:

- 4x2 and 4x4 mix
- MPG's of new trucks
- Sales percentages of new trucks
- New model introductions

The first three are summarized in Table VI-7.

TABLE VI-7

CAFE Sensitivities to a 1 Percent Change* in Several Variables
(Ford)

Case / Variable	MY 1983			MY 1984			MY 1985		
	Mix	MPG	Sales	Mix	MPG	Sales	Mix	MPG	Sales
NHTSA A	0.03	0.07	0.21	0.03	0.12	0.23	0.03	0.13	0.28
NHTSA B	0.02	0.03	0.18	0.01	0.04	0.16	0.02	0.04	0.17
Mfr. Estimate	0.02	0.05	0.19	0.02	0.08	0.26	0.03	0.09	0.29

* 1 percentage point change for 4x2/4x4 mix and compact truck sales; and 1 percent change in mpg estimates.

The interpretation of the results is obvious -- the variable for which the Agency has the least certainty, the consumer acceptance and resultant sales of the new models -- has the largest effect on CAFE. An overestimate by as little as 30,000 sales of the new vehicles Ford plans to produce could result in a CAFE shift of 0.3 mpg.

A new compact truck introduction, for example, would add about one mpg to Ford's composite CAFE in all cases.

Recognizing the uncertainty inherent in point estimates, especially for something as difficult to predict as the sales 5 years hence of a vehicle which has not yet been produced, has led the Agency to consider the impacts of uncertainty in setting the MY 1983-85 light truck fuel economy standards.

D. SETTING THE LEVEL OF THE STANDARDS.

In setting the numerical levels for the standards, we will discuss each of the three model years, 1983-1985, individually. Case A and Case B bound the relevant range; and, Ford is assumed to be the "least capable" manufacturer. The level of the standards is the Agency's best estimate of the "maximum feasible" upper mpg boundary that is "economically practicable."

Model Year 1983.

In setting the MY 1983 standards, it should be noted that the MY 1982 separate standard for 4x2's is 18 mpg; the separate 4x4 standard is 16; there is no composite standard for MY 1982. If there had been a composite standard for MY 1982, using a 75%/25% split of 4x2/4x4 sales, it would have been set at 17.5 mpg.

MY 1983 CAFE Light Truck
(Ford as Least Capable)

Combined 4X2's 4x4

	Combined	4x2's	4x4's
Case A--Ford	20.4	21.1	18.5
Case B--Ford	19.0	19.5	17.4
NHTSA STANDARD	19.0	19.5	17.5

In setting the MY 1983 fuel economy standards for light trucks, the Agency has selected the conservative Case B scenario across the board. A manufacturer is required to meet a light truck CAFE of 19.0 mpg by MY 1983, or it can elect to meet the separate 4x2 and 4x4 options of 19.5 and 17.5, respectively. The MY 1983 combined standard of 19 requires a 1.5 mpg increase in fuel economy effort over MY 1982 (17.5). The individual separate standards are also 1.5 mpg above their MY 1982 levels (i.e., 19.5 over 18 for 4x2's and 17.5 over 16 for 4x4's).

Model Year 1984.

In MY 1984, the 4x4 level chosen was right on target with the conservative Case B level (18.5). However, the Agency believes that the sales of Ford's new compact pickup (4x2) should exceed Case B sales volumes. Consequently, the 4x2 standard set by the Agency reflects this assumption (20.3 vs. 19.5 for Case B).

MY 1984 Light Truck CAFE
(Ford as Least Capable)

	combined	4x2's	4x4's
Case A--Ford	21.8	22.5	19.8
Case B--Ford	19.3	19.5	18.5
NHTSA STANDARD	20.0	20.3	18.5

The combined level for the MY 1984 standard (20.0) shows a 0.7 mpg increase over the case B level (19.3), reflecting NHTSA's belief that the increased sales volumes of compact pickups will be higher than the Case B projections. The 20.0 combine standard is roughly consistent with an 80%/20% split in 4x2 and 4x4 sales, slightly different from Ford's historical average (75%/25%). This reflects the Agency's (1) doubtful outlook on a recovery in 4x4 sales and (2) its policy of encouraging fuel economy on the part of those manufacturers who might try to hide behind the combined standard and sell a "rich" mix of standard size 4x4's. The combined and 4x4 standards are only one mpg higher than the MY 1983 standard, and the 4x2 standard is only 0.8 mpg higher.

