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COMMITTEE ON WAYS AND MEANS
U.S. HOUSE OF REPRESENTATIVES

The Energy Crisis and Proposed Solutions

PREPARED STATEMENTS PRESENTED IN PANEL DISCUSSIONS

ON THE SUBJECT OF

AUTOMOBILE EFFICIENCY AND CONSERVATION

DOCUMENTS
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FOR TRANSPORTATION PROGRAMS
ENERGY CONSERVATION AND ENVIRONMENT

FEDERAL ENERGY ADMINISTRATION

Mr. Chairman and Members of the Committee:

I appreciate this opportunity to appear before you today to discuss automobile fuel economy. I would like specifically to focus on the various policy options available to influence fuel economy.

The gap between domestic demand for energy and domestic supplies has been filled over the last 10 years by an increasing reliance on imported petroleum. In 1960, the United States imported only 15% of its petroleum requirements. By 1973 this figure had grown to 35% or 6 million barrels per day. And in 1974, even accounting for the reduced consumption caused by the embargo and last year's price increases, our imports grew to 38% of our total consumption, or 6.4 million barrels per day. If this trend continues unaltered, our projections indicate that by 1985 we will import up to 12.7 million barrels per day, or more than half our oil needs. It is this intolerable vulnerability that must be reduced by a set of energy policy actions. Any energy strategy aimed at lessening our dependence on imported petroleum must institutionalize reductions in demand. Conservation actions are especially important in the transportation sector, since all of the energy it uses comes directly from petroleum.

The Transportation sector accounts for 25% of total U.S. energy consumption and about 60% of U.S. petroleum consumption.

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Motor vehicles consume about 77% of transportation energy or almost one-fifth of all U.S. energy. In 1972, passenger cars alone used almost 14% of our total energy, and over 28% of our total petroleum consumption or 4.7 million barrels per day. Passenger cars consumed even more petroleum in 1974. This represents an increase of almost 50% since 1950, and is the result of a 10% decrease in automobile fuel economy since 1950 and a 170% increase in the total number of vehicle miles traveled by passenger cars since 1950. As a result, we have focused considerable attention on exploring the available ways to reduce energy consumption by the transportation sector, and more specifically, to reduce automobile fuel consumption.

There are essentially two ways to reduce automobile fuel consumption. The first, which we are discussing today, is to improve new car fuel economy. The second way, of equal if not more importance, is to reduce the number of vehicle miles traveled each year. Several policies have both effects, in varying proportion.

The President's energy program addresses the problem of reducing total vehicle miles traveled by increasing the cost of petroleum relative to other consumer costs, and thereby providing an economic incentive for motorists to drive less. Implementation of the President's program--specifically the

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petroleum import fees and the President's comprehensive petroleum tax and decontrol program--is expected to increase gasoline prices by at least 10¢ per gallon. The Federal Energy Administration is planning to propose regulations which require that a larger proportion of those tax increases be applied to gasoline. This tilt toward gasoline could ultimately lead to gasoline price increases of 15¢ per gallon.

It is important for members of this Committee to understand that the reason the President is relying most strongly on increasing the price of petroleum products is because savings due to increased prices accrue immediately and rapidly, while savings due to improved automobile fuel economy accrue relatively slowly. Increased gasoline prices cause an immediate reduction in inessential driving, while it takes about 10 years for the full effects of improved new car fuel efficiency to be fully reflected in the total automobile fleet since new cars enter the fleet at a relatively slow rate. Yet there is no question that in addition to increasing prices, it is incumbent upon us to improve new car fuel economy.

We have spent the last eight months working on the issue of improving new car fuel economy by obtaining voluntary commitments from the auto manufacturers to improve the production weighted average fuel economy of their new cars 40% by 1980. Measured against the 1974 model average of 14.0 miles per

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gallon, the 40% gaol translates into a production weighted average fuel economy of 19.6 miles per gallon for 1980 models, or a 29% reduction in new car fuel consumption.

Achievement of the 40% goal alone, without any other conservation program, will reduce the total amount of gasoline consumed by automobiles in 1980 from the current projection of 5.65 million barrels per day of gasoline to 5.05 million barrels per day--a savings of about 600,000 barrels of gasoline per day.

If the projected 10¢ per gallon gasoline price increase due to implementation of the President's energy program is added to the effects of a 40% improvement in new car fuel economy, the resulting savings are projected to be 737,000 barrels of gasoline per day in 1980. If one assumes a 15¢ increase in the price of a gallon of gasoline, the savings amount to 822,000 barrels per day in 1980.

Based upon the performance and cooperation of the auto manufacturers to date, it is clear that the voluntary approach to improving new car fuel economy is a feasible and workable way to achieve our goals. It is the Administration position that mandatory controls and regulations are not yet necessary, but that we will ask for mandatory standards authority if progress under our voluntary program is unsatisfactory.

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A good deal of internal debate and dicussion preceded the decision to opt for a voluntary program. I will omit the technological questions and the intimately related issues of auto emissions, air quality, and the Clean Air Act, since these will no doubt be covered fully by Dr. Goodson and Mr. De Kany. I would like to summarize briefly for you our evaluation of the pluses and minuses of other approaches to automobile fuel economy.

Mandatory Standards: The principle advantage of this approach is that, if the standards are reasonable, and the enforcement mechanism appropriate, a certain level of efficiency and thus of petroleum savings is guaranteed. The inflexibility inherent in any mandatory scheme, however, may lead to unexpected and unwelcome results. We know a good deal more about automobiles and the automobile industry than any other area in which I have participated in shaping public policy, yet even here the uncertainties in setting standards for five or ten years in the future are unsettling. Imagine if this were 1965 and you were setting auto efficiency standards for 1975: it was a year of low inflation, continued prosperity, only the beginning of heavy U.S. involvement in Vietnam, limited dependency on foreign oil, no national auto emissions or safety standards or even legislation--how realistic would those standards now be? What kind of a car would we have locked ourselves into?

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Excise Taxes Graduated by Fuel Economy: A tax schedule such as the one discussed by the Chairman also has some advantages: it moves consumers in the direction of more efficient cars while still offering them the option, at an increasing premium, of driving an inefficient car. Moreover, it can be used to influence the small car/big car mix and thus have an effect on overall fuel economy more quickly than could any legitimate set of mandatory standards. Its weak points are that success in achieving a particular efficiency goal is uncertain, because we do not have good information on own price or cross elasticity of demand for autos by class of car. Thus designing an appropriate tax schedule is a difficult task indeed.

Moreover, any excise tax will have the aggregate effect of depressing auto sales, and the wisdom of such a policy is subject to question.

New Car Purchase Rebates: We have made our own internal analysis of the effectiveness of rebates, a copy of which is attached. This is not, let me add, and FEA or Administration supported proposal, but is submitted for the analysis it includes. While such a policy stimulates car sales to some extent, we are again unable to predict precise results because of our lack of information. We have sought such information from the domestic auto manufacturers, but have so far been

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unable to obtain any written response. Any rebate, as the paper indicates, also has the effect of subsidizing the purchase of imported cars, since these are by and large more efficient than domestic autos.

Policies which affect gasoline consumption also have spillover effects on new car fuel economy. I have attached five additional papers prepared by FEA which should be helpful in deriving an overall energy strategy in the transportation area:

- Gasoline Consumption - This is our most careful summary of exactly how and how much gasoline is used. Any policies to influence this consumption should start from this base of fact.
- Allocation and Price Controls as a Solution to the Energy Problem - Long gas lines have an amazing impact on new car sales, as the experience during the embargo indicated. This paper lays out the problems inherent in allocation systems.
- Analysis of Gasoline Rationing - This appears to be a much less popular solution to the energy crisis than it seemed a month or so ago. The paper presents the advantages and disadvantages of using rationing as a conservation tool rather than an emergency curtailment measure.

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- Mass Transit and Energy Conservation - While we strongly support mass transit, a realistic appraisal of its potential for energy savings indicates that it is not the panacea some have assumed it to be.
- One-Day A Week Driving Ban on Private Automobiles - This is a brief analysis of a bad idea.

We are also preparing similar papers on abolishing credit cards and on banning Sunday driving and will be happy to share them when they are completed.

I will be happy to answer any questions you may have.

Hirsc/Hemphill
Dec. 21, 1974

FACT SHEET: GRADUATED AUTOMOBILE PURCHASE REBATE

I. Introduction - The purpose of this measure is to reduce U.S. gasoline consumption by stimulating the purchase of efficient new cars. The measure provides prospective purchasers of new cars direct financial incentives tied to the fuel efficiency of the vehicle. Retroactive to January 1, 1975, direct cash rebate to purchasers of fuel efficient automobiles would be provided according to the following schedule:

16 to 17.9 mpg	$100 rebate
18 to 19.9 mpg	$200 rebate
20 mpg and up	$300 rebate

The schedule of fuel economy would be increased annually based on studies conducted by FEA and Transportation. The individual payments would be handled by Treasury; the program would end five years after initiation, on December 31, 1979.

This schedule of rebates provides three social benefits. First, it encourages the auto industry to produce efficient vehicles. Second, it encourages consumers to buy efficient vehicles; in this manner the credit works to supplement the effectiveness of new car fuel economy standards. Finally, the measure boosts auto sales by reducing the purchase price for some vehicles; this will help the auto industry (whose sales are far below last year's) and the economy in general.

Calculations of the impact of the rebate are based on the following:

Data Estimates for Calculating Impacts of the New Care Tax Credit

Market class	Market share[a] (%)	Retail sales price[b] ($)	Estimated own-price elasticity[c]	Fuel economy[d] (mpg)
Subcompact	23	2,900	-0.6	20
Compact	17	3,200	-0.5	18
Intermediate	22	4,000	-0.3	16
Standard	21	5,300	-0.2	13
Luxury	17	6,900	0.0	11
Averages	--	4,500	-0.33	15.8

a Market shares are for 1973, obtained from the Chase Econometric Associates report, "The Effect of Tax and Regulatory Alternatives on Car Sales and Gasoline Consumption," May 1974.

b Retail sales prices are estimates based on an assumed average sales price of $4,500 and the relative prices from the Chase report.

c Own-price elasticities are estimated; they are adjusted to yield an overall elasticity of -0.33 (including the feedback effects on used car sales) from the Rand Corp. report, "How to Save Gasoline: Public Policy Alternatives for the Automobile," October 1974.

d Fuel economy estimates for each market class are adjusted to yield the EPA/FEA estimate of 1975 sales-weighted fuel economy average of 15.8 mpg.

Roughly 60% of all vehicles sold in the U.S. will be eligible for some level of rebate. Twenty-five percent of the vehicles eligible will be foreign-made. Estimates of net impact of the rebate system on sales of foreign vs. domestic cars are as follows:

Total Number of New Cars Eligible for Rebate (millions)

	Subcompacts			+ Compacts			+ Intermediates	= Totals
	T	= D	+ F	T	= D	+ F		
1975	2.26	0.89	1.37	1.66	1.51	0.15	2.04	5.96
1977	2.91	1.14	1.77	2.16	1.97	0.19	2.63	7.70
1980	3.23	1.26	1.97	2.38	2.17	0.21	2.92	8.53

T = Sales of Total vehicles; D = Sales of domestically-produced vehicles; F = Sales of foreign-produced vehicles.

The above table uses FEA new car sales forecasts and assumes that foreign cars continue to account for 15.5% of total U.S. automobile sales through 1980. It also assumes that 90% of foreign cars sold in the U.S. will continue to be subcompacts and the remainder will continue to be compacts. It assumes that the overall market shares for 1973 persist through 1980. Thus it is implicitly assumed that the same fraction of vehicles are eligible for the credit. This also implies that the domestic manufacturers improve the fuel economy of their cars only at the same rate as the foreign manufacturers. Thus the table probably underestimates the extent to which domestic automobiles will capture an increasing share of rebate, because domestic fuel economy can increase more rapidly than can fuel economy of foreign cars, because the domestics start at a lower base.

While the rebate could be applied only to domestic autos, this violates Article III, Paragraph 4 of the General Agreement on tariffs and Trade, to which the United States is a party. This Article states in part that products imported into a country for sale must be accorded treatment no less favorable than similar native products. Violation of this provision would invite retaliatory action on the part of our trading partners.

Overall, new car sales are likely to increase by about 2-2.5% because of the rebate. The increase in sales of fuel-efficient cars is likely to increase the sales-weighted average fuel economy of the 1975 fleet by about 2.5% to over 16 mpg. The increase in new car sales and the reduction in new car

prices will probably increase used car scrappage rates slightly; this in turn yields a slight improvement in ambient air quality.

II. Energy Savings and Consumer Costs - The energy savings to the nation (in reduced gasoline use) and the dollar savings to consumers (in reduced purchase prices of some new cars) are shown below:

	1975	1977	1980	1985
Crude Oil Savings (MBD @ $7/bbl)	20	87	134	0
Savings to Consumers (Billion $)	1.2	1.5	1.7	0

III. Legislative and/or Administrative Actions - This policy will require new legislation which will include the following provisions:

- Rebate/fuel economy levels for 1976 on will be set annually by the Treasury Department based on recommendations of FEA and DOT; initial rebates/levels will be as indicated in the Introduction.
- The fuel economy levels at which the rebates apply will be increased each year; these levels will be tied to the voluntary or mandatory industry-wide production-weighted fuel economy standards, and must begin at a level at least 10% higher than the production-weighted average standard.
- The EPA fuel economy figures will be used in establishing and implementing the rebate schedule.
- The rebate program will end on December 31, 1979.

IV. Costs to the Government for Implementation

The costs of administering the rebate should be limited. The system would work as follows:

- Manufacturers would submit to IRS a certified monthly or quarterly listing of engine serial numbers of those cars qualifying for rebates.

- Each new car qualifying for a rebate would have an IBM card prepunched with its engine serial number and pre-addressed envelope as part of the papers a new owner receives. The purchaser would take this card, certify that he had purchased the car, and mail it in.

- IRS would check the card against appropriate serial number and dispatch the check.

- Administrative costs could be decreased by making the rebates to the manufacturers and requiring that they be passed down to consumers; this was the procedure used for the repeal of the 7% excise tax in 1971. However, the psychological impact of this approach is somewhat less, and possibilities of fraud slightly greater.

- Funds and personnel will be required to process rebate applications, to audit manufacturers, and to publicize the program, although one can safely assume that the auto industry and auto dealers will ensure that prospective auto purchasers are well-informed on the rebate.

The likely costs to the Federal Government are:

	1975	1977	1980	1985
Additional government employees needed	50	50	40	0
Administration costs (million $)	3.9	3.7	2.0	0
Foregone tax revenues (billion $)	1.2	1.5	1.7	0

V. Responsibility for Implementation - The Treasury Department will be responsible for setting the fuel economy/rebate schedules for each year from 1976 thourhg 1979, based on recommendations of FEA and DOT. The IRS will be responsible for processing rebate applications and making rebate payments.

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Conservation and Environment
March 5, 1975

J. Hemphill
March 3, 1975

GASOLINE CONSUMPTION

Gasoline is a complex mixture consisting almost exclusively of hydrocarbons, used primarily as an energy source for powering internal combustion engines. Approximately 39 percent of the annual petroleum consumption (by volume) in the United States is gasoline. Highway transportation accounts for over 96 percent of the total gasoline consumption with the major user being the automobile, which consumes about 73% of the total. Trucks use about 23 percent. Table 1 shows a breakdown of gasoline by mode for highway use and by sector for nonhighway use.

TABLE 1. Percent Annual Gasoline Consumption[1/] by Mode and by Sector

		% of Total Gasoline Use	% of Total Petroleum Use
Highway:	Mode		
	Automobile	73.52	28.53
	Bus	0.38	0.15
	Truck	22.72	8.82
	Total highway	96.62	37.50
Nonhighway:	Sector		
	Agriculture	1.70	0.66
	Aviation	.35	0.14
	Indus, Comm, & Constr.	.37	0.14
	Marine	.69	0.27
	Misc & Unclassified	.27	0.10
	Total nonhighway	3.38	1.31
	Total Highway & Nonhighway	100.00	38.81

The automobile consumes about 76 percent of the highway gasoline (73 percent of total gasoline)[2/] used annually. Trucks consume about 24 percent with buses accounting for less than one percent. Most of the automobile travel occurs in the private sector, which consumes over 63 percent of the total highway gasoline. The percent highway gasoline use by mode and sector is given in Table 2.

TABLE 2. Percent Highway Gasoline Use[1/] by Mode and Sector

Sector:	Mode: Automobile	Bus	Truck	Total
Private	62.65	-	17.28	79.93
Business/Comm.	13.04	0.06	5.70	18.80
Government	0.40	0.33	0.54	1.27
Total	76.09	0.39	23.52	100.00

During the ten-year period between 1963 and 1973 automobile gasoline consumption grew at a rate of about 5 to 6 percent per year. However, due to supply shortages during the oil embargo and subsequent higher gasoline prices, gasoline consumption fell in 1974 to about 1972 levels. Estimates based on continued higher prices for gasoline show consumption to begin increasing again at an annual rate of between 2 to 3 percent. Table 3 gives historical[4/] and forecasted[4/] automobile gasoline consumption and, historical[5/] and forecasted total gasoline consumption[6/] and the annual rate of growth for each.

TABLE 3. Automobile Gasoline Use 1970-85
(MMB/D)

Year:	Auto Gasoline Use (MMB/D)	% Increase From Prev. Yr.	Total Gasoline Use (MMB/D)	% Increase From Prev. Yr.
		HISTORICAL		
1970	4.29	+5.1	6.01	
1971	4.53	+5.3	6.29	+4.5
1972	4.79	+5.4	6.69[7/]	+6.0
1973	5.09	+5.9	6.92	+3.3
		FORECASTED		
1974	4.90	-3.7	6.63	-4.2
1975	4.83	-1.4	6.61	-0.3
1976	4.93	+2.0	6.61	0.0
1977	5.05	+2.4	6.65	+0.6
1978	5.29	+4.5	6.89	+3.5
1979	5.49	+3.6	7.13	+3.4
1980	5.65	+2.8	7.36	+3.1
1981	5.80	+2.6	7.57	+2.8
1982	5.99	+3.2	7.80	+2.9
1983	6.17	+2.9	8.01	+2.6
1984	6.36	+3.0	8.23	+2.7
1985	6.55	+2.9	8.45	+2.6

Regionally per capita total gasoline consumption in the United States varies by as much as 52 percent. The Middle Atlantic States of New York, New Jersey, and Pennsylvania together average only 397 gallons per capita while the Mountain region consisting of Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, and Nevada, average over 600 gallons per capita. Table 4 gives total gasoline use and average per capita usage by region for 1972. Regional divisions of the United States are shown in Figure 1. Table 5 gives the ranked average per capita gasoline consumption by States.

TABLE 4. 1972 Regional Total and Per Capita Gasoline Use[5/]

Region	Total Gasoline Use (MMB/D)	Population (10^6)	Total Gasoline Use Per Capita (gals/capita)
New England	0.34	12.11	429.55
Middle Atlantic	0.97	37.62	369.61
East North Central	1.26	40.79	474.17
West North Central	0.63	16.62	584.82
South Atlantic	1.07	31.92	512.47
East South Central	0.44	13.15	515.58
West South Central	0.76	19.98	580.03
Mountain	0.35	8.88	601.32
Pacific	0.87	27.16	492.11
Total United States	6.69	208.23	492.80

TABLE 5. Ranking of States by Total Gasoline Consumption Per Capita--1972[5/]

State	Gasoline Use (gals/capita)	State	Gasoline Use (gals/capita)
Hawaii	327.51	Vermont	529.37
New York	369.20	North Carolina	530.07
Alaska	377.35	Mississippi	534.07
Massachusetts	395.15	Florida	538.47
West Virginia	410.46	Minnesota	544.21
Pennsylvania	415.83	Oregon	548.61
Md.-D.C.	422.75	South Carolina	549.78
Rhode Island	426.64	Colorado	550.12
Illinois	431.53	Arkansas	560.00
Connecticut	433.78	Missouri	562.02
New Jersey	433.93	Arizona	563.21
Louisiana	455.86	Georgia	568.03
Ohio	464.67	Iowa	580.39
Wisconsin	476.14	Nebraska	600.27
Washington	482.36	Texas	611.32
Kentucky	494.11	Utah	611.38
California	496.23	Idaho	613.43
Virginia	505.63	New Mexico	613.98
New Hampshire	508.16	Oklahoma	633.02
Michigan	508.72	Montana	639.34
Maine	511.99	Kansas	639.61
Delaware	512.66	North Dakota	677.73
Alabama	514.52	South Dakota	691.94
Tennessee	523.46	Nevada	701.99
Indiana	523.46	Wyoming	835.00

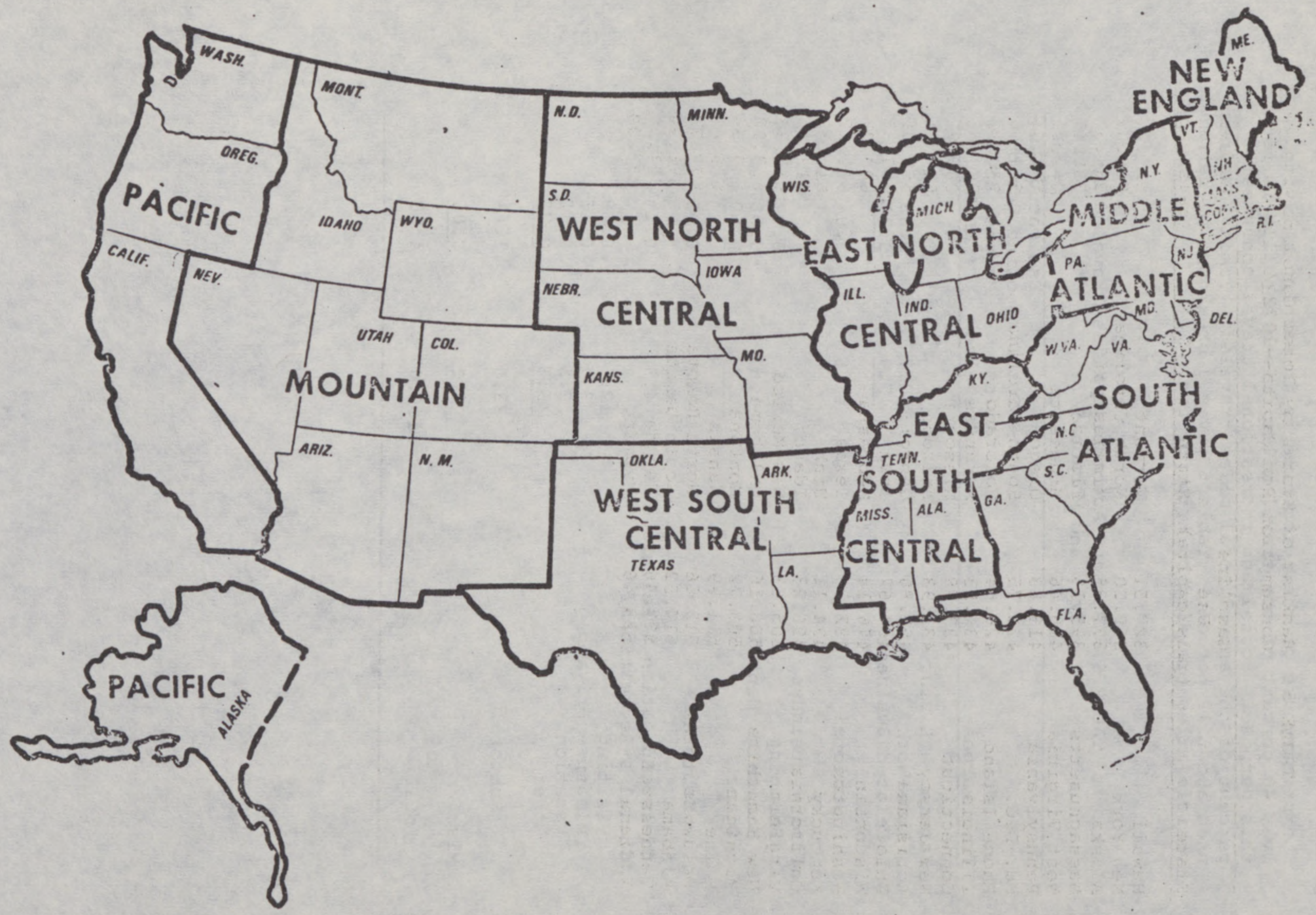

FIGURE 1. - Regional divisions of the United States.

The primary use of the automobile is in earning a living. Over 40 percent of the travel miles driven annually is for this purpose. Social and recreational travel consumes 33 percent of the annual total miles traveled. Family business uses about 19 percent. Table 6 gives a breakdown of percent vehicle miles traveled by trip purpose.

TABLE 6. Percent Automobile Miles Traveled by Trip and Purpose[8/]

Trip Purpose:	% Total Miles Traveled	Estimated Gasoline Use by Purpose 1974 (MMB/D)
Earning a Living		
Home-Work	33.7	1.65
Related Business	7.9	0.39
Subtotal	41.6	2.04
Family Business		
Shopping	7.5	0.37
Medical & Dental	1.6	0.08
Other	10.2	0.50
Subtotal	19.3	0.95
Civic, Education & Religious	4.9	0.24
Social & Recreational		
Visiting	12.1	0.59
Pleasure Driving	3.1	0.15
Vacation	2.5	0.12
Other	15.3	0.75
Subtotal	33.0	1.61
Misc.	1.2	0.06
Total	100.0	4.90

Estimates of the average gasoline expenditures and the percent income spent on gasoline for five income groups are given in Table 7. Of the five groups, the lowest income group pays the largest percent of their income for gasoline. The percent income spent on gasoline declines as income increases.

