[April 1976?]

Amendments to the Clean Air Act proposed by the Senate Public Works Committee

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- Stationary sources of air pollution such as utilities, refineries and production factories; and,

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Before final debate and action is taken by the full Senate, it is important to emphasize at the outset that these amendments would not generate significant air quality benefits - in general - for the Nation. They would, however, exact significant economic and energy costs on industry and would, thereby, impose a significant inflationary penalty on consumers.

What follows is a brief description of the major amendments proposed by the Senate Public Works Committee and the major impacts associated with each.

Stationary Sources

1. Significant Deterioration Amendment:

The Significant Deterioration Amendment deals with areas of the Nation which are already "cleaner" than needed to meet EPA established health standards. The health standards reflect threshold levels of ambient air quality -- the condition of the air around us. Pollutant concentrations above (dirtier than) the standards pose a threat to the public's health, and the Clean Air Act is -- and ought to be -- explicit about the measures needed to reduce those concentrations to levels which meet the standards. On the other hand, because these ambient health standards contain an adequate margin of safety air quality which is already better than the levels required by the standards should not jeopardize the public's health or welfare - and, to repeat, it is only these "clean" areas that are affected by the amendment.

Perhaps because there is no issue of public health involved, the current Clean Air Act does not now explicitly address these clean areas of the Nation. Nevertheless, in 1973 the courts construed the Act as requiring that the Federal Government must take some action anyway to prevent the air quality of these clean areas from "significantly deteriorating."

Consequently, in the Energy Independence Act of 1975, the President requested that Congress clarify its position and intentions with respect to areas already cleaner than needed to meet the health standards and suggested that one alternative would be to preclude Federal intervention in, what amounts to, basic State and local land-use decisions -- especially since public health is not involved. It is possible, however, that some form of protection of pristine areas would have aesthetic benefits by maintaining visibility, particularly in areas of ligitimate Federal interest, such as National Parks and Wilderness areas.

In the meantime, EPA published a regulation to meet the court-imposed requirements. The regulation calls for States to divide clean areas of the Nation -- areas where the quality of the air currently presents no health threat -- into three geographical classes -- those which must remain pristine, those which would be permitted moderate, but well controlled growth, and those areas which would be allowed heavy industrial growth so long as the health standards were not violated.

The Senate Public Works Committee is proposing to:

- Eliminate the third category - areas which would be allowed heavy industrial growth consistent with meeting health standards, and

- Classify as mandatory Class I areas - areas which must remain pristine - approximately 29 million acres (144 parks and wilderness areas) which would be considerably more acreage than expected under current EPA regulations.

This amendment will provide no benefit relative to EPA's health standards, but will result in significant economic costs:

- Because of the requirement that areas which do not meet health related ambient air quality standards must improve their air quality (so called "dirty areas" where industry has traditionally located) new industrial and utility sources now have very limited ability to locate in these "dirty" areas. With the proposed amendment, however, critical industries such as refineries, synthetic fuel plants and large industrial complexes in many cases would also be precluded from locating in clean areas - even though their emissions would not result in health standard violations - without spending very large sums on pollution control equipment.

- Similarly, consumers will face significant utility rate increases since new powerplants, forced to locate in areas allowing for only moderate growth, will face increased capital requirements and increased energy penalties. This is documented in a joint FEA/EPA study.

- The designation of a large number of areas as pristine (especially in the West) could adversely impact on significant amounts of coal extraction, which is needed to achieve energy independence.

- The proposed amendment not only forces the Federal Government to impose land-use restrictions on the Nation but also requires that the sole criterion for decisions on the use of land be air quality rather than the total mix of social and economic needs of the community.

2. Best Available Control Technology Amendment:

Though the principal objective of the Clean Air Act is to achieve the ambient standards - how clean the air around us should be - the Act also requires that EPA establish emission limitations - what level of pollutants can be put through a smokestack into the air - for new or modified industrial plants. These emission standards - called New Source Performance Standards - are based on EPA's estimate of the best systems for reduction considering the costs associated with that reduction. Because the costs associated with using the very best technology may be - and often are - more than an industry could bear and still be economically viable, EPA often sets emission limitations which require significant amounts of pollution reduction - to help attain acceptable ambient air quality - but not the maximum amount technically feasible.

The Senate Public Works Committee has proposed, as part of its significant deterioration amendment, that no large new facility be constructed in clean areas of the Nation - areas where the quality of the air currently presents no health threat - unless they use the best available control technology, even if not necessary to meet significant deterioration requirements. Although cost is to be taken into consideration in determining what technology is "available," the Committee intends that significantly less weight be given to cost than EPA has been giving in developing New Source Performance Standards. Indeed the technology required under EPA's standards would - under the amendment - become the minimum requirement in the future.

This amendment will provide <u>no benefit relative to EPA's health standards</u> since it applies to areas that are already clean, but will result in <u>significant economic costs</u>:

- Many new powerplants or refineries attempting to locate in clean areas of the country would be forced to purchase better (and more expensive) control technology than they would have had to purchase to meet EPA's New Source Performance Standards. Of special concern are these higher non-productive capital costs that will be imposed on the utility industry - estimated at up to $8 to $11 billion - at a time when increased productive capacity should be emphasized.

- A 5 to 10% energy penalty will be experienced because of the technology required by this amendment.

The Senate Amendment places the administration of significant deterioration policy primarily in the hands of the States. Current EPA regulations, (with an additional provision permitting some areas to increase the ambient concentrations up to but not beyond the national ambient standards) actually provide as much flexibility, if not more, for States in carrying out the requirements of the Clean Air Act.

<u>Mobile Sources</u>

1. <u>Automobile Emission Standards</u>

Emissions from automobiles contribute, along with stationary sources, to ambient concentration levels of three pollutants: photochemical oxidants - to which auto emissions of hydrocarbons (HC) contribute - carbon monoxide (CO), and nitrogen oxides (NO_x). Although reductions of such emissions can contribute to improving ambient air quality, any further tightening of current Federal emission standards will not have any material effect on ambient air quality - because automobile emission standards have already reduced the amount of allowable pollutant emissions very significantly.

Unlike ambient health standards, stationary emission standards and mobile emission standards for trucks, buses and motorcycles which are set by the EPA Administrator, automobile emission standards are set by the Congress. This law now requires emission standards which the automobile industry clearly cannot attain in the allowed time period. The required technology is simply not available at least without a significant fuel economy loss.

On June 27, 1975, the President submitted an amendment for Congressional consideration which would hold emission standards constant at the 1975-1976 levels through model year 1981. This proposal was based on an in-depth executive branch review which demonstrated that maintaining the 1975 standards would

- provide for air quality improvement at about the same rate as tightening the standards;

- avoid the potential health risks of sulfuric acid emitted by the new catalyst technologies required to meet more stringent standards; and,

- permit substantially greater fuel efficiencies over the next five years, helping the Nation's effort to achieve energy independence.

The proposed Senate Public Works Committee amendment on automobile emission standards would impose significantly stricter standards. The existing law, the proposed amendment and the President's proposal are shown in the following table for comparative purposes:

	Clean Air Act			Senate Committee Proposal			President's Proposal		
	HC	CO	NO_x	HC	CO	NO_x	HC	CO	NO_x
	gr/mile			gr/mile			gr/mile		
1975-76	1.5	15	3.1	1.5	15	3.1	1.5	15	3.1
1977	1.5	15	2.0	1.5	15	2.0*	1.5	15	3.1
1978	.4	3.4	.4	1.5	15	2.0	1.5	15	3.1
1979	.4	3.4	.4	.4	3.4	2.0**	1.5	15	3.1
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* .4 grams/mile NO_x level becomes a research objective to which auto manufacturers must build demonstration vehicles on an annual basis.

** 10% of vehicles must meet 1980 standards.

Imposition of tighter emission standards will have <u>only limited impacts on air quality</u>. The emission limits proposed by the Senate Public Works Committee for 1977 and 1978 would not increase the ability of any area of the Nation to either achieve or maintain the ambient health standards. Even at the limits proposed for 1979 and 1980, ambient levels of auto related pollutants would not be altered significantly.

However, adoption of the Committee's amendment will have <u>significant economic and energy costs</u> over adoption of the President's proposal:

- a 5% to 10% fuel economy loss in 1977 and 1978, a 10% to 15% loss in 1979 and a 15% to 20% loss in 1980.

- a 200% or more increase in sulfuric acid emissions because many vehicle models will have to use "air pump catalysts" to meet the standards.

2. Transportation Control Plans Amendment:

Current law requires that areas with severe auto related pollution must have transportation control plans to supplement the mandated auto emission limitations. These plans range from requiring carpooling and bus lanes to the rationing of gasoline in air pollution emergency conditions. Because full implementation of these plans could cause severe economic and social disruption, extending the deadline for implementation is necessary. In the Energy Independence Act the President proposed extending the deadline for implementing transportation control plans, provided that areas take all reasonable measures as expeditiously as possible.

The Committee amendment also would extend the deadline but would impose more stringent conditions on extensions, including the establishment of new areawide planning agencies to redraft existing transportation control plans. These agencies would be Federally funded at 100% for the first two years and 75%, 50% and 25% for the third, fourth and fifth years, respectively.

This feature will lead to a duplication of ongoing planning programs funded under other Federal programs, especially those of:

- The Urban Mass Transportation Administration (DOT) which funds areawide transportation planning.

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Other conditions imposed by the Senate Committee amendment on deadline extensions include requirements that:

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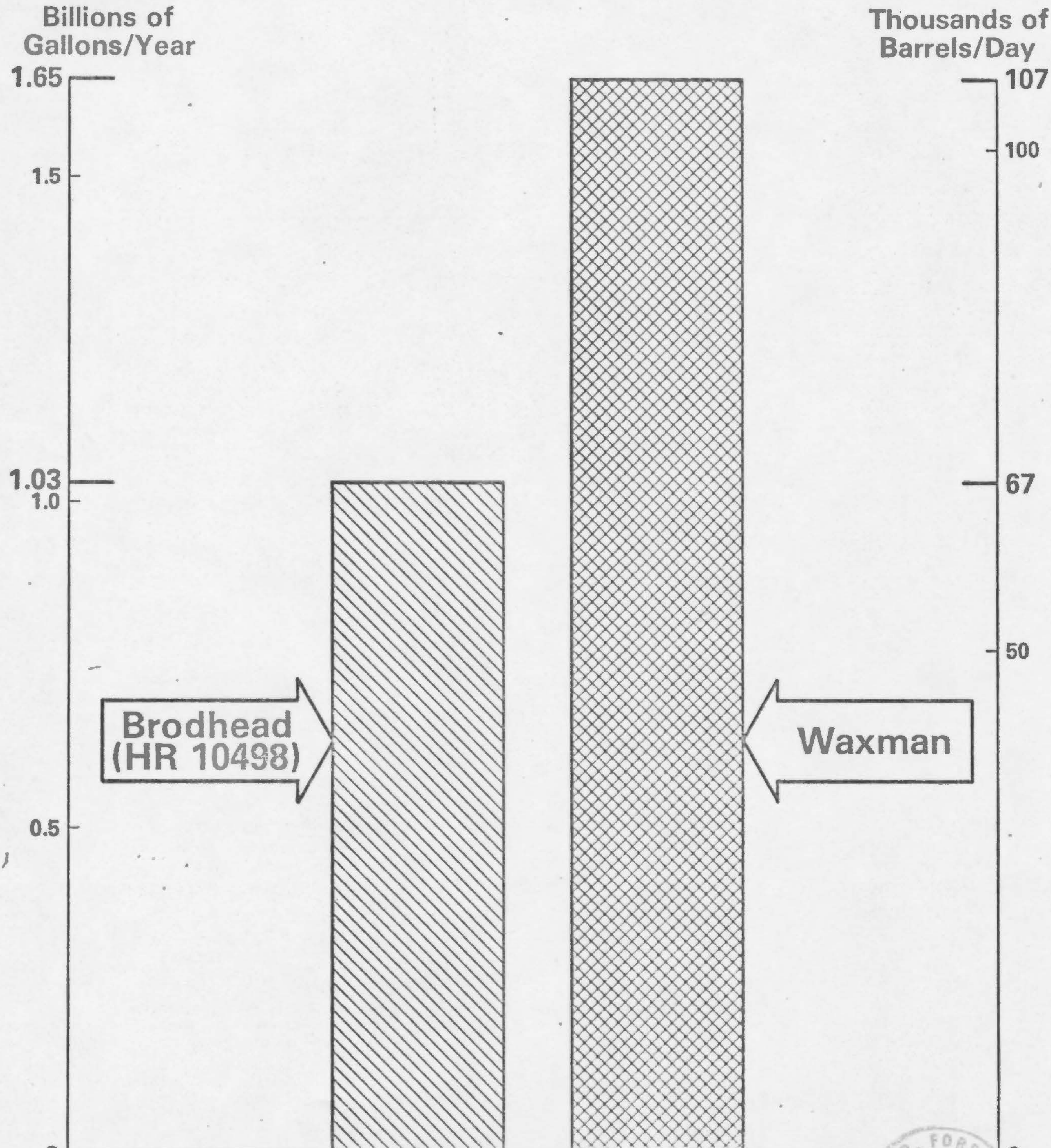
[April 1976?]

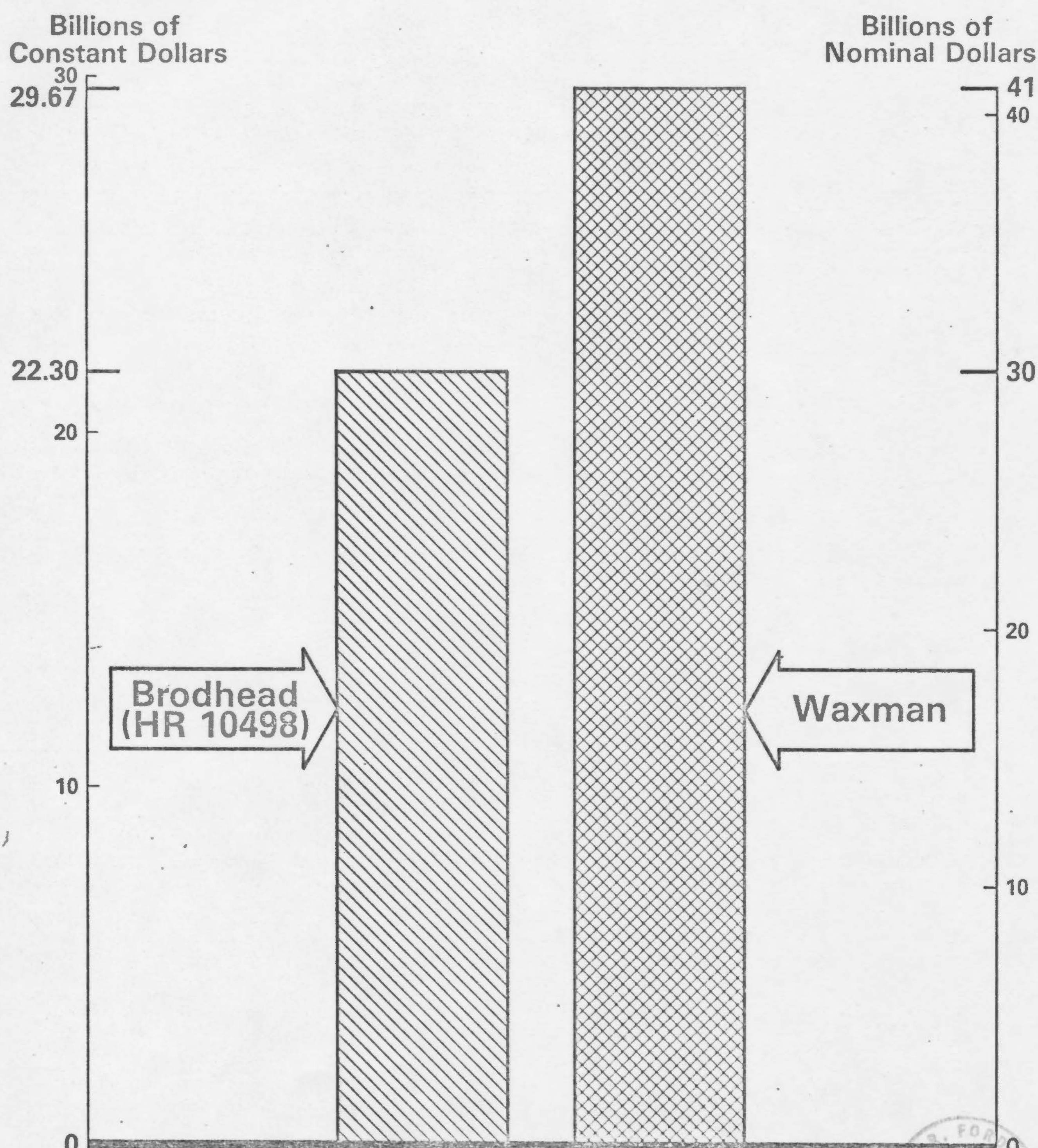
Maximum Fuel Penalty of Brodhead and Waxman Standards Relative to Train Standards



Cumulative Model Years 1977-1985

Source: Staff Analysis Based on Interagency Auto Emissions Control Report of April 8, 1976.