Model Year 1985.

The standards set for MY 1985 encourage Ford to produce and sell a "lean" mix of light trucks; that is, a high percentage of compacts. The separate standards are significantly lower for Ford than Case A. Though these MY 1985 standards might place some pressure on Ford, the pressure from the market is expected to greatly surpass anything the Agency establishes.

MY 1985 Light Truck CAFE
(Ford as the Least Capable)

	Combined	4x2's	4x4's
Case A--Ford	21.8	22.5	19.5
Case B--Ford	19.4	19.7	18.4
NHTSA STANDARD	21.0	21.6	19.0

The table shows that the MY 1985 standards fall between Case A and Case B with a definite lean towards Case A. It should be noted that, in developing the 4x2 standard, the Agency assumed a greater percent of compact pickup sales than did Case B or Ford. In running sensitivity analyses on Ford's MY 1985 CAFE, a number of alternative scenarios were examined with compact truck mixes ranging between Case A and B levels. It was felt that a middle ground between Case A and Case B--shaded towards Case A--would provide Ford with a sufficient margin for "market risk." Note that the standards were set well below the Case A levels. The separate 4x4 standard only requires a 0.5 mpg effort over MY 1984 (19 over 18.5). The increased compact share has increased the combined standard one full mpg over MY 1984 (21 over 20) and the 4x2 standard slightly more (1.3 mpg--21.6 vs 20.3).

PART VII

IMPACTS OF THE FINAL RULE

VII. Impacts of the Final Rule

This part of the Regulatory Analysis discusses the impacts of the final rule on the manufacturers, consumers, and the national economy. It parallels the analyses presented in Parts IV and V, under Case A and Case B, which were intended to provide supporting data for the final rule. Thus, this part will include a section by section analysis of Parts IV and V, using the same methodology. We assume that each domestic manufacturer only meets the composite standards of 19.0 mpg in MY 1983, 20.0 mpg in MY 1984, and 21.0 mpg in MY 1985, and that the imports meet an average level of 28 mpg in all three model years, 1983-85.

While Part VI discusses the fact that the standards were set between Case A and Case B for Ford (the least capable manufacturer), this does not necessarily mean that the capital requirements or fuel savings of the final rule will be between Cases A and B. According to our analysis, GM, AM and Chrysler would exceed the 1985 composite standard of 21.0 mpg, even for Case B; and, the industry average for Case B is 22.2 mpg in MY 1985. Thus, capital requirements, fuel savings and other effects of each manufacturer just meeting the final standards will be shown in most cases (i.e., other than for Ford) to be less than for Case B. For example, in Case B total estimated industry capital requirements are $5 Billion (including launch and engineering), while the final rule's capital requirements are estimated to be only $3.8 billion.

A) Capital Requirements, Launch and Engineering, and Total Investments

Using the projected manufacturer's fuel economy capabilities, a determination was made of the new models, engines, and transmissions each manufacturer would need to meet the standards. The capital requirements associated with these fuel economy improvements were determined by using Appendix A. Launch and Engineering were determined by using the percentages assumed previously in the analysis (Part IV). Total investments are just the addition of capital requirements and launch and engineering.

The assumptions used for determining the capital requirements associated with the final rule of 21.0 mpg as a composite standard in MY 1985 are:

Table VII-1

Capital Requirements, Launch and Engineering, and Total Investments (millions of constant 1980 dollars)

	Capital Requirements	Launch and Engineering	Total Investments
General Motors	1070	CONFIDENTIAL	
Ford	1035		
Chrysler	240		
American Motors	280		
Total	2625	1175	3800

The results of this analysis are that capital requirements needed to meet the final rules are estimated to be $2.6 billion for the industry, with GM and Ford spending about four times the amount of Chrysler and American Motors.

Launch and engineering expenses for the industry total $1.2 billion, for an estimated total investment of $3.8 billion. This is less than the estimated total investments for either Case A ($6.8 billion) or Case B ($5.0 billion), because, to meet the standards, three of the four companies need no capital spending for MY 1985.