TABLE 7. Annual Household Gasoline Expenditures--1972

Income Group ($)	Number of Households (millions)	Annual Expenditures on Gas and Oil per Household ($)	Mean Households Income ($)	% of Income Spent on Gas & Oil
$3,000 and less	8.6	96.22	1,880	5.14
$3,001 - 6,000	10.4	197.60	4,500	4.39
$6,001 - 10,000	13.4	312.00	8,012	3.89
$10,000 - 15,000	13.9	410.80	12,370	3.32
$15,000 +	13.4	499.20	22,240	2.24
Income Not Reported	11.6	182.00	--	--
Total	71.2	301.60	12,160	4.24

NOTES

1/ Sources: 1972 "Highway Statistics", U.S. Department of Transportation, FHWA
"Facts Bearing on the Problem" unpublished, FHWA, April 4, 1974.

2/ Automobile consumption is often expressed in terms of its percent use of highway fuels (gasoline + diesel). Using highway fuels as a base, the automobile's consumption is approximately 70%.

3/ Source: 1970-1973 "Highway Statistics", U.S. Department of Transportation, FHWA.

4/ Source: FEA Auto Simulation Model.

5/ Source: American Petroleum Institute (API), Division of Statistics and Economics.

6/ Source: FEA Energy Demand Simulation Model, February 25, 1975.

7/ DOT estimated total gasoline consumption for 1972 was 6.52 MMB/D.

8/ Source: "Nationwide Personal Transportation Study, Report 10", U.S. Department of Transportation, FHWA, May 1974.

February 4, 1975
Conservation and
Environment

ALLOCATION AND PRICE CONTROLS AS A SOLUTION TO THE ENERGY PROBLEM

Introduction

Allocation is one method of distributing petroleum products throughout the U.S. economy. It does not of itself reduce demand; it merely provides a set of rules and mechanisms to pass out whatever quantity of petroleum supplies are available. Allocation has been linked with price controls, and will no doubt continue to be. This paper discusses the possible use of a mechanism consisting of an import cap, price controls and allocation as an alternative to the President's program to reduce imports. It assumes that the import cap will be used to reduce petroleum imports by one million barrels a day; that prices will not then be allowed to rise to market clearing levels and thus a shortage will be created; and that this shortage will be managed by an allocation program similar in most respects to that which has been in effect since January, 1974.

This should not be confused with the President's program to limit imports. The President's proposal would not create a shortage in fuel and, hence, does not depend on an allocation mechanism to distribute the shortage around the country. Instead, the President's program, by increasing the price for petroleum relative to other goods and services, would cause individuals and industry to reduce their demand for petroleum products thereby reducing the need for imported oil.

Present Allocation Program

The Emergency Petroleum Allocation Act of 1973 provides for the mandatory allocation of crude oil, residual fuel oil and certain refined petroleum products, and for price controls for the producer, refiner, reseller, and retailer levels of the petroleum marketing chain. Major features of the present program are:

- First sales of domestic crude oil are subject to a "two-tier" pricing system. "Old" oil (crude oil produced in amounts up to 1972 levels from a particular property) is priced at an average of $5.25 per barrel. Oil produced from a property in excess of 1972 levels and oil from a property which produced less than 10 barrels per well per day may be sold at free market prices. The price of imported crude oil is also uncontrolled.

- In general, refiners may pass along their increased crude oil costs and some limited non-product cost increases, but may not generally increase profit margins. These same rules apply down the marketing chain: a dollar-for-dollar pass-through of increased product costs, and some additional limited increases in selling prices to reflect non-product cost increases.

- The regulations provide for a crude oil supply program for small and independent refiners, utilizing a freeze as of December 1, 1973 of supplier-purchaser relationships for crude oil and a buy/sell list, under which the 15 major oil corporations are required to sell specified volumes of crude oil to these small and independent refiners. There is also a program which provides for substantial equalization of average crude oil prices among refiners by the purchase and sale of "entitlements" to run cheap, price-controlled "old" oil in the same nationwide proportion at all refineries.

- Refined products are distributed to ultimate users in accordance with the allocation regulations, except for gasoline, where the mandatory allocation chain ends at the retail station and bulk purchaser. Three general classes of users are established:

  - Those users who are authorized to receive their "current requirements" - essentially whatever they request -- and are not subject to any allocation fraction. This includes Department of Defense, agriculture, and space heating for hospitals.

  - Those who receive their current requirements but are subject to an allocation fraction -- emergency services, energy production, etc.

  - Those who receive some percentage of their historical consumption, or "base period volume" (usually based on 1972) and are subject to an allocation fraction.

  - These class definitions, and further percentage delineations within the third class are decided by the government and are spelled out in detail in regulations. Their effect is to limit each user to a specific monthly, or for some fuels quarterly, authorized amount; the user/category scheme varies from one petroleum product to another.

- A supplier must continue to supply the same customers he serviced during the base period. If he has sufficient product to meet the sum of all his customers' authorized amounts, he delivers this amount to each. If not, he reduces each purchaser's share on a pro rata basis by applying his "allocation fraction", equal to his total supply over the sum of his customers' authorizations, and delivers this percentage of authorization to each customer.

- A portion of the product is reserved for each state to use flexibly to eliminate hardships. This "state set-aside" is administered by state energy offices.

- A detailed case handling and appeals process has been established to handle adjustments of base period use to account for changed circumstances or unusual growth, and other applications for exceptions and assignment of supplier.

Positive Aspects of an Import Cap and Allocation Program

There are at least four positive accomplishments that can be expected from a cap on imports and allocation.

- The level of reduction in petroleum imports can be established with certainty. There is no dependence on price elasticities of energy for achieving conservation results.

- Prices can be kept from rising, thus minimizing any increase in the consumer price index.

- Although the allocation program does not save energy, it can spread around the nation the shortages caused by the import cap, thus tempering the regional impacts of such a program.

- The Government can make gross choices as to which sectors of the economy should be allocated the greatest portion of the shortage. For example, fuel can be made available to the industrial sector at the expense of home heating fuel or gasoline for automobiles.

Basic Difficulties with An Import Cap and Allocation

- Under an allocation program the government replaces the market in distributing energy supplies. Several significant problems arise with such a substitution.

  -- An allocation system depends on a government determination of a person's "need" for fuel, and yet need is almost impossible to define. The standards currently employed for making this determination rely on historical use and a government judgment on priorities (e.g., agriculture should get all the fuel it needs). Unfortunately, in thousands of cases, the amount of fuel an individual or firm used two years ago may have little or no relation to how much fuel he currently needs. Thus, an exceptions process must be created and administrative judgment and procedures used to supplement the historical use standard. There simply are not enough Solomons around to make such a system work well.

  In addition, any system that classifies users according to government-determined priorities shifts the struggle for market advantage from the marketplace to the offices of those who write definitions and regulations. The political pressures to give groups special preference become very great. Should tobacco growing be made part of agriculture, and thus tobacco growers be made eligible for the same priority as wheat farmers? What about green houses growing flowers? Are portable toilets part of "sanitation services?" Those who are most effective in these political battles are not necessarily those who would be the most effective in a competitive market situation but for each the decision regarding

their allocation priority can make the difference as to whether the business thrives or suffers.

-- Because the allocation of petroleum products under an allocation system is performed by the Federal and State governments rather than by the market, public costs are incurred. Allocation during the recent embargo required the full-time efforts of about 4,000 people and cost approximately $100 million; in addition, substantial record keeping, reports and audits were required of the private sector.

-- An allocation system assumes that retailers will distribute supplies according to rules set by the government. In practice, however, it is impossible to enforce these rules equitably among thousands of gas station operators and fuel oil dealers. Thus practices such as preferential treatment for special customers, car wash/gasoline fill-up schemes, pre-paid gasoline contracts, and even direct black market operations quickly spring up.

- Allocation does not aid in solving mid- or long-term energy problems. An allocation program, while it is useful in managing a shortage created by embargo or a cap on imports, makes no contribution to our mid- and long-term goals of energy independence, because it provides no incentive for increasing domestic energy supply.

- Choosing the base period in an allocation system is an especially difficult problem. On the one hand, choosing an early base period such as 1972, for which complete data are available, means making numerous individual changes in the system to mirror current consumption, since thousands of new businesses have begun, old ones failed, and many people moved in the intervening years. Using a more recent base period, however, penalizes those who conserved during this period while rewarding those in the same allocation category who did not curtail wasteful fuel use during the base period.

- Allocation has a retarding effect on GNP growth and employment. A reduction of 1 million barrels a day through an import cap and allocation will reduce GNP by an estimated 6 billion dollars and place 250,000 more people on unemployment rolls.

This occurs because an allocation program must spread fuel across the various sectors of the economy according to a set of relatively inflexible and complicated national rules. Energy thus is made available for both more efficient and less efficient uses. On the other hand, reliance on higher prices and the market to deal with a shortage means on the whole a distribution of fuel to those who value it most. It is then more likely to be used efficiently for productive purposes resulting in a higher GNP and greater employment.

- While an allocation and price control program would limit direct increases in fuel costs, it does carry with it other costs. Examples abound: reduced airline schedules and thus reduced mobility; sales of petroleum products linked to contracts or sales of other goods and services; drastically limited service hours; and above all, continuing uncertainty as to supply availability which makes planning impossible for businesses and individual citizens. In this regard, the major cost to the consumer will likely be the inconvenience of gasoline lines. To minimize the negative impact of the shortage on the economy and jobs, most of the reduction in consumption would probably have to come from private auto use of gasoline. Thus, a substantial reduction in imports is likely to result in a recurrence of last year's long gasoline lines.

- Even the best designed allocation program generates unforeseeable effects. During the recent embargo, for example, people took few long trips. Thus rural gasoline consumption was down relative to urban consumption; since allocations to gasoline stations were based on historical consumption, urban stations were unable to supply the unexpected increased demand resulting from this changed consumption.

- An allocation program is not an effective conservation tool and has limited utility as a means of distributing products in short supply due to a cap on imports. Because of the inherent complexities in even a carefully designed allocation system, and the fluid nature of American society, the larger the shortage, the shorter the useful life of such a system.

ANALYSIS OF GASOLINE RATIONING

Energy Conservation and Environment
Federal Energy Administration
January 24, 1975

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SUMMARY

Description of Rationing System

- o Each licensed driver in the country would receive an equal monthly allotment of coupons entitling him to purchase 36 gallons/month at the controlled price. These coupons could be freely traded or sold. The coupon market would permit those drivers with needs greater than those represented by the monthly allotment to purchase additional coupons from those who use less than their monthly amount.

- o Commercial users would receive coupon allotments equivalent to 90 percent of their consumption during the 1973 base period.

- o For that limited class of users for whose special needs the coupon resale market is not a reasonable solution, 3% of the coupons would be set aside and distributed by the state. This distribution would be based primarily on emergency or hardship.

- o Coupons would be picked up in person at Post Offices by each eligible individual. They will be invalidated at the pump at time of purchase, and deposited by retailers with banks in a special coupon account. Gasoline deliveries to suppliers will be made to retailers only for amounts equivalent to coupons collected.

Gasoline Use Data

- o Estimated consumption in 1975 is 6.4 million barrels per day or 270 millions of gallons per day (MG/D)

- o Number of licensed drivers in 1974 was 125.1 million. There will be an increase of up to 15 million anticipated if coupon rationing is put into effect.

- o Without rationing, each driver would use 50 gallons per month.

- o With the expected increase in licensed drivers and supply limited by 1 million barrels per day, by rationing, the allowance for each licensed driver would be: per day = 1.2 gallons
  per month = 36 gallons
  per year = 432 gallons

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Problems with Gasoline Rationing

Gallons per month and price of Gasoline

- o To save 1 million barrels per day, while assuring adequate fuel for business will mean limiting each licensed driver to about 36 gallons per month, compared to current average of 50 gallons/month. It is expected that the coupons will sell for about $1.20 per gallon. Hence, for those who must purchase more than their basic ration, the effective price of gasoline (pump plus coupon price) is estimated at $1.75/gallon.

Impact on National Energy Goals

- o Gasoline rationing, while it may limit consumption in the short run, makes no contribution to our mid- and long-term goals of energy independence, because it provides no incentives for increasing supply.

- o Gasoline consumption is only 40% of total petroleum use. Residual and fuel oil comprise a substantial amount of total petroleum imports. By concentrating exclusively on private vehicles and gasoline, other fruitful areas for energy conservation are not addressed -- such as improved industrial efficiency and better constructed and insulated buildings. In the final analysis, we cannot be independent unless these other petroleum uses are also reduced dramatically.

Potential for Inequities

- o Each person receives an equal number of coupons, but use of gasoline varies widely among drivers. Thus, rationing inevitably leads to inequities. Some examples are:

  - A widowed secretary with two children living in the suburbs who commutes 16 miles each way to work in a car that gets 12 mpg will experience a 68% increase in her commuting costs, because she must purchase 17 additional coupons each month at an average cost of $1.20 per gallon. This amounts to about $245/year in additional costs.

  - A blue-collar worker who owns a car that gets only 9 mpg can drive just over 320 miles/month on his basic ration, and could not easily afford to purchase a new more efficient automobile. On the other hand, an affluent neighbor can readily trade in his equally inefficient old car to purchase one getting better

than 22 mpg. This allows him to drive over 790 miles on the same allotment of coupons.

- Substantial regional inequities would exist. The average driver in some rural states such as Montana travels nearly 600 miles per month versus about 300 in less rural states such as New York and New Jersey. Similar disparities exist between city dwellers and suburbanites. Under rationing each would receive the same gallonage.

- Certain very poor persons, such as migrants, drive large distances each year. They can neither afford to buy additional coupons nor are alternative methods of transportation available to them.

- The recreation and tourism industry would be very heavily impacted, as would the auto industry. Automobile sales could decrease 35% from what they would otherwise be.

Increase Bureaucracy and Complexity

o The Government would be involved in many new aspects of our every day life, adding an inescapable portion of bureaucracy, complexity, and inconvenience.

o The Government would decide:

- if a new business should get fuel;
- if expanding businesses deserve more fuel;
- if specific individuals would qualify for more coupons because of hardships.

o Gasoline rationing can be implemented but it is complex, expensive, and at best a short term solution. It takes 4-6 months to implement, about 15 to 25,000 full-time people and $2 billion in Federal costs, uses 40,000 Post Offices for distribution, and requires 3,000 state and local boards to handle exceptions.

o Because coupons are transferable, they must be picked up by each driver in person quarterly at Post Offices. Long lines and delays are inevitable.

o Gas stations, with limited quantities to sell, are unlikely to maintain more than the most limited service hours. Evening and weekend closings are almost a certainty.

Impact on GNP

- o Use of allocation and rationing to reduce imports by one million barrels per day could create a drop of nearly 13 billion dollars in the GNP and place several hundred thousand more workers on unemployment rolls. Also, rationing would have an inflationary impact due to the significantly higher clearing price of gasoline coupons sold by those having excess coupons.

Comparison of Gas Rationing and President's Program

- o Each option has major regional impacts; rationing hits the mountain states, the southwest and the mid-west hardest. The President's program affects New England and the east coast.

- o Rationing will reduce consumption in the short term but is inadequate as long term solution. The President's program is effective in both the short and long run.

- o Both rationing and the President's program transfer about $2 billion to poor families in the first year.

- o Rationing is costly and complex; the President's program is inexpensive and easy to administer.

- o Rationing raises the CPI by over 2.5 percentage points; the President's program by about 2.5 points.

- o Rationing could cost the country $13 billion in GNP and a substantial increase in unemployment; the President's program would have negligible effects in each area.

DESCRIPTION OF COUPON RATIONING SYSTEM

At the time of the 1973 embargo an effort was begun to design a rationing plan. After much analysis regarding various possible approaches, that effort culminated in the development of a proposed rationing program and the purchase of 4.8 billion coupons. A description of that proposed plan is outlined below.

I. SYSTEM OPERATION

A. Entitlements

- o An estimated 140 million licensed drivers receive an equal monthly coupon allotment (estimated at 36 gallons per month). These coupons could be freely traded and sold.

- o Commercial users receive a coupon allotment equivalent to a percentage of base period consumption, estimated at 10% less than 1973 consumption.

- o State set-aside for special cases (3% of available supply), i.e., migrants, the handicapped, etc.

- o Government and non-profit organizations included in commercial sector.

- o Coupons for first quarter are all of the same denomination, and are not serialized. Changes could be made in subsequent quarters.

B. Distribution

- o Postal Service would distribute coupons at the 40,000 Post Offices four times a year.

- o Estimated that 4.8 billion coupons would be needed in first quarter (amount currently in storage).

- o Under special conditions, an agent could pick up coupons for those not able to do so themselves.

- o Users would pay a fee of $3.00 per quarter amounting to $1.5 billion. (This would cover most of estimated program cost).

- o Local Boards throughout the states would handle special appeals from state residents with emergency or hardship gasoline needs.

- o In first quarter, individuals would turn in self-executed application forms at their Post Office. Postal employees would validate application, examine and mark driver's license, and issue ration coupons.

- o In subsequent quarters, licensed drivers would receive state-issued authorization cards in the mail, entitling them to pick up ration coupons at their post offices.

- o For first quarter, commercial users would submit an FEA form to their bank, which would issue them an allotment in the form of a coupon draft. These drafts would be exchanged for coupons at the Post Office. Forms would be forwarded by banks to FEA so that FEA could issue coupon drafts for the second and following quarters.

- o Forms retained for audit purposes.

- o U.S. agencies would apply directly to FEA for coupon allotments.

C. Banking System

- o Commercial banks would be mainstay of coupon redemption mechanism.

- o Initially, gas stations take deposit ration coupons received from motorists to local banks and receive gasoline drafts (in gallons) enabling them to purchase additional gasoline from their supplier.

- o In subsequent quarters, a complete ration banking system would be established, in which commercial, government and non-profit users along with gas stations, and suppliers, would participate.

- o FEA Processing Centers would handle initial applications and maintain records of all commercial users. These centers would issue drafts for ration coupons in subsequent quarters, through the mail.

D. Coupon Resale Market

- o Unused coupons would be freely traded or sold. Those with excess coupons could sell them to those willing to pay the price.

- o Federal Government would make no attempt to control or regulate trade in coupons except to identify and prohibit practices which inhibit natural interplay of market forces.

- o It is estimated that excess coupons would be sought by more than one half of all users.

E. State Set-Aside

- o State set-aside of coupons (about 3%) would be available to recognize claims of users for whom the resale market is not a vehicle for their special needs.

- o About 3,000 local boards throughout the states would administer the set-asides, replying to applications.

- o The State set-aside will also be used for organizations or governmental units performing essential public health or safety services.

- o Federal Government could provide quidelines to assure uniform application of eligibility criteria.

F. Enforcement System

- o Vigorous enforcement program would be required to prevent widespread abuses.

- o The audit program would focus on commercial and non-profit users to detect overstatement of base period volumes, and on gasoline suppliers to detect illegal shipments of gasoline.

- o There would also be a system to detect multiple applications by individuals.

II. PRELIMINARY ESTIMATE OF RESOURCES REQUIRED (STEADY-STATE ANNUALIZED BASIS)

A. Personnel Resources

(1) Federal

FEA Headquarters - 625 positions

FEA Regions - 3,250 positions (1,200 opl; 2,000 enforcmt)

U.S. Post Office - unknown

Non-FEA Enforcement - 2,500 positions

(2) State and Local

3,000 local boards @10 each (15,000 volunteers; 15,000 support staff)

51 Department of Motor Vehicle @100 each - 5,100 positions

B. Costs	(million $)
USPS Distribution @ $1.60 per transaction	845
USPS shipping costs	50
Coupon printing serialized	195
Forms printing	30
ADP system	200
Public Education Materials	10
	1,330
Direct Salaries	
o Federal (6375 @ 20K)	127.5
o State and local (20,100 @ 20K)	402
GRAND TOTAL	1.86 billion

GASOLINE USE DATA

Use Data

A. Estimated consumption in 1975

Millions of barrels per day (MB/D)	6.4 MB/D
Millions of gallons per day (MG/D)	270 MG/D

B. End use categories - volume (MG/D) and percent

Private use	205	76%
Business/Commercial	57	21%
Government	8	3%

C. Number of registered vehicles in 1975 — 130.75 million

D. Number of licensed drivers in 1974 — 125.1 million
(increase of up to 15 million anticipated if coupon rationing is put into effect)

Programmatic Assumptions for Rationing

A. Will achieve 1 MB/D saving through reduction in gasoline consumption

B. Business will receive 90% of 1973 gasoline consumption

C. Coupons will be provided to licensed drivers as opposed to allocations based on registered vehicles

Key Parameters of Data and Assumptions

A. Savings target (1 million B/D) — 42 MG/D

B. Business and Government Allowance

o Estimated 1975 consumption	65 MG/D
o Less 10% of 1973 Consumption	6 MG/D
o Allowance	59 MG/D

C. Private Use Allowance

o Estimated 1975 consumption	205 MG/D
o Less reduction	36 MG/D
o Allowance	169 MG/D

D. Allowance for Each Licensed Driver
Gallons: Per day = 1.2
per month = 36
per year = 432

E. Private Use of Automobiles by Trip Purpose

Work trip	31%
Recreational trip	31%
Family business	34%

PROBLEMS WITH GASOLINE RATIONING

Gallons per Month and Price of Gasoline

- To save 1 million barrels per day, while assuring adequate fuel for business will mean limiting each licensed driver to about 36 gallons per month, compared to current average of 50 gallons/month and restricting businesses to 10% less than their last year's use. It is expected that the coupon will sell for about $1.20 per gallon during the first year. Hence, for those who must purchase more than their basic ration, the effective price of gasoline (pump, plus coupon price) is estimated at $1.75/gallon.

Impact on Energy Conservation Goals

- Gasoline rationing, while it may limit consumption in the short run, makes no contribution to our mid- and long-term goals of energy independence.

- Rationing limits the consumption of gasoline not through price but through proscription. Thus, an artificial shortage is created, inciting people to attempt to "beat the system" rather than to conserve fuel.

- Moreover, because of the inherent complexities in even the most carefully designed rationing system, and the fluid nature of American society, a rationing scheme is probably limited to a useful life of no more than two years. Thus, even as a conservation tool, it has a limited utility.

- Rationing provides no incentive for increasing domestic petroleum supply or bringing on alternate energy sources.

- Gasoline consumption is only 40% of total petroleum use. Residual and fuel oil compromise a substantial amount of total petroleum imports. By concentrating exclusively on private vehicles, many other fruitful areas for energy conservation are not addressed -- such as improved industrial efficiency, better constructed and insulated buildings, less wasteful use of electricity and natural gas. In the final analysis, we cannot be independent unless those other petroleum uses are also reduced dramatically.

Potential for Inequities

- Each person receives an equal number of coupons, but use of gasoline varies widely among drivers. Govern-

mental decisions will be based on statistical averages and broad, objective criteria; they cannot possibly take into account most of the differences in individual needs and preferences. Thus, rationing inevitably leads to inequities. Some examples are:

- A widowed secretary with two children living in the suburbs who commutes 16 miles each way to work in a car that gets 12 mpg will experience a 68% increase in her commuting costs, because she must purchase 17 additional coupons each month at an average cost of $1.20 per gallon each. This amounts to about $245/year in additional costs.

- A blue-collar worker who owns a car that gets only 9 miles/gallon can drive just over 320 miles/month on his basic ration, and could not easily afford to purchase a new, more efficient automobile. On the other hand, an affluent neighbor can readily trade in his equally inefficient old car to purchase one getting better than 22 mpg. This allows him to drive over 790 miles on the same allotment of coupons.

- A single individual with a mid-size car (14 mpg) could drive up to 17 miles/day. If he wanted to take a 500 mile trip over a long 4-day weekend, he could only use his car for that four-day period during that month. He would have to arrange for other transportation for the remaining 26 days of the month, or purchase additional coupons.

- A Congressman living in Georgetown has enough gas to drive his 10 mpg car to work by himself 5 days a week and still travel 54 miles on the weekend.

- Substantial regional inequities would exist. The average driver in some rural states such as Montana travels nearly 600 miles per month versus about 300 in less rural states such as New York and New Jersey. Similar disparities exist between city dwellers and suburbanites. Under rationing each would receive the same gallonage.

- A family of 4 with two licensed drivers and one car which gets 15 mpg moves from New York to California. This move would take 2-3/4 months of the family's coupons. One out of every five families moves every year.

- Certain very poor persons, such as migrants, drive large distances each year. They can neither afford to buy additional coupons nor are alternative methods of transportation available to them.

- A family in which the husband, wife and two teenage children all drive would receive sufficient coupons to drive approximately 2160 miles per month while the next door neighbor with only one licensed driver could drive only 540 miles per month, assuming both own cars which get 15 mpg.

- The recreation and tourism industry would be very heavily impacted, as would the auto industry. Automobile sales would decrease 35% from what they would otherwise be.

- A small successful Midwestern sales firm which had increased its business and sales area 50% since 1973 would have the market area it can cover reduced 40% under its basic rationing allotment.

Increased Bureaucracy and Complexity

- o The Government would be involved in many new aspects of our everyday life, adding an inescapable portion of bureaucracy, complexity, and inconvenience.

- o Gasoline rationing can be implemented but it is complex, expensive, and at best a short term solution. It takes 4-6 months to implement, about 15 to 25,000 full-time people and $2 billion in Federal costs, uses 40,000 Post Offices for distribution, and requires 3,000 state and local boards to handle exceptions.

- o The Government would decide:

  - if a new business should get fuel;
  - if expanding businesses deserve more fuel;
  - if specific individuals would qualify for more coupons because of hardships.

- o Because coupons are transferable, they must be picked up by each driver in person quarterly at Post Offices. Long lines and delays are inevitable.

- o Gas stations, with limited quantities to sell, are unlikely to maintain more than the most limited service hours. Evening and weekend closings are almost a certainty.