Added Consumer Cost of Brodhead and Waxman Standards Relative to Train Standards



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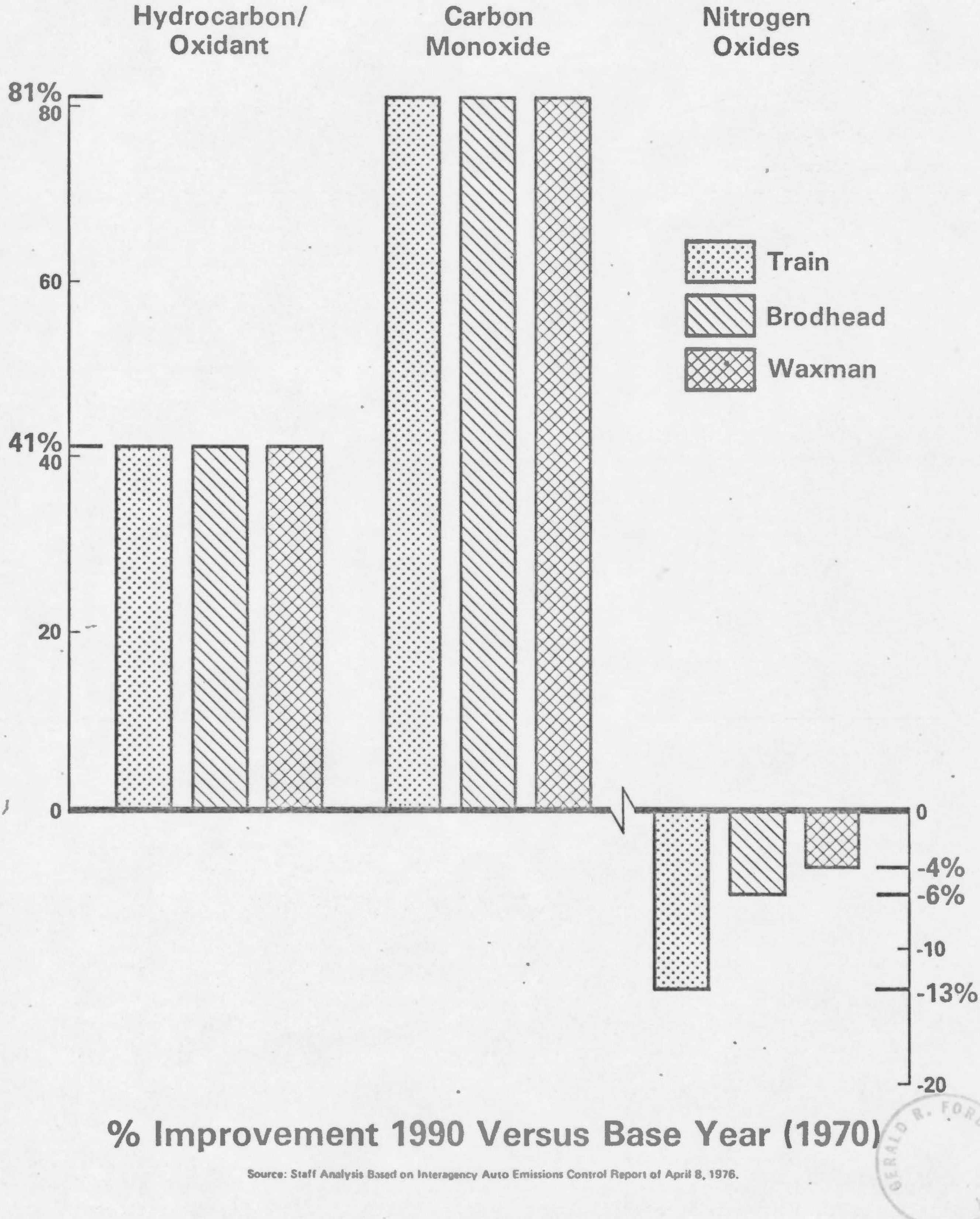
Effect of Alternative Auto Emission Standards on Future Air Quality



% Improvement 1990 Versus Base Year (1970)

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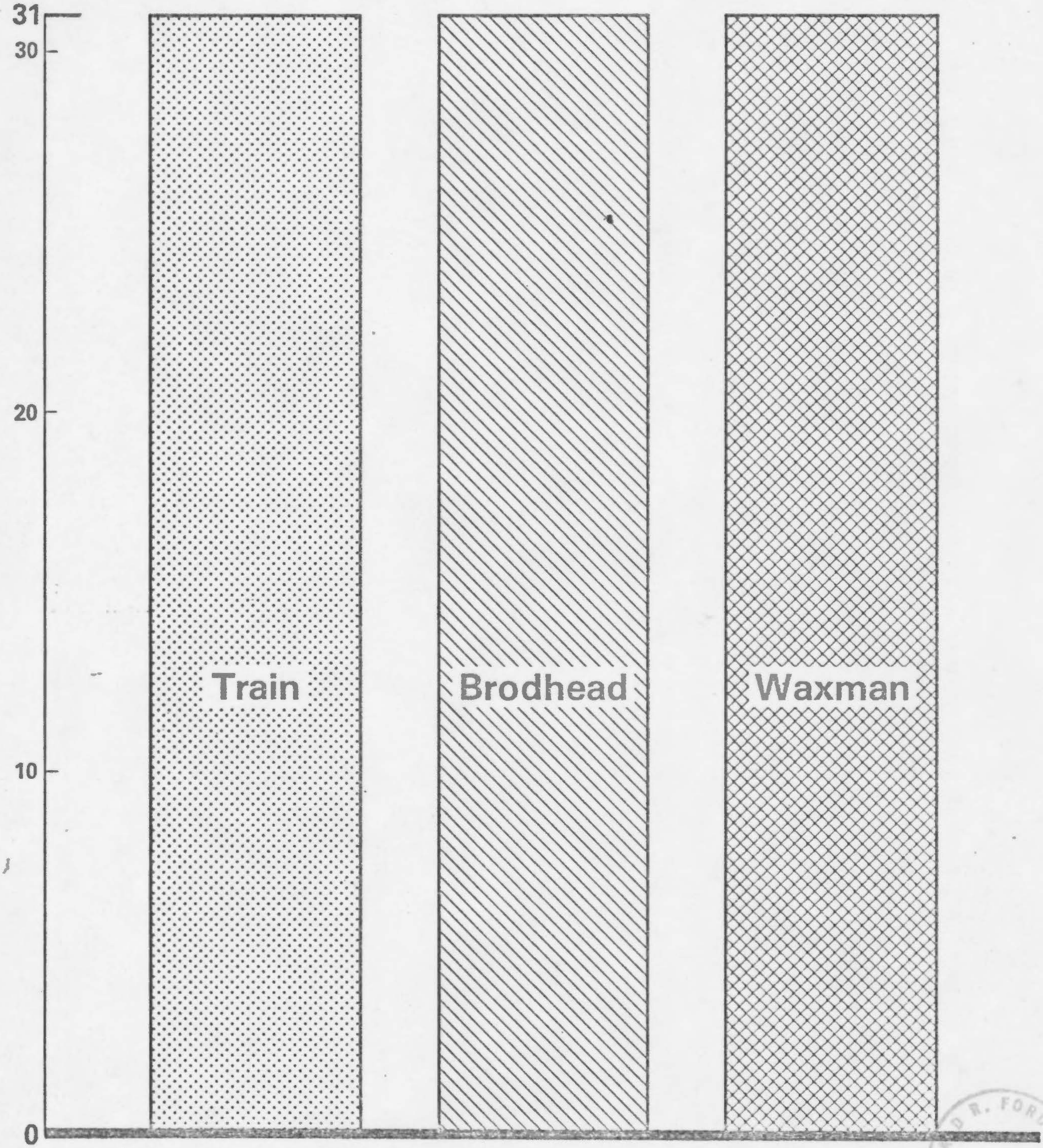


Number of Regions Exceeding 1990 Air Quality Standards

Source: Staff Analysis Based on Interagency Auto Emissions Control Report of April 8, 1976.

FEDERAL ENERGY ADMINISTRATION

Date: April 1, 1976 mh

Reply to Attn of: Margot Hastings, Legislative Liaison, Office of Congressional Affairs

Subject: Senate Clean Air Act Amendments (S3219)

To: Glenn R. Schleede (White House)
William Gorog
Max Friedersdorf
William Kendall
Joe Jenckes
Tom Loeffler
Charlie Leppert

Jim Tozzi (OMB)

Ray Peck (Interior)

PRIORITY ATTENTION: Attached is a copy of the Senate Clean Air Act Amendments (S3219) and accompanying Committee Report (94-717) as filed by Senator Muskie March 29, 1976.

Scheduling for Senate Floor action is still unresolved. There is still a good chance it will come to vote before the Easter Recess (Apr 14-26); if not, expect it immediately afterward the Recess.

file ???

File
Clean Air
Act Amendments

ANALYSIS OF SOME EFFECTS OF SEVERAL
SPECIFIED ALTERNATIVE AUTOMOBILE
EMISSION CONTROL SCHEDULES

April 8, 1976

prepared by

U.S. Department of Transportation
Environmental Protection Agency
Federal Energy Administration

ANALYSIS OF SOME EFFECTS OF SEVERAL SPECIFIED ALTERNATIVE AUTOMOBILE EMISSION CONTROL SCHEDULES

This analysis is the product of a coordinated effort among the U. S. Department of Transportation, the Environmental Protection Agency, and the Federal Energy Administration to compare certain specific effects of several schedules for implementing more stringent automobile emission control standards. This analysis was prepared in response to a request to the Economic Policy Board, Executive Office of the President, by letter of March 19, 1976, from Congressman John D. Dingell.

The specific emission control schedules are set forth in detail in Appendix A. For convenient reference, the schedules are identified in this analysis as follows:

Schedule	Brief Description of Schedule
DT	Amendment offered by Rep. John D. Dingell, and earlier suggested by EPA Administrator Train
A-C	A combination of two similar schedules considered by House Interstate and Foreign Commerce Committee
B	Schedule contained in the current Senate Public Works Committee Bill, S.32.9
D	Schedule adopted by House Interstate and Foreign Commerce Committee (Brodhead Amendment) H.R. 10498
E	Extension of present Federal standards indefinitely for analytical purposes.

Analytical Assumptions

Any analysis of this type must make a number of assumptions. Two assumptions were necessary to permit the comparison of the effects on fuel economy of the various emission control schedules. These assumptions deal with anticipated changes in average vehicle weight and with the mix of vehicle size-classes sold, each of which factors has a significant effect on fuel economy.*

1. It has been assumed that major vehicle weight reduction programs will occur regardless of which emission control schedule is imposed. The projection of vehicle weight trends through model year 1985 used in this analysis is set forth in Appendix B. It is based on the announced plans of manufacturers to introduce lighter weight cars through the end of the 1970's and an assessment of engineering design practicality for the later years. It is not a judgment or prediction that manufacturers will in fact produce cars in accordance with the projection of average weight.

2. Average fuel economy of the new-fleet depends not only on the weight of individual cars offered for sale, but also on the mix in which such models are sold. For the purpose of this analysis it has been assumed that the model mix listed below, (which approximates the anticipated 1976 model year sales), will continue through 1985, i.e.:

- 40 percent full-size cars (6 passenger capacity)
- 30 percent medium-size cars (5 passenger capacity)
- 30 percent small-size cars (4 passenger capacity)

Cars in each size class in 1985 would be lighter in weight than cars in the same size class in 1976 and would accommodate its designated number of passengers in reasonable comfort. The actual sales mix in future years

---

*"Fuel economy" throughout this analysis refers to fuel economy based on the EPA composite city-highway driving schedule.

will be determined by consumer desires, manufacturer's decisions, and actions by the Federal government. Nevertheless, this assumption about the sales mix of cars is reasonable for the purposes of this analysis.

In addition, one must recognize that there is considerable uncertainty in making predictions of the impact of technology that is not currently in use. Thus, with the exception of Schedule E, estimates for all emission control schedules are given in terms of a lower and an upper range, by reference to the fuel economy effects.

For schedule E, which would extend indefinitely the currently applicable emission standards, the assumptions used are spelled out in Appendix C. The low range estimates assume use of technology that is already in production, is being certified for use in 1977 cars, or has otherwise been extensively tested and demonstrated to be feasible by the auto industry. It tends to undervalue the technological improvements that may be made and used in the later years. The high range estimates assume that each manufacturer will be able to make full use of all promising technology that is potentially available even though such technololgy requires further development, comprehensive testing, and reduction to commercial production practice before it can be fully judged to be available, and thus it presents benefits that may not actually be achieved in the years under consideration. Appendix D gives a detailed discussion of emission control technologies assumed to be used for each range of estimates.

Finally, in each case in which a schedule provides for administrative discretion in establishing the NO_x standard that must be met, this analysis has assumed that the least stringent permissable NO_x standard would be established.

Section 1. Fuel Economy Impacts of the Several Schedules for Emission Control

Estimated fuel economy impacts are presented in terms of miles per gallon for the new car fleet for each model year (Table 1a) and of percentage differences of fuel economy for each schedule relative to Schedule DT (Table 1b), rounded to the nearest full percent. New car fleet average fuel economy was 14 mpg in 1974 and 15.8 mpg in 1975.

Table 1c presents the lifetime fuel consumption of the new car fleet by model year for the DT schedule. It also presents the differences in lifetime fuel consumption in each model year for each schedule with the DT schedule as reference. Plus numbers represent consumption greater than Schedule DT and minus numbers represent savings in fuel. The analysis has assumed that the average car is driven 100,000 miles and that the annual new car fleet is 10 million cars. By comparison, the nation's automobile fleet today consumes approximately 75 billion gallons of gasoline annually, or about 5 million barrels of oil per day. As a perspective on the magnitude of these amounts, note that about 2 million barrels per day are expected to flow through the Alaskan pipeline when in full operation.

These tables reflect only the use of gasoline engine powered vehicles. The use of diesel engines in place of a small fraction (10 percent to 20 percent by 1985) of gasoline engines would result in a small but significant improvement in fuel economy and a resulting reduction in fuel consumption of 4 percent to 7 percent by 1985 over the improvements predicted for gasoline engines alone. The corresponding reduction in lifetime new car fleet fuel consumption for the 1985 model year cars ranges between 1.5 and 2.4 billion gallons. Table D-3 of Appendix D shows the impact of diesel vehicle on new car fleet average fuel economy.