B) Retail Prices

Unlike previous rulemakings, where new fuel economy improving technologies had been added to existing vehicles and retail price increases were applicable to existing vehicles, the retail price increases associated with this rulemaking mainly depend upon the mix of vehicles in the fleet. Using the assumed retail price for each type of vehicle and the new model introductions assumed in developing the capital requirements for the manufacturers to meet the standards, the average retail price is $6175. This is a $65 increase over the 1982 baseline. The price increase for each manufacturer is $80 for GM, $50 for Ford, $30 for Chrysler, and $0 for American Motors.

C) Operating Cost Savings

A harmonic average on-road mpg assuming the domestic manufacturers just meet the composite standards and assuming that imports get 28 mpg each year is presented in Table VII-2. As in Part IV, on-road mpg is assumed to be 89% of EPA estimated mpg. Using these on-road mpg's, the average operating cost savings per vehicle can be determined based on the same methodology used in Part IV. The operating cost savings are $726 in 1982, when the compact pickups enter the fleet and greatly increase the mpg. By 1985 the cumulative operating cost savings over MY 1982 are $1250. These gasoline cost savings far outweigh the retail price increases. As was discussed previously in Part IV, if the harmonically averaged mpg projected for MY 1980 of 18.4 mpg (EPA estimate) or 16.38 (on-road estimate) were used as a baseline for MY 1982, this higher baseline would reduce the MY 1983 operating cost savings as well as the cumulative savings in MY's 1984 and 1985 by $236.

Table VII-2

Lifetime Operating Cost Savings
of meeting the final rules
($/vehicle)

	Harmonic Average On-Road MPG	Present Value of Operating Cost Savings Over Previous Model Year ($ 1980 Dollars)	Cumulative Present Value of Operating Cost Savings Over 1982 ($ 1980 Dollars)
MY 1982	15.84	---	---
MY 1983	17.62	726	726
MY 1984	18.33	255	981
MY 1985	19.14	271	1252

D. Cash Flow

The capital spending, profits, and cash flow for Ford, shown on Tables IV-10 to IV-12 under analysis #3 (Case A), would be identical to a cash flow analysis based on the final rule. This occurs because, in order to meet the final standards, Ford must use all the capital investments projected in Case A. If our analysis is correct, Ford will have more than a $7 billion cash flow deficit over the 5 year period 1980-1984.

For GM, capital requirements of the final rule are $760 million less than they would have been in Case B. This means that its profits and cash flow would be slightly better in 1983 and 1984. GM's cash flow deficit over the 5 year period 1980-1984 would be about $4 billion.

E. Effect on Petroleum Consumption

The effect that the final rules will have on petroleum consumption will be examined in two different ways. First, the lifetime consumption of gasoline of the MY 1983-85 light trucks will be analyzed. Second, the effects the final standards will have on gasoline consumption will be considered for each year.

Using the harmonic average on-road mpg of the final standards, as shown in Table VII-2, total gasoline consumption is shown for each model year in Table VII-3. In developing Table VII-3, it was assumed that the domestic manufacturers just meet the final standards and that the imports average 28 mpg (EPA). Case A sales assumptions were used.

TABLE VII-3

TOTAL NEW LIGHT TRUCK LIFETIME GASOLINE CONSUMPTION
(128,195 MILES TRAVELLED)
(BILLION GALLONS)

MY	Gasoline Consumption Assuming Final Rules are met	Gasoline Consumption Assuming New Models Only Meet MY 1982 Standards	Gas Savings
1983	19.935	22.175	2.240
1984	21.611	25.008	3.397
1985	21.466	25.938	4.472
TOTALS	63.012	73.121	10.109

If the manufacturers only met the MY 1983-85 standards, this would result in a savings of 10.1 billion gallons or 240 million barrels. This is 14% less fuel than the three new light truck fleets would have used, if their fuel economy did not improve over the MY 1982 standards.

One alternative discussed in Part V, was to use the projected MY 1980 light truck fleet harmonic mpg as a baseline instead of the MY 1982 standards. The MY 1980 projected average is 18.4 mpg (EPA estimate) as compared to the MY 1982 standards of 17.8 mpg including imports. If the MY 1980 projected average is used as a baseline in Table VII-3, the total gas savings for the three models years would be 7.695 billion gallons. This amounts to an 11% decrease in fuel consumption.