- o The longer a rationing program is in place, the more likely collusive and illegal behavior becomes, such as counterfeiting or pilferage of coupons.

Impact on GNP

- o Use of allocation and rationing to reduce imports by one million barrels per day would create a drop of nearly 13 billion dollars in the GNP and place several hundred thousand more workers on unemployment rolls. Also, rationing would have an inflationary impact due to the significantly higher market clearing price of gasoline (pump plus coupon) resulting from reduced supplies.

- o Rationing leads to distortions in the marketplace as adjustments in business investments, modes of distribution, and purchases are made based on artificial, rationing-imposed costs.

Impact on Poor

- o Low income people are likely to drive less than average and thus, have excess coupons to sell. If speculators buy large quantities of coupons from the poor at low prices in order to resell them at high prices to the more affluent, the potential income benefits of the rationing program will be garnered by these entrepreneurs rather than by the poor.

Effects on Refining Runs

- o A reduction of 1 million barrels per day in the use of gasoline through rationing would have the following effects on refining production:

  - 1,500,000 b/d crude oil imports

  + 500,000 b/d product imports (made up of approximately 300,000 b/d residual oil products and 200,000 b/d middle distillates)

- o Such a reduction is likely to reduce domestic petroleum related employment, increase the cost/barrel of domestic production, and decrease the production rate and efficiency of U.S. refiners.

COMPARISON OF GAS RATIONING
AND PRESIDENT'S PROGRAM

There are two principal options for reducing petroleum imports in the short to mid-term. They include the President's program of a petroleum tariff and decontrol of domestic oil prices; and a cap on imports with gasoline rationing and petroleum allocation. This paper briefly describes these options and discusses the impact of each on reducing imports, regional equity, inflationary impact, impact on the poor, administrative complexity and cost, and impact on the recession and employment.

OPTION A: IMPORT CAP/RATIONING

- A volumetric limit would be placed on imports equivalent to the reductions called for in the President's program. A reduction of 1 million barrels per day cannot feasibly be allocated without rationing.
- The current system of price controls for petroleum would be strengthened, including control of new domestic crude; thus an artificial shortage would be created.

- Since price is not used to determine distribution of petroleum products, the government would maintain its system of allocating to retailers, based essentially on historical use for products other than gasoline. The government would also control refinery yields.

- To prevent long gas lines, coupon rationing would be introduced. Such a program would include as its basic features:

  1) Each licensed driver would receive an equal monthly coupon allotment; these coupons could be freely traded or sold. The coupon market (the "white market") permits those drivers with needs greater than those represented by the monthly allotment to purchase additional coupons from those who use less than their monthly amount. Thus the market, rather than the government, is responsible for assessing "need" for gasoline above the basic minimum ration. Failure to provide a white market would invite a black market and increase the inequities.

2) Commercial users, whether they buy in bulk or at the pump, would receive coupon allotments equivalent to a percentage of their consumption during the 1973 base period.

3) For that limited class of users (migrants, handicapped, etc.) for whose special needs the coupon resale market is not a reasonable solution, a proportion of coupons would be set aside and distributed by the state. This distribution would be based primarily on emergency or hardship needs.

4) Coupons would be picked up in person at Post Offices by each eligible individual. They will be invalidated at the pump at the time of purchase, and deposited by retailers with banks in a special coupon account. Gasoline deliveries to suppliers will be made to retailers only for amounts equivalent to coupons collected.

OPTION B: PRESIDENT'S PROGRAM OF TARIFF, TAX DECONTROL AND REBATE

- After April 1975, this program would consist of an additional tariff on petroleum imports of $2 per barrel and an excise tax of $2 per barrel on all domestic petroleum.

- Domestic oil prices will be decontrolled and a windfall profits tax implemented to ensure that the revenue generated will accrue to the government, not the oil companies. This will raise the overall price of petroleum by $2 a barrel. The tariff, taxes and decontrol, then, will add $4 to the price of a barrel of oil.

- In addition, an excise tax on natural gas equivalent to $2 a barrel would be adopted and new natural gas prices deregulated to equalize the impact on oil and natural gas consumers and decrease natural gas consumption.

- $30 billion will be collected by the government from the tariff and taxes. These revenues will all be rebated to consumers and governments.

Regional Disparities

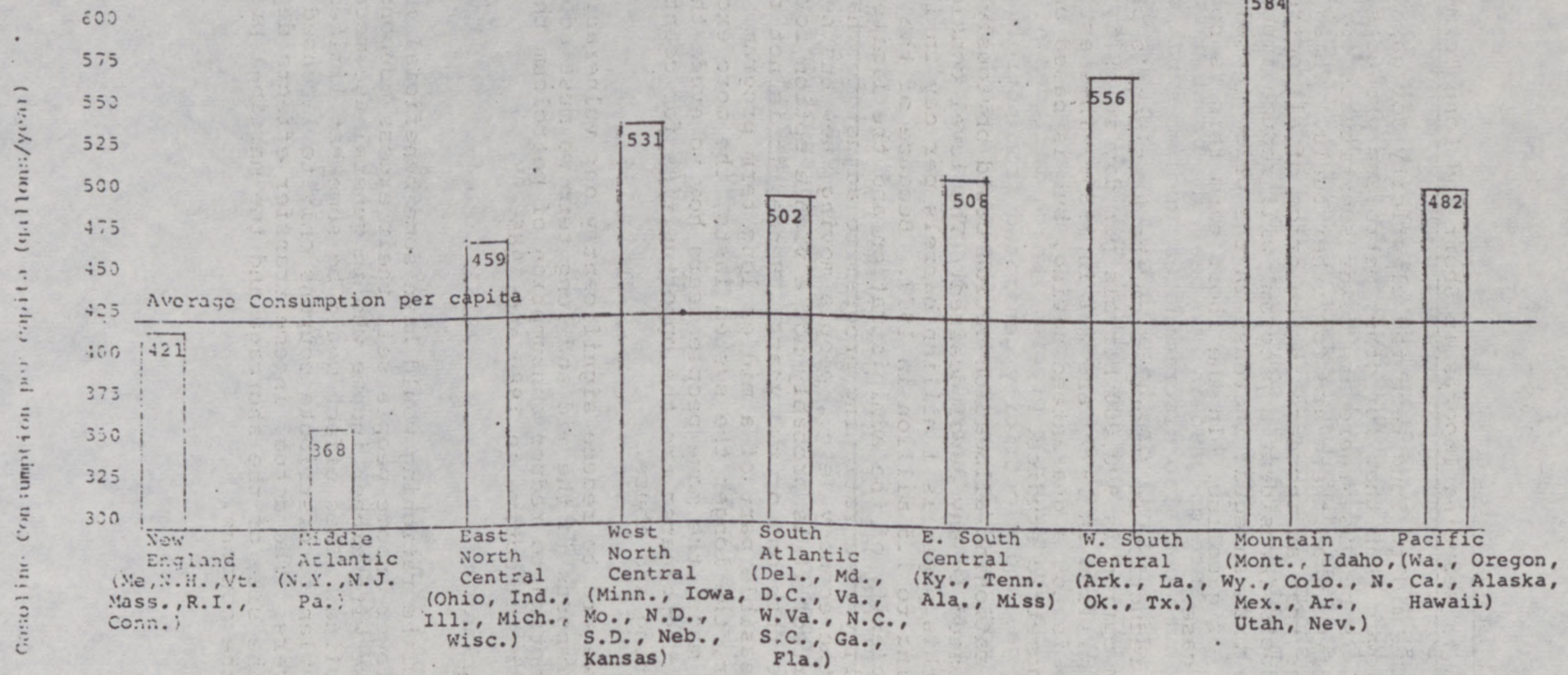
- o Both options have major regional impacts. There are substantial regional variations in per capita gasoline use. Those in the Middle Atlantic states use less than two-thirds the gasoline of those in the Mountain states. Gasoline rationing as the attached chart shows, weighs more heavily on residents of the mountain states, southwest, and mid-west than on other citizens.

- o Reliance on gasoline to bear the brunt petroleum cutbacks also discriminates against rural dwellers and in favor of those in cities. In the aggregate, rural dwellers use almost twice the gasoline/year of city dwellers.

- o The President's program, which includes oil, natural gas and electricity generated from petroleum, impacts most heavily on the New England, West North Central, West South Central, and Mountain states.

Petroleum and Natural Gas Use by Regions of the United States

* Per Household per Year	Petroleum Consumption (bbl)*	Natural Gas Consumption (MMCF)*	Petroleum & Natural Gas (BTU)*
United States Total	744.02	3.307	7384.8
New England	120.57	.071	731.74
Mid-Atlantic	85.81	.156	625.86
East North Central	66.19	.326	688.85
West North Central	74.12	.386	792.61
South Atlantic	88.62	.164	649.80
East South Central	62.34	.299	640.76
West South Central	97.89	1.158	1694.87
Mountain	80.51	.467	907.81
Pacific	67.97	.280	652.37


Gasoline Consumption per capita (gallons/year)
600
575
550
525
500
475
450
425
400
375
350
325
300
Average Consumption per capita
421
368
459
531
502
508
556
584
482
New England (Me,N.H.,Vt. Mass.,R.I., Conn.)
Middle Atlantic (N.Y.,N.J. Pa.)
East North Central (Ohio, Ind., Ill., Mich., Wisc.)
West North Central (Minn., Iowa, Mo., N.D., S.D., Neb., Kansas)
South Atlantic (Del., Md., D.C., Va., W.Va., N.C., S.C., Ga., Fla.)
E. South Central (Ky., Tenn. Ala., Miss)
W. South Central (Ark., La., Ok., Tx.)
Mountain (Mont., Idaho, Wy., Colo., N. Mex., Ar., Utah, Nev.)
Pacific (Wa., Oregon, Ca., Alaska, Hawaii)

Effectiveness in Reducing Imports in Short and Long Term

- In the mid to long term the elasticity for gasoline is lower than that for other petroleum products. This is because there are fewer substitutes for gasoline than there are for other fuels. This means that an increase in the price of all petroleum products (President's program) will reduce imports more than an equal increase in the price (gasoline tax) of gasoline. In the short term this is not the case.

- The reduction in imports from the President's program option is 900,000 barrels per day in 1975, 1.6 million in 1977, and 2.1 in 1985. This estimate is not a guaranteed saving, but is based on econometric studies.

- The rationing/allocation option could obviously be adjusted to any level desired. The level considered in this paper is 1 million barrels per day in 1975 moving to 1.5 million in 1977. Because of the complexity of the administration and the limited ability of a rationing program to adjust to changes in the economy (e.g., people moving, new businesses started) it is probably not a viable option for more than one or two years. Hence, it is not really a feasible part of a mid or long term program. Moreover, the longer the system lasts, the more exceptions are made, the more people learn how to evade the rules, and the greater are the opportunities for counterfeiting and abuse.

- If we are to reduce significantly our vulnerability to imports in the mid and long term we must adopt an option to reduce consumption of petroleum that can be effective in 1980 and 1985.

Income Effect

- Gasoline rationing would have some beneficial impact as lower income people sell their excess coupons to those with higher income who in general use more gasoline. This effect would be somewhat limited by the plan to distribute coupons only to licensed drivers. The actual income transfer effects depend on the size of the shortage and the marginal price of the coupons.

- Private sector demand for gasoline in 1975 is estimated to be approximately 206 MG/D. Reducing daily petroleum consumption by 1 MMB/D solely through reductions in gasoline would result in a 17 percent reduction in supplies. The equilibrium price of gasoline would be about $1.75 per gallon ($.56/gal pump price plus $1.19/coupon).

- The average "poor" household consumes 404.7 gallons of gasoline per year per vehicle while the "lower," "middle" and "well-off" households average 632.2, 823.1, and 800.8 gallons per year per vehicle, respectively. The average number of gallons of gasoline consumed per vehicle is 727.8. The surplus/shortage of gasoline per household group and the potential income transfer can be calculated by comparing the individual household consumption rates with the average consumption rate. The table shows the average gasoline use, by household income, the surplus/shortage of gasoline, and the net income transfer likely to occur through the sale of coupons.

GASOLINE CONSUMPTION
AND INCOME TRANSFER

Income	(0-5,000)	(5,000-12,000)	(12,000-16,000)	(16,000+)
Gal/Veh	404.7	632.2	823.1	800.8
Net Surplus/ Shortage (Gal/Veh)	+199.4	-28.1	-219.0	-196.7
Net Income Transfer ($Billions)	+2.20	-.20	-.92	-1.08

- The poor household would have surplus coupons for 1,852 billion gallons of gasoline. The coupons for purchase of gasoline would trade at $1.19/gallon which would result in a net transfer of 2.20 billion dollars to the poor category of households in the first year.

o Similarly, the President's program would transfer roughly $2 billion from those with incomes above $12,000 to those with lower incomes, preliminary calculations indicate.

	Income ($1,000)			
	0-5	5-12	12-16	16+
Additional Cost of Energy ($Mil)	725	8,200	2,900	7,500
Rebated Revenues ($Mil)	3,520	7,350	3,610	4,520
Net Transfer ($Billions)	+1.36	+0.44	-1.06	-.74

Administrative Complexity and Cost

o The cost and number of people required to implement the President's system of tariffs, taxes and rebates is estimated at about $50 million and 400-500 additional people on the government payroll.

o The complexity of administering gasoline rationing and allocation is considerably greater than the other option, both because of the printing, distribution, collection, and control of coupons and because of the exceptions process for the poor necessary in every state and local community. Rationing will require an additional 17,000 government employees and approximately $2 billion per year to administer.

Inflationary Impact

o A $2/barrel import tariff plus excise taxes on domestic petroleum and natural gas would increase the Consumer Price Index by about 2.5 percentage points in 1975. Again, these fees would be returned to consumers so that the overall level of disposable income would not be changed.

- Under rationing, the cost of buying an additional coupon should stabilize at the market clearing level of $1.19. Thus, there would be an "inflationary" impact of over 2.5 percentage points on the Consumer Price Index in 1975.

ADDENDUM

To save 1MMB/D of petroleum imports in 1975 could be accomplished by reducing market supplies of gasoline, distillates, residual etc., in varing amounts. The amount of gasoline that would be available for private use and the costs of gasoline would depend on the amount of petroleum saving that is "loaded" onto gasoline. The table shows the amount of gasoline per registered driver, the percent reduction of gasoline supply, and the estimated cost of coupons under 100, 70 and 50 percent application of petroleum saving to gasoline.

% of 1MMB/D Applied to gasoline	Gasoline per driver/wk (gals)	Gasoline per driver per month (gals)	Cost of coupon ($ per gal)
100	8.4	36	1.19
70	9.1	39	.64
50	9.5	41	.38

A similar computation for a rationing program lasting through 1977 and equaling the impact of the President's tax package (1.6 MMBD savings of petroleum imports) can be made:

% of 1MMB/D Applied to gasoline	Gasoline per driver/wk (gals)	Gasoline per driver per month (gals)	Cost of coupon ($ per gal)
100	7.5	32	.70
70	8.2	35	.41
50	8.8	38	.26

ONE-DAY A WEEK DRIVING BAN ON PRIVATE AUTOMOBILES

Energy Conservation and Environment
Federal Energy Administration
February 4, 1975

PROPOSAL

One possible method for reducing auto travel is to prohibit use of every private automobile one day each week. In other words, each automobile owner would be allowed to select six days of the week during which his vehicle could be legally operated. Each motorist would be given a sticker to affix to the windshield of his automobile. The color or shape of the sticker would indicate the day of the week on which that car cannot be driven. The stickers would have to be large enough so that enforcement is feasible. Government, commercial, and emergency vehicles would not be covered under such a program.

ENERGY SAVINGS

According to statistics collected by the Federal Highway Administration (FHWA), automobile travel is spread nearly equally among the seven days of the week (roughly 14% each day). However, the distribution of auto travel (in terms of trip purpose, trip length, and origin/destination combination) is quite different for different days. Table 1 shows automobile trip distributions for a typical weekday and for the weekend.

Table 1. Distribution of Daily Automobile Travel

	Weekday	Weekend
Earning a living	52.1%	13.8%
Family business	20.0	17.4
Educational, civic, & religious	4.9	5.2
Social & recreational	21.1	60.8
Other	1.9	2.8
Total	100.0%	100.0%

The maximum possible savings due to implementation of this proposal would be one-seventh of all private automobile fuel use. In 1975, this maximum savings would be 650 thousand bbl/day (1.3 Quads per year). However, this maximum cannot be achieved for a number of reasons.

Perhaps the most important reason that the maximum savings will not be achieved is that most drivers are likely to respond to the one-day a week driving prohibition by shifting their travel to one or more of the other six days rather than by reducing their auto travel. This is especially true for multi-car families, since they can shift travel, whether for commuting, shopping, or personal business, with only minor inconvenience, and equally minor travel reductions. More than half of all U.S. households have two or more cars.

In addition, a mandatory program such as this one, operated over an extended period of time (several years), is prone to abuse. Individuals can buy low-cost, junked cars, register them with the state, and then have two stickers - thus permitting them to drive all seven days of the week. Forging stickers or transferring stickers from one car to another is likely to be easy unless adequate enforcement is available.

Commuting travel is more difficult to curtail or shift. Thus, most people are unlikely to choose a weekday for their non-driving day if they currently commute by car. This is because mass transit is presently unavailable to most people. About 95% of all work related travel is conducted with automobiles. In other words, bus and rail transit presently carry only about 5% of the work-related travel in the U.S. More than half of all the people surveyed by the FHWA (in a 1969 study) indicated that public transportation was not available to them for home-to-work travel. Even among those for whom transit is available, the transit option is generally not exercised because it takes too long, is not convenient to the place of work, and involves too many transfers.

To reduce the ability of motorists to avoid reductions in auto travel, the system could mandate which day of the week each driver must not drive. Such an arrangement would, of course, require an elaborate exceptions and appeals system, and would still not guarantee substantial savings. Because of the great uncertainty with respect to the degree of auto travel reduction due to this program, it is difficult to estimate exact energy savings. Table 2 shows the energy savings in 1975 for a range of travel reductions.

Table 2. Potential Energy Savings in 1975 With a One Day Per Week Driving Ban

Percent reduction in auto travel	Petroleum Savings	
	Quads	bbl/day
0	0	0
5	0.5	230,000
10	0.9	460,000
14	1.3	650,000

In Israel, a one-day per week driving ban imposed during and shortly after the October 1973 war resulted in a 10% reduction in private gasoline consumption. However, the savings are likely to be much lower in the U.S. because of differences in driving levels and patterns and because the intense wartime emergency situation does not exist here. We estimate that U.S. savings would be no more than 200,000 barrels of oil per day, even with substantial enforcement efforts.

EQUITY IMPACTS

This program strongly favors wealthy households because poor people own fewer cars than do wealthy people. Table 3 shows auto ownership in 1969 as a function of income, in terms of both average auto ownership per household and the number of cars owned per household. As income grows, households are more likely to own an automobile and more likely to own more than one automobile. Because this program relates mobility to auto ownership, poor people - who generally own no more than one car - suffer a loss in mobility relative to wealthier families that own more than one car.

Table 3. Automobile Ownership by Income Class

Annual household income ($)	Average number of cars per household	% of households in income class with -		
		1 car	2 cars	3 or more cars
under 3,000	0.40	33.6	3.3	0.0
3,000 - 3,999	0.74	56.5	8.4	0.3
4,000 - 4,999	0.90	62.3	11.3	1.4
5,000 - 5,999	0.93	64.7	16.5	2.0
6,000 - 7,499	1.22	57.8	25.6	3.6
7,500 - 9,999	1.35	59.2	30.8	4.1
10,000 -14,999	1.61	44.0	46.0	7.2
15,000 and over	1.94	27.4	55.2	16.2
All	1.17	48.4	26.4	4.6

Moreover, such a set of limitations is a very large government incursion into an individual's freedom of mobility, and thus by inference his freedom of association and assembly.

DOLLAR COSTS OF PROGRAM

There are essentially no private dollar costs of operating this program. However, the government costs are likely to be substantial. These costs are the result of:

- producing the stickers
- public advertising and education
- distributing the stickers to motorists
- enforcing the system

The cost of producing the stickers similar to state inspection stickers is about 5¢ each. With 102 million private automobiles and 5 million motorcycles, in use, the annual cost of printing the stickers would be $5.4 million.

The cost of public education and advertising is harder to estimate. Use of both print and broadcast media for advertising would probably cost about $20 million during the first year. Education costs would decline substantially after the program has been in effect for some time.

The cost of distributing the stickers is a function of the distribution mechanism. Post Offices are likely vehicles to use for distribution, although Post Offices are quasi-federal establishments and motor vehicle registrations are handled by state agencies. Assuming 3 minutes to process each sticker and a $10/hour (labor + overhead) cost yields a total cost each year of $54 million. This does not include the additional costs of providing stickers to purchasers of new and used cars or for people who wish to change the day of the week allowed to them. Nor does it include the costs of processing exempt vehicles. Thus, the overall annual costs are likely to be about $70 million.

The cost of enforcement is likely to be sizeable. Without strict enforcement on the part of state highway patrols and municipal police, compliance with the system would decrease with time. For example, the response to the 55 mph speed limit was initially quite good during the embargo; however, as gasoline supplies increased and enforcement waned, average highway speeds gradually increased.

The total cost of highway patrol departments in 1974 was over $1.0 billion. Assuming a 10% increase in highway patrols (and associated support costs) suggests that the cost for adequately enforcing the sticker system would be about $200 million annually ($100 million for rural highway patrols and $100 million for municipal police).

In summary, the total cost to governments of implementing and enforcing this program is about $300 million dollars during the first year. This cost is likely to decrease somewhat with time.

RELEVANT PAST EXPERIENCES

During the October 1973 mideast war, Israel instituted and strictly enforced the system discussed here. The estimated 10% saving was attributed to both the enforcement efforts and to substantial voluntary compliance, since compliance was equated with patriotism, at least during the emergency. Recently, Israel dropped the system in favor of raising gasoline prices from $1.30 to $2.00 per gallon to encourage conservation.

One of the proposals for the Boston Transportation Control Plan (TCP) was to limit driving to six days per week. The only difference between the Boston proposal and the one discussed here is that the Boston proposal assigned the non-driving day to people. The goal of the Boston proposal was to reduce air pollution, rather than to save gasoline. The proposal was later dropped because of the overwhelming public opposition expressed to the plan at the TCP public hearings.

Conservation and Environment
March 5, 1975

Mayo S. Stuntz, Jr.
February 26, 1975

MASS TRANSIT AND ENERGY CONSERVATION

Introduction

Recently, there has been much discussion of the energy conservation potential of improved mass transit. Articles in "Passenger Transport", "Mass Transit", the general press, and testimony before Congress on the National Mass Transportation Assistance Act of 1974 have argued that increased transit funding will promote substantial energy conservation. Since, on an aggregate basis, transit travel is two to four times more efficient than auto travel, such savings appear possible at first glance. However, it must be realized that the magnitude of the energy conservation requirements are quite large, and mass transit accounts for only a small portion of the Nation's urban travel. When the issue is analyzed realistically and in perspective, it becomes evident that mass transit improvements alone have the potential of playing only a small role in the U.S. energy conservation efforts.

Background

Transit presently carries about 7 billion passengers annually [1], about 2% of the total urban passenger travel. Fifty five percent of transit travel is for commuting purposes [2]. Total transit fuel use (1973) was 0.04 MMB/D (million barrels per day), compared with total auto fuel use (urban and rural) of nearly 5 MMB/D [3]. The Department of Transportation estimates that present transit service is saving approximately 0.08 MMB/D relative to a theoretical situation in which no transit exists, and all trips are made by the auto [3]. Thus, even the doubling of transit ridership by shifting auto drivers to transit would save only an additional 0.08 MMB/D.

TABLE 1

Trends in Annual Urban Transportation Demand

Year	Transit Pass.[2] (in millions)	Transit PM*[9] (in millions)	Auto PM*[9] (in millions)	% Transit
1945	23,254	NA	NA	NA
1950	17,246	46,000	260,000	15%
1955	11,529	31,000	310,000	10%
1960	9,395	25,000	400,000	5%
1965	8,253	22,000	530,000	4%
1970	7,332	20,000	690,000	3%
1973	6,660	18,000 (est)	774,000 (est)	2%
1974	7,002 (est)	19,000 (est)	774,000 (est)	2%

Transit ridership has declined steadily from the World War II peak of 23 billion riders [1] with the exception of a slight increase during the Arab embargo of 1973-4 (see Table 1). This decline is due to a number of factors, the most important being the urban/suburban growth patterns caused from reliance on the private auto. It is important to note that the decline has continued since the creation of Federal mass transit assistance programs in 1964, even though $3.1 B has been spent by UMTA on transit improvement through FY 1974.

Transit Improvements

The reasons for transit's disappointing performance are many, but center around the relative attractiveness of the auto vs. transit in serving today's travel patterns. Since transit is in most cases far less attractive than the auto, improvements to transit have little effect. Fare elasticities, for example, have been estimated [4] to be -.1 to -.3, which means that a 10% decrease in fares will result in only a 1-3%

* Person Miles

increase in ridership. Experience has shown, however, that much of the increase in ridership does not come from former auto drivers, but rather from walkers, carpoolers or those that didn't make the trip before (latent demand). The energy saved from this kind of ridership increase is far less than if all new transit riders were diverted from low occupancy autos. Similarly, service improvements will have an effect on ridership, although the elasticities are also low and the impacts of such improvements generally unpredicable. For example, only 8% of the riders of Chicago's new Dan Ryan Expressway rail line were formerly auto drivers; the ridership increases in the Shirley Highway (Va.), Bus-on-Freeway demonstration came largely from parallel non-freeway bus lines and carpoolers, while auto traffic in the corridor was virtually unaffected; and the $11 million extension of the MTA into the Quincy area south of Boston has had no impact in reducing travel on the three parallel highways [5].

