Collection: Harlow, Bryce: Files
Folder Title: Clean Air Act (4 of 6)
Box: OA 17036

LEGISLATION REDUCTION BENEFITS

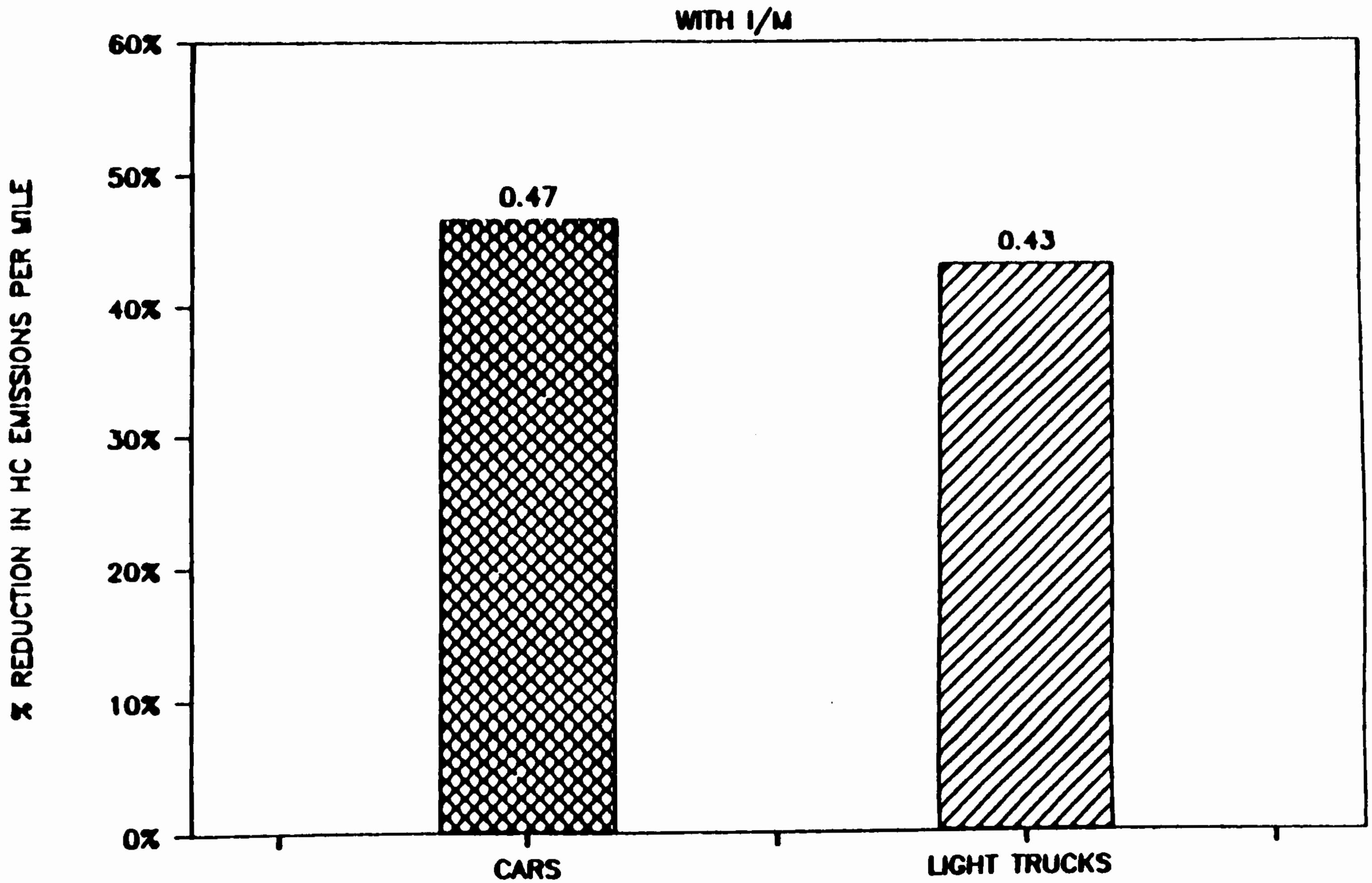