Another way of examining petroleum consumption is by calendar year. Table VII-4 shows fleet fuel consumption for light trucks, assuming a baseline of no improvement over MY 1982 standards and the effect on fuel consumption if the new light truck fleet just meets the final rules. These numbers assume total sales levels of Case A. Also, they reflect fuel consumption for the total light truck fleet, not just for the new models.

TABLE VII-4
LIGHT TRUCK FLEET FUEL CONSUMPTION BY CALENDAR YEAR
(BILLIONS OF GALLONS)

Calendar Year	Fuel Consumption Assuming no mpg Improvements over MY 1982 Standards	Fuel Consumption if New Light Trucks Meet the Final Rule	Fuel Savings Over My 1982 Standards
1981	24.3	24.3	____
1982	23.9	23.9	____
1983	23.9	23.6	.3
1984	24.1	23.4	.7
1985	24.3	23.2	1.1
1990	25.7	22.7	3.0
1995	26.2	22.2	4.0
2000	26.4	21.9	4.5
2005	26.4	21.9	4.5

Table VII-4 shows that annual fuel savings reach 1.1 billion gallons in 1985 and 4.5 billion gallons by the year 2000. If one compares these to total U.S. demand for crude oil in 1979 of 222.3 billion gallons (Table I-1), 1985 savings are 0.5% of U.S. demand, while in 2000, the savings are 2.0%. The table shows that, if no improvement is made to light truck fuel economy, total light truck fuel consumption increases by 1990 above the 1981 projected levels. However, the effect of the final rules for MY's 1983-85 is to decrease total light truck fuel consumption by over 2 billion gallons by 1990.

Another alternative would be to use the projected MY 1980 harmonic average of 18.4 mpg (EPA estimate) as a baseline estimate. Using the higher baseline, fuel savings would be 0.8 billion gallons in 1985 and 3.7 billion gallons in 2005. Thus, the difference in savings between the two baselines are 0.3 billion gallons in 1985 and 0.8 billion gallons by 2005.

F. Impact on the U.S. Balance of Trade

The impact these final rules will have on petroleum savings will result in the reduction of oil imports and the subsequent decrease in the value of imported goods. In 1985 savings of 1.1 billion gallons or 26 million barrels of oil (42 gallons per barrel) would be valued at $780 million (assuming $30/barrel as the cost of imported oil). In 2000, savings of 4.5 billion gallons or 107 million barrels of oil would mean that imports would be reduced by $3,210 million.

G. Societal Cost/Benefit

A societal cost/benefit analysis could be made by comparing the major costs (capital investments and retail price increases) to the major benefit (the value of fuel saved expressed as the present value of operating cost savings). Such an analysis was made for the three MY's 1983-85, based on Cases A and B, and the final rule, as compared to a continuation of the MY 1982 standards.

The results of this analysis are that the cost to benefit ratio is about .5, or benefits outweigh costs by a ratio of 2 to 1.

TABLE VII-5

SOCIETAL COST/BENEFIT
(million dollars)

	Total Capital Investment	Total Retail Price Increase	Total Costs	Total Operating Cost Savings	Cost Benefits
Case A	6,755	838	7613	14,785	.51
Case B	4,985	718	5703	11,943	.48
Final Rule	3,800	599	4399	9,033	.49

APPENDICES

APPENDIX A

CONFIDENTIAL

APPENDIX B

CASH FLOW ASSUMPTIONS

Cash flow analyses were performed for GM and Ford to estimate the financial impacts of capital spending levels planned for the early to mid-1980's. No analysis was prepared for AM because of the uncertainty surrounding its eventual financial capabilites after its relationship with Renault reaches fruition. No analysis was performed for Chrysler because of the availability of Treasury Department and Chrysler Loan Guarantee Board reports which examine Chrysler's financial future in much greater detail.