TABLE 1a

Estimated Fuel Economy of New Car Fleet in Miles Per Gallon by Model Year, for Each Schedule of Emission Control

Model Year	Low Range DT	Low Range A-C	Low Range B	Low Range D	High Range DT	High Range A-C	High Range B	High Range D	Reference E
	Emission Control Schedule								
1976	17.6	→			17.6	→			17.6
1977	18.4	→			19.0	→			19.0
1978	20.7	19.7	20.7	20.7	21.1	20.9	21.1	21.1	21.1
1979	21.8	20.8	19.8	21.8	22.2	22.2	21.8	21.2	22.2
1980	21.7	20.6	20.2	20.6	23.1	22.9	22.4	22.9	23.1
1981	23.0	22.0	21.6	22.0	24.5	24.5	24.0	24.5	24.5
1982	23.3	23.3	23.0	23.3	25.9	25.9	25.6	25.9	25.9
1983	24.6	24.6	24.2	24.6	27.2	27.2	27.2	27.2	27.2
1984	26.2	26.2	25.6	26.2	28.8	28.8	28.8	28.8	28.8
1985	27.0	25.7	26.6	25.7	29.7	26.7	29.7	26.7	29.7

TABLE 1b

Percentage Fuel Economy Difference of New Car Fleet, by Model Year, Comparing Each Schedule to Schedule DT

Model Year	Low Range A-C	Low Range B	Low Range D	Low Range E	High Range A-C	High Range B	High Range D	High Range E
1976	–	–	–	–	–	–	–	–
1977	–	–	–	+3%	–	–	–	–
1978	-5%	–	–	+2%	-1%	–	–	–
1979	-5%	-9%	–	+2%	–	-2%	–	–
1980	-5%	-7%	-5%	+6%	-1%	-3%	-1%	–
1981	-4%	-6%	-4%	+7%	–	-2%	–	–
1982	–	-1%	–	+11%	–	-1%	–	–
1983	–	-2%	–	+11%	–	–	–	–
1984	–	-2%	–	+10%	–	–	–	–
1985	-5%	-1%	-5%	+10%	-10%	–	-10%	–

TABLE 1c

Lifetime New Car Fleet Fuel Consumption - Total for Schedule DT and Differences for Other Schedules Relative to Schedule DT, for Low Range and High Range, by Model Year.
(In billions of gallons)

	Low Range Projections					High Range Projections				
	Fuel Consumption	Consumption Differences				Fuel Consumption	Consumption Differences			
Model Year	DT	A-C	B	D	E	DT	A-C	B	D	E
1976	56.82	0	0	0	0	56.82	0	0	0	0
1977	54.35	0	0	0	-1.72	52.63	0	0	0	0
1978	48.31	2.45	0	0	-0.92	47.39	.46	0	0	0
1979	47.72	0.46	2.89	0	-2.57	45.05	0	.82	0	0
1980	46.08	2.46	3.42	2.46	-2.79	43.29	.38	1.35	.38	0
1981	43.48	1.97	2.82	1.97	-2.66	40.82	0	.85	0	0
1982	42.92	0	.56	0	-4.31	38.61	0	.45	0	0
1983	40.65	0	.67	0	-3.89	36.76	0	0	0	0
1984	38.17	0	.89	0	-3.45	34.72	0	0	0	0
1985	37.04	1.87	.55	1.87	-3.37	33.67	3.78	0	3.78	0

Section 2. Health Benefits

Tables 2a and 2b present the air quality effects of the emission control schedules while Tables 2c, 2d, and 2e present selected health effect indicators associated with HC, CO, and NO_x, respectively, for the schedules. This analysis draws upon the recent comprehensive report on air quality and health consequences of changing automobile emission standards prepared by EPA for the Air Quality, Noise, and Health Panel of the Task Force on Motor Vehicle Goals Beyond 1980.

A high degree of stringency of stationary source control for automotive related pollutants was assumed in the analysis as was the imposition of programs such as inspection and maintenance to ensure minimum deterioration of emission control over the lifetime of the car. Less optimistic assumptions would have produced less air quality improvement and a higher level of health effects. However, since the same set of assumptions has been applied to all schedules, the relative ranking of the emission control schedules in terms of air quality and health effects would probably not be affected.

There are two points that should be kept clearly in mind in considering the results presented here. First, it should be noted that the health effects indicators represent only a partial listing of the effects from high air pollution levels and are not intended to represent a statement of gross benefits from pollution control. Their primary significance is in the context of relative differences between emission control schedules.

Second, there is a high degree of uncertainty in making both air quality and health impact projections. The data base is limited and in some cases still subject to scientific debate, and the methodologies are subject to additional development. As a result the estimates below may well be too high or too low, and they may vary relative to each other.

Table 2a presents projections of the percentage reduction in ambient concentration of mobile source related air pollutants in 1990 in comparison with base years in the early 1970's for the DT emission control schedule. It also presents the percentage point differences for the other schedules relative to the DT schedule. Plus numbers indicate improvements in air quality while negative numbers indicate relatively poorer air quality. For all schedules, there is improvement in the oxidant and carbon monoxide air quality relative to the base years.

Table 2b summarizes the number of air quality control regions that are projected to exceed the national primary ambient air quality standard for each pollutant in 1990 for each emission control schedule.

Table 2c gives the projected numbers of aggravation of heart and lung disease in elderly patients, incidents of eye irritation, and excess headaches in 1980, in 1990, and for the total period from 1980 through 1990 due to oxidants which is controlled through reductions in hydrocarbon emissions. The effects in 1980 are predominantly due to the cars in use in 1980 which, for the most part, reflect less stringent hydrocarbon emission standards than the standards in the schedules considered in this analysis. The 1990 numbers are associated with the cars that are produced to meet the specific emission control schedule. There are other health effects of oxidants than those listed.

Table 2d presents some health effects indicators of ambient carbon monoxide; specifically, excess cardiac deaths and excess person hours of disability. As with oxidants, the health effects in 1980 are due to the older cars still on the road in that year. The 1990 health indicators reflect the cars that meet the standards in the emission control schedules.

Table 2e gives health effect indicators of oxides of nitrogen emissions in 1980, 1990, and cumulated for the period from 1980 through 1990. The health effect indicators are lower respiratory disease (chest colds, bronchitis, croup, pneumonia) in children and days of restricted activity due to lower respiratory disease in children. Even though the oxides of nitrogen emissions from automobiles decline relative to the peak year, oxides of nitrogen from other sources are projected to increase even more rapidly so that the health effect indicators are projected to increase from 1980 to 1990 for all emission control schedules considered in this analysis.

TABLE 2a. Percentage Reduction in Pollutant Concentrations in 1990 from Base Year for Schedule E and Percentage Point Differences for Other Schedules Relative to Schedule DT

Pollutant	Percentage Reduction Schedule DT	Differences Relative to Schedule DT Schedules A-C	B	D	E
HC (Oxidant)	41	0	1%	0	-5%
CO	81	0	2%	0	-5%
NO_x	-17%	13%	9%	11%	-12%

TABLE 2b. Number of Air Quality Control Regions Exceeding Ambient Air Quality Standard in 1990 for Each Emission Control Schedule

Pollutant	Emission Control Schedule DT	A-C	B	D	E
HC (Oxidant)	31	31	30	31	32
CO	0	0	0	0	3
NO_x	8	8	8	8	9

Table 2c. Selected Health Effect Indicators for Hydrocarbon Emission (Oxidant Effects) in 1980, in 1990, and Cumulative from 1980 through 1990 for each Emission Control Schedule

		Projected Health Consequences		
Time Period	Emission Control Schedule	Aggravation of Heart and Lung Disease in Elderly Patients (in thousands)	Eye Irritation (in thousands)	Headache (in thousands)
Base Year		43	2,160	3,200
1980	DT	35	1,750	2,650
	AC	34	1,725	2,630
	B	33	1,700	2,600
	D	36	1,775	2,680
	E	36	1,800	2,700
1990	DT	9	525	1,000
	AC	9	510	1,000
	B	9	500	1,000
	D	9	510	1,000
	E	13	690	1,200
Cumulative 1980-1990	DT	177	9,700	15,000
	AC	176	9,700	15,100
	B	175	9,400	14,800
	D	177	9,700	15,000
	E	210	10,900	17,100

Selected Health Effect Indicators for Carbon Monoxide Emissions in 1980, 1990, and Cumulative from 1980 through 1990 for each Emission Control Schedule

Time Period	Emission Control Schedule	Projected Health Consequences Excess Cardiac Deaths (Units)	Excess Person Hours of Disability
Base Year		20.0	330,000
1980	DT	1.4	32,000
	A-C	1.4	31,000
	B	1.4	20,000
	D	1.4	32,000
	E	2.0	33,000
1990	DT, A-C B, D, E	0	0
Cumulative Impact Between 1980 and 1990	DT	5	83,000
	A-C	5	80,000
	B	5	67,000
	D	5	83,000
	E	5	110,000

TABLE 2e. Selected Health Effect Indicators for Oxide of Nitrogen Emissions in 1980, in 1990, and Cumulative from 1980 through 1990 for Each Emission Control Schedule

Time Period	Schedule	Projected Health Consequences: Excess Attacks of Lower Respiratory Disease in Children (in thousands)	Projected Health Consequences: Excess Days of Restricted Activity from Lower Respiratory Disease in Children (in thousands)
Base Year		700	1,900
1980	DT	740	2,000
	A-C	740	2,000
	B	740	2,000
	D	740	2,000
	E	760	2,100
1990	DT	880	2,300
	A-C	730	2,000
	B	770	2,100
	D	750	2,000
	E	1,450	3,900
Total Impact Between 1980 and 1990	DT	8,100	21,000
	A-C	7,350	19,800
	B	7,550	20,400
	D	7,450	20,100
	E	11,100	30,000

Section 3. Consumer Cost Impacts

The estimate for impact in terms of consumer costs is presented in terms of differences (in 1975 dollars) between each emission control schedule and schedule DT, for the low range and high range estimates. The cost differences are presented as undiscounted lifetime cost per vehicle, which consists for the sum of additional new car cost (sticker price), lifetime maintenance cost, and lifetime fuel costs at 60 cents per gallon for gasoline, assuming the average car is driven 100,000 miles during its life. Table 3a presents these estimates for the low range; Table 3b presents these estimates for the high range. Negative numbers represent cost savings. Appendix E is a discussion of the assumptions and methodology used in obtaining these results. For perspective, these costs should be compared to the lifetime cost of an average 1976 passenger car of approximately $16,700.

Table 3c presents the undiscounted lifetime costs for the entire new car fleet in each model year, parallel to Tables 3a and 3b, assuming 10 million cars in each model year. Note that the numbers in Table 3c are exactly 10,000,000 times greater than the numbers in Tables 3a and 3b. It is useful to note that the aggregate lifetime cost of the 1976 model year fleet, at 10 million cars, would be about 167 billion dollars. Undiscounted costs tend to over value costs incurred in later years relative to first costs. Discounting at a 10 percent rate and using the typical schedule of miles driven as a function of age of car would change the numbers in all three tables to some extent but probably would not change the relative rankings between emission control schedules.

ncremental Lifetime Cost Per Vehicle 1/
Each Emission Control Schedule Relative to Schedule DT

Emission Control Schedule

TABLE 3a (Low Range) / TABLE 3b (High Range)

Model Year	(Low Range) A-C	B	D	E	(High Range) A-C	B	D	E
1976	Base				$ 0	$ 0	$ 0	$ 0
1977	Same as 1976				0	0	0	- 20
1978	$197	$ 0	$ 0	$- 55	83	0	0	- 20
1979	78	223	0	-154	55	124	0	- 20
1980	147	540	147	-217	63	266	63	- 55
1981	118	504	118	-210	40	236	40	- 55
1982	0	369	0	-209	0	217	0	-100
1983	335	375	335	-283	70	190	70	-100
1984	335	388	335	-257	70	190	70	-100
1985	462	368	447	-252	357	190	277	-100

TABLE 3c

Comparison of Incremental Lifetime Cost of New Car Fleet 1/
for Each Emission Control Schedule Relative to Schedule DT
(dollars in billions)

Emission Control Schedule

Model Year	(Low Range) A-C	B	D	E	(High Range) A-C	B	D	E
1976	Base		$ 0	$	$ 0	$ 0	$ 0	$ 0
1977	Same as 1976		0	-1.03	0	0	0	- .20
1978	$1.97	$ 0	0	- .55	.83	0	0	- .20
1979	.78	2.23	0	-1.54	.55	1.24	0	- .20
1980	1.47	5.04	1.47	-2.17	.63	2.66	.63	- .55
1981	1.18	5.04	1.18	-2.10	.40	2.36	.40	- .55
1982	0	3.69	0	-2.09	0	2.17	0	-1.00
1983	3.35	3.75	3.35	-2.83	.70	1.90	.70	-1.00
1984	3.35	3.88	3.35	-2.57	.70	1.90	.70	-1.00
1985	4.62	3.68	4.47	-2.52	3.57	1.90	2.77	-1.00

1/ All costs expressed in 1975 dollars, undiscounted.

Appendix A

Emission Control Schedules

The table below presents the emission standards assumed to be applicable to new cars in each model year for the analysis provided in this report.

Schedule	Brief Description of Schedule 1/
DT	Amendment offered by Rep. John D. Dingell, and earlier suggested by EPA Administrator Train
A-C	A combination of two similar schedules considered by House Interstate and Foreign Commerce Committee
B	Schedule contained in current Senate Public Works Committee Bill, S.3219
D	Schedule adopted by House Interstate and Foreign Commerce Committee (Brodhead Amendment) H.R. 10498
E	Extension of present Federal standards indefinitely for analytical purposes.

Model Year	Emission Control Schedule $HC/CO/NO_x$ - gm/mi D(T)	A-C	B	D	E
1976	1.5/15/3.1	1.5/15/3.1	1.5/15/3.1	1.5/15/3.1	1.5/15/3.
1977	1.5/15/2	1.5/15/2	1.5/15/2	1.5/15/2	1.5/15/3.
1978	1.5/15/2	.9/9/2	1.5/15/2	1.5/15/2	1.5/15/3.
1979	1.5/15/2	.9/9/2	.4/3.4/2	1.5/15/2	1.5/15/3.
1980	.9/9 /2	.4/3.4/2	.4/3.4/1	.4/3.4/2	1.5/15/3.
1981	.9/9 /2	.4/3.4/2	.4/3.4/1	.4/3.4/2	1.5/15/3.
1982	.4/3.4/2	.4/3.4/2	.4/3.4/1	.4/3.4/2	1.5/15/3.
1983	.4/3.4/2	.4/3.4/1.5	.4/3.4/1	.4/3.4/1.5	1.5/15/3.
1984	.4/3.4/2	.4/3.4/1.5	.4/3.4/1	.4/3.4/1.5	1.5/15/3.
1985	.4/3.4/2	.4/3.4/ .4	.4/3.4/1	.4/3.4/4	1.5/15/3.

1/ As applicable, for purposes this analysis, it has been assumed that in all cases the least stringent NO_x standard would be granted by waiver.

Appendix B

Assumptions for Average Weight of Cars, by Model Year

In this report estimates for fuel economy impacts of different emission standards have been normalized to reflect consistent treatment of the vehicle weight in each emission control schedule. It has been assumed that vehicle weight would successfully be reduced by the auto companies as a part of their ongoing weight reduction programs, and that the model mix of cars sold would remain steady at 40 percent large-size (6 passenger), 30 percent mid-size (5 passenger), and 30 percent small-size (4 passenger).