In an effort to overcome many of these problems, Federal and local transportation planners have moved to build major new, technologically advanced, rapid rail transit systems. These systems, however, are not included in present energy conservation plans, primarily because the lead times associated with such projects are long (greater than 10 years) while energy conservation needs are much greater in the near term (5-10 years). In addition, the costs associated with these projects are quite high (up to $100 M/mile construction costs) compared to alternative systems (especially bus systems). Finally, rail systems, as presently used, are less energy efficient than equivalent bus systems, although rail is still not as inefficient in the aggregate as the auto (see Table 2).

TABLE 2

Relative Efficiencies of Urban Transportation Modes

Mode	Energy Intensiveness (BTU/Passenger Mile)
Auto (1.4 occupancy)	8,100
Auto (2.0 occupancy)	5,700
Rail Systems	4,100[1]/
Bus Systems	3,700[1]/

1/ Energy intensiveness based on existing load factors (26% for rail, 18% for bus). Any expansion of these systems causing lower load factors would result in higher energy intensiveness.

SOURCE: Hirst, Eric [9]

But, rail transit may play an important part in helping to foster more efficient urban form, although one model [8] has indicated that rail may have a suburbanizing effect on cities. These changes take time, however, and rail transit construction therefore should not be advocated as the solution to our near term problems.

Energy Savings

The only way that mass transit can have any energy conservation impact in the near-term would be to combine transit improvements with policies aimed at reducing single-occupant auto travel into a comprehensive multi-modal urban transportation package (see Table 3). Even though transit improvements are relatively ineffective by themselves, combining these measures with auto disincentives such as parking surcharges, increased tolls, and auto-control zones can have significant modal shift and hence, energy conservation impacts. Studies [7] have shown that the single most effective inducement to shifts from the auto is higher auto user costs, as higher auto costs tend to equalize the attractiveness of auto and transit.

TABLE 3

Mass Transit Mode Shift Policies

Transit Incentives

A. Time and Service

- Exclusive Bus Lanes
- Priority Traffic Signals
- Improved Scheduling
- Reduced Headways
- Improved Routing
- Para-transit
- Park and Ride

B. Costs

- Eliminate Fares
- Revise Fare Structure
- Employer-Subsidized Fares

Auto Disincentives

A. Time

- Auto Control Zones
- Reduced Freeway Lanes

B. Costs

- Parking Taxes
- Highway Tolls
- Increased gasoline prices

Even whan a comprehensive program is used, however, energy savings are not large. FEA and DOT analyses [3, 6] indicate that savings of 50-100,000 barrels/day is the maximum likely conservation impact possible over the next 5 years, due to the lack of bus production capacity, problems in attracting ridership, and inherent local institutional constraints. Compared to the President's stated conservation goal of 1 MMB/D in 1975 and 2 MMB/D in 1977, and the conservation impacts of alternative transportation strategies (See Table 4), transit savings are quite small -- less than 5% of the President's goal, at best.

TABLE 4

Energy Conservation Potential of Various Transportation Policy Actions

Policy	Estimated Energy Savings (1980)
1. 40% increase in new car fuel economy	550,000 barrels/day [6]
2. Increase car occupancy to 2.0 PM/VM	350,000 barrels/day [6]
3. Double mass transit system size and ridership	80,000 barrels/day [3]

Conclusions

Transit does have a very important role in society. Mobility and environmental considerations, when coupled with energy concerns, make the argument for transit legitimately strong, and programs are now in effect which are sufficient to deal with these problems on a feasible level. For example, the new National Mass Transportation Assistance Act of 1974 provides $11.8 billion over the next six years which can be used for both capital and operating expenses, and the Federal Highway Administration has a smaller but significant transit assistance program of its own. It is important, however, to ensure that arguments for further major transit expenditures be carefully evaluated before committing the required public funds in the name of energy conservation, especially when less costly measures to achieve the same results are available to National, state and local governments.

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STATEMENT OF DR. RAYMOND E. GOODSON, CHIEF SCIENTIST, DEPARTMENT OF TRANSPORTATION, BEFORE THE HOUSE WAYS AND MEANS COMMITTEE ON AUTOMOTIVE FUEL ECONOMY, MARCH 12, 1975

Mr. Chairman and Members of the Committee:

Thank you for your invitation to appear and present the views of the Department of Transportation on the subject of automotive fuel economy and the alternatives discussed by your Task Forces in "Alternatives for Consideration of an Energy Program" published March 3.

I am Chief Scientist of the Department of Transportation. With me today are Dr. Richard L. Strombotne, Chief of the Energy and Environment Division in the Office of the Assistant Secretary for Systems Development and Technology and Mr. Myron Miller, Acting Director of the Office of Transportation Energy Policy. Our offices have been directly involved in automotive energy efficiency programs including the joint report submitted to Congress, Potential for Motor Vehicle Fuel Economy Improvement. We were assigned responsibility for leading in the development of the President's Voluntary Fuel Economy Program and have been directly involved in its administration in cooperation with the Federal Energy Administration and the Environmental Protection Agency.

Motor vehicles are of critical importance in our efforts to save fuel and in our nation's economy:

- Highway transportation accounts for almost 40 percent of our petroleum consumption.

- Of the more than 2.4 trillion annual person miles of travel in the United States, 92 percent are by automobile.
- In recent years automotive and associated industries have accounted for approximately 10 percent of the gross national product; one out of 7 jobs is associated with the automobile.

As you know, Mr. Chairman, the joint study mandated by Congress and completed last October by the Department of Transportation and the Environmental Protection Agency, concluded that a substantial improvement of fuel economy was achievable for 1980 vehicles. In evaluating the study and determining an appropriate numerical goal, the Administration took into account simultaneous achievement of fuel economy, low pollutant emissions, and occupant safety and the interaction of these objectives. Weighing these relationships, as well as industry investment requirements and consumer needs, recognizes the costs as well as the benefits of a fuel economy program. On October 8, the President announced the goal of 40 percent improvement in the fuel economy of new autos within a four-year development period, which is equivalent to 19.6 mpg. To achieve this goal, a voluntary program was established by the Energy Resources Council (ERC). In January the three major U.S. auto manufacturers made commitments to achieve target goals. Other manufacturers have submitted proposed improvements. The Fuel Economy Improvement Program also involves monitoring of the automobile manufacturer's results, a similar program for trucks and buses, amendments to the

Clean Air Act, and a vehicle fuel economy labeling program. To date, the program has been successfully begun. We expect substantial fuel savings. By 1980, it should save the U.S. up to 600,000 barrels of oil per day. At such time as a voluntary approach may appear to falter, however, we are prepared to propose more stringent measures to Congress.

The Administration's program is balanced and comprehensive. In developing it, we exhaustively screened and rejected many proposals including some now under consideration by Congress. We believe that this program should be given the chance to prove itself.

A national energy program must provide incentives for energy conservation to all sectors of the economy. In transportation, for example, the pump price of gasoline operates to create both incentives for more efficient operation of existing automobiles and for the purchase of more efficient new automobiles. Despite the major role of the automobile as an energy consumer, however, neither equity nor efficiency dictates placing all the burden on the motorist. The President's program for taxes on crude oil and for decontrol of prices for old oil has the benefit of creating conservation incentives for all petroleum consumers.

You may well ask why automobile manufacturers will voluntarily comply with our fuel economy goal when mandatory programs have been necessary for emissions and safety. The crucial difference is that

fuel economy has market value. While improved emissions controls and safety features add to the price of a car, fuel economy features offer the prospect of lower operating costs. Because fuel efficiency features make cars more attractive financially to consumers, manufacturers have an economic incentive to produce them. Recent investment decisions by auto makers provide evidence to support this view.

We are confident that the present voluntary program is both responsive and flexible enough to keep pace with a changing energy and economic situation. It promises steady progress. It preserves consumer choices. It incorporates the economic incentives of the marketplace. It offers what we believe is a well-chosen trade-off between costs and benefits--balancing safety, environmental and consumer costs against energy conservation needs. The response to it has been encouraging.

Mr. Chairman, the Committee's Task Force No. 4 considered additional energy conservation measures including an auto mileage efficiency tax and tax credits for purchases of new autos. A program of cash rebates to purchasers of fuel-efficient new cars and a tax on purchasers of new cars with poor fuel economy has several attractive features. (1) It would preserve consumer choice so that a large family would still have the option of buying a large car to meet its needs. (2) It would create addition economic incentives for purchase of fuel-efficient cars. (3) It could achieve significant saving of gasoline over the coming years.

Such a program may also present some potentially undesirable features that should be considered. (1) It might provide an incentive

to some owners of cars in the existing fleet to keep older, less fuel-efficient cars. (2) It would not stimulate the addition of any more fuel saving technologies to cars than are already planned for the next few years. (3) It might increase the percentage of small cars before their structural design can be changed to improve crash-survivability and thereby expose passengers to increased accident risks since small cars are generally less safe than large cars. (4) It might induce manufacturers to substantially increase small car prices, offsetting the cash rebates, to compensate for the tax on large cars. (5) It might increase the market share of foreign auto makers and further depress the domestic industry.

Task Force No. 2 has suggested a possible substantial gasoline tax -- 40¢ per gallon in 1979--combined with a refundable tax credit or tax abatement coupons. The attractive features of this proposal include:

(1) It would reduce demand for gasoline through the marketplace.

(2) It would provide increased incentives for the purchase and production of more fuel-efficient cars. Again, undesirable features of such a gasoline tax-rebate program should be considered. Some of the same points might be raised here as were suggested with Task Force No. 4's proposals. In addition, the rebate to drivers might provide an incentive to people to retain the 7 million cars that usually are scrapped each year.

It should be recognized that estimates of the amount of reduced demand due to increases in the price of gasoline are not precise.

Therefore, it is uncertain what the ultimate effects of the gasoline tax-rebate program would be upon (1) demand for gasoline, (2) demand for cars of various sizes, (3) the financial health of automobile manufacturers and suppliers, (4) employment in automobile and related industries, (5) transportation needs, (6) the incidence of serious highway accidents, and (7) the national economy. These are among the factors which must be weighed in considering any program.

Mr. Chairman, the alternatives now being considered by the Committee to accelerate use of more fuel-efficient motor vehicles are motivated by the same concern for saving energy that has animated the Administration's efforts. We believe that present programs are realistic in their goals and offer the prospect of success in achieving substantial energy savings. We hope that the Committee will give those programs a chance to prove their worth even as it discusses additional measures which may prove necessary at some future date.

Mr. Chairman, that completes my statement. I will be pleased to respond to any questions you or any other members of the Committee may have.

STATEMENT OF
JOHN DeKANY
DIRECTOR, EMISSION CONTROL TECHNOLOGY DIVISION
ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR, MICHIGAN
BEFORE THE
COMMITTEE ON WAYS AND MEANS
HOUSE OF REPRESENTATIVES
WASHINGTON, D. C.
MARCH 12, 1975

Mr. Chairman and Members of the Committee:

I appreciate the opportunity to appear before you today to discuss the technological aspects of automobile fuel efficiency and its relationship to our air pollution control efforts. I am accompanied today by Mr. Albert Fry, Director of the Policy Planning Division within EPA.

We at EPA have a long and continuing involvement in the fuel economy of automobiles. In short, EPA has long been required by law to generate data on motor vehicle performance which incidentally includes fuel economy measurements. I have reference, of course, to our testing and certification of vehicles which must meet the emission control requirements established under the Clean Air Act.

In the Fall of 1971, EPA began an intensive study of the factors which affect automobile fuel economy. In part this effort was our response to exaggerated claims about fuel economy losses caused by the Federal emission control requirements. As a result of this study we were able to

separate out and quantify the several factors which cause fuel economy to vary among cars. The field of fuel economy data has been continuously under review and refinement by our staff since that time.

In the Spring of 1973, the President directed EPA to develop fuel economy testing procedures and labeling methods for automobiles. In May of 1973, we published fuel economy data on the 1973 model year vehicles. In September of 1973 and again in September of 1974, we published fuel economy data for the 1974 and 1975 model years, respectively. For the 1975 model year the publication of the fuel economy data and the operation of the voluntary fuel economy labeling program are, as the Committee may know, sponsored cooperatively by EPA and the Federal Energy Administration. In that manner we have been able to do a better job of informing the public on this important subject than either FEA or EPA alone could have done.

We believe that these data on fuel economy represent the most reliable data presently available. A recent Government Accounting Office review has determined that the generation of these data by EPA, as an integral part of our emission testing activities, is far and away the least costly way in which the Federal government can obtain valid fuel economy data. As we implement the assembly-line test requirements of

the Clean Air Act, as we expect to do shortly, we will be able to buttress our current fuel economy data base, which comes from emission certification testing, with additional data generated on cars as they leave the manufacturer's plant. Thus the economies of the Federal government continuing to look to EPA to develop fuel economy data are substantial and will continue to be substantial.

The success of this program is demonstrated by the public and industry acceptance of our fuel economy data. For example, I am sure the members of this Committee have noted that the automobile industry is currently making extensive use of our fuel economy data as an integral part of its mass media advertising.

On June 26, 1974, the President signed into law the Energy Supply and Environmental Coordination Act of 1974. In part, the Act directed the Administrator of the Environmental Protection Agency and the Secretary of the Department of Transportation to jointly conduct a study and report on the practicality of a fuel economy improvement standard of 20% for new motor vehicles by 1980. As required by section 10 of the Act, the report to the Congress includes an assessment of the technological problems of meeting any such standard, including lead times involved, the test procedures required to determine compliance, the economic costs and benefits, the

enforcement means, the effect on energy and other resources, and the relationship of safety and emission standards. In summary, that report, which was submitted on October 24, 1974, concludes that it is clearly practicable to achieve by a variety of means a fuel economy improvement of 20% in the 1980 model year fleet compared to 1974 with little further price increase. The full range of potential improvements may be as high as 40 to 60 percent. Simultaneous achievement of the statutory emission standards for hydrocarbons and carbon monoxide with substantial fuel economy improvement is feasible in the new car fleet in 1980. However, the issue of the level and costs of oxides of nitrogen emissions achievable by 1980 concurrent with substantial fuel economy improvement was unresolved, the report stated. I must also emphasize that the report does not take into consideration the implementation of a sulfates standard in 1979, does not attempt to make a judgment of whether a Federal mandatory fuel economy improvement standard is required, and does not address a possible delay in implementation of the statutory standards beyond model year 1980.

However, we believe that any fuel economy improvement program would be best served if it uses the EPA fuel economy test procedure as a basic measure of this important factor. Even though we readily admit that our test procedure is not perfect, in the sense that no single fuel economy test procedure can ever fully reflect each of the wide variety of

driving conditions encountered in actual use, the view that our test procedure is the best available has in recent months gained wide support. For example, in the recent DOT/EPA report to Congress, the government technical experts concluded that the EPA test procedure suitably reflects actual driving under city and highway conditions. In recent hearings before the Federal Trade Commission on the subject of fuel economy advertising, the Ford Motor Company, among others, stated that the EPA test procedure is appropriate and should be used as the standard reference for fuel economy. The National Academy of Sciences, in a major report on motor vehicle emissions, also reached the conclusion that the EPA fuel economy data are valid. This general agreement on the validity of the EPA test procedure for measuring fuel economy, coupled with the fact that use of this procedure provides simultaneous data on the emissions that come from the car's exhaust--a piece of data that would in any case, be needed to assure that the car being tested meets emission standards--should give the Committee confidence in establishing the EPA test procedure as the basis for any program.

Mr. Fry and I will be pleased to answer any questions the Committee may have.

Statement of

General Motors Corporation

on

Energy Tax Alternatives and Related Plans

Submitted to the

House Ways and Means Committee

Presented by

Dr. Henry L. Duncombe, Jr.

Vice President and Chief Economist

Washington, D.C.

March 12, 1975

Mr. Chairman and members of the House Ways and Means Committee, I am Henry L. Duncombe, Jr., vice president and chief economist of General Motors. We are pleased to have the opportunity to discuss with you today the views of General Motors Corporation on the proposals being considered by this Committee dealing with automobile efficiency and energy conservation.

We are particularly pleased that the Committee is enlisting a broad range of views. We share with the Committee its sense of urgency and its keen awareness of the complexities of energy policy issues.

We are convinced that improved fuel economy is extremely important. Our future model programs are pressing as hard as possible in this direction.

This was recently discussed by our Chairman Mr. Thomas Murphy. Let me quote:

> "... General Motors has embarked on a new-car program that will affect virtually every automobile we will make -- large and small, luxury and economy -- almost every Cadillac, Buick, Oldsmobile, Pontiac and Chevrolet.
>
> "Our objective is to offer motorists cars suited to an energy-short world; cars they can afford to buy and operate in a world ridden by inflation, cars large enough or small enough to meet their particular needs -- not somebody else's; and cars that

will still meet all the stringent standards for safety and clean air now in effect.

"This is no ordinary program. This is going to be GM's answer to the times, and we intend that it be the loudest and clearest answer the auto world has ever heard. We are talking about the most comprehensive, ambitious far-reaching, and costly program of its kind in the history of our industry. Last year, in our North American operations, General Motors spent more than $900 million for special tools, and more than $1.2 billion for facilities. As we push ahead with this program, we see no let up in this level of spending until we get the job done. We have never embarked on a program of this magnitude before at General Motors, and neither, as far as I know, has any other manufacturer.

"We will be taking weight out of our cars. We will be trimming down the outside dimensions, while keeping inside dimensions about as roomy. A six-passenger car will still be comfortable for six passengers. We will be increasing efficiency -- and therefore fuel economy -- through modifications in our engines, our transmissions, and our drivelines. We will be improving aerodynamics to use less energy to overcome

wind resistance. And we will be cutting down on the power needed to operate accessory equipment.

"This multi-billion dollar investment is a measure of GM's commitment to go all out to adjust automobile travel in the United States to our Nation's tightened energy budget . . . We will spend the amounts I have been talking about for the simple reason that this is what we think it will take to do the job that the future demands be done."

I can assure you that such a commitment is not taken lightly by General Motors. We are investing billions of dollars on product improvements because we're convinced the American car buying public will demand improved fuel economy along with comfort, convenience and the suitability of cars to their needs.

I would like to stress this point because, unlike vehicle emission standards which could not be expected to have customer appeal, fuel efficiency is a marketable attribute of a car. Attributes in addition to fuel economy, such as adequate interior space, good handling, reasonable comfort and adaptability to a variety of driving conditions, must be achieved if we hope to induce our customers to replace their present less efficient cars by more fuel-efficient ones. Unless we can do this, the contribution which motor vehicle manufacturers can make to reduce gasoline consumption will be minimal or nonexistent.

We believe our product improvement programs responding to market demands meet this requirement. As we reported to the Federal Energy Administration last August, the addition of the more fuel-efficient GM cars in the years ahead is expected to result in a continuing decline in fuel use by all GM cars on the road. The fuel used by all GM cars will not exceed the 1973 level until at least the early 1980's, even if it is assumed that no further improvements will be made in the fuel economy of our cars beyond what we are planning in the 1978 model year.

This program we have outlined bears directly on proposals before this Committee which would impact upon the purchase and use of automobiles by American consumers. One such proposal is for a combination of an "auto mileage efficiency tax" and tax credits for purchases of more fuel-efficient cars. The approach, it is suggested, would discourage the purchase and production of full-size cars and stimulate the purchase and production of smaller cars which attain more miles per gallon.

Such proposals, if enacted, would not make a measurable contribution to the reduction of petroleum imports from insecure sources -- presumably a major objective of any energy policy. In this statement, we will amplify some of our concerns that their implementation would impose a major new burden on consumers and create further adverse effects on output and employment in the United States. In other words, it is doubtful that the proposals would reduce oil imports appreciably and any reduction would be far in the future. This would be traded for a near-term and

certain substantial cost to consumers and to the economy in terms of reduced jobs.

Market Disruptions of These Proposals

There is no question that the taxing power of the state can be used to put the price of a product beyond the reach of any but the affluent members of society -- or alternatively, through the use of tax subsidies, to induce a purchase that otherwise might not be made. Such a mechanism can have powerful effects, but the consequences may extend considerably beyond the intended goals.

Some have argued that American families don't really need to drive anything but smaller cars. However, even if true, such claims are beside the point. If our new models -- at the prices at which they must be sold, including the taxes -- are not acceptable to consumers, then millions of people will simply continue to drive their present cars rather than buy new ones. It is important to remember that the 100 million cars on the road can, with adequate maintenance, be made to serve for years to come. If this is the choice made by many buyers, the fuel economy average of all cars on the road would not improve. In fact, it will decline. It must be recognized that energy savings will occur only if and when we can sell the more fuel efficient cars that are now well along in our planning.

It is incorrect to assume that full-size cars and station wagons are socially undesirable and should be discouraged while small cars

are good and should be encouraged. The goal is not to do away with everything but small cars. The goal is to conserve energy. This can be done by making all cars more fuel efficient -- and this we are doing.

Furthermore, the small car cannot adequately perform all of the functions required by automobile owners. They do not have sufficient seating capability for many families. According to the United States Bureau of Census, approximately 12 million families, or 23% of all U.S. families, have five or more persons. For example, in West Virginia 23% of all families have five or more members. In many states the percentage of large families is even higher. Large families have as much need for large cars as they do for large houses, regardless of their economic status.

For a large family traveling together, a full-size automobile is quite fuel efficient on a passenger miles-per-gallon basis. The full-size 1975 Chevrolet with a 400 CID engine achieved 17 miles per gallon on the EPA's highway test for fuel economy. Using a rough calculation of MPG times passengers carried, we can quickly figure that the family of five will obtain approximately 85 passenger miles per gallon, and the family of six will obtain approximately 100 passenger miles per gallon when traveling together in a full-size Chevrolet.

Millions of American families own and have sizable investments in boats, travel trailers, camping trailers, slide-in campers, and other recreational equipment. If new cars and pickup trucks capable of towing or carrying this equipment were not available or increased substantially in price due to federal taxes -- which is what some people are suggesting today -- these families would be done a severe injustice. They might simply lose the sizable investments they have made. Or they might risk pulling their boats and trailers or carrying their campers with new vehicles that are inadequately sized and powered.

Not only will families who have already bought these trailers and boats suffer, but so would people employed by those industries which manufacture such products and companies which supply those industries and service those products. Motels, resort complexes, road-side restaurants, service stations and many others all depend upon long distance auto travel.

In addition, there are large numbers of people who depend on full-size cars for everyday business purposes. There is the sales-

man who uses his car to carry equipment, products, displays and personal baggage. It is his office. It is his traveling warehouse. Also, many moderate income families lease trailers to move their personal goods. It is the most economical way they can do it -- and often the only way they can afford. These families and the businesses which lease such trailers depend on the availability of cars and trucks with the necessary towing capability.

Adequately powered and sized light-duty trucks are required by millions of American farmers, contractors and other independent businessmen. They must have these trucks to haul heavy and bulky loads such as agricultural products, tools and equipment.

These are just a few examples. I am not attempting to be comprehensive. In addition, there are many people who prefer a regular-sized car, even though they may drive only a few thousand miles in a year, using small amounts of gasoline.

Members of this Committee should consider very carefully whether they really want to bring about the drastic changes in life styles that would result from passage of legislation such as that being considered here. We seriously question whether these measures would meet either the simple test of equity or the stern test of national energy conservation.

It is more likely that large numbers of American people would simply retain their older cars that suit their chosen ways of life. The adverse effect on employment in the automobile industry could be profound. The disruption to our economy and resultant unemployment, extending well beyond the auto industry, could exceed even the recession levels we are experiencing today.

It is generally estimated that a loss of $1 billion in auto sales represents a loss of about 250,000 cars. For each loss of 250,000 unit sales, more than 20,000 workers would lose their jobs in the production end of our business. Because the loss of jobs in the auto industry "ripples" through the economy, a total of almost 60,000 Americans would lose their jobs for every drop of 250,000 units of auto production.

Remember, if you will, that industry-wide auto sales in 1974 were 2.5 million units below the 1973 level -- ten times as great as the figures cited in this example. Thus, this implies the loss of close to 600,000 jobs; and some analysts put the figure higher. We do not believe that the economy can afford the continuing unemployment ripple -- nor would the Congress want to enact programs that cause such results because of tampering with the complex mechanism of our industry.

Another important consideration is the effect of these deliberately discriminatory taxes and subsidies on the competitive position of domestic vs. imported cars. The subsidies on high fuel-efficient

cars would promote the sale of small cars, imported as well as domestic, at the expense of larger domestic cars. To the extent that imports were benefited, the effect on domestic employment and production would be adverse. In addition, there would be balance of trade implications that would have to be carefully assessed in the broader context of a continuing negative balance of payments.

Market demands are moving toward smaller more fuel efficient cars. But, it must be emphasized that only by building a full range of cars that serve the varied needs of consumers will we make any real and lasting contribution to increased overall fuel economy.

Energy Policy

We start from a conviction that it is essential for our nation to reduce its vulnerability from insecure oil imports. This should be the focal point of our appraisal of energy policy issues. Moreover, we believe any programs adopted should be judged in terms of the following criteria: (1) effectiveness in achieving this basic energy objective, both short and long-term; (2) maximum reliance on free market choices, or alternatively, minimum government regulation, and (3) development and maintenance of a healthy economy.

We are not in agreement with other proposed approaches which would attempt to substitute for market forces such non-price methods as rationing, quotas, arbitrary fuel standards or discriminatory taxes. There is no reason to expect these arbitrary measures to succeed.

They would require a costly new bureaucracy to administer and police the program. Because they are arbitrary, they would encourage all sorts of special pleading, adding further to uncertainty. Finally, they would not generate the resources nor provide the incentive essential to expanding energy supplies.