The analyses follow the same general approach and format as those performed for the MY 1982-1985 light truck fuel economy Rulemaking Support Paper and Preliminary Regulatory Analysis (December 1979). Both analyses focus on North American Automotive Operations (NAAO) to place capital investment impacts in the proper context of North American (U.S. and Canada) automotive financial activity rather than that of total corporate operations. Both passenger cars and trucks are included in NAAO because commonality of investment, components, marketing systems, and other overhead costs preclude meaningful disaggregation. Calendar years (CY) 1980-1985 are presented. The year 1980 is shown mainly to allow comparisons between the calculated results and media and analyst speculations concerning likely 1980 financial performance. The years 1981-1984 are the primary years during which investments will be made to bring car and truck fuel economy up to 1985 MY levels. The year 1985 is shown merely as a convenient end point. The analyses were performed in nominal dollars to more accurately reflect the behavior of various accounts. However, all figures presented here have been adjusted to 1980 dollars for ease of comparison between years. Finally, the usual caveat must be noted that these figures are not forecasts of future financial performance; they are merely indicative of recent sales and financial trends for GM and Ford.

Assumptions

A. Inflation Adjustment

As indicated above, the cash flow analyses were performed in nominal dollars (that is, 1981 financial results were estimated in 1981 dollars, and so forth), but were then adjusted to 1980 economics for presentation. In addition, inflation adjustments were needed to convert non-1980 dollar estimates (such as revenue per unit) into 1980 economics. The values used for the adjustments were taken from the Data Resources Inc., Summer 1980, U.S. Long-Term Review, TRENDLONG0680 projection for the GNP deflator. The GNP deflator was applied, rather than the consumer price index as used in the NPRM, because it more accurately represents the rate of cost increases experienced by the manufacturers. The assumed values are shown in Table B -1.

TABLE B -1

Inflation Rates by Calendar Year
(Change in GNP Deflator)

Year	Inflation Rate
1979	8.9%
1980	9.0
1981	9.5
1982	9.6
1983	8.4
1984	8.0
1985	7.9

SOURCE: Data Resources Inc., U.S. Long-Term Review, Summer 1980.

B. Revenue and Variable Cost

The baseline unit revenue estimate for each firm was derived from their 1979 annual reports, using the procedure outlined in Table B-2. The estimated 1979 unit revenues are $6,842 and $6,395 for GM and Ford, respectively, in 1979 dollars. These translate to $7,458 and $6,974, respectively, in 1980 dollars.

The variable cost per unit assumptions used in the NPRM were those which best fit 1978 financial results for each firm. For this analysis, essentially the same figures were used, except for a slight increase (about 2%) in the GM unit variable cost. This resulted in a better fit with 1979 GM financial performance. The final values used were $5,472 for GM and $5,600 for Ford.

When projecting into the future, NHTSA focused on the difference between variable costs and revenues (the variable margin) rather than variable costs or revenues per se. This difference represents the income available to cover expenses which are generally considered to be fixed such as depreciation, administrative salaries, interest expense, pension costs, etc.

The variable margin assumptions used for both firms were that margins decline 20 percent in 1980 from 1979 levels. In CY 1981, they return to 1979 levels. After 1981, they increase linearly so that 1978 variable margins are re-attained in 1985. The values used are provided in Table B-3.

The decline from 1979 to 1980 is consistent with Ford's apparent experience between 1978 and 1979. If one assumes that Ford's variable costs increased no faster than the GNP deflator in 1979 (8.9%), North American automotive margins dropped 21% in one year ($1,734 to $1,374 per unit in 1980 dollars). The major cause of this decline was an unanticipated shift in demand from large cars to small cars and a virtual collapse of the truck markets. This trend has continued in 1980, exacerbated by the general economic decline in the U.S. economy.

General Motors apparently experienced a much smaller margin deterioration in 1979 (NHTSA estimates about 3 percent) than Ford did. However, it appears to be sliding much further in 1980 as evidenced by the company's $257 million loss so far this year. Rebates have cut heavily into unit margins, and the general softness of the market has lessened automakers' ability to pass through cost increases.

TABLE B-2

Derivation of 1979 Revenue per Unit for North American Automotive Operations

	GM	Ford
North American Revenue	$54,172 million	$26,790 million
Nonautomotive Revenue	$4,305 million	$3,615 million
North American Automotive Revenue	$49,867 million	$23,175 million
Car and Truck Units	7.288 million	3.624 million
Average Revenue/Unit	$ 6,842	$ 6,395

SOURCES: 1979 annual reports to shareholders.