The average new car test weight in each model year which results from these assumptions is:

Model Year	76	77	78	79	80	81	82	83	84	8[illegible]
Average test weight	3820	3700	3600	3500	3410	3310	3220	3130	3040	2[illegible]

N.B. - Test weight is curb weight plus 300 pounds.

Appendix C

Basis for Estimate of New Car Fuel Economy for Emission Control Schedule E

Emission control Schedule E, which assumes an indefinite extention of the present Federal standards of 1.5 g/mi HC, 15 g/mi CO, and e.1 g/mi NO_x, provides the most reliable basis for projecting fuel economy improvements because of the large amount of available test data. Even with Schedule E, there is still a range of estimates for fuel economy in the future because of the uncertainty about the actual choices manufacturers will make as to the technology to be used in their production cars.

The technical staff developed upper range and lower range fuel economy projections for Schedule E. The average, or mid-range, projection was then used as a reference case to estimate the effects of the other emission control schedules. Table C gives the three fuel economy projections. Each projection includes the assumptions about weight changes and model mix descri[illegible] above. The lower range estimate assumes that engines will be improved by 198[illegible] to the point where all are as good as the best engines produced in model year 1975 and that upgraded transmissions featuring a lock-up clutch on the torque converter will be introduced in the early 1980s and used throughout the new car fleet by 1985. It also assumes some reduction in engine size to increase average efficiency with a corresponding increase in the time required to accelerate from 0 to 60 mph; (that is, 15 seconds as a representative figure for the whole new car fleet) and the phased-in use of oxidation catalysts with 70 percent conversion efficiency at 50,000 miles.

The upper range estimate assumes that the engines are improved to the "best 1975" level by 1978, that there is an increase in the average efficienc[illegible] of engines, a greater increase in the 0 to 60 mph acceleration time by 1985 than that used in the low range projections, and the use of electronic engine controls.

Table C

Projections of New Car Fleet Fuel Economy by Model Year for Schedule E with Different Technology Assumptions. (Miles per gallon)

	Model Year								
Projection	76	77	78	79	80	81	82	83	84	8
Lower Range	17.6	18.5	19.4	20.3	21.0	22.1	23.1	24.4	25.7	27.
Upper Range	17.6	19.4	22.8	24.1	25.2	26.9	29.7	30	32	32.
Mid-range (used in analysis)	17.6	19.0	21.1	22.2	23.1	24.5	25.9	27.2	28.8	29.

Appendix D

Assumptions on Utilization of Technology to Meet More Stringent Emission Standards for Low-Range and High-Range Projections

It was noted in the body of the report that different assumptions had been made for the low range and the high range fuel economy projections for each of the increasingly more stringent emission schedules, in each model year, and that these assumptions differed in terms of the degree to which advanced technology that currently may require further development would be utilized and the impacts of that technology on fuel economy.

Substantial additional successful development will be needed before all the technology discussed for the high range will be suitable and available for production. Therefore, the degree of uncertainty associated with the fuel economy projections for the high range is large. There is also a degree of uncertainty associated with the low range since it assumes the use of reasonably well developed and demonstrated technology and makes no allowance for improvements in fuel economy due to emission control technology which is now only in the early stages of development.

This appendix discusses the assumptions about the emission control technology and displays in Figures D-1 and D-2 the differences in application of these technologies for each of the two ranges. Finally, there is a discussion of the impact of diesel powered vehicles.

Technology for the Low Range Projections

The low range fuel economy projections for the various emission control schedules use the concept of Emission Control Impact (ECI), which is defined here as the percentage difference between the fuel economy at one emission standard and the fuel economy at 1.5 HC, 15 CO, 3.1 NO_x (emission control schedule E).* Negative values for ECI indicate a relative loss in fuel economy. Table D-1 displays the ECI values for each emission standard under consideration as a function of model year for cars in the 4000 lb. inertia weight class. (An x in Table D-1 for an emission standard and a model year indicates that no such ECI value was needed for any of the emission control schedules in this analysis.) The procedure used to develop the entries for Table D-1 is discussed below.

The next step in the generation of the low range projections is to generalize the ECI values in Table D-1 for the 4000 inertia weight car to the total new car fleet. This generalization is done by multiplying the ECI value for any model year by the ratio of average test weight for that model year (from Appendix B) to 4000 lb. This process reflects the effect of weight upon ECI. The table of ECI values that results is then matched against the emission control schedules (Appendix A) to produce Table D-2, which presents the Emission Control Impact value for the entire new car fleet in any model year for each emission control schedule other than schedule E, which is the reference schedule. Table D-2 is used with the mid-range fuel economy projection for emission control schedule E from Appendix C to calculate for each model year the low range fuel economy projections presented in Section 1, Table 1a.

The starting point for the Emission Control Impact estimates of Table D-1 was the estimates of the effect of emission standards upon fuel economy reported by GM[1] for their 3500-4500 pound cars. These

[1] Reference GM comments on JPL Report "Should We Have A New Engine?" dated November 1975.

*Note that in the body of the report all comparisons are made with respect to schedule DT. This appendix describes the analytical values were considered to be representative of present practice.

Next, these Emission Control Impacts are adjusted to account for the impact of the recent change in specifications of the durability test fuel. The fuel specification change results in improved oxidation catalyst durability, representing an improvement from 55 percent to about 70 percent oxidation catalyst efficiency at 50,000 miles. A two percent improvement in average fuel economy is assumed to result from the retuning of all engines in the new car fleet at the current emission levels, and a four percent improvement for the lower emission standards. It is assumed that a two-year phase-in period is sufficient for such engine retuning. Additional effects upon fuel economy of further developments in emission control technology beyond those indicated in Figure D-1 are not included in these low range projections. Also, the initial drop in fuel economy and improvement in later years that commonly occurs when emission standard levels are changed has not been included.

The emission control technology assumed representative in this low-range case for each emission standard is shown in Figure D-1. For the .4/3.4/2 case, an option exists to add the switched-out start catalyst to the emission control system. If this is done, it would improve the estimated ECI by two percentage points and increase the incremental automobile retail price by $50. No additional maintenance within 50,000 miles is assumed.

TABLE D1

Low Range

Emission Control Impacts for 4000 Pound Car

Estimated percentage point differences in fuel economy at various emission standards by reference to fuel economy at 1.5/15/3.1 standard in each model year.

MY / Standard	76	77	78	79	80	81	82	83	84	85
1.5/15/3.1	0	0	→	→	→	→	→	→	→	→
1.5/15/2.0	x*	-3	-2	→	→	→	→	→	→	→
.9/9/2.0	x	x	-7	→	→	→	→	→	→	→
.4/3.4/2.0	x	x	x	-12	→	→	→	→	→	→
.4/3.4/1.5	x	x	x	x	-12	→	→	→	→	→
.4/3.4/1.0	x	x	x	x	-14	→	→	→	→	→
.4/3.4/0.4	x	x	x	x	x	x	x	x	x	-18

*,x- standard not applicable

TABLE D2

Low Range
Emission Control Impacts for New Car Fleet

Estimated percentage point differences in fuel economy for each emission control schedule referenced to the fuel economy for schedule E for the new car fleet in each model year.

Model Year	Emission Control Schedule			
	D(T)	A	B	D
76	0	0	0	0
77	-2.9	- 2.9	- 2.9	- 2.9
78	-1.9	- 6.5	- 1.9	- 1.9
79	-1.8	- 6.3	-10.8	- 1.8
80	-6.2	-10.6	-12.4	-10.6
81	-5.9	-10.1	-11.8	-10.1
82	-9.6	- 9.6	-11.2	- 9.6
83	-9.4	- 9.4	-11.2	- 9.4
84	-9.2	- 9.2	-10.8	- 9.2
85	-9.0	-13.5	-10.5	-13.5

FIGURE D-1

EMISSION CONTROL TECHNOLOGIES ASSUMED FOR LOW RANGE ESTIMATES

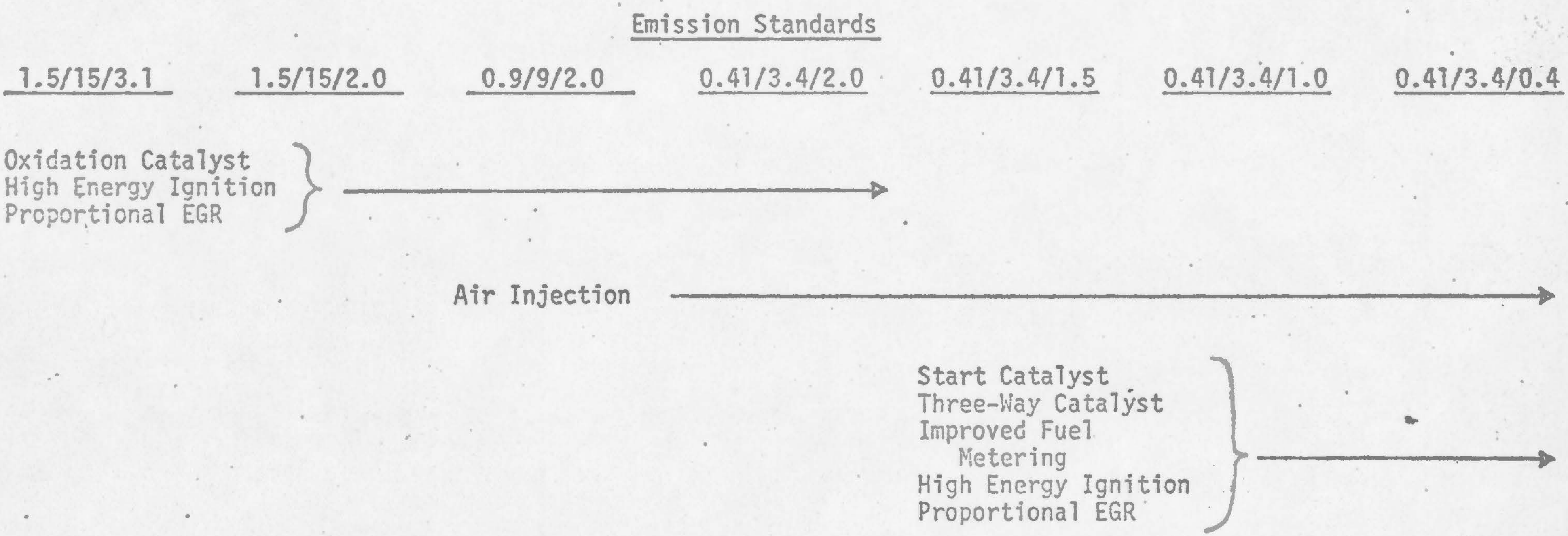
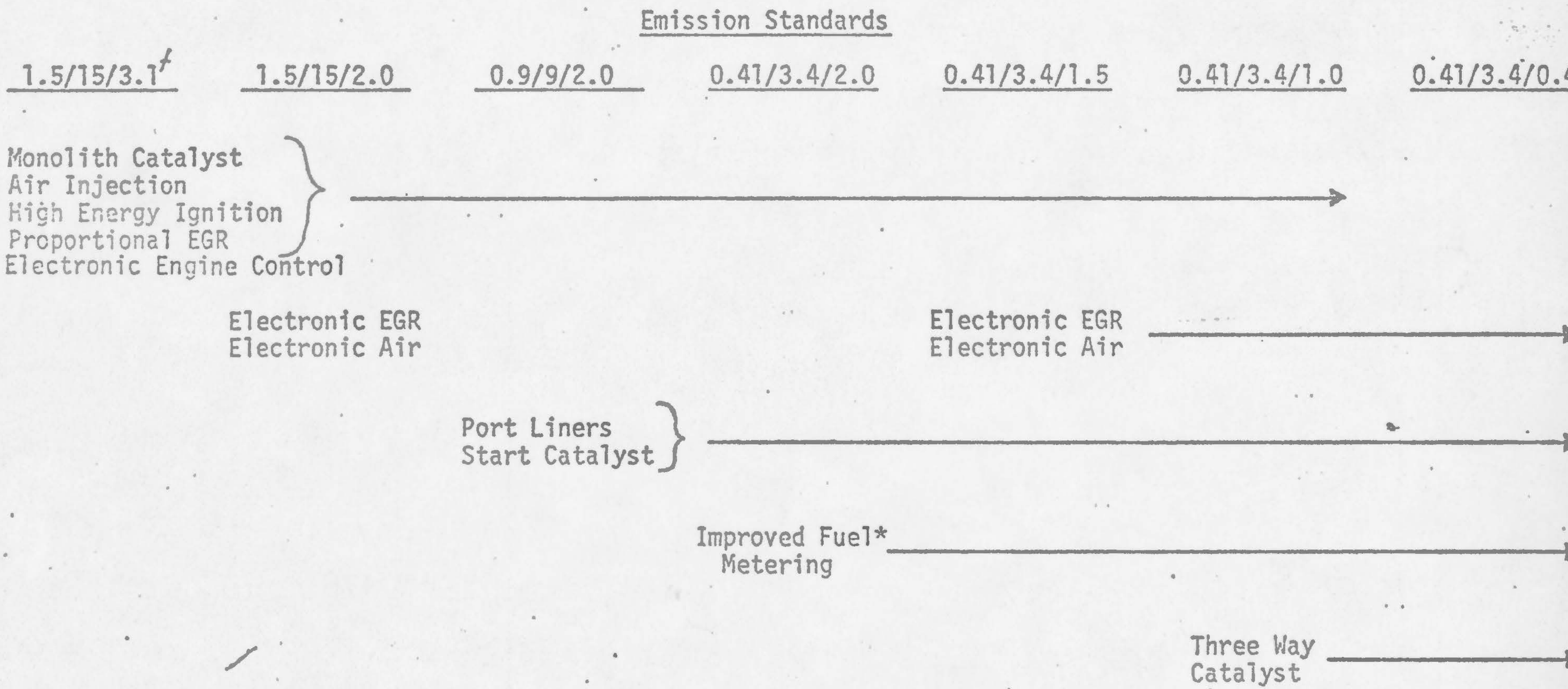


FIGURE D-2

EMISSION CONTROL TECHNOLOGIES ASSUMED FOR HIGH RANGE ESTIMATES



≠ (in order of $HC/CO/NO_x$))

* Electronic Modulated Carburetor

Technology for the High Range Projections

The underlying assumption for the high range projection of fuel economy for the different emission control schedules is that by 1978 all engine types would be improved in efficiency to the level of the best engine types produced in 1975 and that these engines will be designed and engineered to give their best fuel economy at emission standards of 1.5/15/3.1 and above while using 91 RON unleaded gasoline and the basic emission control system.

The basic emission control system utilized to meet emission standards in the range between 1.5 HC, 15 CO, 3.1 NO_x and 0.41 HC, 3.4 CO, and 1.0 NO_x consists of monolith oxidation catalyst, air injection, high energy ignition and proportional exhaust gas circulation (EGR). This basic emission control system offers a degree of emission control that is significantly greater than the minimum required to meet the standards at 1.5 HC, 15.0 CO, and 3.1 NO_x, and thereby permits the adjustment of engine parameters for improved fuel economy at the less stringent emission levels within the stated range of standards.

At 1.5 HC, 15 CO, 3.1 NO_x optimal fuel economy may be achieved through the use of the basic technology identified if a good EGR system that is truly proportional to engine load is used, such as back pressure modulated EGR which controls the EGR rate in proportion to the exhaust system pressure. In 1975 and 1976 few vehicles utilized this system (manifold vacuum modulated units were used) and optimum fuel economy was not achieved. The use of the better EGR systems in 1977 and subsequent years is expected to provide for continued fuel economy improvements of up to 10 percent relative to 1976. Additional improvements are possible at this emission control level, and at more stringent levels, with use of electronic engine controls.