Proposals for punitive taxes or mandatory fuel economy standards have often been supported by the charge that Americans waste energy -- and in support of this the so-called "gas guzzling" automobile has been cited as public enemy number one. It is important for this Committee to recognize that the evolution of vehicle design in the United States has reflected, among other things, the fact that we have had a "cheap energy" policy. With this policy, it was reasonable for the American car buyer to attach a relatively low priority to fuel efficiency. Other vehicle attributes such as performance or riding quality were accorded a much higher priority, and motor vehicle manufacturers designed their products with these consumer demands in mind.

The same scale of priority, as we know, has applied to a great many purchases by consumers, including the size and construction of the houses they bought and many of the power appliances they purchased. As long as energy was low cost, efficiency in its use remained low on the priority list, and this was a perfectly rational choice given the circumstances. In retro-

spect, and given our present understanding, there is no question but that our cheap energy policy should have been replaced a number of years ago by one more reflective of the true costs which exists.

Gasoline Tax Increases

Presumably, it is in recognition of this that the proposals before this Committee include a gradual increase in gasoline taxes, combined with certain exemption provisions. We have, however, serious reservations about this limited tax approach. For federal policies to be effective, attention must be given to all energy uses rather than any one single use, such as gasoline for autos. Such policies also must encompass all alternative energy resources. Only by dealing with the overall energy supply and demand situation, and the price controls and regulations that have contributed substantially to the present imbalance, can we make needed progress.

Unfortunately, the automobile is assumed to be an easy target for painlessly achieving a large part of needed energy conservation. This, despite the fact that the automobile accounts for only about 13% of all energy use, and all transportation accounts for only 25%. In fact, if every car in the United States were taken off the road, we would still need to import oil. As we learned so painfully during the oil embargo, massive and sudden upheavals that affect the use of cars and trucks disorganizes personal lives and triggers severe repercussions in the national economy.

Whether any appreciable net reduction in overall petroleum usage would result from a gasoline tax is problematical. More to the point, since gasoline taxes do not discriminate between domestic and foreign source energy, there is no reason for assuming that any reduction which did occur would come out of foreign source crude. However, such taxes might favor imported cars, even if phased in slowly.

We are not unalterably opposed to tax measures to help solve our energy problems, if such measures prove necessary. However, it seems only reasonable that we first remove controls which hold an important part of the domestic petroleum supply at artificially low price levels. There is no more glaring inconsistency in our current policy than public exhortations to conserve energy while consumption is encouraged by price controls.

If market related prices prove inadequate, then any tax supplements should be directed at all energy usage or at petroleum imports directly. Only in such a way can we be certain that tax measures would actually contribute to our energy goals.

One feature of the current gasoline tax proposal requires special mention -- the proposal to earmark portions of the tax as a basis for funding needed energy developments. This recognition of the need for encouraging future supplies deserves commendation. We, however, feel that a better method for financing needed energy developments would be through price decontrol of "old oil" and new natural gas, coupled with an earnings

plowback provision. A persuasive case can already be made for the proposition that our current difficulties reflect too much government regulation and interference. We should not compound these difficulties by adding still more. We discuss these and other aspects of an overall energy policy more fully in Appendix A.

In summary, we believe tax proposals to tinker with the market and proposals to establish minimum fuel economy standards are not only unnecessary but can be positively harmful. The proposals would impose large costs with respect to disruption of the economy and hardship on individual citizens and offer virtually no benefit in terms of evolving a comprehensive and coherent energy policy which this nation so urgently requires.

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ATTACHMENT A

Statement of

General Motors Corporation

on

National Energy Policy

Submitted to the

Subcommittee on Energy and Power

of the

House Committee on Interstate

and Foreign Commerce

Presented by

Dr. Henry L. Duncombe, Jr.

Vice President and Chief Economist

Washington, D.C.

February 20, 1975

Mr. Chairman and members of the Energy and Power Subcommittee, I am Henry L. Duncombe, Jr., vice president and chief economist of General Motors. Let me emphasize that we believe the development of a comprehensive and realistic national energy policy is one of the urgent priorities before the Congress and the nation.

Today -- almost 16 months after the start of the Arab embargo on oil -- this nation does not yet have a comprehensive and realistic national energy policy. This year -- 1975 we will produce less oil in this country than we did last year. We are using only about the same amount of coal as we used shortly after World War II.

We urgently need a national energy policy because of the need to restore confidence and to establish a climate for risk taking, innovation, and investment, all of which are necessary to expand employment. The lack of a comprehensive energy policy is one reason for business and consumer uncertainty and the unwillingness to make commitments for the future.

In accordance with your request, Mr. Chairman, we are limiting ourselves to an overview of energy policy -- to the broad parameters which we believe are fundamental to any sound energy policy for the short and long term.

A Broad-based Energy Policy

At the outset, we must express our firm belief that it is no longer debatable whether the United States must develop a

strategy for energy policy that will serve its vital interests.

To succeed, this strategy must assure orderly and sustained domestic economic growth as we progress toward greater security of energy supplies. And we will achieve that progress with less waste and disruption of employment and patterns of living if we rely primarily on the free market. In this way we can maintain balance between conservation and greater domestic production in securing our energy future.

Conservation is simply the wise use of our resources and it should comprehend all uses of energy from the home to the factory, and all sources from the coal-pit to the hydro-electric dam.

Unfortunately, the automobile is assumed to be an easy target for painlessly achieving a large part of needed energy conservation. This, despite the fact that the automobile accounts for only about 13% of all energy use, and all transportation accounts for less than 30%. In fact, if every car in the United States were taken off the road, we would still need to import oil.

Still, as we learned so painfully during the oil embargo, a massive and sudden curtailment in the use of cars and trucks disorganizes personal lives and triggers severe repercussions in the national economy.

The lessons we learned during the embargo and are re-learning during this difficult time in our economy are precisely the reasons why we urge caution by the Administration and the Congress

in formulating programs that could severely impact the automotive industry.

We are talking now about threats of gasoline allocation or coupon rationing -- or punitive taxes directed at vehicle weight or horsepower. These will serve only to further confuse the consumer and keep him out of the new car market. Ultimately, this could lead to massive new layoffs in our industry and many other segments of the economy.

Recently, the New York Times had a Nobel prize-winning economist draw up an appropriate program and run it through a computerized model of the American economy. As the basis of his calculations, he took a loss of $1 billion in auto sales, which represents a loss of about 250,000 cars.

For each loss of 250,000 unit sales, the economist, Wassily Leontief, calculated that 22,900 Americans would lose their jobs in the production end of our business. Because the loss of jobs in the auto industry "ripples" through the economy, Leontief calculated that a total of 57,000 Americans would lose their jobs for every drop of 250,000 units of auto production.

Remember, if you will, that industry-wide auto sales in 1974 were 2.5 million units below the 1973 level -- ten times as great as was assumed in the Times model. Thus, this implies the loss of

570,000 jobs. We do not believe that the economy can afford the continuing unemployment ripple -- nor would the Congress want to enact programs that cause such results because of tampering with the complex mechanism of our industry.

We are convinced that any policy adopted should rely as fully as possible on the market mechanism. For this reason, we have supported the broad thrust of the President's program. There is no more glaring inconsistency in the nation's current approach to energy than exhortations on the one hand to conserve energy while on the other hand, the prices of a significant part of supply of those energy sources for which conservation is most vital -- petroleum and natural gas -- are controlled at artificially low levels. The fact is that the exhortations do not square with the realities the public perceives and this makes all the more important that the federal government assume the responsibility for informing the American people clearly and concisely about the necessity for conservation.

Consistent with maximum reliance on the market mechanism, General Motors has proposed a four-part energy program. Its objectives would be to encourage necessary short-term conservation needed to reduce our vulnerability to insecure petroleum sources, and also, to stimulate and hasten greater investment required for the long-term expansion of domestic energy supplies:

1. A comprehensive policy must encompass all energy sources and uses

For the next several years, at least, energy conservation must be a major public concern, although conservation is only part of a comprehensive policy. Conservation -- the wise use of existing resources -- should comprehend all uses of energy from the home to the factory and all types from the coal-pit to the hydro-electric dam.

The nation's conservation program should extend evenhandedly to all applications. All users of petroleum should assume their fair share of the conservation burden, for all have a stake in assuring the nation's long-term supply. The use of coal, our most abundant resource, should be encouraged where it is best suited -- in boiler and utility applications, for example -- so that petroleum and natural gas can be conserved for high priority uses where no substitute energy sources are available.

With the prospect of weakness in the economy this year and the necessity to reduce import requirements,

it may be appropriate to question whether an arbitrary import reduction goal is desirable. Our targets for reducing imports must be considered in the light of energy needs for economic recovery and our ability to increase domestic energy production in the short run.

2. Remove price controls from crude oil, petroleum products and new natural gas.

Governmental policy, which has attempted by price control to provide cheap energy in the United States, has carried with it a heavy price. It has worsened the energy shortage because it has encouraged excessive use and the diversion of scarce energy resources, such as natural gas and oil, to uses that could have been served just as well by more abundant types, such as coal and nuclear fuel.

At the same time, these controls, coupled with continuing uncertainty about our national policy, have reduced the incentive for domestic exploration and development, as well as the construction of refineries and other energy facilities.

Decontrol would tend to increase consumer prices. Unlike the inflationary pressures of the past two years, however, this would reflect the fact that we must pay more for imported oil and the cost of new

energy sources will be higher -- a far different circumstance from the generalized case of "too much money chasing too few goods."

Actions would be needed to mitigate inequities for those who would bear a disproportionately heavy burden; but these should be considered separately. Policy tools such as income tax rebates or reductions are available for low or fixed income groups. An increase in welfare payments may be required by needy families.

3. Provide incentives for private development of American energy resources.

The short-term necessity to save energy must be complemented by the primary longer-term goal of increasing domestic supplies. The removal of price controls on petroleum and new natural gas would increase the revenues and earnings of domestic producers. A special tax on that incremental income which is not reinvested in domestic exploration and development would give private industry a supplementary and powerful incentive to find and develop American energy *for* America's needs. This so-called "plowback" provision, although not included in the President's policy proposals, would

provide a linkage between short-term conservation and long-term energy resource development.

There are conventional domestic resources, such as coal, which seem abundant in terms of present consumption and whose development should be encouraged. Beyond this, demand is expected to continue to grow; and new forms of energy may be required to meet the nation's long-term needs. Development of these sources will also be encouraged if a free market approach is adopted.

In some instances, long-term and high-risk investments in energy development may not be suitable for private enterprise because of uncertainties surrounding OPEC and U.S. energy policies. In these cases, the Energy Research and Development Administration offers a means of channeling portions of the government's energy-related revenues jointly with private industry into such investments during the developmental years.

4. <u>Adopt other measures, including taxation, if necessary</u>.

Immediate attention should be given to the President's proposals for more rapid licensing of nuclear power

plants, an expanded use of coal, the leasing of the Continental Shelf, the development of Naval petroleum reserves, a strategic stockpile, and programs that will assure the needed growth of electric supplies.

Without in any way minimizing the importance of environmental considerations, it seems clear that these concerns have unnecessarily delayed urgently needed development.

Finally, if price decontrol and other measures do not achieve the necessary balance between demand and supply, General Motors would support additional steps to supplement market mechanisms, including import fees and new taxes on petroleum and natural gas. We would concur in such extreme and unpopular steps only because of our conviction that the conservation of energy and the reduction of oil imports are nothing short of essential to national security and growth.

Any supplements to the market mechanism that may be needed should, however, be tested against four standards: (1) effectiveness in achieving energy objectives, (2) minimum government regulation, (3) compatibility with free market choices and (4) development and maintenance of a healthy economy. We are not in agreement with other proposed approaches which would attempt to substitute for market forces such non-price methods

as rationing, quotas or other arbitrary quantitative restrictions.

There is no reason to expect these arbitrary measures to succeed. They would require a costly new bureaucracy to administer and police the program. Because they are arbitrary, they would encourage all sorts of special pleading, adding further to uncertainty. Finally, they would not generate the resources nor provide the incentive essential to expanding energy supplies.

Energy Policy and the Automobile

Let me comment further about energy policy and the automobile. A number of proposals have been aired to impose tax penalties on larger cars, or to establish arbitrary fuel economy standards on manufacturers. We are convinced that the implementation of these proposals would make, at most, a minimal contribution to energy conservation for a decade or more.

In any one year, a tax on new full-size cars would affect the purchase of less than 5% of the total car population in the United States. Moreover, such taxes could well delay the desired replacement of older, less-efficient cars with newer, more fuel-efficient, low-emission vehicles. The effect on energy conservation would be minor and long delayed, but the cost to the economy in lower sales and reduced employment would be major and immediate.

In addition, such punitive taxes would unfairly penalize those at all income levels who need larger cars for family or business reasons. Small cars also will not satisfy the needs of millions of American families interested in the out of doors, whose equipment is often such that they require large cars. The need is not to rule out family size cars, but to make cars of all sizes more efficient -- and we are determined to do this.

The people who buy cars are demanding and in the future will be more insistent in demanding good fuel economy along with comfort, convenience and suitability of the cars to their needs. I can assure you that there is no more compelling discipline for any manufacturer than serving the customer in a free competitive economy. For the government to impose regulation in an area where competition clearly can do a better job is not only redundant but also costly to the auto buyer and to the nation's economy.

GM is investing hundreds of millions of dollars from now through 1978 on our future models that are designed with the fuel economy-conscious customer in mind. We recently assured the Administration that we will make an all-out effort to increase the fuel economy of our cars by a sales-weighted average of 53% between 1974 and 1980. But whether or not we succeed will depend in large measure upon the decision of Congress regarding automotive emission and safety standards. And the decision of Congress will also determine what the ultimate cost to the consumer will be.

In short, we are convinced that reliance on market adjustments to the new realities of energy supply as well as market-related responses by all users of energy to its higher cost provides an efficient framework for a new energy policy. A persuasive case can already be made for the proposition that our current difficulties reflect too much government regulation. We should not compound these difficulties by adding still more.

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STATEMENT OF JAMES W. FORD
PANEL DISCUSSION ON AUTOMOBILE EFFICIENCY AND CONSERVATION
BEFORE THE COMMITTEE ON WAYS AND MEANS, U.S. HOUSE OF REPRESENTATIVES

March 12, 1975

Mr. Chairman, Members of the Committee on Ways and Means, and members of the discussion panel, I am James W. Ford, Assistant Controller and chief economist of Ford Motor Company. I appreciate the opportunity to participate in today's discussion of "Automobile Efficiency and Conservation", a part of your Committee's hearings on energy problems and proposals.

In keeping with today's subject, I shall confine my comments to aspects of the energy situation directly related to automobile transportation.

In brief, the question is how automobile transportation -- among other uses of oil -- should adjust to the higher costs of oil dictated by (1) progressive depletion of low-cost sources, and (2) the uncertainty of supply and high price imposed by the OPEC cartel.

The first step should be to allow the facts of the situation to affect the behavior of all users of oil products and U.S. oil producers. By controlling the price of old oil, the Government has added to the basic problem by causing both more demand and less supply than we need to have. Observers on Mars must wonder why we think that the right way to respond to increasing natural scarcity of oil, compounded by OPEC opportunism, is to make matters worse. Having magnified the problem by our own actions, we are now debating whether to solve it by added taxes on gasoline, taxes or subsidies on cars, fuel economy standards (for vehicles only), allocations, quotas, tax incentives, or tariffs.

Both the President's and your Committee's programs emphasize the importance of removing price controls on oil and natural gas. As the report of your Task Force #5 states:

> Present price controls on oil and new natural gas have the disadvantage of encouraging extensive use of scarce energy resources by keeping their prices substantially lower than they would be under free market conditions. They also remove some of the incentives to increase output of sources of energy.

In short, the market can and should be working for us. Basic to the whole energy question is a fundamental difference between the problem of energy conservation and the problem of pollution control. There is no way an individual can, as a practical matter, buy clean air where he lives through his own actions. This is the reason the Government, as the instrument of collective decision-making, must act to restrict or encourage private actions if we are to control pollution.

This is not true of energy conservation. Consumers and businesses can save oil through their own actions, and they normally have incentives to do so that are commensurate with the available supply and the risk of interruptions or diminution of supply. To digress for a moment, some years ago conversion of power plants and factories from coal to oil and natural gas was speeded because of the vulnerability of coal-burning furnaces to coal strikes. The market will respond to our present vulnerability to interruptions of foreign oil supply if we will let it.

Consumers and businesses have already demonstrated how strongly they can react to higher gasoline prices, even though price control of old oil has attenuated the price impact of OPEC actions. Gasoline usage by automobiles decreased 4% in 1974, in sharp contrast to an average increase of about 5% a year during the preceding 10 years. In part, the 1974 decrease was caused by declining real incomes, but in part by higher gasoline prices and the oil embargo.

The 1974 drop in gasoline consumption reflected mainly a reduction in vehicle miles travelled, which fell from 1,312 billion in 1973 to 1,278 billion in 1974. Lower consumption reflected also a reduction in the average speed of highway travel and, probably, more careful driving to conserve fuel.

Another strong consumer response to higher gasoline prices in 1974 -- and to the gasoline shortages early in the year -- was a sharp increase in the share of small cars in total new-car purchases. Small-cars, domestic and foreign, accounted for 38% of total industry sales in 1972, 42% in 1973, and 48% in 1974.

In the first quarter of 1974, small cars were 51% of total industry sales, and the share would have been higher if manufacturers had had sufficient capacity at that time to produce more. After gasoline supply eased, the market share of small-car sales decreased somewhat and the share of intermediate-size cars increased. Although small cars have continued to account for nearly half of total industry sales, a substantial number of car buyers continue to prefer larger cars, even at today's higher gasoline prices.

Nearly all of the 6 percentage-point increase in small-car market share from 1973 to 1974 was in U.S.-made cars; the foreign share increased only from 15% to 15.7%. The increase in domestic small-car share was achieved by the introduction of new small cars -- Ford introduced the Mustang II in the 1974 model year and the Granada and Monarch as 1975 models -- and by all-out utilization of existing small-car capacity and addition of new capacity. Ford converted two assembly plants from large to small cars in 1974, increased the capacity of three other assembly plants, and added to production capacity for small-car engines and transmissions. The total cost of these actions was nearly $500 million.

In short, a considerable amount of automotive fuel conservation has already occurred in response to actual and anticipated increases in gasoline prices. The long-run price elasticity of gasoline consumption is several times the short-run elasticity, so further reductions will result from the price increases already experienced, as people adjust to them. The present issue is not whether automotive transportation -- among other uses of energy -- should conserve petroleum, but how that should be accomplished.

There are a number of options for conserving gasoline:

1. Driving fewer miles -- that is, reducing vehicle-miles of travel;
2. Utilizing vehicle capacity more fully -- that is, more passenger-miles per vehicle-mile;

3. Driving more carefully to use less gasoline per vehicle-mile;

4. Increasing the mix of cars that use less gasoline per vehicle-mile (not necessarily less per passenger-mile, however);

5. Increasing the gasoline mileage of all cars by changes in technology, weight reduction, and other changes in vehicle design.

All of these methods should be, have been, and will be used. The first three have a larger immediate effect because they involve all cars on the road; the last two take effect over time as new cars are added.

These conservation actions require tradeoffs -- that is, they require people to do things in today's changed energy circumstances that they would otherwise have reason not to do. With one exception, the combination of choices among the options -- driving less, car-pooling more often, using a smaller or less comfortable car, paying more for a car with greater fuel economy -- can be determined either by individuals deciding for themselves or by Government deciding for them.

The one exception is the tradeoff between fuel economy and emissions control. That must be decided by Government, and it is urgent that it be decided quickly and reasonably, to allow progress on fuel economy.

The more general public policy issue, in a nutshell, is how the combination of other tradeoffs should be determined -- by decentralized decision-making, with each consumer deciding for himself how best to economize, or by the Government's deciding what conservation actions are "right", regardless of costs and the different effects on different individuals. It would seem that individual choices should be overridden only if Congress and the Administration decide that letting the market work to reduce our dependence on OPEC is not sufficient or that Government can decide better than people individually how we should conserve oil. As far as I know, neither case has been made.

Let me now discuss briefly the main proposals (other than decontrol of oil prices) for automobile conservation programs, beginning with those that would most severely restrict individual decision-making and disrupt automobile production.

1. Mandatory Fuel-Economy Standards for New Cars

If the increased fuel economy required by standards were less than that required by market demand --either for individual vehicle classes or on average for a manufacturer's products -- the standards would have no effect. If the standards required greater economy than people would freely choose, then the effect would be either to make cars cost more than they otherwise would or to restrict the availability of certain cars and features, or both.

For many people, a larger car is the cheapest transportation available. It does not seem equitable for the Government to establish regulations that impose added costs on a large family, a salesman, a carpool, or anyone else who has special need for a larger car -- and virtually everyone needs a large car at some times. Eighty-two percent of all workers travel to their jobs by car, and 68% of all trips are related to earning a living or family business. It is clear that the cost of automobile transportation is a serious matter for most people.

Further, the Government's dictating fuel economy improvements, or a mix of large and small cars different from that consumers would freely choose, could greatly increase the difficulty and cost of the manufacturers' actions to increase fuel economy.

Automobile manufacturers in January committed to a 40% overall improvement in gasoline mileage by 1980. Until Congress decides

what action to take on new standards, we do not know whether a 40% improvement is even feasible.

A greater task almost certainly would be beyond the financial resources of at least some U.S. automobile manufacturers. Even if the technical and financial problems could be overcome, sales lost because of added new-car costs and dislocations forced by deadlines for achieving a changed product-line mix could cause substantial unemployment in the industry.

Added to these problems, there would be a substantial administrative burden for the Government to devise appropriate procedures for testing and certification and the policing of standards.

It would seem clearly inefficient and unwise to enact legislation that would impose such constraints on consumers, create such risks in the economy, and be so complex to administer, when equal energy conservation can be achieved by simpler, less costly, and fairer means.

2. Vehicle Taxes and Subsidies Based on Gasoline Mileage

Taxes and subsidies to encourage purchase of cars with greater gasoline mileage would be less rigid than fuel economy standards, but they would create similar inequities, and they also would add unnecessarily to conservation costs for people with a greater need for larger cars. Small cars are bought mainly by people who are younger, more highly educated, and have smaller families. What is equitable about a Government conservation program that, in effect,

favors their preferences over other people's?

A program of fuel economy-based vehicle taxes and subsidies would cause the same kind of adjustment problems for automobile companies and workers that fuel-economy standards would cause. The effects of particular standards or tax subsidy plans would be extremely difficult to predict, and, therefore, in both cases there would be grave risks of creating massive financial and unemployment problems in the industry.

3. Gasoline Taxes

A tax on gasoline would be greatly preferable to vehicle standards or taxes because it would allow consumers -- and, therefore, the automobile industry -- far more flexibility in conserving gasoline. On the other hand, a tax as high as 40¢ a gallon, which would represent a 75% increase over today's gasoline price, would impose a heavy burden on automobile transportation users. We estimate that a tax of 40¢ a gallon would reduce industry car sales about 750,000 units in 1979, resulting in 175,000 fewer jobs in the automobile and supporting industries.

Apart from the effects on automobile sales and employment, it is difficult to see why gasoline should be taxed while use of oil for heating and other household, commercial, and industrial uses should not be taxed equally -- why 40% of "the problem", if you will, should be taxed, but 60% should not be. One important fact that is usually overlooked is that other fuels can be substituted for oil in stationary applications, but there is no practical alternative to petroleum fuels in vehicles.

Taxing gasoline only, then, reflects a judgment that automotive usage is less necessary or less socially desirable than other uses of oil. This is based, in part, on the fallacy that most driving is pleasure driving. The fact is that most of us could give up some of each of our uses of energy more easily than we could give up a lot of any one.

Proposals to tax gasoline alone are based in great part on highly subjective judgments. It is fashionable to question the need for comfortable cars, or two cars in a family, but well-appointed, air-conditioned offices or dining rooms are signs of cultivation, a vacation at a comfortable resort is innocent or high-minded pleasure, and having two or more bathrooms in a home is simply civilized. We all have our own tastes and values, but it seems inappropriate to base legislation on such judgments. A tax on gasoline alone is a highly selective override of individual decisions, and it is not necessary to achieve the public purpose of cutting back oil usage.

Mandatory allocations of oil among product uses is subject to similar objections. Mandatory allocations would be worse than a tax on gasoline, however, because they might further restrict consumers by taking away the option of using more gasoline at a price. Very simply, allocations are meaningless if there is enough oil for all uses, and they are a euphemism for rationing if there is a shortage.

4. A Tax on All Oil

If decontrol of oil prices does not cut back demand and increase U.S. production sufficiently to cause the OPEC cartel to dissolve or become ineffective, the most effective and fairest Government policy could be to tax all oil, or just imported oil. A tariff on imported oil seems preferable to a quota, because a tariff would be effective in reducing imports (and encouraging U.S. production), but it would allow some importation at a high price and it would not provide absolute protection of U.S. sources, which might ultimately make possible highly inefficient oil production in the U.S.

* * * * * *

In summary, then, we believe the long-run adjustment to higher cost oil and the immediate defense against the OPEC cartel should be managed with the least

possible cost to the national economic welfare. Automobile conservation, and indeed all other aspects of the adjustment, should be accomplished by leaving individual consumers and businesses the widest possible choice in making the adjustments that are least costly for them. This can be done by letting the market price reflect the true scarcity of oil.

The objection that decontrolling the price of old oil is inflationary reflects a confusion of thought. The damage from inflation is the loss of buying power it causes. In the case of oil, OPEC has taken away buying power directly by restricting the supply of oil -- that is the "inflationary" act, if you will. Whether or not the price of oil and the Consumer Price Index are allowed to rise to reflect the restricted supply, the same loss of real income results. The only question, then, is how we adjust to the loss. The experience under price controls in 1973 and 1974 should have showed us, once again, that controls and shortages are the worst way to deal with restricted supply.