TABLE B -3

Assumed Unit Variable Margins by Calendar Year
(1980 dollars)

	GM	FORD
1978	2044	1734
1979	1986	1374
1980	1589	1100
1981	1986	1374
1982	2001	1464
1983	2015	1554
1984	2030	1644
1985	2044	1734

To achieve a return to 1978 margins by 1985, the companies must succeed in completely passing through all variable cost increases or offset them through productivity improvements. Variable cost increases are expected due to fuel economy, safety, and emission standards, and these will be extremely difficult to pass through completely without resulting in sales losses. Contributing to this difficulty will be the domestic manufacturers' inferior cost positions compared to Japanese competition and the expected continuing lack of demand for the large rear-wheel drive cars and trucks that will still be offered for sale by domestic manufacturers through much of the 1980-1985 period.

Productivity improvements associated with new models and production facilities must be relied on heavily to offset these cost increases. In addition, domestic manufacturers must get higher margins on small vehicles since these will comprise the bulk of sales in the mid-1980's. Historically, margins have been quite low on small cars. Increasing consumer demand has raised these margins, but it is not likely that they will stabilize at the historically high levels of standard-sized cars and light trucks. This is because competition will be intense in this market segment in the mid-1980's as supply is brought into balance with demand.

C. Unit Sales

The unit sales projections (see Table B -4) include U.S. and Canadian sales of passenger cars and light, medium, and heavy trucks. The 1980 sales are based on a continuation of sales rates for the first half of this year. The 1981-1985 light truck sales estimates are based on the Case A projection.

TABLE B -4

Assumed North American Car and Truck Sales
(millions of units)

Year	GM Cars	GM Trucks	Ford Cars	Ford Trucks
1980	4.70	1.22	1.72	0.95
1981	4.76	1.43	1.86	1.02
1982	5.52	1.47	2.20	1.09
1983	5.79	1.64	2.34	1.20
1984	6.06	1.70	2.49	1.37
1985	6.23	2.02	2.61	1.40

The 1981-85 medium and heavy truck sales estimates are from NHTSA's internal projection of 300,000 in 1981 and 350,000 annually during 1982-85. Market shares are 25 percent for Ford and 27 percent for G.M. The 1981-85 passenger car sales are based on the DRI TRENDLONG0680 projection. GM's and Ford's market shares trend upwards toward 48 percent and 20 percent, respectively, by 1985. Ford's market share rises from its January-June 1980 level of 16.8 percent to 18 percent in 1981, 18.5 percent in 1982, 19 percent in 1983, and 19.5 percent in 1984. GM's market share rises from its first half 1980 level of 45.5 percent to 46 percent in 1981, 46.5 percent in 1982, 47 percent in 1983, and 47.5 percent in 1984. Canadian sales add about 11.5 percent to GM's U. S. car and truck sales and 11 percent to Ford's.

D. Fixed Costs

The December 1979, NPRM used a 1978 estimate of $3,911 million ($4,645 million in 1980 dollars) for Ford and $5,444 million ($6,462 million in 1980 dollars) for G.M. Press stories this year (Wall Street Journal, April 16, 1980) have indicated that Ford will attempt to cut operating costs in North American by $1.5 billion annually to reduce losses. Specific actions include elimination of 6,100 white collar employees, closing of at least four plants, and reduced operations at others. This will result in a reduction of capacity, limiting Ford's ability to respond to any upswing in market demand. In addition, any engineering expense reductions occurring as part of Ford's effects to trim costs in North America may affect Ford's ability to offer new high-quality fuel-efficient vehicles in a timely fashion.

For analytical purposes, it was assumed that the maximum reduction in the fixed operating cost area was $1 billion on an annual basis. It is likely that at least $500 million of the $1.5 billion reduction is in the variable cost area; these are already counted in this analysis as overall variable cost reductions as volume declines.

In 1980, a fixed cost savings of $500 million was assumed. The full savings are not immediately available because the cutbacks were spread throughout the year with some not taking place until year end, and severence pay and other cutback-related expenses mean that it will be some time before the complete savings are realized. The full $1 billion was assumed to be achieved in 1981. Rising sales volume in 1982 results in an increase in operating costs; the savings decline to $750 million. Further increases in sales volume during 1983-85 reduce the annual savings to $500 million.