To maintain optimal fuel economy calibration in the lower part of the range of standards, additional emission control hardware must be added to the basic system. GM and other investigators have shown that good fuel economy and stringent NO_x control down to 1.0 gm/mile NO_x can be maintained through a delicate balance of EGR rate, air/fuel ratio (A/F) and spark ignition timing, in some specific engines, although HC emissions increase as NO_x decreases. The key to maintaining good fuel economy and NO_x control involves the use of HC control measures that are complementary to the basic catalyst technology. The emission control components useful at various emission standards levels are discussed below. Figure D-2, which displays the emission control technologies used at the different emission standards, may be helpful in understanding the schedules and relationships.

At 1.5 HC, 15 CO, 2.0 NO_x the basic emission control is used, except EGR modulation is accomplished electronically to obtain the optimum fuel economy level. In some cases modulation of the air injection rate electronically may also be required. The development of these techniques is required before they can be used, but it is assumed that development and application is completed within the next few years.

At 0.9 HC, 9.0 CO, 2.0 NO_x the basic emission control system is also used. The recalibrated A/F, EGR rate, and timing needed for NO_x control and optimum fuel economy result in HC emissions that are greater than can be handled by the primary oxidation catalyst, so exhaust port liners and a start catalyst need to be added to the basic technology at this emission control level to treat the excess HC and maintain optimum fuel economy. The port liners conserve heat in the exhaust gas and thus permit continued combustion of HC (and CO) in the exhaust system. The start catalyst is a small oxidation catalyst located very close to the exhaust mainfold. The size and location of this catalyst permits rapid warm-up during cold-start of the engine (much faster than the larger main catalyst located much further from the engine) which results in more complete oxidation of HC during cold start. (The cold start contributes a significant fraction of the HC emissions.)

At 0.41 HC, 3.4 CO, 2.0 NO_x, more stringent HC control is required. Either improved catalysts with higher conversion efficiencies, or improved fuel metering such as electronically modulated carburetors would provide the more stringent HC control. These carburetors would reduce HC by cutting off fuel during decelerations and more precise fuel metering during accelerations. Since the conventional carburetor goes extremely rich under both these conditions. Such carburetors require development.

At 0.41 HC, 3.4 CO, 1.5 NO_x and 0.41 HC, 3.4 CO, and 1.0 NO_x the same systems as used for 0.41 HC, 3.4 CO, and 2.0 NO_x is employed except that reoptimization of EGR rate, A/F ratio, and ignition timing to keep good fuel economy results in even more excess HC. To simultaneously achieve good fuel economy and emissions control requires the use of improved catalysts (conversion efficiency of 75 percent at 50,000 miles) and improved fuel metering. A catalyst change at 25,000 miles may be required to achieve good fuel economy for some engines that have difficult emission control problems.

At the 0.41 HC, 3.4 CO, 0.4 NO_x level a three-way catalyst system or a dual catalyst would be required. While good fuel economy has been demonstrated for both systems in some prototype test cars, 50,000 mile durability of the catalyst remains to be demonstrated. Fuel economy

1985 about 1.5 to 2 MPG higher. Table D-3 gives the projected new car fleet average fuel economy for each emission control schedule based on these assumptions about diesel engine market penetration.

The lifetime new car fleet fuel consumption figures corresponding to Table 1c would be lower, i.e., about 2% lower in 1980 and 4% to 7% lower in 1985. Fuel savings in the 1985 new car fleet due to the use of diesel engine would range from 1.5 to 2.4 billion gallons. This analysis assumes that diesel vehicle fuel economy will be 25% greater than the improved gasoline engine vehicle fuel economy in 1985 based on the fact that most diesel engine vehicles are presently about 25% better than the best 1976 gas engines. There are other potential problems (such as odor, particulate levels, and noise) which diesel engines may need to overcome before full market penetration can be achieved. In addition, it must be noted that NO_x standards of 1.0 g/mi and below may affect the fuel economy of the heavier cars with diesel engines and may well preclude the development and application of the diesel engine for the heavier cars.

TABLE D-3. New Car Fleet Fuel Economy Projections with Diesel Engine Cars Included, for Emission Control Schedules and Model Years 1976 through 1985 (in miles per gallon)

	Low Range Projection (10% diesel in 1985)					High Range Projection (20% diesel in 1985)				
Model Year	D(T)	A	B	D	E	D(T)	A	B	D	E
76	17.6				17.6					17.6
77	18.4				19.0					19.1
78	20.8	19.8	20.8	20.8	21.2	21.2	21.0	21.2	21.2	21.2
79	22.0	21.0	20.6	22.0	22.4	22.6	22.6	22.1	22.6	22.6
80	22.0	20.9	20.5	20.9	23.3	23.5	23.3	22.8	23.3	23.5
81	23.4	22.4	22.1	22.4	24.8	25.1	25.1	24.6	25.1	25.1
82	23.9	23.9	23.6	23.9	26.3	26.7	26.7	26.5	26.7	26.7
83	25.4	25.4	25	25.4	27.7	28.3				28.3
84	27.1	27.1	26.6	27.1	29.5	30.2				30.2
85	28.0	26.8	27.6	26.8	30.4	31.2	28.8	31.2	28.8	31.2

Appendix E

Assumptions on the Incremental Consumer Cost Impacts of Alternative Emissions Reduction Schedules

Section 3 of this report summarized the impact of total lifetime consumer costs per car and for the total new car fleet for the alternative emissions reduction schedules relative to Schedule DT. As with any estimate of future costs, the estimates are subject to uncertainty, especially concerning periods further in the future.

Table E-1 summarizes the technology assumptions (from Section 3) and estimated equipment and maintenance costs at the different emission levels for the low and high ranges. The major source for the cost estimates was the 1975 Emissions Control Status Report, submitted on April 5, 1976.1/

Equipment costs were estimated under the assumption that all technologies (and therefore costs) for the 1.5/15/3.1 base case are included in all schedules and thus are not incremental. For the high range case, this means that some advanced technologies (such as electronic spark control) are included in the base case and appear in each of the alternative schedules, including the DT schedule.

1/ Automobile Emission Control - The Current Status and Development Trends As of March 1976, A Report to the Administrator, EPA, April 1976.

TABLE E-1

TECHNOLOGIES AND COSTS ASSUMED FOR ANALYSIS

Emission Levels (HC/CO/NO_x)	Low Range: Technologies Assumed	Low Range: Incremental Cost Estimates[1] Sticker Price $	Low Range: Incremental Cost Estimates[1] Maintenance[2] $	High Range: Technologies Assumed	High Range: Incremental Cost Estimates[1] Sticker Price $	High Range: Incremental Cost Estimates[1] Maintenanc $
1.5/15/3.1	Oxidation Catalyst High Energy Ignition Proportional EGR	Base		Monolith Catalyst High Energy Ignition Proportional EGR Electronic Spark Control	Base	
1.5/15/2.0	Same as Base	$0	$0	Base Plus Electronic EGR Electronic Air	$20	$0
0.9/9/2.0	Base Plus Air Injection	$25	$25	Base Plus Port Liners Start Catalyst	$(5) (50) $$55	$0 0 $0
0.41/3.4/2.0	Same as Above	$25	$25	Above Plus Improved Fuel Metering or Improved Catalysts	$ (15) $70	$ (25) $25
0.41/3.4/1.5	Above Plus Start Catalyst Three Way Catalyst (Replaces Ox. Cat.) Improved Fuel Metering Increment	$(50) (30) (15) $(95) $ 120	$— (150)[3] (40) (30)[4] $(220) $ 245	Above Plus Electronic EGR Electronic Air	$(20) $ 90	$(50) $ 75
0.41/3.4/1.0	Same as Above	$120	$ 245	Above Plus Three Way Catalyst (Replaces Ox. Cat.)	$(30) $ 120	$(50)[5] $125
0.41/3.4/0.4	Same as Above	$120	$ 260	Same as Above	$ [illegible]	

TABLE E-1

NOTES:

1/ All costs are incremental to the base case and are expressed in undiscounted 1975 dollars.
2/ Lifetime maintenance costs (100,000 miles)
3/ One 3-way catalyst change
4/ 3 Oxygen sensor changes.
5/ 3-way catalyst change on one-half of the cars.

( ) Indicates unit cost estimates

FROM THE OFFICE OF CONGRESSMAN JOHN D. DINGELL
ON THE DINGELL/TRAIN AMENDMENT

APRIL 14, 1976

SUMMARY OF THE DOT/EPA/FEA EMISSION CONTROL ANALYSIS

The interagency auto emission control analysis updates our understanding of the energy costs and air quality benefits of implementing more stringent federal emission standards. The report focuses on alternative emission reduction schedules for the period 1977-1985. Three schedules in the report are of special relevance to upcoming floor debate in the House on the Clean Air Act Amendments, H. R. 10498. Those schedules are: 1) standards offered by Congressman William Brodhead and adopted by the Interstate and Foreign Commerce Committee in the bill as reported, 2) a set of less stringent standards proposed by EPA Administrator Russell Train, and which will be offered by Congressman John Dingell, and 3) standards proposed by Congressman Henry Waxman which are more stringent than those of Mr. Brodhead.

	BRODHEAD		TRAIN	WAXMAN	
	(as adopted in H.R. 10498)	NOx Waiver	(as proposed by Dingell)	(as proposed in 3/18 press conference)	NOx Waiver
1977	1.5/15/2		1.5/15/2	1.5/15/2	
1978	1.5/15/2		1.5/15/2	.9/9/2	
1979	1.5/15/2		1.5/15/2	.9/9/2	
1980	.4/3.4/2		.9/9/2	.4/3.4/.4	1.5
1981	.4/3.4/.4	2.0	.9/9/2	.4/3.4/.4	1.5
1982	.4/3.4/.4	2.0	.4/3.4/2	.4/3.4/.4	1.0
1983	.4/3.4/.4	1.5	.4/3.4/2	.4/3.4/.4	1.0
1984	.4/3.4/.4	1.5	.4/3.4/2	.4/3.4/.4	1.0
1985	.4/3.4/.4	No Waiver	.4/3.4/2*	.4/3.4/.4	No Waiver

*(1985 NOx on Dingell/Train will be set administratively. The 2.0 NOx is assumed for purposes of analysis.)

The interagency study assumes that the average car is driven 100,000 miles and that new car sales will average 10 million units per year through 1985. Fuel economy per car is projected to improve with successive model years.

A final assumption is that "in each case in which a schedule provides for administrative discretion in establishing the NOx standard that must be met, this analysis has assumed that the least stringent permissable NOx standard would be established." This last assumption is potentially troublesome, in that it minimizes the potential fuel and economic penalty associated with discretionary standards.

For example, the Brodhead standard provides for a 1981-1984 NOx emission of .4 gm/mi, with administrative authority to raise the standard to as high as 2.0 gm/mi, if the more stringent standard is determined to be impractical or unachievable.

QUESTION: Should an analysis of the Brodhead standards assume a NOx standard of .4 gm/mi, 2.0 gm/mi, or something in between? The interagency study uses 2.0 gm/mi. This results in a lower fuel and economic cost calculation than if .4 had been assumed.

Working with staff from the interagency study to evaluate the case in which auto manufacturers are required to achieve a 1.0 gm/mi NOx emission under Brodhead from 1981-1984, and under Waxman from 1980-1984, our review of the interagency analysis leads to the following conclusions:

FUEL ECONOMY IMPACTS

The 1977-1985 Brodhead standards (as incorporated in H. R. 10498) would create additional engine demands and cause consumption of as much as 9.27 billion gallons of gasoline more than under Dingell/Train standards. Over a nine year period,this amounts to 67,000 barrels of oil per day. The Waxman standards would result in 14.89 billion gallons greater gasoline consumption than under Dingell/Train.

CONSUMER COST IMPACTS

In addition to increased operating fuel costs, more stringent standards require more expensive emission control equipment and maintenance. These costs are ultimately paid by the car purchaser/owner. The interagency study concludes that new car costs, lifetime maintenance costs, and lifetime fuel costs at 60 cents per gallon for gasoline, would total as much as 22.3 billion more under the Brodhead standards than under Dingell/Train. Waxman standards could cost consumers $29.67 billion more than Dingell/Train. Accounting for inflation would increase these added costs to roughly $30 billion for Brodhead and $41 billion for Waxman.

AIR QUALITY BENEFITS

Estimates of air quality and health consequences of changing automobile emission standards in the interagency study were derived from a recent comprehensive report prepared by EPA for the Air Quality, Noise, and Health Panel of the Task Force on Motor Vehicle Goals Beyond 1980. Relative to mobile source related air pollutants in the 1970's, the Dingell/Train auto emission standards are projected to reduce hydrocarbons (HC) in 1990 by 41 percent and carbon monoxide (CO) by 81 percent. Nitrogen oxides (NOx) are expected to increase by 17 percent. Ambient levels of hydrocarbons and carbon monoxide are predicted to be no lower under either the Brodhead or Waxman standards than under Dingell/Train. The Brodhead standards would dampen the increase in nitrogen oxides to 6 percent, while the Waxman standards would lead to only a 4 percent increase.

Exactly 31 air quality control regions are expected to exceed ambient air quality standards in 1990 under all three auto emission standards.

THE WHITE HOUSE
WASHINGTON

4/14/76

File
Clean Air
Act
Amendments

Charlie Leppert:

For your information.

Bill Gorog

THE WHITE HOUSE

WASHINGTON

April 13, 1976

MEMORANDUM FOR THE EXECUTIVE COMMITTEE, ECONOMIC POLICY BOARD

FROM: WILLIAM F. GOROG WFG BY TEA

SUBJECT: Agency Report to Congressman John Dingell concerning Relative Costs and Benefits of Alternative Automobile Emissions Standards.

At the request of Congressman Dingell, I coordinated an interagency report by DOT,FEA, and EPA which considered relative costs and benefits of alternative auto emissions standards. You will find a copy of the same attached.

As Dingell requested, the agencies provided him with an objective analysis free from subjective judgments. Therefore, the report should not be construed as an advocacy paper.

Before the report was transmitted to Dingell, it was reviewed by Messrs. Seidman, Train, and Zarb.

ANALYSIS OF SOME EFFECTS OF SEVERAL
SPECIFIED ALTERNATIVE AUTOMOBILE
EMISSION CONTROL SCHEDULES

April 8, 1976

prepared by

U.S. Department of Transportation
Environmental Protection Agency
Federal Energy Administration

ANALYSIS OF SOME EFFECTS OF SEVERAL SPECIFIED ALTERNATIVE AUTOMOBILE EMISSION CONTROL SCHEDULES

This analysis is the product of a coordinated effort among the U. S. Department of Transportation, the Environmental Protection Agency, and the Federal Energy Administration to compare certain specific effects of several schedules for implementing more stringent automobile emission control standards. This analysis was prepared in response to a request to the Economic Policy Board, Executive Office of the President, by letter of March 19, 1976, from Congressman John D. Dingell.

The specific emission control schedules are set forth in detail in Appendix A. For convenient reference, the schedules are identified in this analysis as follows:

Schedule	Brief Description of Schedule
DT	Amendment offered by Rep. John D. Dingell, and earlier suggested by EPA Administrator Train
A-C	A combination of two similar schedules considered by House Interstate and Foreign Commerce Committee
B	Schedule contained in the current Senate Public Works Committee Bill, S.32.9
D	Schedule adopted by House Interstate and Foreign Commerce Committee (Brodhead Amendment) H.R. 10498
E	Extension of present Federal standards indefinitely for analytical purposes.