Government policies and programs cannot lessen the impact of the cartel's restriction, but they can facilitate an adjustment of the U.S. economy that eventually will nullify the power of the cartel. The free market is our most effective organization to do this.

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SUMMARY OF STATEMENT OF
RALPH T. MILLET
BEFORE THE
HOUSE WAYS AND MEANS COMMITTEE
MARCH 12, 1975

1. Imported cars have made, and will continue to make, a significant contribution to the cause of fuel conservation, while satisfying the safety and emission-control standards required by Federal and state laws.

2. A tax credit for efficient cars would be undesirable because it would disproportionately benefit imported cars and hurt domestic cars.

3. A gasoline tax would be a useful short-term measure to conserve fuel, bring about less use of heavier, less-efficient cars, and hasten their retirement.

4. An excise tax on inefficient cars would be an effective long-term measure to stimulate all manufacturers to shift permanently to the production of smaller, more-efficient cars.

5. Whatever measures Congress adopts must not discriminate against imports. Discriminatory measures would result in far less fuel conservation, would hurt the imported car industry, which is a significant domestic industry, and would violate our international obligations -- thereby disrupting the new trade negotiations and inviting retaliation.

STATEMENT OF RALPH T. MILLET
BEFORE THE
COMMITTEE ON WAYS AND MEANS
OF THE HOUSE OF REPRESENTATIVES
ON AUTOMOBILE EFFICIENCY AND CONSERVATION
MARCH 12, 1975

Mr. Chairman and Members of the Committee, my name is Ralph T. Millet. I am the U.S. Representative of SAAB-SCANIA, AB, which manufactures the SAAB car, as well as President of the Automobile Importers of America, which consists of all of the major foreign automobile manufacturers, except Volkswagen and Mercedes-Benz. I also serve as a member of the National Motor Vehicle Safety Advisory Council to the Secretary of Transportation.

I understand, however, that you have invited me to appear today in my personal capacity and not as a representative of any particular foreign manufacturer or group of manufacturers. I am particularly grateful for your invitation, and I hope that my views will assist the Committee in its deliberations on the subject of automobile efficiency and conservation.

For a number of years, most foreign car manufacturers have concentrated on building a small, light, and maneuverable car that is relatively inexpensive to run and maintain. This has been due primarily to the higher cost of gasoline abroad, which has generally

been more than a dollar per gallon, as well as to lower income levels. As a result, the vast majority of imported cars are relatively efficient users of gasoline, and, at the same time, turn in some of the best performances in emission-control tests under the Clean Air Act.

In short, the imported car has made a significant contribution to the cause of fuel conservation. Foreign manufacturers as a whole are committed to making further strides in the conservation of fuel, while continuing to make cars that are safe and clean as required by Federal and state laws. In fact, the benefits afforded by imported cars prove once again that our free enterprise system works out for the good of all. Over the past 15 years imported cars have given Americans a choice in terms of price, economy, size, weight, efficiency, and technical innovation.

I should now like to discuss three proposals that have been made to encourage automobile efficiency and fuel conservation and that all fall within the jurisdiction of this Committee. These are, first, a tax credit for efficient cars, second, a gasoline tax, and, third, an excise tax on inefficient cars.

I am opposed to the tax credit primarily because, at least in the short term, it would disproportionately benefit imported cars and hurt domestic cars. Assume, for example, that a $500

or $1,000 tax credit were given to each purchaser of a car that achieved better than 26.5 miles per gallon. We estimate that, of the 50 or so models that qualified, about 40 would be imported. This could create a very strong incentive to buy imported cars and also jeopardize the intensive efforts that domestic manufacturers are now making to shift their production increasingly to smaller and more efficient cars. While the imported car industry has stressed the need for fair legislative treatment, by the same token it is not seeking unfair advantages.

As I see it, we need a short-term measure that will reduce the number and use of gas-guzzlers on the road, and a long-term measure that will stimulate the production of new, more efficient cars. I believe that a gasoline tax can meet the first need, and an excise tax the second. Let me elaborate on both points.

A graduated gasoline tax going as high as 40 or 50 cents per gallon in four or five years, or sooner, would conserve fuel, bring about less use of the heavier, less-efficient cars, and hasten their retirement. How steep the increases in the tax should be and over what period of time obviously depends upon one's assessment of the seriousness of the problem. I do believe, however, that it would be necessary to provide some kind of

exemption from the gasoline tax so as not to inflict undue hardship on those who must use cars for their livelihood. No measure that will effectively conserve fuel will be free of pain to some members of the public, but we should make that pain as tolerable as possible.

For the long term, I would suggest an excise tax that would be tied to increasing levels of fuel economy. If, for example, in a given year the required level of fuel economy was 25 miles per gallon and the Environmental Protection Agency determined that a given car achieved 15 miles per gallon, the purchaser would have to pay a certain excise tax. With each year, the minimum level would increase, and the excise tax could also increase. It seems to me that this would create a very strong stimulus upon all manufacturers to shift permanently to the production of smaller, more efficient cars. If a consumer were faced with a choice between a car with no excise tax and one with a $250 excise tax, he would be strongly influenced to buy the former. Manufacturers both here and abroad would be likely to plan accordingly.

Whatever measure or measures may be finally enacted, it is terribly important that they be applied equally to imported and domestic cars alike. Whether they are in the nature of incentives or disincentives, they must operate in a non-discriminatory

fashion, for several reasons. First, a discriminatory measure would in all likelihood result in far less fuel conservation than a non-discriminatory measure, since, in comparison with domestic models, imported models are generally achieving higher levels of fuel economy. Among the 19 models that attain more than 30 miles per gallon in the highway cycle, the only domestically-made model is the Gremlin 258. An incentive granted only to domestic cars would clearly discourage the purchase of the efficient imported cars. Likewise, a disincentive imposed only on imported cars would not effectively encourage the purchase of smaller, efficient cars.

Second, a discriminatory measure would harm the imported car industry. Consisting of importers, distributors, and dealers, it is a significant domestic industry. In 1973, for example, it employed more than 143,000 persons, had an annual payroll of $1.44 billion and sales of $9 billion, of which over half remained in this country.

Third, a discriminatory measure would be an outright violation of the "national treatment" obligation in our treaties of friendship, commerce, and navigation with Italy, Japan, and West Germany and in the General Agreement on Tariffs and Trade. Under the national treatment obligation, the United States must accord to

products of other countries treatment no less favorable than that granted to domestic products in all matters affecting internal taxation, sale, distribution, and use. Such a blatant violation of this obligation affecting all imported cars would seriously disrupt the efforts -- to which this Committee has made such a contribution -- to launch a new round of trade negotiations in Geneva. Moreover, in my judgment, it would probably lead to retaliatory action that would hurt U.S. exports and aggravate still further our trade deficit.

I would emphasize the need to assure that the imported cars that already achieve good mileage are not penalized for their efficiency. By that I mean that the same increase in efficiency that may be expected of American cars cannot and should not be expected of imported cars. It would be patently unfair to expect, in the same period of time, a 40 percent increase, for example, in the efficiency of a 15-mile-per-gallon car and a 30 mile-per-gallon car. While, as I said earlier, foreign manufacturers are committed to a general improvement in the efficiency of their cars, their potential for improvement in terms of existing technology is necessarily much less than the potential of the American cars.

In summary, I urge that any measure that the Congress adopts to encourage the manufacture, sale, and use of more fuel-efficient

cars be non-discriminatory -- for the sake of energy conservation, the imported car industry, and the international trade program of the United States. Imported cars have done much to demonstrate to the American public and automotive industry that efficiency, safety, and low emissions are not incompatible. They can and, I am sure, will continue to serve as a salutary guide and example, so long as discriminatory measures are not enacted or promulgated.

REMARKS by

Dr. Lawrence A. Goldmuntz, Chairman
Economics & Science Planning, Inc.
Washington, D.C. 20036

At Hearings before the Committee on Ways and Means of the U. S. House of Representatives on Automobile Efficiency and Conservation, in Washington, D.C., on Wednesday, March 12, 1975.

My name is Lawrence Goldmuntz. I am a Visiting Professor of Engineering and Public Policy at Carnegie-Mellon University and Chairman of a Washington-based consulting firm, Economics & Science Planning, Inc.

Mr. Chairman, it is a great pleasure to have this opportunity to appear before you to discuss some of the issues associated with automobile efficiency and conservation. I was first introduced to ambient air quality problems as an Assistant Director for Civilian Technology in the old Office of Science and Technology in the Executive Office of the President. I have maintained an active interest in the automobile emission and air quality problem since that time, ~~having~~ and have prepared a number of reports on this matter for the National Science Foundation. I should like to focus my testimony on two major points.

(1) There is a definite relationship between automotive emission standards and fuel economy, the more stringent the standard, the poorer the fuel economy. This effect can be somewhat mitigated by making a greater capital investment in the engine or by compromising automotive performance.

(2) The current statutory standards on automotive emissions 0.4 grams/mile HC, 3.4 grams/mile CO, 0.4 grams/mile NO_x, are not necessary to meet the ambient air quality standards in the 49 States, excluding California.

One abates automotive emissions for a purpose. That purpose is to achieve ambient air quality standards. Non-automotive sources also contribute to the ambient air quality. These sources can be stationary, such as power plants, homes or industrial establishments. There are also non-anthropogenic, natural sources for some of these pollutants. Based on recent measurements conducted by many organizations such as Bell Laboratories, not associated with the automobile industry but associated with state environmental departments or universities, one can say that the EPA strategy for achieving ambient air quality by reducing automotive emissions to the statutory or near-statutory levels is in total disarray.

The simplest pollutant is carbon monoxide. It is formed primarily by automobiles. It does not react with other pollutants to form secondary pollutants. Its presence can be measured directly in the blood stream of, for example, blood donors. It appears as a substance called carboxyhemoglobin and is readily measurable. Based on these measurements one can say with a high degree of assurance that the statutory automotive emission standard of 3.4 grams/mile CO is not needed to meet the ambient standard. It seems that a standard of approximately 20 grams/mile would be much more appropriate. The importance of this finding is that from the point of view of carbon monoxide it would no

longer be necessary to use catalytic converter technology to achieve ~~the~~ a 20 gram standard. Technologies that are cheaper and more efficient in fuel consumption could be used. These technologies depend on high compression engines and the use of leaded fuel, which happen to poisons catalysts.

In the same way recent experimental results in the field have shown that the hydrocarbon and NO_x strategy that has been picked primarily to control oxidants, is incorrect. Bell Telephone Laboratories measured automotive pollutants in the Philadelphia/Camden area on Sundays and on workdays. They found as expected that the carbon monoxide level on Sundays was decreased to between 30% and 50% of its workday level. However, the oxidant level not only did not decrease on Sundays, it actually increased by approximately 10% at the Federal Standard of .08 ppm. This and other supportive measurements indicate that the current strategy to reduce oxidants due to automotive emissions is not going to work.

Therefore ~~There~~ is no rationale for reducing NO_x emissions from the current level of 3.1 to the level of 2 grams/mile as suggested by EPA. The comparison of Sunday versus workday traffic is a surrogate for a far greater reduction in both hydrocarbons and NO_x than the one proposed by the Environmental Protection Agency. It does not work.

The reasons are dimly understood. There is no doubt that the reduction of NO_2 and HC as proposed by EPA is going to cost the consumer money and fuel in some combination. If this part of the abatement program continues the Bell Laboratories experiment in the Philadelphia area demonstrates, there will be no improvement in air quality and the entire expenditure in fuel and increased automotive cost will have been for nought.

The Environmental Protection Agency must recognize that field measurements to date on the carboxyhemoglobin level in blood and on oxidants on Sundays versus workdays are a large observable stop light to all who are willing to ~~observe~~ see it. It says "You're not going to get what you hope for -- it's going to cost the public money and fuel."

EPA should spare the consumer until we have a strategy that has a chance of working.

Balancing environmental, energy and transportation costs, I conclude that U.S. Federal Standards for the 49 States, excluding California, should be set at 2, 20, 3.1 for the next five years. These standards have been selected for the following reasons:

(a) The ambient air quality standards can be met by 1985, within our ability to predict ambient air quality, and where air quality is determined essentially by automotive emissions. Furthermore, this is approximately the period necessary to replace the present inventory of cars with those having lower emissions;

(b) EPA's projections for HC and NO_x and measurements of air quality by Bell Telephone Laboratories on Sundays versus workdays show that even major reductions from current auto emission standards yield negligible (if any) improvement in ambient air quality. In the case of CO, recent measurements on human subjects indicates that the interim and statutory automotive emission standards are also too stringent;

(c) Some of the technologies that become available at these stabdards have promise of improved fuel economy of as much as 8-10% with respect to the economies achieved in 1975 and at a lower first cost than the 1975 technologies.

(d) The use of lead additives up to approximately 1 gram/gallon will not violate actual or prospective ambient air quality standards and should be permitted. This will allow the use of higher compression engines as compared to those available in 1975 with consequent improvements in fuel economy and without adding to the energy or capital requirements of refineries;

(e) It will not be necessary to remove sulfur from gasoline with the engine technologies that these standards permit. At stricter standards it might be necessary, and at an investment cost to the nation of approximately $5 billion, increasing the price of gasoline by approximately one cent per gallon.

(f) California needs stricter automotive emissions standards than those applicable to the 49 States. The citizens of California are capable of determining for themselves the proper balance between their air quality and automobile costs and fuel economy;

(g) These recommended standards are approximately those adopted by Canada -- 2, 25, 3.1.

For the last half of the next decade any changes in automotive standards that would increase cost or energy consumption should be justified on the basis of the specific health or aesthetic needs that are served by stricter standards. The costs should be compared to other costs on the nation's health agenda. The test of a standard should be the relationships of the marginal benefits to the marginal costs. The justification for a standard should not be based solely on its technical feasibility. The automotive abatement strategy should be related to that applied to stationary sources and to the influence of natural sources. The costs of meeting Federal standards borne by the consumer should be considered equivalent to direct Federal expenditures when allocating resources to specific national objectives. These measures would help discipline the standard setting process so that a reasonable estimate of the external costs of the automobile is internalized by the regulatory process.

-7-

At these standards a technology that is precluded by more restrictive standards, the lean burn engine can compete with the stratified charge and catalyst equipped engines. At these levels the lean burn engine has some important advantages with respect to its competitors -- greater fuel economy, lower first cost, less investment requirement for its production, and no problems with sulfur and lead content in fuels. The emission abatement is available at lower cost due to lean burn, without additional cost for the catalyst. The additional cost may be invested in variable spark timing to improve fuel economy and performance. Higher compression ratios are possible to further conserve fuel. These advantages erode if the emission standards are stricter than the 2, 20 and 3.1 levels suggested here.

February 4, 1975

RECOMMENDED U.S. AUTOMOTIVE EMISSION STANDARDS[1/]

Balancing environmental, energy and transportation costs, it is concluded that:

(1) U.S. Federal Standards for the 49 States, excluding California, should be set at 2, 20, 3.1* for the next five years.

(a) The ambient air quality standards will then be met by 1985, within our ability to predict ambient air quality, and where air quality is determined essentially by automotive emissions;

(b) EPA's projections show that even major reductions from current auto emission standards yield negligible improvement in ambient air quality by 1985. A 73% reduction in HC auto emissions, leads to only a 10% reduction in oxidants in the 49 States. A 90% reduction in NO_x auto emissions reduces ambient NO_x from only 5 to 20% in the major cities of the 49 States.

(c) Some of the technologies that become available at these standards, such as the lean burn engine, have promise of improved fuel economy of as much as 8-10% with respect to the economies achieved in 1975 and at a lower first cost than the 1975 technologies;

(d) These recommended standards are approximately those adopted by Canada -- 2, 25, 3.1.

1/ This report should be read in conjunction with a previous study prepared for STPO under Order No. 74-SP-0913 dated 9/1/74, entitled "Policy Issues for Automotive Emission Control."

* HC, CO, NO_x emissions, all in grams per mile.

(2) Lead additives up to approximately one gram/gallon will not violate ambient air quality standards, should be permitted, and will allow the use of high compression engines with consequent improvements in fuel economy.*

(3) Sulfur will not have to be removed from gasoline with the engine technologies that these standards permit. Catalysts, used to meet the stricter interim and statutory standards, will eventually require sulfur removal at an investment cost to the nation of approximately $5 billion, increasing the price of gasoline by approximately one cent per gallon.

(4) California needs stricter automotive emissions standards than those applicable to the 49 States.

(5) The recommended CO standard was determined by two techniques: The first uses CAMP station annual average data and rolls back the automotive emissions necessary to achieve the ambient air quality standards for various traffic densities in metropolitan centers. The other approach uses the carboxy-hemoglobin levels in blood donors in urban centers as a measure of exposure. The rollback is based on reducing the upper 90 percentile range in the most impacted city (Denver) to that which would obtain with the desired ambient air quality. This leads to a standard of approximately 20 grams per mile.

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* The Wash., D.C. Court of Appeals gave support to this point of view in a decision rendered January 28, 1975.

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RECOMMENDED U.S. AUTOMOTIVE EMISSION STANDARDS

PREPARED FOR

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NATIONAL SCIENCE FOUNDATION

ORDER NO. 75-SP-0409

DECEMBER 27, 1974

As revised February 3, 1975.

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December 27, 1974

RECOMMENDED U.S. AUTOMOTIVE EMISSION STANDARDS[1/]
(1975 - 1985)

1. Introduction

Balancing environmental, energy and transportation costs, this study concludes:

(1) U.S. Federal Standards for the 49 States, excluding California, should be set at 2, 20, 3.1* for the next five years. These standards have been selected for the following reasons:

(a) The ambient air quality standards can be met by 1985, within our ability to predict ambient air quality, and where air quality is determined essentially by automotive emissions. Furthermore, this is the period necessary to replace the present inventory of cars with those having lower emissions;

(b) As explained in (8) below, EPA's projections for HC and NO_x show that even major reductions from current auto emission standards yield negligible improvement in ambient air quality by 1985. In the case of CO, recent measurements on human subjects indicates that the interim and statutory automotive emission standards are also too stringent;

(c) Some of the technologies that become available at these standards have promise of improved fuel economy of as much as 8-10% with respect to the economies achieved in 1975 and at a lower first cost than the 1975 technologies.

(2) The use of lead additives up to approximately 1 gram/gallon will not violate actual or prospective ambient air quality standards and should be permitted. This will allow the use of

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1/ This report should be read in conjunction with a previous study prepared for STPO under Order No. 74-SP=0913 dated 9/1/74, entitled "Policy Issues for Automotive Emission Control."

* HC, CO, NO_x emissions, all in grams per mile.

higher compression engines as compared to those available in 1975 with consequent improvements in fuel economy and without adding to the energy or capital requirements of refineries.*

(3) It will not be necessary to remove sulfur from gasoline with the engine technologies that these standards permit. At stricter standards it will be necessary, and at an investment cost to the nation of approximately $5 billion, increasing the price of gasoline by approximately one cent per gallon.

(4) California needs stricter automotive emissions standards than those applicable to the 49 States. The citizens of California are capable of determining for themselves the proper balance between their air quality and automobile costs and fuel economy.

(5) These recommended standards are approximately those adopted by Canada -- 2, 25, 3.1. The U.S., Canada and Mexico should attempt to agree on a single North American standard. The OECD countries should then also make the more difficult attempt to achieve a single standard. Japan and California might logically have a single stricter standard than the remainder of OECD. Such uniform standard setting would reduce cost and facilitate mobility near borders.

(6) For the last half of the next decade any changes in automotive standards that would increase cost or energy consumption should be justified on the basis of the specific health or aesthetic needs that are served by stricter standards. The costs should be compared to other costs on the nation's health agenda. The test of a standard should be the relationships of the marginal benefits to the marginal costs. The justification for a standard should not be based solely on its technical feasibility. The automotive abatement strategy should be related to that applied to stationary sources and to the influence of natural sources. The costs of

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* The Wash., D.C. Court of Appeals gave support to this point of view in a decision rendered January 28, 1975.

meeting Federal standards borne by the consumer should be considered equivalent to direct Federal expenditures when allocating resources to specific national objectives. These measures would help discipline the standard setting process so that a reasonable estimate of the external costs of the automobile is internalized by the regulatory process.

(7) The recommended CO standard was determined by two techniques -- one derived in a companion report[1/] and the other here. The first technique uses CAMP station annual average data and rolls back the automotive emissions necessary to achieve the ambient air quality standards for various traffic densities in metropolitan centers. This approach leads to a CO automotive emission standard of about 25 grams per mile. In this report, the carboxyhemoglobin level in blood donors in urban centers is used as a measure of CO exposure. The rollback is based on reducing the upper 90 percentile range in the most impacted city (Denver) to the ambient air quality. This leads to a standard of approximately 20 grams per mile.*

(8) The HC and NO_x recommendations are based on EPA projections. These show that a 73% reduction in the hydrocarbon auto emissions standard will produce only a 10% reduction in the oxidant ambient levels in the 49 states. Oxidant levels cannot be measured to this precision. It is also shown that a 90% reduction in NO_x automotive emissions from the current level of 3.1 grams/mile to 0.4 grams/mile would cause an improvement in air quality in Denver and Philadelphia of only 5%; in Chicago, New York and Washington, D.C. of approximately 10%; in Baltimore of 20%; and Los Angeles of 25%. This demonstrates the need to place more reliance on stationary source NO_x if further reductions are required.

1/ Ibid, p. 1.

* Reviewers have pointed out that the CO emission rate from the inventory of light duty vehicles operating in Denver was twice as high as the national average assumed in this paper. This implies a considerably higher permissible CO auto emission standard than recommended here.

(9) At these standards a technology that is precluded by more restrictive standards, the lean burn engine* can compete with the stratified charge and catalyst equipped engines. At these levels the lean burn engine has some important advantages with respect to its competitors -- greater fuel economy, lower first cost, less investment requirement for its production, and no problems with sulfur and lead content in fuels. The emission abatement is available at lower cost due to lean burn, without additional cost for the catalyst. The additional cost may be invested in variable spark timing to improve fuel economy and performance. Higher compression ratios are possible to further conserve fuel. These advantages erode if the emission standards are stricter than the 2, 20 and 3.1 levels suggested here.

2. Other Recommended Standards

The recommendation in this report differs from those of other studies which are enumerated in Table 1.

Table 1

Proposed Automotive Emission Standards

	G.M. (1)			Ford (2)		Calif.		Chrysler		Fede-ral Statu-tory	National Academy of (3) Sciences
	Cal.	Ci-ties	Rest of U.S.	Calif.	States	Orig-inal	Now	1976	1979		
HC	0.8	3.2	6.6	1.4-2.1	1.4-2.1	0.9	0.9	1.5	1.0	0.41	0.4
CO	24	56	78	12-15	12-15	17	9.0	15	15	3.4	3.4
NO_x	1.4	2.4	3.1	1.5-2.5	2.7-3.9	1.5	2	3.1	1.5	0.4	0.4-2

(1) Comments by GM to FEA on Passenger Car Fuel Economy, August 1974
(2) The Relationship of Vehicle Emission Standards and Air Quality Standards, Ford Scientific Research Staff, 4-24-74
(3) Air Quality and Automobile Emission Control, NAS/NAE, Sept., 1974

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* An engine with a high air/fuel rate.

The differences have to do with (1) varying concerns about first cost, fuel economy and automotive emissions, (2) varying assumptions on the relative role of mobile and stationary source abatement, (3) differing estimates on the cost and effectiveness of various engine technologies, (4) various estimates of the cost-effectiveness of the abatement strategies, (5) differing estimates of the appropriate ambient levels, (6) varied interpretations of the effects of background emissions -- particularly hydrocarbons, (7) different interpretations of pollutant measurements; for example, as a function of siting. Some of the differences seem legitimate in view of the lack of data; however, some are due to negligence or predisposition of the analyst.

The Federal Statutory Standards are essentially a guess -- established before the desired ambients were determined, before mobile and stationary source inventories were available, before applicable engine technology was understood, before any cost benefit analysis had been accomplished, before natural sources of pollutants had been evaluated, before inflation and fuel economy became important aspects of public policy. Many of these issues are still unclear but were certainly murky in 1970 when the standards were established. There is no a priori reason to believe that the Federal standards have validity today in view of changing priorities and better understanding.

The analysis and in particular the summary of the National Academy of Sciences study is faulty in a number of respects. They neglected to take into account the contributions of stationary sources of NO_x to the ambient NO_x level. By the year 1985, NO_x from stationary sources will exceed that from mobile sources by 50% in Los Angeles and 800% in Chicago and New York, should the current Federal statutory standard prevail, as shown in Table 5 of this report. Since it is cheaper to remove a ton of NO_x from utility plants as compared to automobiles, this is an expensive error.

NAS down-played natural sources of hydrocarbon and oxidant. There is increasing evidence that these natural sources overwhelm anthropogenic sources in many parts of the country. No abatement strategy is likely to be effective that ignores these backgrounds.

The National Academy of Sciences study attempted to compute the "consumption benefit" of clean air assuming that such a benefit is not included in the benefits associated with improved health and reduced property damage. Unfortunately, the calculation of this benefit is based on CO levels that cannot be detected by human beings and on an incorrect surrogate for oxidant. Oxidant is not proportional to the product of $HC*NO_x$ concentrations, the surrogate used in the NAS model. An excess of NO_x -- in city centers for example -- scavanges oxidant. One consequence of this effect is that oxidant may be lower in city centers than in suburbs and higher on Sundays than weekdays.*

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* Bell Laboratories Interim Status Report 5/30/74 -- Statistical Analysis and Phenomenological Interpretation of the Atmosphere in the N.Y.-N.J. Metropolitan Region.