General Motors has also announced salaried work force cutbacks this year. The most significant reduction was the decision to lay off 10 percent of GM's 180,000 worldwide salaried employees (Wall Street Journal, April 28, 1980). GM did not announce the potential magnitude of the saving. If one assumes the average salaried worker earns between $30,000 and $35,000, the savings could range from $540 million to $630 million.

As in the case of Ford, full savings are not immediately achieved, mainly due to severence pay expenses. Laid-off workers with one year or more of company service get severance allowances of 75 percent of their base pay for six months and 60 percent for the next six months (Detroit Free Press, April 26, 1980).

This analysis assumed the corporate savings would be $600 million. Since NAAO contributed about 75 percent of GM's corporate revenues in 1979, three-quarters of the savings, or $450 million, was allocated to North America. It was also assumed that the savings would only occur in 1981; staff would be rehired as sales recovered in 1982. This is consistent with GM statements that the company would bring back many of these workers as the economy improves (American Metal Market/Metalworking News, June 2, 1980).

E. Capital Spending

Capital spending estimates used were based on manufacturers' pronouncements. The estimates used in the NPRM were derived by NHTSA by building them up from an assumed product plan. While this approach closely approximates manufacturers' capital spending for new product programs (and vehicle pollution control standards compliance), it excludes investment in areas such as plant pollution control, medium and heavy truck programs, capitalized maintenance of existing tools and facilities, other government regulatory requirements, productivity improvements, and other non-product capital spending (such as engineering facilities, wind tunnels, etc.). As a consequence, NHTSA's capital spending estimates are about 30 percent below GM's and Ford's announced levels. Rather than adjusting NHTSA's estimates upward, the industry figures were used.

The assumed capital spending levels for Ford's North American Automotive Operations were $2.1 billion annually, in nominal dollars, between 1980 and 1984 (Wall Street Journal, May 9, 1980). These 1980-1984 spending levels represent a $500 million average annual cutback from the company's previous plan. Ford had previously announced that two-thirds, or $2.6 to $2.7 billion, of its projected $4 billion average annual worldwide corporate investment during this time frame would be spent in North America (1979 Annual Report, page 5). The $500 million average annual retrenchment, \$2.5 billion in total, includes program deferrals, maintenance delays, and reductions in the number of models and options. A continuation of the nominal spending levels was assumed for 1985.

GM's capital spending assumptions are based on the company's announcement that it will spend \$40 billion between 1980 and 1984, with about 80 percent earmarked for North America (Automotive News, July 14, 1980, page 6). When adjusted for inflation, this translates into about \$5.3 billion annually in 1980 dollars. The same level was assumed for 1985.

F. Dividends

It was assumed that dividend payouts are allocated to North America Automotive Operations on the basis of its fraction of total corporate revenue. The estimated 1979 factions of 75 percent for GM and 55 percent for Ford were used in these analyses.

The Ford 1980 dividend is based on the current rate (\$1 per share for the first two quarters and \$0.30 per share for the second two quarters for a total of \$2.60). The 1981 dividend equals the 1980 dividend in nominal terms (\$2.60 per share or \$0.65 per quarter). The 1982-1985 dividends return to the real historical average of about \$4 per share.

The GM 1980 common stock dividend is based on the current rate of \$2.95 per share. The 1981 dividend is \$3 per share in nominal terms. The 1982-1985 dividends return to the real average during the 1970's of approximately \$7 per share.

General Motors pays a nominal preferred stock dividend of \$12.9 million annually. Three-quarters of this, or \$10 million, is charged to NAAO.

G. Debt Repayments

The fractions of corporate debt principal repayments allocated to North American Automotive Operations are the same as in the dividends case above. The 1980-1984 repayment schedule for each firm was taken from the companies' 1979 annual reports. This includes only debt outstanding as of the end of that year. The 1985 payment for GM was assumed to be zero. The 1985 Ford payment is based on the due date for \$250 million of \$400 million in new long-term debt that the company acquired in early 1980.

APPENDIX C

Regulatory Analysis Review Group Comments:

The Regulatory Analysis Review Group (RARG) has been charged by the President to review significant regulations and to provide comments and recommendations to improve these regulations. The RARG recommendations and the Agency's disposition of these are as follows:

Recommendation (1) Use the following two-step procedure:

Step 1. Determine which fuel economy modifications will generate fuel savings greater than their resource costs.