Analytical Assumptions

Any analysis of this type must make a number of assumptions. Two assumptions were necessary to permit the comparison of the effects on fuel economy of the various emission control schedules. These assumptions deal with anticipated changes in average vehicle weight and with the mix of vehicle size-classes sold, each of which factors has a significant effect on fuel economy.*

1. It has been assumed that major vehicle weight reduction programs will occur regardless of which emission control schedule is imposed. The projection of vehicle weight trends through model year 1985 used in this analysis is set forth in Appendix B. It is based on the announced plans of manufacturers to introduce lighter weight cars through the end of the 1970's and an assessment of engineering design practicality for the later years. It is not a judgment or prediction that manufacturers will in fact produce cars in accordance with the projection of average weight.

2. Average fuel economy of the new-fleet depends not only on the weight of individual cars offered for sale, but also on the mix in which such models are sold. For the purpose of this analysis it has been assumed that the model mix listed below, (which approximates the anticipated 1976 model year sales), will continue through 1985, i.e.:

40 percent full-size cars (6 passenger capacity)
30 percent medium-size cars (5 passenger capacity)
30 percent small-size cars (4 passenger capacity)

Cars in each size class in 1985 would be lighter in weight than cars in the same size class in 1976 and would accommodate its designated number of passengers in reasonable comfort. The actual sales mix in future years

*"Fuel economy" throughout this analysis refers to fuel economy based on the EPA composite city-highway driving schedule.

will be determined by consumer desires, manufacturer's decisions, and actions by the Federal government. Nevertheless, this assumption about the sales mix of cars is reasonable for the purposes of this analysis.

In addition, one must recognize that there is considerable uncertainty in making predictions of the impact of technology that is not currently in use. Thus, with the exception of Schedule E, estimates for all emission control schedules are given in terms of a lower and an upper range, by reference to the fuel economy effects.

For schedule E, which would extend indefinitely the currently applicable emission standards, the assumptions used are spelled out in Appendix C. The low range estimates assume use of technology that is already in production, is being certified for use in 1977 cars, or has otherwise been extensively tested and demonstrated to be feasible by the auto industry. It tends to undervalue the technological improvements that may be made and used in the later years. The high range estimates assume that each manufacturer will be able to make full use of all promising technology that is potentially available even though such technololgy requires further development, comprehensive testing, and reduction to commercial production practice before it can be fully judged to be available, and thus it presents benefits that may not actually be achieved in the years under consideration. Appendix D gives a detailed discussion of emission control technologies assumed to be used for each range of estimates.

Finally, in each case in which a schedule provides for administrative discretion in establishing the NO_x standard that must be met, this analysis has assumed that the least stringent permissable NO_x standard would be established.

Section 1. Fuel Economy Impacts of the Several Schedules for Emission Control

Estimated fuel economy impacts are presented in terms of miles per gallon for the new car fleet for each model year (Table 1a) and of percentage differences of fuel economy for each schedule relative to Schedule DT (Table 1b), rounded to the nearest full percent. New car fleet average fuel economy was 14 mpg in 1974 and 15.8 mpg in 1975.

Table 1c presents the lifetime fuel consumption of the new car fleet by model year for the DT schedule. It also presents the differences in lifetime fuel consumption in each model year for each schedule with the DT schedule as reference. Plus numbers represent consumption greater than Schedule DT and minus numbers represent savings in fuel. The analysis has assumed that the average car is driven 100,000 miles and that the annual new car fleet is 10 million cars. By comparison, the nation's automobile fleet today consumes approximately 75 billion gallons of gasoline annually, or about 5 million barrels of oil per day. As a perspective on the magnitude of these amounts, note that about 2 million barrels per day are expected to flow through the Alaskan pipeline when in full operation.

These tables reflect only the use of gasoline engine powered vehicles. The use of diesel engines in place of a small fraction (10 percent to 20 percent by 1985) of gasoline engines would result in a small but significant improvement in fuel economy and a resulting reduction in fuel consumption of 4 percent to 7 percent by 1985 over the improvements predicted for gasoline engines alone. The corresponding reduction in lifetime new car fleet fuel consumption for the 1985 model year cars ranges between 1.5 and 2.4 billion gallons. Table D-3 of Appendix D shows the impact of diesel vehicle on new car fleet average fuel economy.

TABLE 1a

Estimated Fuel Economy of New Car Fleet in Miles Per Gallon by Model Year, for Each Schedule of Emission Control

	Emission Control Schedule								
Model	Low Range				High Range				Reference
Year	DT	A-C	B	D	DT	A-C	B	D	E
1976	17.6	→			17.6	→			17.6
1977	18.4	→			19.0	→			19.0
1978	20.7	19.7	20.7	20.7	21.1	20.9	21.1	21.1	21.1
1979	21.8	20.8	19.8	21.8	22.2	22.2	21.8	21.2	22.2
1980	21.7	20.6	20.2	20.6	23.1	22.9	22.4	22.9	23.1
1981	23.0	22.0	21.6	22.0	24.5	24.5	24.0	24.5	24.5
1982	23.3	23.3	23.0	23.3	25.9	25.9	25.6	25.9	25.9
1983	24.6	24.6	24.2	24.6	27.2	27.2	27.2	27.2	27.2
1984	26.2	26.2	25.6	26.2	28.8	28.8	28.8	28.8	28.8
1985	27.0	25.7	26.6	25.7	29.7	26.7	29.7	26.7	29.7

TABLE 1b

Percentage Fuel Economy Difference of New Car Fleet, by Model Year, Comparing Each Schedule to Schedule DT

Model	Low Range				High Range			
Year	A-C	B	D	E	A-C	B	D	E
1976	–	–	–	–	–	–	–	–
1977	–	–	–	+3%	–	–	–	–
1978	-5%	–	–	+2%	-1%	–	–	–
1979	-5%	-9%	–	+2%	–	-2%	–	–
1980	-5%	-7%	-5%	+6%	-1%	-3%	-1%	–
1981	-4%	-6%	-4%	+7%	–	-2%	–	–
1982	–	-1%	–	+11%	–	-1%	–	–
1983	–	-2%	–	+11%	–	–	–	–
1984	–	-2%	–	+10%	–	–	–	–
1985	-5%	-1%	-5%	+10%	-10%	–	-10%	–

TABLE 1c

Lifetime New Car Fleet Fuel Consumption - Total for Schedule DT and Differences for Other Schedules Relative to Schedule DT, for Low Range and High Range, by Model Year. (In billions of gallons)

	Low Range Projections					High Range Projections				
	Fuel Consumption	Consumption Differences				Fuel Consumption	Consumption Differences			
Model Year	DT	A-C	B	D	E	DT	A-C	B	D	E
1976	56.82	0	0	0	0	56.82	0	0	0	0
1977	54.35	0	0	0	-1.72	52.63	0	0	0	0
1978	48.31	2.45	0	0	-0.92	47.39	.46	0	0	0
1979	47.72	0.46	2.89	0	-2.57	45.05	0	.82	0	0
1980	46.08	2.46	3.42	2.46	-2.79	43.29	.38	1.35	.38	0
1981	43.48	1.97	2.82	1.97	-2.66	40.82	0	.85	0	0
1982	42.92	0	.56	0	-4.31	38.61	0	.45	0	0
1983	40.65	0	.67	0	-3.89	36.76	0	0	0	0
1984	38.17	0	.89	0	-3.45	34.72	0	0	0	0
1985	37.04	1.87	.55	1.87	-3.37	33.67	3.78	0	3.78	0

Section 2. Health Benefits

Tables 2a and 2b present the air quality effects of the emission control schedules while Tables 2c, 2d, and 2e present selected health effect indicators associated with HC, CO, and NO_x, respectively, for the schedules. This analysis draws upon the recent comprehensive report on air quality and health consequences of changing automobile emission standards prepared by EPA for the Air Quality, Noise, and Health Panel of the Task Force on Motor Vehicle Goals Beyond 1980.

A high degree of stringency of stationary source control for automotive related pollutants was assumed in the analysis as was the imposition of programs such as inspection and maintenance to ensure minimum deterioration of emission control over the lifetime of the car. Less optimistic assumptions would have produced less air quality improvement and a higher level of health effects. However, since the same set of assumptions has been applied to all schedules, the relative ranking of the emission control schedules in terms of air quality and health effects would probably not be affected.

There are two points that should be kept clearly in mind in considering the results presented here. First, it should be noted that the health effects indicators represent only a partial listing of the effects from high air pollution levels and are not intended to represent a statement of gross benefits from pollution control. Their primary significance is in the context of relative differences between emission control schedules.

Second, there is a high degree of uncertainty in making both air quality and health impact projections. The data base is limited and in some cases still subject to scientific debate, and the methodologies are subject to additional development. As a result the estimates below may well be too high or too low, and they may vary relative to each other.

Table 2a presents projections of the percentage reduction in ambient concentration of mobile source related air pollutants in 1990 in comparison with base years in the early 1970's for the DT emission control schedule. It also presents the percentage point differences for the other schedules relative to the DT schedule. Plus numbers indicate improvements in air quality while negative numbers indicate relatively poorer air quality. For all schedules, there is improvement in the oxidant and carbon monoxide air quality relative to the base years.

Table 2b summarizes the number of air quality control regions that are projected to exceed the national primary ambient air quality standard for each pollutant in 1990 for each emission control schedule.

Table 2c gives the projected numbers of aggravation of heart and lung disease in elderly patients, incidents of eye irritation, and excess headaches in 1980, in 1990, and for the total period from 1980 through 1990 due to oxidants which is controlled through reductions in hydrocarbon emissions. The effects in 1980 are predominantly due to the cars in use in 1980 which, for the most part, reflect less stringent hydrocarbon emission standards than the standards in the schedules considered in this analysis. The 1990 numbers are associated with the cars that are produced to meet the specific emission control schedule. There are other health effects of oxidants than those listed.

Table 2d presents some health effects indicators of ambient carbon monoxide; specifically, excess cardiac deaths and excess person hours of disability. As with oxidants, the health effects in 1980 are due to the older cars still on the road in that year. The 1990 health indicators reflect the cars that meet the standards in the emission control schedules.

Table 2e gives health effect indicators of oxides of nitrogen emissions in 1980, 1990, and cumulated for the period from 1980 through 1990. The health effect indicators are lower respiratory disease (chest colds, bronchitis, croup, pneumonia) in children and days of restricted activity due to lower respiratory disease in children. Even though the oxides of nitrogen emissions from automobiles decline relative to the peak year, oxides of nitrogen from other sources are projected to increase even more rapidly so that the health effect indicators are projected to increase from 1980 to 1990 for all emission control schedules considered in this analysis.

TABLE 2a. Percentage Reduction in Pollutant Concentrations in 1990 from Base Year for Schedule E and Percentage Point Differences for Other Schedules Relative to Schedule DT

Pollutant	Percentage Reduction Schedule DT	Differences Relative to Schedule DT Schedules			
		A-C	B	D	E
HC (Oxidant)	41	0	1%	0	-5%
CO	81	0	2%	0	-5%
NO_x	-17%	13%	9%	11%	-12%

TABLE 2b. Number of Air Quality Control Regions Exceeding Ambient Air Quality Standard in 1990 for Each Emission Control Schedule

Pollutant	Emission Control Schedule				
	DT	A-C	B	D	E
HC (Oxidant)	31	31	30	31	32
CO	0	0	0	0	3
NO_x	8	8	8	8	9

Table 2c. Selected Health Effect Indicators for Hydrocarbon Emission (Oxidant Effects) in 1980, in 1990, and Cumulative from 1980 through 1990 for each Emission Control Schedule

Time Period	Emission Control Schedule	Projected Health Consequences: Aggravation of Heart and Lung Disease in Elderly Patients (in thousands)	Eye Irritation (in thousands)	Headache (in thousands
Base Year		43	2,160	3,200
1980	DT	35	1,750	2,650
	AC	34	1,725	2,630
	B	33	1,700	2,600
	D	36	1,775	2,680
	E	36	1,800	2,700
1990	DT	9	525	1,000
	AC	9	510	1,000
	B	9	500	1,000
	D	9	510	1,000
	E	13	690	1,200
Cumulative 1980-1990	DT	177	9,700	15,000
	AC	176	9,700	15,100
	B	175	9,400	14,800
	D	177	9,700	15,000
	E	210	10,900	17,100

Selected Health Effect Indicators for Carbon Monoxide Emissions in 1980, 1990, and Cumulative from 1980 through 1990 for each Emission Control Schedule

		Projected Health Consequences	
Time Period	Emission Control Schedule	Excess Cardiac Deaths (Units)	Excess Person Hours of Disability
Base Year		20.0	330,000
1980	DT	1.4	32,000
	A-C	1.4	31,000
	B	1.4	20,000
	D	1.4	32,000
	E	2.0	33,000
1990	DT, A-C		
	B, D, E	0	0
Cumulative Impact Between 1980 and 1990	DT	5	83,000
	A-C	5	80,000
	B	5	67,000
	D	5	83,000
	E	5	110,000

TABLE 2e. Selected Health Effect Indicators for Oxide of Nitrogen Emissions in 1980, in 1990, and Cumulative from 1980 through 1990 for Each Emission Control Schedule

		Projected Health Consequences	
Time Period	Schedule	Excess Attacks of Lower Respiratory Disease in Children (in thousands)	Excess Days of Restricted Activity from Lower Respiratory Disease in Children (in thousands)
Base Year		700	1,900
1980	DT	740	2,000
	A-C	740	2,000
	B	740	2,000
	D	740	2,000
	E	760	2,100
1990	DT	880	2,300
	A-C	730	2,000
	B	770	2,100
	D	750	2,000
	E	1,450	3,900
Total Impact Between 1980 and 1990	DT	8,100	21,000
	A-C	7,350	19,800
	B	7,550	20,400
	D	7,450	20,100
	E	11,100	30,000

Section 3. Consumer Cost Impacts

The estimate for impact in terms of consumer costs is presented in terms of differences (in 1975 dollars) between each emission control schedule and schedule DT, for the low range and high range estimates. The cost differences are presented as undiscounted lifetime cost per vehicle, which consists for the sum of additional new car cost (sticker price), lifetime maintenance cost, and lifetime fuel costs at 60 cents per gallon for gasoline, assuming the average car is driven 100,000 miles during its life. Table 3a presents these estimates for the low range; Table 3b presents these estimates for the high range. Negative numbers represent cost savings. Appendix E is a discussion of the assumptions and methodology used in obtaining these results. For perspective, these costs should be compared to the lifetime cost of an average 1976 passenger car of approximately $16,700.

Table 3c presents the undiscounted lifetime costs for the entire new car fleet in each model year, parallel to Tables 3a and 3b, assuming 10 million cars in each model year. Note that the numbers in Table 3c are exactly 10,000,000 times greater than the numbers in Tables 3a and 3b. It is useful to note that the aggregate lifetime cost of the 1976 model year fleet, at 10 million cars, would be about 167 billion dollars. Undiscounted costs tend to over value costs incurred in later years relative to first costs. Discounting at a 10 percent rate and using the typical schedule of miles driven as a function of age of car would change the numbers in all three tables to some extent but probably would not change the relative rankings between emission control schedules.