Furthermore, oxidant has to be at approximately three times the U.S. level before it is detectable by man. Therefore the model is probably not measuring response to automotive pollutants detectable by man. The model may be responsive to the noise due to automobiles, or the sense of danger due to the propinquity of large numbers of automobiles. Perhaps the model is calculating the "consumption benefit" of automobile abatement, not the "consumption benefit" of automotive emissions abatement. The use of such an evaluation to inform public policy on automotive emissions is questionable.

The National Academy did not calculate the marginal benefits and costs associated with lowering the standards from the interim to the statutory levels with respect to CO and HC -- a major issue facing the public. They did perform this calculation with respect to NO_x and seemed to recommend some relaxation in the statutory standard. Since the interim standards will attain the required ambient air quality level almost everywhere where attainable and since even the statutory standards will still not satisfy the ambient air quality levels in some places (notably California), it is no surprise that a cost-benefit analysis at the margin of the interim standards, indicates costs that substantially outweigh the benefits. Furthermore, the NAS cost-benefit study did not consider the likely requirement to remove sulphur from gasoline used in catalyst equipped cars (Section 2, (2)).

The recommendations of the Chrysler Corporation are based on the capabilities of a non-catalyst lean burn engine they have under development and an assessment of the requirements for automotive emissions to meet air quality ambient levels. This engine does not use EGR, air pump or oxidizing catalysts. It achieves control of all three pollutants by using single point fuel injection and controlled intake air through a non-conventional carburetor that provides the good homogeneity that is required in the lean range of 17.5 - 19.5 air fuel ratio. Spark timing is variable and optimized as a function of many engine and load parameters. The compression ratio would be increased to 8.5-9. This engine could effectively use 95 octane fuel which could be obtained most economically and with greatest conservation of energy, by using up to 1 gram/gallon of lead additives. The engine exhibits good commercial drivability and cold weather start capability -- a nemesis of many lean burn engines.

The external characteristics of this engine are claimed to be 13% better fuel economy than 1974 cars and a 6-7% better fuel economy than 1975 catalyst equipped cars at current Federal interim standards of 1.5, 15, 3.1. The selling price is claimed to be $75 over 1974 models or approximately $75 less than catalyst equipped 1975 cars. These two fuel economy improvements would be decreased by 6-7% if the standards were decreased to 1.0, 15, 1.5 from the current Federal interim standards.

The General Motors Corporation, unlike Chrysler, has invested heavily in catalyst technology. They emphasize the maintenance saving of the new engine systems designed to meet the 1975 standards Some of this maintenance saving is due to the removal of lead, which cannot be tolerated by the catalyst system. However, the maintenance saving is not all due to lead removal. For example, the larger spark gap made possible by high energy ignition systems helps prevent fouling.

GM seems to indicate that the Chrysler engine is too lean for fuel economy, that this degree of leanness is required by the emission standards. GM suggests that adding an oxidizing catalyst to the approach Chrysler has adopted would permit them to optimize to even greater fuel economy. However, how much additional fuel economy could be obtained for the additional catalyst investment is unknown. If the 49-State interim standard were set at 2, 20, 3.1, as suggested in this report, then the lean burn engine air-fuel ratio could be optimized for maximum fuel economy resulting in a 8-10% improvement over 1975 catalyst equipped cars.

While catalytic after treatment has permitted engine spark and mixture adjustments to be set so as to maximize fuel economy, because the catalysts are lead intolerant, compression ratios have been dropped approximately one unit so that lower octane lead free gasoline could be used. This has in turn caused a fuel economy loss of 6-7%. It is an advantage of the lean burn engine that compression ratios could be increased to regain that fuel economy. This

requires 95-octane gasoline which is most effectively provided by adding 1 gram/gallon of lead additives. This is one-half to one-third the lead previously used in high octane gasoline.

The effect of higher compression ratios on stratified charge engines is unclear. The fuel economy of a divided chamber stratified charge engine is not likely to be as good as a catalyst equipped engine at the statutory level of emissions. Whether it is as good at the more relaxed levels of the Federal interim standard or at the standards suggested in this report is unknown. Its first cost may be cheaper than catalyst equipped cars and more expensive than lean burn engines at the emission levels suggested in this report.

The Ford estimates do not show the same differences between the cars appropriate to California and those to the 49 States as the GM estimates. This is due to different estimates of the ambient levels required, and different interpretations of the rollback of automotive emissions necessary to achieve the ambients for various sharings of the burden between stationary and mobile sources. Nevertheless, the differences are probably sufficient to warrant a two-car strategy since the NO_x requirements differ by 1 gram/mile which does imply some fuel penalty.

3. Justifications for the Recommended Standards - The Relationship of Emissions to Ambient Levels

One might ask why should it be necessary to recommend standards of 2, 20, 3.1 for the 49 States when the current interim standards are 1.5, 15, 3.1. The answer has a number of dimensions enumerated

below:

(1) Relationship of Standards to Non-Catalyst Cars

The initial 49-State standards were promulgated at their present level so that catalysts would not be needed; the notion being that the nation could experiment in California with catalysts before a national commitment to this approach. Actually 80% of the cars for the 49-States in 1975 have been catalyst equipped to meet the Federal interim standards with minimum impact on fuel economy and to be ready for further decreases toward the statutory levels. If the 49-State standards were set at 2, 20, 3.1, there would be an opportunity to develop a non-catalyst engine that would be cheaper, more rugged and that could be lead tolerant. Its first cost would be lower and it would provide better fuel economy than current catalyst equipped cars. This is an important option to have available especially in view of (2) below.

(2) Health Problems Associated With Catalyst Cars

It remains an unfortunate possibility that catalyst equipped cars may lead to a more serious health hazard than the pollutants they abate. The following text and charts are from a publication of EPA, National Environmental Research Center, July 3, 1974, entitled "Impact of Using Oxidation Catalysts On Light Duty Motor Vehicles on Human Exposures to Regulated and Non-Regulated Emission Products":

"Acid-sulfate aerosols composed of particulate sulfates and sulfuric acid comprise the major problem associated with the use of oxidation catalysts. All current gasoline contains sulfur, the national average being around 300 ppm. Currently, non-catalyst vehicles emit this sulfur as sulfur dioxide gas. This sulfur dioxide is dispersed in the atmosphere and slowly reacts to form particulate sulfate. On a national inventory basis, sulfur dioxide from mobile sources constitutes about 1% of the total sufur dioxide emissions.

"Oxidation catalytic techniques have been used since the late 1800's to produce sulfuric acid from sulfur dioxide. It, therefore, was not unexpected to find that the oxidation catalyst systems envisioned for light duty motor vehicles oxidized some of the exhaust sulfur dioxide to sulfur trioxide which, in the presence of water vapor, reacts almost instantaneously to form sulfuric acid aerosol.

"Table 2 provides estimated percentage increases in the urban median sulfate concentrations after 2, 4, and 10 model years are catalyst-equipped. Two cases are studied for each electric power region , urban population centers exceeding 2 million, and urban centers with populations between 100,000 and 2 million. It is apparent that the incremental acid-sulfate aerosol exposure associated with oxidation catalysts significantly increases the median levels to which urban populations will be exposed.

"... Table 3 translates the percentage increase in sulfate level exposures due to catalysts into the increased number of days per year during which exposures would exceed the current estimates for adverse health effects and mortality thresholds (10 and 25 ugm/M^3 respectively). After four model years are equipped with catalysts, the mortality threshold might be exceeded an additional 76 days due to vehicle-generated sulfuric acid aerosols."

TABLE 2

SUSPENDED WATER SOLUBLE URBAN SULFATE LEVELS
BY ENERGY REGION AND POPULATION CLASS:
IMPACT OF CATALYST SULFATE EMISSIONS
ON 24-HOUR MEDIAN CONCENTRATIONS*,**

Urban Population Class: > 2 Million[1]

Energy Power Region	Median Sulfate Levels (ugm/M3)(Base)	Incremental Percentage Increase in Base Sulfates Due to Use Catalysts After: 2 years	4 years	10 year
NPCC - MAAC	17.2	15	30	75
ECAR	14.1	18	36	92
MAIN	17.0	15	31	76
SERC	14.0	19	37	93
MARCA	-	-	-	-
SWPP - ERCOT	4.8	54	108	270
WSCC	4.9	53	106	265

Urban Population Class: 100,000 to 2 Million[2]

NPCC - MAAC	13.3	12	24	60
ECAR	10.4	15	31	77
MAIN	7.3	22	44	110
SERC	8.2	19	39	97
MARCA	5.8	28	55	138
SWPP - ERCOT	5.2	31	61	154
USCC	4.3	37	74	186

*Assumes no coversion of power plants to coal.

**Assumes median urban sulfate concentrations (24-hour) will not change from 1970 base levels.

[1]Assumes high estimate catalyst sulfate exposure model (COHb surrogate) for urban centers.

[2]Assumes low estimate catalyst sulfate exposure model (COHb surrogate) for suburban areas.

TABLE 3

NUMBER OF DAYS DOWNTOWN NEW YORK CITY EXCEEDS SPECIFIED AMBIENT 24-HOUR SULFATE LEVELS: IMPACT OF CATALYST-EQUIPPED VEHICLES AFTER 2 and 4 YEARS*

New York City (1970)	Number of Days Sulfate Levels Exceed:* 10 μgm/M^3(1)	25 μgm/M^3(2)
Base Case (1970)	332	110
After 2 years catalyst-equipped vehicles	347	135
After 4 years catalyst-equipped vehicles	352	186

*Assumes base case (1970) sulfate levels do not change and no power plants are converted to coal.

**Assumes catalyst incremental sulfate frequency distribution is the same as NYC ambient sulfate frequency distribution.

(1) CHESS study health effects threshold

(2) CHESS study mortality threshold.

(3) Setting the NO_x 49-State Standard -- 3.1 Grams/Mile

At an emission level of 3.1 grams/mile, two cities -- Chicago and Los Angeles -- would violate the ambient air quality measurement for NO_2 in 1985 and five are approximately at the standard within the precision of measurement, siting and instrumental ($\pm$ 10 µgrams/M^3), as shown in Table 4 prepared by EPA. This table includes only cities with the highest NO_x levels.

TABLE 4

Projected Nitrogen Dioxide Air Quality Levels
in 1985 at Various Emission Standards

Ambient Air Quality Standard: 100 µg/m^3

	3.1 g/m	2.0 g/m	1.0 g/m	0.40 g/m
1. Phoenix	78	72	69	66
2. Los Angeles	153	135	120	110
3. San Francisco	87	83	79	76
4. Denver	101	99	97	95
5. New York	99	95	89	86
6. Philadelphia	109	106	104	102
7. Washington, D.C.	102	98	94	89
8. Chicago	127	122	112	111
9. Baltimore	107	101	94	88
10. Salt Lake	60	56	50	46

This table shows something else of great interest. Despite a 90% reduction in NO_x emissions to 0.4 grams/mile, the air quality in Denver and Philadelphia is improved by only 5%; in Chicago, New York and Washington, D.C. by approximately 10%; in Baltimore by 20%; and Los Angeles by 25%. Evidently something else is contributing to the NO_x burden in these cities.

The major source of NO_x in the 49 States is from stationary utility and industrial plants, as indicated in Table 5, where the automotive emission standard is set at 0.4 grams/mile. This table was provided by EPA in 1971 to the RECAT Committee.

TABLE 5

Relative Stationary and Mobile Source NO_x

AQCR	Source of Emission	Quantity of Emissions Per Year (10^3 tons/yr) 1975	1980	1985
Chicago	Mobile	140	71	31
	Stationary	233	241	245
New York	Mobile	276	139	60
	Stationary	358	407	467
Philadelphia	Mobile	124	64	28
	Stationary	306	347	397
Washington DC	Mobile	67	38	19
	Stationary	87	101	119
Los Angeles	Mobile	442	349	103
	Stationary	139	142	146

With respect to Chicago, New York, Philadelphia, and Washington, D.C., the emissions from stationary sources in 1985 exceed those from mobile sources by factors of 5-10 should the automotive standard be 0.4 grams/mile.

A 50% reduction in stationary source NO_x in Chicago would be equivalent in NO_x reduction to a change in automotive standards of 90% from 3.1 to 0.4 grams/mile. It could be obtained at

substantially lower cost. It has been known for some time that the cost of removing a ton of NO_x from automotive sources is three to twenty times as great as the highest estimated cost for accomplishing the same NO_x removal from stationary power plant sources.[2/,3/] There is not likely to be any energy penalty associated with limiting NO_x emissions from stationary sources. The chemically based nitrogen in certain fuels can be converted to elemental nitrogen by providing a reducing atmosphere through limitation of oxygen availability in a portion of the burner. One can prevent the fixation of molecular nitrogen in combustion air by avoiding peak temperatures in the burner systems. This does not imply lowering the working temperatures of the boiler and therefore no decrease in efficiency is expected.

Los Angeles is a special problem. It seems clear that even with maximum stationary source technology it will be necessary to reduce automotive emission standards to levels less than that appropriate for the 49 States. Since it is a problem peculiar to California, it has been recommended that Californians themselves set that standard and make the compromise necessary between transportation costs, fuel economy and the environment.

2/ "Cumulative Regulatory Effects on the Cost of Automotive Transportation (RECAT)" Office of Science & Technology, Executive Office of the President, Feb. 28, 1972, p. 10.

3/ "Control Techniques for Nitrogen Oxide Emissions from Stationary Sources" National Air Pollution Control Administration Publication AP-67, Wash., D.C., Mar. 1970.

There is shown in Figure 1 the distribution of NO_x from stationary sources as derived by EPA. It can be seen that more than 75% of the emissions come from point sources, so that such a control strategy seems perfectly reasonable. A 50% rollback of stationary source NO_x while maintaining the 49-State automotive emission standard at 3.1 (a 50% rollback) would satisfy the 49-State ambient NO_2 standard.

The suggested NO_x standard in the 49 States can be determined from another point of view. A rollback calculation for NO_2 in Chicago using a present air quality of 0.06 ppm and a present emission value of the current inventory of cars of 6 grams/mile, a growth factor of 1.5 and a background of 0.004 ppm, leads to an automotive emission standard of 3.0 grams/mile.

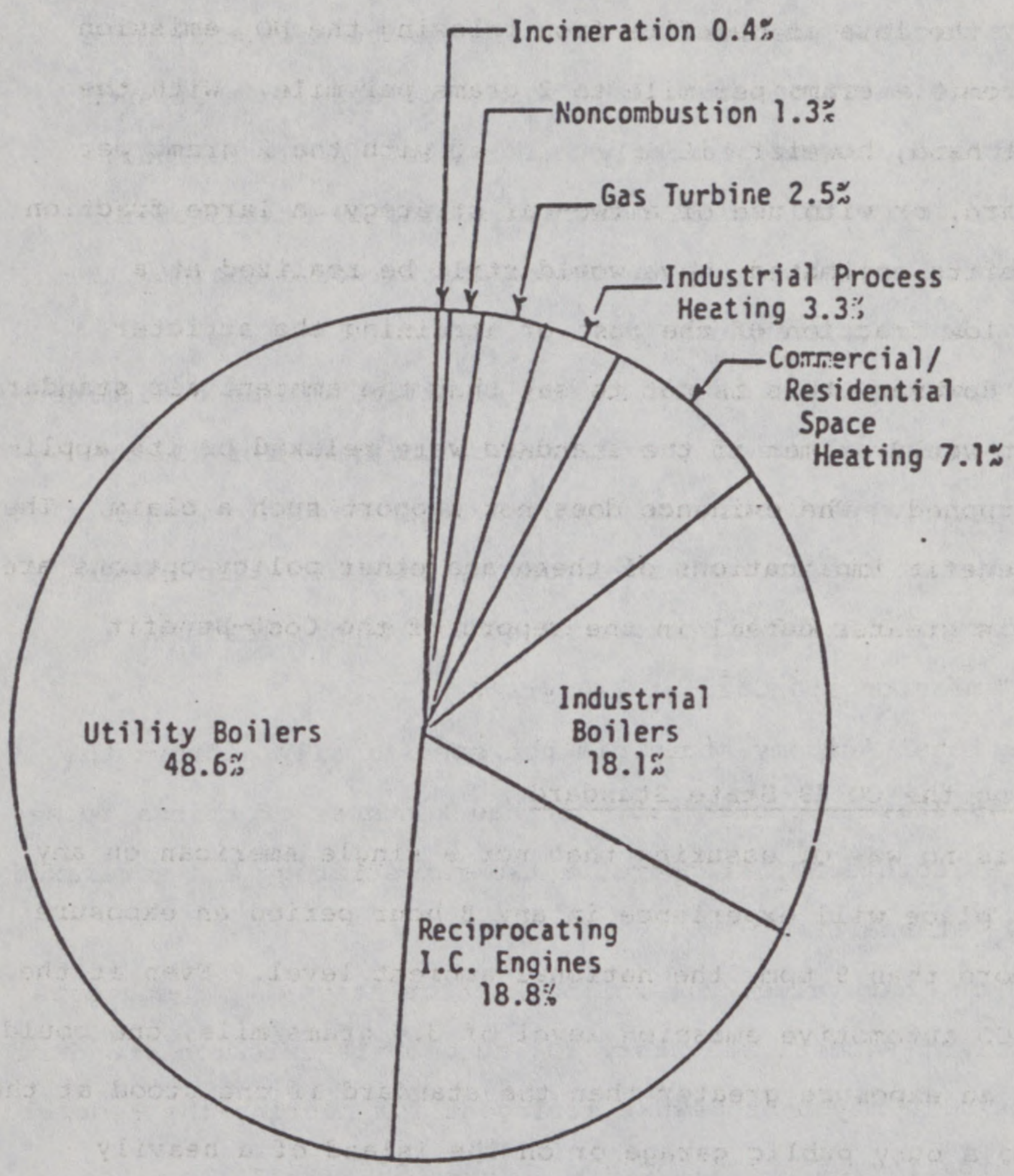
The National Academy study did not specifically address the issue of a 49-State NO_x standard. It had a number of things to say about the California NO_x standard, a two-car strategy and a relaxed national NO_x standard.

"Based on that value, the rollback calculation . . . suggests that the current Federal statutory NO_x automobile emission standard of 0.4 grams/mile may be somewhat stringent for meeting the Federal ambient air quality standard for NO_2 in Los Angeles."4/

4/ "Air Quality and Automobile Emission Control" A Report by the Coordinating Committee on Air Quality Studies, National Academy of Sciences/National Academy of Engineering, Sept., 1974, Vol. 3, pp. 126, 128.

FIGURE 1

TOTAL NO_x EMITTED IN THE U.S. FROM STATIONARY SOURCES, 1972



Source	Estimated NO_x Emissions Tons/Year
Utility Boilers	5,670,000
Reciprocating I.C. Engines	2,189,000
Industrial Boilers	2,103,000
Commercial/Residential Heating	826,800
Industrial Process Heating	390,200
Gas Turbines	291,000
Noncombustion	149,000
Incineration	41,000
TOTAL	11,665,000

"The benefit data are too crude to permit estimating numerically the loss in benefits from relaxing the NO_x emission standard from 0.4 grams per mile to 2 grams per mile. With the evidence at hand, howefer, it appears that with the 2 grams per mile standard, or with use of a two-car strategy, a large fraction of the benefits estimated above would still be realized at a relatively low fraction of the cost of attaining the stricter standard. However, this is not to say that the ambient air standard for oxidant would be met if the standard were relaxed or its application postponed. The evidence does not support such a claim. The cost and benefit implications of these and other policy options are discussed in greater detail in the report of the Cost-Benefit Committee." 5/

(4) Setting the CO 49-State Standard

Thre is no way of assuring that not a single American on any day in any place will experience in any 8-hour period an exposure to CO of more than 9 ppm, the national ambient level. Even at the statutory CO automotive emission level of 3.4 grams/mile, one could experience an exposure greater than the standard if one stood at the entrance to a busy public garage or on the island of a heavily burdened highway. Therefore the standard has to be interpreted in terms of a national policy that determines the siting of monitoring stations.

5/ "Air Quality and Automobile Emission Control" A Report by the Coordinating Committee on Air Quality Studies, National Academy of Sciencds/National Academy of Engineering, Sep. '74, Vol. 1, p. 16.

One of the most reasonable monitoring stations is the human body itself. By measuring the amount of carboxyhemoglobin in the blood stream, one obtains an indication of the amount of carbon monoxide inhaled and retained during the course of an 8-hour period.[6/] The following table is reproduced from the report summarizing the results of this technique.

Table 6—Median, Carboxyhemoglobin (COHb) Saturation and 90% Range for Smokers and Nonsmokers

Location	Cigarette Smokers	Nonsmokers	No. of Nonsmokers	% of Nonsmokers With COHb >1.5%
Anchorage	4.7 (0.9-9.5)	1.5 (0.6-3.2)	152	56
Chicago	5.8 (2.0-9.9)	1.7 (1.0-3.2)	401	74
Denver	5.5 (2.0-9.8)	2.0 (0.9-3.7)	744	76
Detroit	5.6 (1.6-10.4)	1.6 (0.7-2.7)	1,172	42
Honolulu	4.9 (1.6-9.0)	1.4 (0.7-2.5)	503	39
Houston	3.2 (1.0-7.8)	1.2 (0.6-3.5)	240	30
Los Angeles	6.2 (2.0-10.3)	1.8 (1.0-3.0)	2,886	76
Miami	5.0 (1.2-9.7)	1.2 (0.4-3.0)	398	33
Milwaukee	4.2 (1.0-8.9)	1.2 (0.5-2.5)	2,720	26
New Orleans	5.5 (2.0-9.6)	1.6 (1.0-3.0)	159	59
New York	4.8 (1.2-9.1)	1.2 (0.6-2.5)	2,291	35
Phoenix	4.1 (0.9-8.7)	1.2 (0.5-2.5)	147	24
St. Louis	5.1 (1.7-9.2)	1.4 (0.9-2.1)	671	35
Salt Lake City	5.1 (1.5-9.5)	1.2 (0.6-2.5)	544	27
San Francisco	5.4 (1.6-9.8)	1.5 (0.8-2.7)	660	61
Seattle	5.7 (1.7-9.6)	1.5 (0.8-2.7)	585	55
Vermont, New Hampshire	4.8 (1.4-9.0)	1.2 (0.8-2.1)	959	18
Washington, DC	4.9 (1.2-8.4)	1.2 (0.6-2.5)	850	35

6/ "Carboxyhemoglobin Levels in American Blood Donors" Stewart et al, JAMA, Aug. 26, 1974, Vol. 299, #9, p. 1187.

It is generally considered that a carboxyhemoglobin (COHb) of 1.5% saturation corresponds to the ambient air quality standard of 9 ppm CO.* The average of the medians for non-smokers in Table 6 is 1.42%, within the standard. However, the average of the upper limit of the 90% range in non-smokers is 2.77%. This reflects the conclusion of this study that 45% of all the non-smoking blood donors tested had COHb saturations greater than 1.5% corresponding to the ambient standard.

In most communities, mobile sources and primarily light duty vehicles are the major contributor (80-90%) to CO pollution. During the period of the carboxyhemoglobin test 1968-1972, automobiles in the operating inventory emitted an average of 55-60 grams/mile of CO.

If the ambient standard were to be interpreted as a mandate to reduce the upper limit of the 90% range for non-smokers from 2.77% of COHb to 1.5% COHb, then automotive emissions would have to be reduced to 1.5/2.77 or approximately 50% of their previous level. This suggests a CO standard of 25-30 grams/mile.

If the ambient air quality standard were interpreted as a mandate to reduce the upper limit of the 90% range for non-smokers in the city with peak CO excursions, Denver, then the reduction would have to be 1.5/3.7 or 40%. This suggests a CO auto emissions standard of approximately 20 grams/mile, the recommendation of this study.

Thus the recommendation for a CO automotive emission standard of 20 grams is based in part on the best CO exposure data currently

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* COHb is linearly related to ambient CO in this region.

available that tends to resolve the siting issue in an unambiguous manner.

(5) Setting the HC 49-State Standard

The Federal ambient hydrocarbon standard, 0.24 ppm maximum 3-hour concentration not to be exceeded more than once per year, has been set to control photochemical oxidants at a level of 0.08 ppm -- maximum one hour concentration not to be exceeded more than once per year. The ambient hydrocarbon at these levels is not considered by itself a health hazard.

Table 7 indicates the relative distribution of hydrocarbon emissions between stationary and mobile sources according to EPA.[7/] It reflects the substantial HC automotive emission abatement program to the statutory limit of 0.41 grams/mile.

TABLE 7

Relative Stationary and Mobile Source HC

AQCR	Source of Emission	Quantity of Emissions Per Year (10^3 tons/yr) 1975	1980	1985
Chicago	Mobile	115	46	19
	Stationary	17	17	18
New York	Mobile	163	64	26
	Stationary	28	29	31
Philadelphia	Mobile	120	48	20
	Stationary	108	112	115
Washington DC	Mobile	148	66	30
	Stationary	18	19	20
Los Angeles	Mobile	420	237	146
	Stationary	347	365	365

7/ "Cumulative Regulatory Effects on the Cost of Automotive Transportation (RECAT)" Feb. 28, 1972, OST, PI-67.