Step 2. Determine whether taking into account two additional factors -- benefits of oil import reduction not reflected in gasoline prices, and consumer costs associated with sacrifices in truck performance -- changes the set of measures that appear desirable.

Discussion: Step 1. First, on an industry-wide basis, our analysis has clearly demonstrated that societal benefits outweigh societal costs by a substantial margin. The ratio of lifetime operating cost savings to costs, both industry capital costs and consumer costs, is over 10 to 1. Lifetime operating cost savings to consumer costs yield a ratio over 19 to 1. Second, unlike previous rulemaking, the manufacturers are not just improving fuel economy, for example, through a modified transmission; they are introducing a whole new fleet of fuel efficient light trucks--compact pickups, vans, and sport utilities. The market, as well as fuel economy standards, has provided the impetus for the introduction of these new compact trucks. Each manufacturer must downsize to remain competitive and preserve its market share. In light of this, to disaggregate each capital spending event for each manufacturer for the purpose of a benefit/cost ratio is to miss the point of this fleetwide downsizing. Third from the consumer standpoint alone, each new model introduction is cost beneficial; lifetime operating cost savings exceed consumer costs (estimated retail price increases) in every instance.

Discussion: Step 2. While a stable, strong dollar on the international currency markets would be undoubtedly of great importance to the nation, we do not know how to impute a dollarized value to the effect of reduced import oil payments to achieving these goals. Likewise, we do not know how to dollarize the value to our national security for decreased dependence on foreign oil. Because it is difficult to make interpersonal utility comparisons, it is difficult to develop a consistent cost associated with sacrifices in truck performance. For example, just because Mr. A is willing to pay an extra $700 to purchase a conventional pickup, and an extra $1,250 in lifetime operating costs (for gas), to achieve certain payload volume requirements does not mean Mr. B will be willing to do the same.

Despite the fact that we are unable to impute these values, we do not believe that the addition of these factors to our costs or benefits would change any of our conclusions. Lifetime operating fuel savings average over $1,250 per vehicle, at least $500 more than our estimated retail base price differential between a mini-pickup and a conventional pickup. Lessened dependence on foreign oil for national security and a more stable dollar would only add to our benefits--which are already well in excess of costs. And, the individual consumer is not forced to buy a compact pickup, he may choose between a wider range of trucks than ever before--mini's, compacts, or standard-sized light trucks.

Recommendation (2) Take into account the effect of truck fuel economy standards on the manufacturers' ability to improve automobile fuel economy, given constraints on their financial capability.

Discussion: One of tne initial assumptions in the cash flow analyses was that the passenger car fuel economy standards are final rules and that the capital costs of the manufacturers' meeting these standards is a given. That is, light truck capital requirements beyond MY 1983 compact pickups were seen as discretionary projects which would only be funded if financing were available. While the Agency's analyses show large negative cash flows, the Agency can not identify a maximum expenditure level for a manufacturer. Thus, the Agency has no way of knowing whether a certain fuel economy standard level for light trucks would change a manufacturers' plans and force it to forego a passenger car investment. However, all of the manufacturers indicated that they would have the finances available to introduce these new light truck models.

Recommendation (3) Update cost and effectiveness estimates of fuel economy modifications to ensure that the standards are based upon the most accurate available data.

Discussion: This has been done to the extent possible.

Recommendation (4) Consider using an alternative classification scheme that sets a composite standard based on fleet mix for each manufacturer, thus encouraging manufacturers to meet fuel economy objectives at lowest cost.

Discussion: This is discussed in Part VI.

Recommendation (5) Increase the advantages of the non-compliance penalty by eliminating the stigma of illegality, expanding the carry forward and carry back provisions to more than one year, and allowing credit offsets between truck classes (if classes are used instead of the composite-standard approach).

Discussion: The Automobile Fuel Efficiency Act of 1980, Section 6, expanded the carry forward and carry back provisions to three years. It also eliminated the "unlawful conduct" stigma in cases where credits were already available to fully offset penalities which would be incurred. The third recommendation in this part is not applicable, since a composite standard is being set for MY's 1983-85.