Comparison of Incremental Lifetime Cost Per Vehicle 1/
for Each Emission Control Schedule Relative to Schedule DT

Emission Control Schedule

	TABLE 3a				TABLE 3b			
	(Low Range)				(High Range)			
Model Year	A-C	B	D	E	A-C	B	D	E
1976	Base				$ 0	$ 0	$ 0	$ 0
1977	Same as 1976				0	0	0	- 20
1978	$197	$ 0	$ 0	$- 55	83	0	0	- 20
1979	78	223	0	-154	55	124	0	- 20
1980	147	540	147	-217	63	266	63	- 55
1981	118	504	118	-210	40	236	40	- 55
1982	0	369	0	-209	0	217	0	-100
1983	335	375	335	-283	70	190	70	-100
1984	335	388	335	-257	70	190	70	-100
1985	462	368	447	-252	357	190	277	-100

TABLE 3c

Comparison of Incremental Lifetime Cost of New Car Fleet 1/
for Each Emission Control Schedule Relative to Schedule DT
(dollars in billions)

Emission Control Schedule

	(Low Range)				(High Range)			
Model Year	A-C	B	D	E	A-C	B	D	E
1976	Base		$ 0	$	$ 0	$ 0	$ 0	$ 0
1977	Same as 1976		0	-1.03	0	0	0	- .20
1978	$1.97	$ 0	0	- .55	.83	0	0	- .20
1979	.78	2.23	0	-1.54	.55	1.24	0	- .20
1980	1.47	5.04	1.47	-2.17	.63	2.66	.63	- .55
1981	1.18	5.04	1.18	-2.10	.40	2.36	.40	- .55
1982	0	3.69	0	-2.09	0	2.17	0	-1.00
1983	3.35	3.75	3.35	-2.83	.70	1.90	.70	-1.00
1984	3.35	3.88	3.35	-2.57	.70	1.90	.70	-1.00
1985	4.62	3.68	4.47	-2.52	3.57	1.90	2.77	-1.00

1/ All costs expressed in 1975 dollars, undiscounted.

Emission Control Schedules

The table below presents the emission standards assumed to be applicable to new cars in each model year for the analysis provided in this report.

Schedule	Brief Description of Schedule 1/
DT	Amendment offered by Rep. John D. Dingell, and earlier suggested by EPA Administrator Train
A-C	A combination of two similar schedules considered by House Interstate and Foreign Commerce Committee
B	Schedule contained in current Senate Public Works Committee Bill, S.3219
D	Schedule adopted by House Interstate and Foreign Commerce Committee (Brodhead Amendment) H.R. 10498
E	Extension of present Federal standards indefinitely for analytical purposes.

Model Year	Emission Control Schedule HC/CO/NO_x - gm/mi				
	D(T)	A-C	B	D	E
1976	1.5/15/3.1	1.5/15/3.1	1.5/15/3.1	1.5/15/3.1	1.5/15/3.1
1977	1.5/15/2	1.5/15/2	1.5/15/2	1.5/15/2	1.5/15/3.1
1978	1.5/15/2	.9/9/2	1.5/15/2	1.5/15/2	1.5/15/3.1
1979	1.5/15/2	.9/9/2	.4/3.4/2	1.5/15/2	1.5/15/3.1
1980	.9/9 /2	.4/3.4/2	.4/3.4/1	.4/3.4/2	1.5/15/3.1
1981	.9/9 /2	.4/3.4/2	.4/3.4/1	.4/3.4/2	1.5/15/3.1
1982	.4/3.4/2	.4/3.4/2	.4/3.4/1	.4/3.4/2	1.5/15/3.1
1983	.4/3.4/2	.4/3.4/1.5	.4/3.4/1	.4/3.4/1.5	1.5/15/3.1
1984	.4/3.4/2	.4/3.4/1.5	.4/3.4/1	.4/3.4/1.5	1.5/15/3.1
1985	.4/3.4/2	.4/3.4/ .4	.4/3.4/1	.4/3.4/4	1.5/15/3.1

1/ As applicable, for purposes this analysis, it has been assumed that in all cases the least stringent NO_x standard would be granted by waiver.

Appendix B

Assumptions for Average Weight of Cars, by Model Year

In this report estimates for fuel economy impacts of different emission standards have been normalized to reflect consistent treatment of the vehicle weight in each emission control schedule. It has been assumed that vehicle weight would successfully be reduced by the auto companies as a part of their ongoing weight reduction programs, and that the model mix of cars sold would remain steady at 40 percent large-size (6 passenger), 30 percent mid-size (5 passenger), and 30 percent small-size (4 passenger).

The average new car test weight in each model year which results from these assumptions is:

Model Year	76	77	78	79	80	81	82	83	84	8[illegible]
Average test weight	3820	3700	3600	3500	3410	3310	3220	3130	3040	2[illegible]

N.B. - Test weight is curb weight plus 300 pounds.

Appendix C

Basis for Estimate of New Car Fuel Economy for Emission Control Schedule E

Emission control Schedule E, which assumes an indefinite extention of the present Federal standards of 1.5 g/mi HC, 15 g/mi CO, and e.1 g/mi NO_x, provides the most reliable basis for projecting fuel economy improvements because of the large amount of available test data. Even with Schedule E, there is still a range of estimates for fuel economy in the future because of the uncertainty about the actual choices manufacturers will make as to the technology to be used in their production cars.

The technical staff developed upper range and lower range fuel economy projections for Schedule E. The average, or mid-range, projection was then used as a reference case to estimate the effects of the other emission control schedules. Table C gives the three fuel economy projections. Each projection includes the assumptions about weight changes and model mix descri above. The lower range estimate assumes that engines will be improved by 1985 to the point where all are as good as the best engines produced in model year 1975 and that upgraded transmissions featuring a lock-up clutch on the torque converter will be introduced in the early 1980s and used throughout the new car fleet by 1985. It also assumes some reduction in engine size to increase average efficiency with a corresponding increase in the time required to accelerate from 0 to 60 mph; (that is, 15 seconds as a representative figure for the whole new car fleet) and the phased-in use of oxidation catalysts with 70 percent conversion efficiency at 50,000 miles.

The upper range estimate assumes that the engines are improved to the "best 1975" level by 1978, that there is an increase in the average efficienc of engines, a greater increase in the 0 to 60 mph acceleration time by 1985 than that used in the low range projections, and the use of electronic engine controls.

Table C

Projections of New Car Fleet Fuel Economy by Model Year for Schedule E with Different Technology Assumptions. (Miles per gallon)

Projection	Model Year 76	77	78	79	80	81	82	83	84	8
Lower Range	17.6	18.5	19.4	20.3	21.0	22.1	23.1	24.4	25.7	27.
Upper Range	17.6	19.4	22.8	24.1	25.2	26.9	29.7	30	32	32.
Mid-range (used in analysis)	17.6	19.0	21.1	22.2	23.1	24.5	25.9	27.2	28.8	29

Appendix D

Assumptions on Utilization of Technology to Meet More Stringent Emission Standards for Low-Range and High-Range Projections

It was noted in the body of the report that different assumptions had been made for the low range and the high range fuel economy projections for each of the increasingly more stringent emission schedules, in each model year, and that these assumptions differed in terms of the degree to which advanced technology that currently may require further development would be utilized and the impacts of that technology on fuel economy.

Substantial additional successful development will be needed before all the technology discussed for the high range will be suitable and available for production. Therefore, the degree of uncertainty associated with the fuel economy projections for the high range is large. There is also a degree of uncertainty associated with the low range since it assumes the use of reasonably well developed and demonstrated technology and makes no allowance for improvements in fuel economy due to emission control technology which is now only in the early stages of development.

This appendix discusses the assumptions about the emission control technology and displays in Figures D-1 and D-2 the differences in application of these technologies for each of the two ranges. Finally, there is a discussion of the impact of diesel powered vehicles.

Technology for the Low Range Projections

The low range fuel economy projections for the various emission control schedules use the concept of Emission Control Impact (ECI), which is defined here as the percentage difference between the fuel economy at one emission standard and the fuel economy at 1.5 HC, 15 CO, 3.1 NO_x (emission control schedule E).* Negative values for ECI indicate a relative loss in fuel economy. Table D-1 displays the ECI values for each emission standard under consideration as a function of model year for cars in the 4000 lb. inertia weight class. (An x in Table D-1 for an emission standard and a model year indicates that no such ECI value was needed for any of the emission control schedules in this analysis.) The procedure used to develop the entries for Table D-1 is discussed below.

The next step in the generation of the low range projections is to generalize the ECI values in Table D-1 for the 4000 inertia weight car to the total new car fleet. This generalization is done by multiplying the ECI value for any model year by the ratio of average test weight for that model year (from Appendix B) to 4000 lb. This process reflects the effect of weight upon ECI. The table of ECI values that results is then matched against the emission control schedules (Appendix A) to produce Table D-2, which presents the Emission Control Impact value for the entire new car fleet in any model year for each emission control schedule other than schedule E, which is the reference schedule. Table D-2 is used with the mid-range fuel economy projection for emission control schedule E from Appendix C to calculate for each model year the low range fuel economy projections presented in Section 1, Table 1a.

The starting point for the Emission Control Impact estimates of Table D-1 was the estimates of the effect of emission standards upon fuel economy reported by GM[1] for their 3500-4500 pound cars. These

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[1] Reference GM comments on JPL Report "Should We Have A New Engine?" dated November 1975.

*Note that in the body of the report all comparisons are made with respect to schedule DT. This appendix describes the analytical values were considered to be representative of present practice.

Next, these Emission Control Impacts are adjusted to account for the impact of the recent change in specifications of the durability test fuel. The fuel specification change results in improved oxidation catalyst durability, representing an improvement from 55 percent to about 70 percent oxidation catalyst efficiency at 50,000 miles. A two percent improvement in average fuel economy is assumed to result from the retuning of all engines in the new car fleet at the current emission levels, and a four percent improvement for the lower emission standards. It is assumed that a two-year phase-in period is sufficient for such engine retuning. Additional effects upon fuel economy of further developments in emission control technology beyond those indicated in Figure D-1 are not included in these low range projections. Also, the initial drop in fuel economy and improvement in later years that commonly occurs when emission standard levels are changed has not been included.

The emission control technology assumed representative in this low-range case for each emission standard is shown in Figure D-1. For the .4/3.4/2 case, an option exists to add the switched-out start catalyst to the emission control system. If this is done, it would improve the estimated ECI by two percentage points and increase the incremental automobile retail price by $50. No additional maintenance within 50,000 miles is assumed.

TABLE D1

Low Range

Emission Control Impacts for 4000 Pound Car

Estimated percentage point differences in fuel economy at various emission standards by reference to fuel economy at 1.5/15/3.1 standard in each model year.

MY / Standard	76	77	78	79	80	81	82	83	84	85
1.5/15/3.1	0	0								
1.5/15/2.0	x*	-3	-2							
.9/9/2.0	x	x	-7							
.4/3.4/2.0	x	x	x	-12						
.4/3.4/1.5	x	x	x	x	-12					
.4/3.4/1.0	x	x	x	x	-14					
.4/3.4/0.4	x	x	x	x	x	x	x	x	x	-18

*,x- standard not applicable

TABLE D2

Low Range
Emission Control Impacts for New Car Fleet

Estimated percentage point differences in fuel economy for each emission control schedule referenced to the fuel economy for schedule E for the new car fleet in each model year.

Model Year	Emission Control Schedule			
	D(T)	A	B	D
76	0	0	0	0
77	-2.9	- 2.9	- 2.9	- 2.9
78	-1.9	- 6.5	- 1.9	- 1.9
79	-1.8	- 6.3	-10.8	- 1.8
80	-6.2	-10.6	-12.4	-10.6
81	-5.9	-10.1	-11.8	-10.1
82	-9.6	- 9.6	-11.2	- 9.6
83	-9.4	- 9.4	-11.2	- 9.4
84	-9.2	- 9.2	-10.8	- 9.2
85	-9.0	-13.5	-10.5	-13.5

FIGURE D-1

EMISSION CONTROL TECHNOLOGIES ASSUMED FOR LOW RANGE ESTIMATES

Emission Standards

1.5/15/3.1	1.5/15/2.0	0.9/9/2.0	0.41/3.4/2.0	0.41/3.4/1.5	0.41/3.4/1.0	0.41/3.4/0.4

Oxidation Catalyst
High Energy Ignition
Proportional EGR

Air Injection

Start Catalyst
Three-Way Catalyst
Improved Fuel
Metering
High Energy Ignition
Proportional EGR

FIGURE D-2

EMISSION CONTROL TECHNOLOGIES ASSUMED FOR HIGH RANGE ESTIMATES

Emission Standards

1.5/15/3.1 ⨍	1.5/15/2.0	0.9/9/2.0	0.41/3.4/2.0	0.41/3.4/1.5	0.41/3.4/1.0	0.41/3.4/0.4

Monolith Catalyst
Air Injection
High Energy Ignition
Proportional EGR
Electronic Engine Control
→

Electronic EGR
Electronic Air

Electronic EGR
Electronic Air →

Port Liners
Start Catalyst →

Improved Fuel* Metering →

Three Way Catalyst →

⨍ (in order of $HC/CO/NO_x$))

* Electronic Modulated Carburetor

Technology for the High Range Projections

The underlying assumption for the high range projection of fuel economy for the different emission control schedules is that by 1978 all engine types would be improved in efficiency to the level of the best engine types produced in 1975 and that these engines will be designed and engineered to give their best fuel economy at emission standards of 1.5/15/3.1 and above while using 91 RON unleaded gasoline and the basic emission control system.

The basic emission control system utilized to meet emission standards in the range between 1.5 HC, 15 CO, 3.1 NO_x and 0.41 HC, 3.4 CO, and 1.0 NO_x consists of monolith oxidation catalyst, air injection, high energy ignition and proportional exhaust gas circulation (EGR). This basic emission control system offers a degree of emission control that is significantly greater than the minimum required to meet the standards at 1.5 HC, 15.0 CO, and 3.1 NO_x, and thereby permits the adjustment of engine parameters for improved fuel economy at the less stringent emission levels within the stated range of standards.

At 1.5 HC, 15 CO, 3.1 NO_x optimal fuel economy may be achieved through the use of the basic technology identified if a good EGR system that is truly proportional to engine load is used, such as back pressure modulated EGR which controls the EGR rate in proportion to the exhaust system pressure. In 1975 and 1976 few vehicles utilized this system (manifold vacuum modulated units were used) and optimum fuel economy was not achieved. The use of the better EGR systems in 1977 and subsequent years is expected to provide for continued fuel economy improvements of up to 10 percent relative to 1976. Additional improvements are possible at this emission control level, and at more stringent levels, with use of electronic engine controls.

To maintain optimal fuel economy calibration in the lower part of the range of standards, additional emission control hardware must be added to the basic system. GM and other investigators have shown that good fuel economy and stringent NO_x control down to 1.0 gm/mile NO_x can be maintained through a delicate balance of EGR rate, air/fuel ratio (A/F) and spark ignition timing, in some specific engines, although HC emissions increase as NO_x decreases. The key to maintaining good fuel economy and NO_x control involves the use of HC control measures that are complementary to the basic catalyst technology. The emission control components useful at various emission standards levels are discussed below. Figure D-2, which displays the emission control technologies used at the different emission standards, may be helpful in understanding the schedules and relationships.

<u>At 1.5 HC, 15 CO, 2.0 NO_x</u> the basic emission control is used, except EGR modulation is accomplished electronically to obtain the optimum fuel economy level. In some cases modulation of the air injection rate electronically may also be required. The development of these techniques is required before they can be used, but it is assumed that development and application is completed within the next few years.

<u>At 0.9 HC, 9.0 CO, 2.0 NO_x</u> the basic emission control system is also used. The recalibrated A/F, EGR rate, and timing needed for NO_x control and optimum fuel economy result in HC emissions that are greater than can be handled by the primary oxidation catalyst, so exhaust port liners and a start catalyst need to be added to the basic technology at this emission control level to treat the excess HC and maintain optimum fuel economy. The port liners conserve heat in the exhaust gas and thus permit continued combustion of HC (and CO) in the exhaust system. The start

catalyst is a small oxidation catalyst located very close to the exhaust mainfold. The size and location of this catalyst permits rapid warm-up during cold-start of the engine (much faster than the larger main catalyst located much further from the engine) which results in more complete oxidation of HC during cold start. (The cold start contributes a significant fraction of the HC emissions.)