This table seems to neglect evaporative losses and filling losses as discussed in the companion to this report.[8] There it has been pointed out that evaporative HC emissions amount to 2.1 grams/mile at low altitude and 6.4 grams/mile at high altitude (Denver) as compared to expected values of 0.2. Furthermore tank filling evaporative losses at 70°F amount to an equivalent of 0.41 grams/mile. This table also seems to ignore background sources of hydrocarbon, which has been documented in the companion to this report.[8] Additional evidence of overwhelming non-anthropogenic hydrocarbons has recently become available.[9] Members of the Naval Research Laboratory analyzed rain water collected in Washington, DC, following the sustained smog alert during August of 1973. Quotations from their report follow:

> "... One smog, in the middle of August, which lasted almost two weeks, was occasioned by a weather pattern of stagnant air which covered the whole area east of the Appalachian Mountains between New Jersey and North Carolina. This weather pattern was accompanied by higher than usual summer temperatures. A general haziness of the atmosphere prevailed which cut visibility at times to less than two miles. These conditions persisted for several days until a gentle rain commenced to fall on the 13th of August.
>
> "Five gallons of rain water were collected on 13 August as run-off from a 4 × 8 ft flat sheet of heavy

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9/ "Identification of Some Organic Smog Components Based on Rain Water Analysis" R. A. Saunders, J. R. Griffith and F. E. Saafeld, NRL, Journal of Biomedical Mass Spectrometry 1, 192 (1974)

8/ "Policy Issues for Automotive Emission Control" Sept. 1, 1974 NSF Order No. 74-SP-0913.

polyethylene film. The plastic had first been washed several times successively with distilled water and ethanol until the final wash water was determined (by analysis described below) to be free of contaminants.

"In conclusion, the smog alert of mid-August could have been caused by terpene-like hydrocarbons volatilized from Appalachian vegetation. Certainly this vegetation contributed to the organic material in the atmosphere at that time. These hydrocarbons were confined in a huge stagnant air mass by an unusual weather system that centered over the coastal plain near Washington. Oxidation of this material produced 3-methylfuran, ozone at an elevated concentration and other photochemical oxidants which resulted in the smog alert.

"The absence in the rain water sample of identifiable concentrations of aliphatic hydrocarbons associated with gasoline, suggests that automobile emissions may have played a minor role in the production of the mid-August smog. The aromatic hydrocarbons detected may be from automobile emission but their concentration, relative to that of 3-methylfuran, suggests that the terpene source is the most important. Obviously, these conclusions apply only to the mid-August 1973 smog. No suggestion is made that automobile emissions do not play a major role in air pollution generally, or are not causative agents in the formation of other smog conditions at other times or places.

"If, as these data support, there are causes other than automobile emission for summer photo-oxidant smogs, responsible agencies should distinguish between such smogs due to naturally occurring hydrocarbons and those attributable to automobile emissions."

The following Table 8, supplied by EPA as recently as December 11, 1974, illustrates the probable futility of lowering the HC standard in the 49 States from 1.5 to 0.41 grams/mile as well as the feasibility of setting the 49-State HC standard at 2 grams/mile with little effect on the oxidant levels.

TABLE 8

Projected Air Quality in 1985

Oxidants

Ambient Air Quality Standard: .08 ppm

Region	1970	1985	
		Statutory Standard	Interim Standard
Birmingham	.13	.05	.05
Mobile-Pensacola	.10	.04	.04
Clark-Mohave	.19	.13	.14
Phoenix-Tucson	.15	.12	.12
Los Angeles	.62	.36	.39
Sacramento Valley	.24	.18	.19
San Diego	.26	.13	.15
San Francisco	.30	.21	.22
San Joaquin	.20	.15	.16
S.E. Desert	.22	.13	.14
Denver	.18	.06	.07
NY-NJ-Conn.	.18	.06	.07
Philadelphia	.14	.06	.06
National Capital	.16	.08	.09
Cincinnati	.13	.06	.07
Indianapolis	.14	.06	.07
S. Lou.-S.E. Texas	.13	.09	.09
Boston	.20	.08	.09
Toledo	.14	.06	.07
El Paso-Las Cruces	.13	.03	.04
Genesee-Finger Lakes	.15	.06	.07
Dayton	.18	.09	.10
Portland	.14	.06	.07
S.W. Pennsylvania	.16	.06	.07
Austin-Waco	.11	.03	.03
Corpus-Christi	.19	.13	.13
Dallas-Ft. Worth	.13	.03	.04
Houston-Galveston	.32	.23	.24
San Antonio	.15	.04	.05
Puget Sound	.16	.06	.07

If one averages all the non-California projected oxidant standards for 1985 using statutory standards (0.41, 3.4, 0.4) one obtains from Table 8 a value of .071 ppm. If one computes the same average for the interim standards (1.5, 15, 3.1), one obtains a value of .08 ppm. Thus a 73% reduction in the automotive emission standard has produced only a 10% reduction in the oxidant ambient levels. Oxidant levels cannot be measured to this precision.

The conclusion from EPA's data is that a substantial reduction from interim standards for HC to statutory standards will not have any effect. The corollary of this statement is that a 30% increase in automotive hydrocarbon emissions from 1.5 grams/mile to 2 grams/mile is likely to have no more than a 5% increment in oxidant. This also could probably not be observed. The advantage of this increase in allowable HC emissions is that it permits a class of engines to be utilized that is likely to have the lowest first cost and greatest fuel economy of all contenders. It is also an engine that is lead tolerant and will not require sulphur removal from gasoline.

If one analyzes Table 8 for the California sites one finds that tightening the HC standard from 0.9 grams/mile to 0.41 grams/mile decreases the average oxidant from 0.199 ppm to 0.184 ppm, which is also likely to be unobservable.

The reason for this is partially apparent from Table 9 provided by the California Air Resources Board. It shows that when the light duty passenger car emissions are reduced 54%, the total reactive hydrocarbons in the Los Angeles basin are reduced only 4%.

TABLE 9

Reactive Hydrocarbons

Estimated Emissions[1] - Los Angeles County (SCAB)

(Tons/day)

Passenger Car 1976 0.9 gm/mile
Standards 1977 0.41

Year	Sources[2] L.D. Pass.	L.D. Truck	H.D. Gas	H.D. Diesel	Motor-cycle	Other[3]	Total Mobile Sources	Stationary Sources	Background[4]	Total
1975	225	35	138	20	8	53	479	250	158	887
1980	80	14	97	15	9	49	264	280	158	702
1985	43	8	78	13	11	51	204	310	158	672
Alternate Passenger Car 1976 0.9 gm/mile Standards 1977 0.9										
1975	225	35	138	20	8	53	479	250	158	887
1980	93	16	97	15	9	49	279	280	158	717
1985	67	12	78	13	11	51	232	310	158	700

1. Estimated values as of 10-28-74.
2. Calif. CUS-2 method used for L.D. vehicle emissions.
3. Includes aircraft, railroads, ships and off-road vehicles.
4. Background hydrocarbons are assumed to be 15% of the 1970 total of mobile and stationary source emissions.

(6) The Lead Additive Issue

An increase in compression rates from current levels to approximately 9 would require 95 octane fuel and could provide, at constant performance, an improvement in fuel economy of approximately 5%.[10/] To obtain this level without lead additives would cost an additional 3%[11/] in refinery energy. Therefore increasing the compression ratio in lead intolerant engines has little overall energy benefits, the 5% gain being offset by the 3% loss. In a lead tolerant engine such as the lean-burn, the full 5% improvement in fuel economy is obtained with respect to a catalytic equipped equivalent engine.

The impact of compression ratio and octane requirement on dual chamber stratified charge engines is still not clear as a function of emission standards and fuel economy.

The health problem associated with lead additives can be simply summarized. The dietary uptake of lead is the most important route for high lead levels in blood. It has been clearly identified with lead in the poisoning of children who have ingested lead based paints (now essentially banned) in old decaying housing of the slums in eastern cities. The National Academy of Sciences summarized respired lead tolerance as follows: ". . . it is not possible, on the basis

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10/ "Value of High Octane Number Unleaded Gasolines in the U.S." Corner & Cunningham, American Chemical Society, Mar. 28-Apr. 2, 1971 meeting in Los Angeles, Calif.

11/ Report by the Committee on Motor Vehicle Emissions" National Academy of Sciences, Novermber 1974, p. 136.

of available epidemiologic evidence, to attribute any increase in blood lead concentration to exposure to ambient air below a mean lead concentration of about 2 or 3 µgrams/M^3."12/

The average annual lead concentration in downtown Philadelphia or Los Angeles was 3 µgrams/M^3 13/during a period when the average lead content per gallon was 2.4 grams. Phasing down this lead content to 1 gram/gallon, sufficient for 95 octane gasoline, would reduce the mean atmospheric lead concentration to 1.? µgrams/M^3. This is within the recommendations of the NAS report and meets the ambient lead standard set by California, 1.5 µgrams/M^3.

Lead traps, integral with muffler systems, can be relied upon to remove exhaust lead emissions if required to meet possible ambient standards that cannot be met by the suggested lead phase-down in gasoline, from 2.4 to 1 gram/gallon.

12/ "Airborne Lead in Perspective" National Academy of Sciences, 1972, p. 210.

13/ Ibid, p. 21.

4. Summary.

This report has suggested that a 49-State automotive emission standard of 2, 20, 3.1 will meet ambient air quality standards where they can be met. It also indicates that the ambient air quality achieved by the Federal Interim Standards of 1.5, 15, 3.1 will not achieve an air quality that is measurably better than the suggested standards. It also points out that the statutory standard for CO, 3.4 grams/mile is not needed to meet the most reasonable siting criteria available for measuring the CO ambient level of 9 ppm. It further indicates that the statutory requirement for HC, 0.41 grams/mile, and NO_x, 0.4 grams.mile, are not likely to achieve a measurably better oxidant air quality and are not needed to achieve the NO_2 ambient standard in the 49 States. Additionally, it suggests that reducing allowable lead additives to approximately 1 gram/gallon from the national level of 2.5 grams will meet ambient air quality requirements for that pollutant.

An additional lead abatement could be obtained by the use of lead traps, but they are probably not needed.

California, on the other hand, does require stricter standards that increase first costs and decrease fuel economy. Therefore a two-car strategy is still indicated. The companion report to this study* indicated the cost and fuel economy advantages of such a strategy.

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* NSF Order No. 74-SP-0913, Sept. 1, 1974, "Policy Issues for Automotive Emission Control."

The advantage of setting the standards at 2, 20, 3.1 is an 8-10% fuel economy improvement over catalyst equipped 1975 cars. The further advantage is that engines meeting these standards are lead and sulphur tolerant and require no heavy capital expenses to place into production. The results are achieved by returning to higher compression ratios and by using variable spark timing. Should the Federal Interim Standard of 1.5, 15, 3.1 be required, the fuel economy would be reduced to 6-7%. Should the Federal Interim Standards be reduced to 1.0, 15, 1.5, the fuel economy would be comparable to 1975 catalyst equipped cars, but sulphur would certainly not have to be removed from gasoline, as appears likely with catalyst equipped cars. No major tooling would be required as is the case with stratified charge engines.

This 8-10% improvement in fuel economy should be compared with other possible improvements 14/ that are reasonable potentials for the 1980 time frame:

(1) Improved Automotive Transmission:
9-12% obtained by addition of an extra gear and elimination of torque converter slip. The cost increase is undetermined at this time.

14/ "Potential for Motor Vehicle Fuel Economy Improvement" Report to the Congress, 24 October 1974, DOT & EPA.

(2) Reduction of Aerodynamic Drag: 1.5%.

(3) Steel Belted Radial Tires: 2.5-4%.

(4) Weight Reduction: A 10% weight reduction would achieve a 7-8% increase in fuel economy. However, when this is obtained by substitution of materials, costs are likely to be higher. Where this change is obtained by reduction in car size, the susceptibility to fatalities and serious injuries are likely to increase. The historical record in this regard is that the probability of fatalities and serious injuries doubles for a 2000 pound decrease in vehicle weight from 4000 to 2000 pounds. The extent to which this historical trend can be overcome by better design or more effective utilization of restraint systems is not clear. The use of restraint systems can certainly be helpful, but cannot overcome the safety implications of reduced car size and weight.

(5) Thermostatically Controlled Cyclic Air Conditioner: 1.4%.

(6) Engine Size Reduction: 10-15% respectively for mid-size and large automobiles by decreasing their power-to-weight ratios to those in many small cars. Acceleration capability and the ability to maintain speed on grade with heavy loads (e.g. trailers) would be compromised. Safety would be diminished, but to an extent that is not known.

One can conclude that relaxing the Federal Interim Standards slightly is one of a number of options to improve fuel economy while maintaining or decreasing first costs. All options have safety and first cost implications. This slight relaxation of the Federal Interim Standards may have the greatest fuel economy benefit per cost increment or safety decrement of the options available to public policy.

Hittman Associates, Inc.

March 12, 1975

Statement of William R. Menchen Prepared For
The Automobile Efficiency and Conservation Panel
Of The Committee on Ways and Means

Hon. Al Ullman
Chairman, Committee on Ways and Means, U.S. House of Representatives, Washington, D.C.

Dear Mr. Chairman:

Approximately one year ago Hittman Associates completed a study* for the Council on Environmental Quality which focused on the supply side of the automobile market in terms of fuel economy. Appendix A to this statement is a summary of the work I refer to.

The CEQ study's objective was to determine industry response to fuel economy policy measures. To accomplish this objective, near term technical alternatives available to the automobile manufacturer were first examined. These alternatives covered six automobile market classes through 1985. The technical factors involved include fuel economy improvement, initial and operating costs and lead time. It is appropriate to add at this point that the recent report to Congress prepared by DOT and EPA** provides an excellent and comprehensive evaluation of the various technological alternatives available to the manufacturers. The DOT/EPA study concluded that a 40 to 60 percent improvement in average new car fuel economy could be achieved from 1974 to 1980. The improvement derives from modifications and a market shift to smaller cars. Our own older analysis indicates that with a large incentive and stable demand for each vehicle class, domestic vehicle fuel economy may improve by 40 percent in 1980 and by 50 percent in 1982.

The production characteristics of each domestic automobile market class were examined under several regulatory and tax schemes. The specific policies we evaluated are as follows:

(1) A flat ban on automobiles which do not meet a standard. The standard used was 12 mpg in 1975, 15 mpg in 1976 and 18 mpg in 1977.

(2) A high tax paid by the consumer at purchase. The tax varies exponentially starting at zero for 20 mpg. A 10 mpg auto would pay $2675.

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* "A Study of Industry Response to Policy Measures Designed to Improve Automobile Fuel Economy", HIT-571, Hittman Assoc., Inc., February 1974 (also available as NTIS PB-234 625/AS)

** "Potential for Motor Vehicle Fuel Economy Improvement, Report to Congress", Prepared by DOT and EPA, November 18, 1974.

(3) A tax phased in over three years, from 1975 to 1977, the tax increasing linearly as fuel economy declines.

To evaluate policy responses, the assumed goals of the manufacturer were taken to be: 1) maximize profit, 2) minimize consumer initial cost including any tax, and 3) maximize fuel economy.

Several generalizations can be drawn from the study. A regulatory ban phased in over several years eliminates a considerable part of the auto manufacturer's current market after 1976. Under a regulatory ban, the availability of several modifications becomes critical in 1977. It is our judgement that if a regulatory ban were to be imposed, a completely redesigned intermediate sized vehicle introduced in 1979, would absorb demand for an automobile larger than a compact.

Under a severe exponential tax (policy 2) the price of the larger automobile suffers its biggest jump going from 1974 to 1975. Beyond 1975 with the exponential tax, technology applications can continue to improve fuel economy so that the initial cost of a large automobile actually decreases with time in fixed dollars. If market forces other than the tax at purchase, provide a demand for large autos, the manufacturer is likely to generate more revenue (and profit) with a tax than without it. This increased revenue will require increased capital expenditures but the manufacturer can have considerable leeway available in how innovations are priced.

The fuel economy of the subcompact vehicle was not sensitive to any of the policies studied. The addition of fuel saving modifications to domestic subcompact and compact vehicles can improve their fuel economy significantly. The policies and market forces required to cause this improvement were not investigated but should be.*

One can ask the question: how applicable are the results of a year ago to today's situation? While the market mix has shifted somewhat, 1974 sales included a substantial percentage of large cars.** The import percent of total U.S. sales was 15.9 percent in 1974 and 15.4 percent in 1973. Inasmuch as no federal fuel economy policy has been imposed in the last year and the effects of 1975 emission controls were included in our studies, I would say that the policy impacts I have noted are still roughly applicable (provided they are taken in the context of being only a supply indicator).

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* FEA has just initiated such a study but with the interactive and essential aspects of the supply side included.

** In 1974, the mix of small, medium and large cars was 40 percent, 29 percent, and 31 percent respectively. In 1973, the same mix was 32 percent, 28 percent, and 40 percent.

I would now like to call your attention to a few impact areas that may be the by-product of fuel economy gains. I would caution that the projected role of imports in the average fuel economy picture be clearly understood before policies are set. The application of a heavy gasoline tax for example, does have the tendency of causing a market shift to economy cars that are foreign produced. The same market forces will evoke a response from domestic manufacturers that could include major retooling and development. However, the fact remains that current domestic subcompacts cannot compete with lighter imports on a fuel economy basis alone. Thus in the short term, there is the potential for an adverse balance of payments and loss of demand for auto, steel and related industries. On the other hand, a quota or other means to restrict imports is counter productive to fuel consumption goals. If in the mid term (say 1985), demand is satisfied by a combination of smaller domestic autos and imports, there will be a sizeable impact on steel requirements. If we compare a scenario that closely follows the 1974 domestic production mix to one where all production is 2500 lb. subcompacts by 1985, there will be a substantial decrease in automobile iron and steel use. Based on some recent data* we have developed for DOT, which includes both original equipment and the aftermarket, this amounts to the equivalent of 4 percent of 1985 iron and steel output. If domestic manufacturers introduce cars smaller than the current subcompact size and imports grow beyond the 16 percent level, then the effect will be somewhat greater.

A variety of factors may commit automobile manufacturers to achieve 40 to 50 percent fuel economy gains in 1980. This hard commitment will, in my opinion, assure the longevity of the modified spark ignition type of engine. Use of the diesel engine represents the single largest technically feasible fuel economy gain that can be achieved within the automobile propulsion system. However, the risk of successful development, customer acceptance in light of higher initial cost, probable inability to meet lower NO_x emission standards all coupled with manufacturer need to meet near and mid term energy goals, probably rules out the diesel for some years to come.

In conclusion I would like to thank the committee for the opportunity to appear on this panel today. The automobile operates within a complex energy system and production responds to market forces which are not easy to predict or shape. Future policy must be made in awareness of all impacts that derive from meeting the objective of lower fuel consumption.

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* "Assessment of the Input-Output Characteristics of the Automotive Industry in the 1975-1985 Time Period," DOT-TSC Contract DOT-TSC-980

Appendix I to Statement by William R. Menchen

Summary of Hittman Associates Study Entitled
"A Study of Industry Response to Policy Measures Designed to Improve Automobile Fuel Economy"

The objective of the work described in this report has been to provide insight as to how automobile manufacturers may respond to government policies designed to minimize passenger automobile fuel consumption. The study consisted of two basic tasks described as follows:

Task I - The first task, completed November 1973, was intended to research and describe the near term technical alternatives available to automobile manufacturers for increasing passenger automobile fuel economy.* These technical alternatives are to be available for consumer use prior to and including the 1986 model year. A relatively short time horizon was inherent in this task, removing from consideration any economy motivated innovation that is not already proven. Automobile modifications providing improved fuel economy were examined for six vehicle classes. These classes were subcompact, loaded compact, intermediate, standard, and luxury. For each combination of alternative and class considered, the results included incremental gasoline savings, capital and operating costs both to the manufacturers and the consumer, and the number of years required to put the alternative into production.

Task II - The second task completed January 1974, was intended to predict the composite nature of each class of passenger automobile that would be produced under a variety of tax and regulatory schemes. The production years of interest are 1974 through 1985. Determinations of the composite nature of each class of auto are based on explicit consideration of both the time-frame required to introduce the production change in response to the tax and regulatory scheme, and the relative incentive to the manufacturer. That is, incremental revenues as opposed to his incremental costs. It has been necessary to view the opposing economic factors in the same light as the manufacturer would, weighing probabilities of lost sales, profit margins on different product lines and other complex and often subjective considerations.

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* Technical alternatives are physical automobile modifications as opposed to use policies.

As the above task descriptions indicate, the concern of this study has been with the supply side of the supply/demand picture for future automobiles. The explicit interactions between supply and demand, isolated to fuel economy, have not been considered. Clearly, however, supply/demand feedback relationships are desirable and these should be addressed in the future.

Task I resulted in the identification of probable modifications to the 1974 automobile which can be implemented in model years 1975 through 1985. These modifications are as follows:

1. Weight Reduction (5 to 15 percent depending upon class, tax, and year required)
2. Aerodynamic Drag Reduction (5 to 10 percent depending upon class, tax, and year)
3. Radial tires
4. Overdrive
5. Continuously variable transmission
6. Improved accessory drive (constant speed)

6a. Thermostatically controlled fan (only)

7. Lean burn engine
8. Displacement reduction (amount varies depending upon class, tax, engines available, etc.)
9. Stratified charge engine (fuel injected version open-chamber type)
10. Electronic fuel injection
11. Axle ratio change (numerical reduction of 5 to 10 percent)
12. Tighter torque converter

The diesel engine is an addition to the above list which was given considerable evaluation during both Tasks I and II. It has not been used as a modification, although its appropriateness is discussed in Chapters III and X.

The domestic automobile manufacturer's responses to three government policies have been evaluated. The three policies examined include: a regulation banning the sale of automobiles that do not meet a prescribed fuel economy standard, a severe exponential tax on mpg that is paid by the consumer at time of purchase, and a tax based on an 18 mpg standard, phased in over a three year period. To obtain some perspective on what effect these policies have over a protracted period, Table I-1 summarizes fuel economy and cost for six market classes under three policies in the 1982 model year.

The subcompact vehicle changes through 1982 are relatively insensitive to any of the policies studied. The subcompact is likely to be viewed as a sure source of revenue and profit and there is no incentive to produce changes in its design and/or economy. As the economy of the compact class approaches the subcompact in the early 1980's, a re-evaluation of the subcompact's fuel economy will be appropriate.

TABLE I-1. THE EFFECT OF THREE POLICIES ON THE 1982 MODEL YEAR COST AND FUEL ECONOMY

1982 PRODUCTION YEAR

	POLICY (1) 1		2		4	
	TOTAL COST	MPG	TOTAL COST	MPG	TOTAL COST	MPG
SC	$2494	22.0	$2494	22.0	$2494	22.0
C	3098	20.7	3176	22.0	3098	20.7
LC	4276	20.2	4276	20.6	4072	19.1
I	4412	19.9	4440	19.5	4152	17.7
S	(2)	(2)	5244	18.3	4886	17.0
L	(2)	(2)	7965	16.6	7460	14.6

COSTS ARE IN 1973 DOLLARS AND INCLUDE ANY TAX REQUIRED

(1) Policy 1 is a regulatory ban.
Policy 2 is a severe tax paid at purchase.
Policy 4 is a less severe tax phased in over three years.

(2) Not Produced

Since the market share of the domestic subcompact is increasing, it is desirable that fuel economy policy include incentives for vehicles already having economy greater than 20 mpg. A brief look at the subcompact class has indicated that relatively strong (but undefined) incentives can yield a fuel economy of 27.4 mpg by 1982. This potential mpg improvement is four times that suggested under the three specific policies examined.

The compact class of automobile has a relatively high baseline fuel economy and is not particularly sensitive to the policies studied. However, its economy may improve between 22 and 29 percent by 1982. This improvement is possible with a relatively small cost increase.

Like the subcompact, the market share of the compact is also increasing. A greater incentive for economy improvement within the compact class could yield about 25.1 mpg in 1982. This mpg improvement is about 1.6 times that likely to be achieved under the severe exponential tax studied.

The response of the manufacturers with the loaded compact is likely to be a return to a six cylinder engine which helps to offset its potentially large tax under policy 2. Through a series of changes to which the consumer will be responsive, the loaded compacts economy is upgraded from a baseline of 13.4 mpg to approximately 20 mpg.

The total initial cost to the consumer is very high for the larger cars in 1975 under policy 2. Total initial cost increases 33, 33, and 32 percent for the intermediate, standard and luxury models respectively, going from a 1974 baseline to 1975. Since the standard size automobile is often viewed as a family oriented vehicle, a jump of over $1400 in first cost (including tax) obviously raises some serious questions about elasticity of demand.

If demand for larger cars (intermediate, standard, and luxury) were to be insensitive to a severe mpg tax (policy 2), the manufacturer will likely generate more revenue (and profit) with a tax than without it. Moreover, under the same situation, the manufacturer will have considerable leeway available in how innovations are priced while still showing a substantial decrease in total initial cost (list + tax).

Under a regulatory ban like policy 1, the manufacturer is faced with major decisions on which class is to be produced in future years. With policy 1, there will be no production of the intermediate, standard, and luxury classes in 1977 and 1978 (the luxury is not produced in 1976 either). Thereater, a judgement has been made that a completely redesigned intermediate sized vehicle will absorb all demand for an automobile larger than a compact.

The availability of modifications for several classes becomes critical in the 1977 model year. Particularly under policy 1 and 2, the manufacturer is provided with considerable incentive to accelerate progress with several potential modifications. These include the open chamber stratified charge engine, an improved accessory drive and a continuously variable transmission.

POLICIES EVALUATED

(1) FLAT BAN ON AUTOS WHICH DO NOT MEET A STANDARD

1975 -- 12 MPG

1976 -- 15 MPG

1977 -- 18 MPG

(2) HiGH TAX PAID BY CONSUMER AT PURCHASE

$$TAX = 100\ (20\text{-}MPG)\ e^{0.1\,(20\text{-}MPG)}$$

(10 MPG AUTO PAYS $2675)

(4) TAX PHASED IN OVER THREE YEARS

1975 -- TAX = $35 ON EACH MPG LESS THAN 18

1976 -- TAX = $70 ON EACH MPG LESS THAN 18

1977 -- TAX = $100 ON EACH MPG LESS THAN 18


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