At 0.41 HC, 3.4 CO, 2.0 NO_x, more stringent HC control is required. Either improved catalysts with higher conversion efficiencies, or improved fuel metering such as electronically modulated carburetors would provide the more stringent HC control. These carburetors would reduce HC by cutting off fuel during decelerations and more precise fuel metering during accelerations. Since the conventional carburetor goes extremely rich under both these conditions. Such carburetors require development.

At 0.41 HC, 3.4 CO, 1.5 NO_x and 0.41 HC, 3.4 CO, and 1.0 NO_x the same systems as used for 0.41 HC, 3.4 CO, and 2.0 NO_x is employed except that reoptimization of EGR rate, A/F ratio, and ignition timing to keep good fuel economy results in even more excess HC. To simultaneously achieve good fuel economy and emissions control requires the use of improved catalysts (conversion efficiency of 75 percent at 50,000 miles) and improved fuel metering. A catalyst change at 25,000 miles may be required to achieve good fuel economy for some engines that have difficult emission control problems.

At the 0.41 HC, 3.4 CO, 0.4 NO_x level a three-way catalyst system or a dual catalyst would be required. While good fuel economy has been demonstrated for both systems in some prototype test cars, 50,000 mile durability of the catalyst remains to be demonstrated. Fuel economy

1985 about 1.5 to 2 MPG higher. Table D-3 gives the projected new car fleet average fuel economy for each emission control schedule based on these assumptions about diesel engine market penetration.

The lifetime new car fleet fuel consumption figures corresponding to Table 1c would be lower, i.e., about 2% lower in 1980 and 4% to 7% lower in 1985. Fuel savings in the 1985 new car fleet due to the use of diesel engine would range from 1.5 to 2.4 billion gallons. This analysis assumes that diesel vehicle fuel economy will be 25% greater than the improved gasoline engine vehicle fuel economy in 1985 based on the fact that most diesel engine vehicles are presently about 25% better than the best 1976 gas engines. There are other potential problems (such as odor, particulate levels, and noise) which diesel engines may need to overcome before full market penetration can be achieved. In addition, it must be noted that NO_x standards of 1.0 g/mi and below may affect the fuel economy of the heavier cars with diesel engines and may well preclude the development and application of the diesel engine for the heavier cars.

TABLE D-3. New Car Fleet Fuel Economy Projections with Diesel Engine Cars Included, for Emission Control Schedules and Model Years 1976 through 1985 (in miles per gallon)

Model Year	Low Range Projection (10% diesel in 1985)					High Range Projection (20% diesel in 1985)				
	D(T)	A	B	D	E	D(T)	A	B	D	E
76	17.6 →	→	→	→	17.6	←	↔	↔	→	17.6
77	18.4 →	→	→	→	19.0	←	↔	↔	→	19.1
78	20.8	19.8	20.8	20.8	21.2	21.2	21.0	21.2	21.2	21.2
79	22.0	21.0	20.6	22.0	22.4	22.6	22.6	22.1	22.6	22.6
80	22.0	20.9	20.5	20.9	23.3	23.5	23.3	22.8	23.3	23.5
81	23.4	22.4	22.1	22.4	24.8	25.1	25.1	24.6	25.1	25.1
82	23.9	23.9	23.6	23.9	26.3	26.7	26.7	26.5	26.7	26.7
83	25.4	25.4	25	25.4	27.7	28.3 ←	↔	↔	→	28.3
84	27.1	27.1	26.6	27.1	29.5	30.2 ←	↔	↔	→	30.2
85	28.0	26.8	27.6	26.8	30.4	31.2	28.8	31.2	28.8	31.2

Appendix E

Assumptions on the Incremental Consumer Cost Impacts of Alternative Emissions Reduction Schedules

Section 3 of this report summarized the impact of total lifetime consumer costs per car and for the total new car fleet for the alternative emissions reduction schedules relative to Schedule DT. As with any estimate of future costs, the estimates are subject to uncertainty, especially concerning periods further in the future.

Table E-1 summarizes the technology assumptions (from Section 3) and estimated equipment and maintenance costs at the different emission levels for the low and high ranges. The major source for the cost estimates was the 1975 Emissions Control Status Report, submitted on April 5, 1976.1/

Equipment costs were estimated under the assumption that all technologies (and therefore costs) for the 1.5/15/3.1 base case are included in all schedules and thus are not incremental. For the high range case, this means that some advanced technologies (such as electronic spark control) are included in the base case and appear in each of the alternative schedules, including the DT schedule.

1/ Automobile Emission Control - The Current Status and Development Trends As of March 1976, A Report to the Administrator, EPA, April 1976.

TABLE E-1

TECHNOLOGIES AND COSTS ASSUMED FOR ANALYSIS

Emission Levels ($HC/CO/NO_x$)	Low Range: Technologies Assumed	Low Range: Incremental Cost Estimates[1] Sticker Price $	Low Range: Incremental Cost Estimates[1] Maintenance[2] $	High Range: Technologies Assumed	High Range: Incremental Cost Estimates[1] Sticker Price $	High Range: Incremental Cost Estimates[1] Maintenanc $
1.5/15/3.1	Oxidation Catalyst High Energy Ignition Proportional EGR	Base		Monolith Catalyst High Energy Ignition Proportional EGR Electronic Spark Control	Base	
1.5/15/2.0	Same as Base	$0	$0	Base Plus Electronic EGR Electronic Air	$20	$0
0.9/9/2.0	Base Plus Air Injection	$25	$25	Base Plus Port Liners Start Catalyst	$(5) (50) $$55	$0 0 $0
0.41/3.4/2.0	Same as Above	$25	$25	Above Plus Improved Fuel Metering or Improved Catalysts	$ (15) $70	$ (25) $25
0.41/3.4/1.5	Above Plus Start Catalyst Three Way Catalyst (Replaces Ox. Cat.) Improved Fuel Metering Increment	 $(50) (30) (15) $(95) $120	 $— (150)[3] (40) (30)[4] $(220) $ 245	Above Plus Electronic EGR Electronic Air	$(20) $ 90	$(50) $ 75
0.41/3.4/1.0	Same as Above	$120	$ 245	Above Plus Three Way Catalyst (Replaces Ox. Cat.)	$(30) $ 120	$(50)[5] $125
0.41/3.4/0.4	Same as Above	$120	$ 260	Same as Above	[illegible]	

TABLE E-1

NOTES:

1/ All costs are incremental to the base case and are expressed in undiscounted 1975 dollars.
2/ Lifetime maintenance costs (100,000 miles)
3/ One 3-way catalyst change
4/ 3 Oxygen sensor changes.
5/ 3-way catalyst change on one-half of the cars.

( ) Indicates unit cost estimates

NEWS CONFERENCE: Congressman John D. Dingell, D-Michigan

April 15, 1976 10 a.m. Washington, D. C. Room 2359 Rayburn HOB

SUBJECT: The Clean Air Act Amendments and the Automobile Air Emission Control Standards

GOOD MORNING:

Our discussions today center on my concern with upcoming Clean Air Act Amendments that would affect schedules of automobile air emission control standards. The standards contained in the present House Interstate and Foreign Commerce Committee bill would cost far more in wasted energy and consumer dollars than would be justified by its negligible air quality benefits. This morning I will outline my proposal to correct this matter.

Administrator Russell Train of the U. S. Environmental Protection Agency in March of 1975 recommended to both the House and Senate a set of modified automobile emission standards under the Clean Air Act. Regrettably, neither Congressional Committee, nor their Subcommittees which were holding hearings at that time, heeded Administrator Train's advice. Subsequently, and following full Committee action in both legislative bodies, the standards headed towards the Floor of each chamber contain auto standards that are overly stringent. The bill in the House, H. R. 10498, is expected to be scheduled soon after the recess.

I will offer an amendment to the Clean Air Act Amendments that I believe is far closer to the best interests of the American consumer and worker. It is a more reasonable approach containing anti-pollution standards which are environmentally sound, more energy efficient, more consumer oriented, more protective of jobs, and that are still strict enough to further the cause of our battle against air pollution.

My amendment contains the auto air emission control levels recommended by Administrator Train of EPA and thus carry the strength of his environmental expertise and that of his agency.

		HC	CO	NOx
DINGELL-TRAIN STANDARDS:	1977	1.5	15.0	2.0
	1978	1.5	15.0	2.0
	1979	1.5	15.0	2.0
	1980	.9	9.0	2.0
	1981	.9	9.0	2.0
	1982	.41	3.4	Administratively established

Important points of my amendment, to which I will refer as the Dingell-Train amendment, include the fact that it will extend and set strict auto standards which will be phased in gradually. This is critical to the U. S. economy, to the auto industry and notably to the millions of Americans who work in auto-related businesses. By offering this amendment, I also am trying to keep us in the direction of achieving one of our major economic objectives. That objective is to halt job dislocations in the industry, an industry that has such a major impact on our economy.

Unemployment is too great in Michigan and nationwide. In my Congressional District, where there are heavy auto manufacturing concentrations and supporting industries, we have had more than our share of unemployment. Job dislocations, and non-productivity due to the 1973-74-75 auto plant shutdowns are a result of the oil embargo and lack of auto sales. In the District I serve, there is a 14 percent plus unemployment rate--double the national average. In Detroit proper, unemployment is 20 percent and in the inner city of Detroit, 40 percent. Other than the fact that I think my amendment is good legislation, the majority of other Members of the Michigan Delegation and I have a rather personal stake in this as we want to see Michigan citizens working.

This issue touches on the lives and pocketbooks of all American citizens. The vast majority drive automobiles and spend hard-earned income on their auto purchases and maintenance which becomes a major lifetime investment. For most Americans the auto is not a luxury. An estimated one third of all trips by car are to and from work and many other trips for purposes of running a household.

I am compelled to point out that the auto air pollution control standards contained in the House Commerce Committee reported bill of March 9 threaten to cause continued economic problems. The amendment adopted by the Committee works against the consumer and against energy conservation. It is not a logical solution. It was offered by my colleague, Congressman William Brodhead of Michigan and it is so identified in the additional data released this morning.

It has aimed the House in the wrong direction, a direction that is counter to consumer interests and economic improvement of the nation. The amendment adopted in Committee was just a compromise for the sake of compromise. In comparison to the Dingell-Train proposal, Brodhead has serious implications for the U. S. economy which can endure no more serious blows. The Brodhead amendment would create higher auto prices, significantly waste gasoline, offer no real added health or air quality environmental benefits, and result in higher maintenance costs to consumers. In addition, and I emphasize this, it would waste such large amounts of fuel under its tighter standards that to meet our national energy needs we would have to experience more damage to the environment through added oil drilling, construction of pipelines and even added strip mining. It would result in wastefulness that would lead to greater demands of imported crude oil at the OPEC cartel's higher prices.

Attached to this statement is an April 14 summary prepared by my office of the comprehensive interagency analysis entitled, "ANALYSIS OF SOME EFFECTS OF SEVERAL SPECIFIED ALTERNATIVE AUTOMOBILE EMISSION CONTROL SCHEDULES," dated April 8, 1976, and transmitted to me by Federal Energy Administrator Frank Zarb. The complete analysis also is attached. It was prepared by the Department of Transportation, the Environmental Protection Agency and the Federal Energy Administration following my request to those agencies March 19. I asked the agencies to compare the Dingell-Train amendment to certain other auto standard proposals based on the criteria of fuel consumption, consumer costs, and health benefits.

The interagency analysis is very comprehensive. It dramatically shows that the Dingell-Train proposal is the most fuel and cost efficient schedule of auto standards. I have omitted consideration of the levels of 1.5/15.0/3.1, as contained in the interagency analysis as these levels were rejected by the full Committee and probably will not be considered by the full House. There is no meaningful difference with respect to air quality improvements or health benefits between the two proposals or between other pending proposals contained in the interagency analysis.

The difference between Dingell-Train and Brodhead standards begin in 1980, at which point Brodhead drops to emission levels of .4 hydrocarbon, 3.4 carbon monoxide, and 2.0 for oxides of nitrogen, while Dingell-Train drops to the respective emission levels of .9/9.0/2.0. Brodhead, or the Committee bill, results in a 5 percent reduction in fuel economy for model year 1980 cars relative to Dingell-Train. A 5 percent reduction corresponds to 2.46 billion gallons of added gasoline consumption over the ten-year lifetime of the model year 1980 auto fleet; this amounts to 16,000 barrels per day.

The additional purchase and operating costs of cars in model year 1980 under Brodhead are estimated at $1.47 billion. Differences between the Dingell-Train and Brodhead schedules continue from model year 1980 through 1985. Cumulative fuel consumption differences between the two standards amount to 9.27 billion gallons (67,000 barrels /day) of gasoline, while total consumer costs are $22.3 billion more under Brodhead than under Dingell-Train. (This assumes a waiver to 1.0 gm/mi on NOx as explained in my staff summary of the interagency analysis.)

The DOT, EPA, FEA interagency emission control analysis also tends to confirm other recent studies which suggest that the cost of moving to more stringent standards than present Federal levels (1.5/15.0/3.1) may prove to be unjustified on the basis of any rational evaluation of costs versus benefits. Present standards represent approximately an 83 percent reduction in HC and CO emissions, and a 38 percent reduction in NOx emissions, relative to uncontrolled autos. Continued replacement of obsolete high-polluting cars with low emission new cars will reduce mobile source related air pollution well into the 1980's regardless of whether more stringent standards are adopted. The added air quality benefits obtained from moving to tougher standards are minute in comparison to the fuel and dollar costs that would be required. One recent study, dated March 22, 1976, performed by Professor S. Fred Singer, Department of Environmental Sciences, University of Virginia, for the National Science Foundation concludes that the benefits and costs of achieving 1975 standards are about equal and the costs will exceed benefits (by as much as $13 billion) as tighter standards are adopted.

In the summary my office prepared, I have pointed out that the DOT, EPA, and FEA comprehensive analysis assumed that EPA, the agency charged with enforcement of auto air pollution regulations, would grant waivers on the oxides of nitrogen levels as contained in the other legislative proposals on this issue. As we note in my summary of the interagency analyais, this, quote, "assumption is potentially troublesome, in that it minimizes the potential fuel and economic penalty associated with discretionary standards," end quote. That is to say, the interagency study does not show, and therefore a major point must be made here, how great the fuel losses would be under the Brodhead and Waxman proposals if the waivers of oxides of nitrogen are not granted by EPA.

		HC	CO	NOx
	1977	1.5	15.0	2.0
HOUSE COMMITTEE BILL,	1978	1.5	15.0	2.0
H. R. 10498	1979	1.5	15.0	2.0
(BRODHEAD AMENDMENT):	1980	.41	3.4	2.0
	1981	.41	3.4	.4 -- 2.0 waiver
	1982	.41	3.4	.4 -- 2.0 waiver
	1983	.41	3.4	.4 -- 1.5 waiver
	1984	.41	3.4	.4 -- 1.5 waiver
	1985	.41	3.4	.4 (no waiver)

You will note the waivers on the Brodhead amendment and then note that under Dingell-Train, there are no waivers. In fact, and this is a critical advantage of Dingell-Train, in model year 1982, we do not set the NOx standard but leave that decision to the experts in the field, Mr. Train and his agency. It is set administratively by EPA discretion.

Also note that the so-called Waxman proposal, reportedly to be offered by Congressman Henry Waxman of California, contains waivers on oxides of nitrogen. In the interagency analysis, Waxman is even more devastating on total fuel and consumer costs.

The Dingell-Train amendment is a strict set of auto standards. It will keep the auto manufacturers sufficiently on notice of expected performance while at the same time allowing them the lead time needed to meet the standards. The phased-in tightening of the standards under my amendment provides for both and it accomplishes what the other proposals do not.