Figure 16

EMISSIONS FROM IN USE VEHICLES

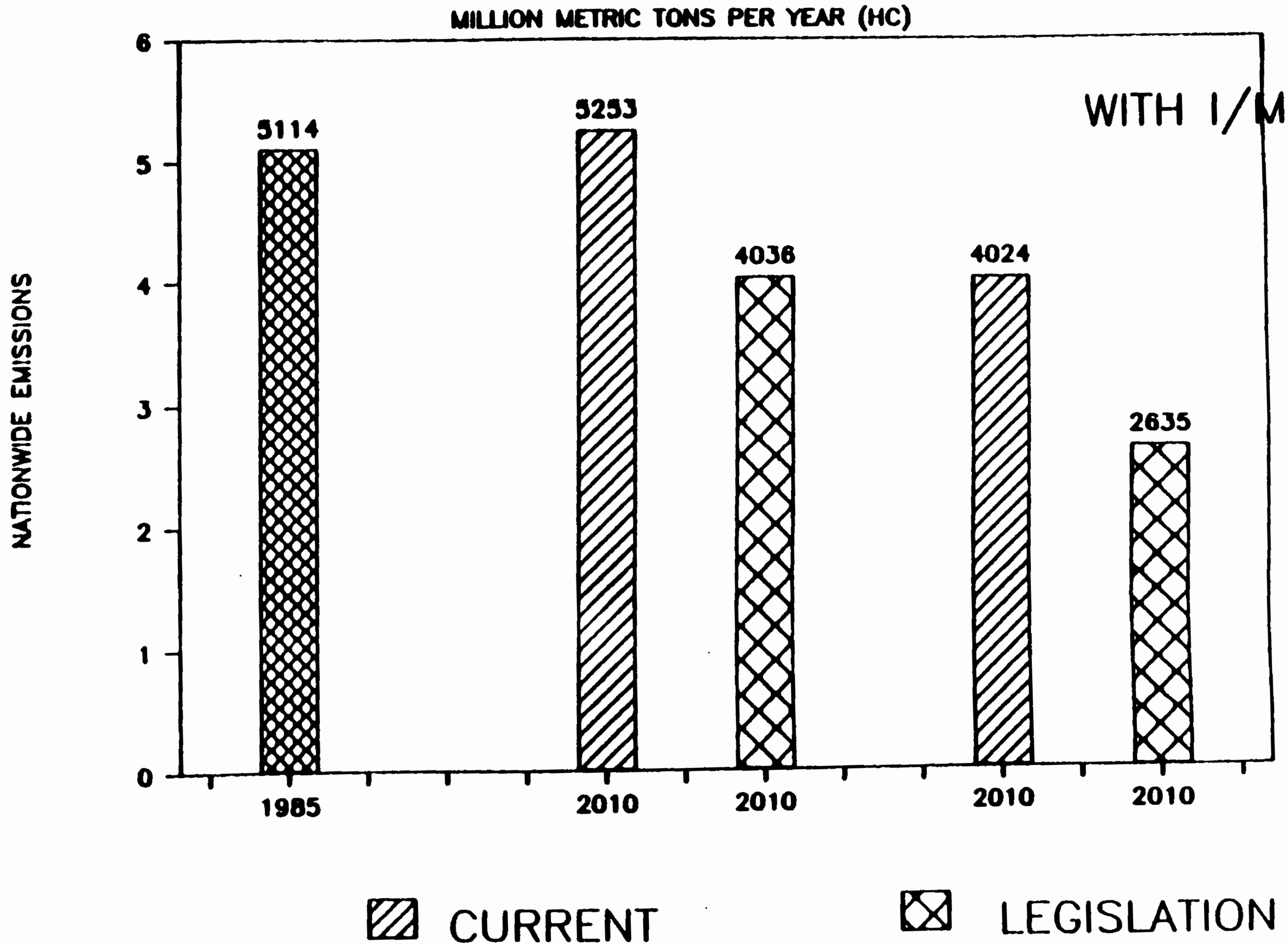


Figure 17

AUTOMOBILE EMISSIONS IN USE

AFTER FULL FLEET TURNOVER

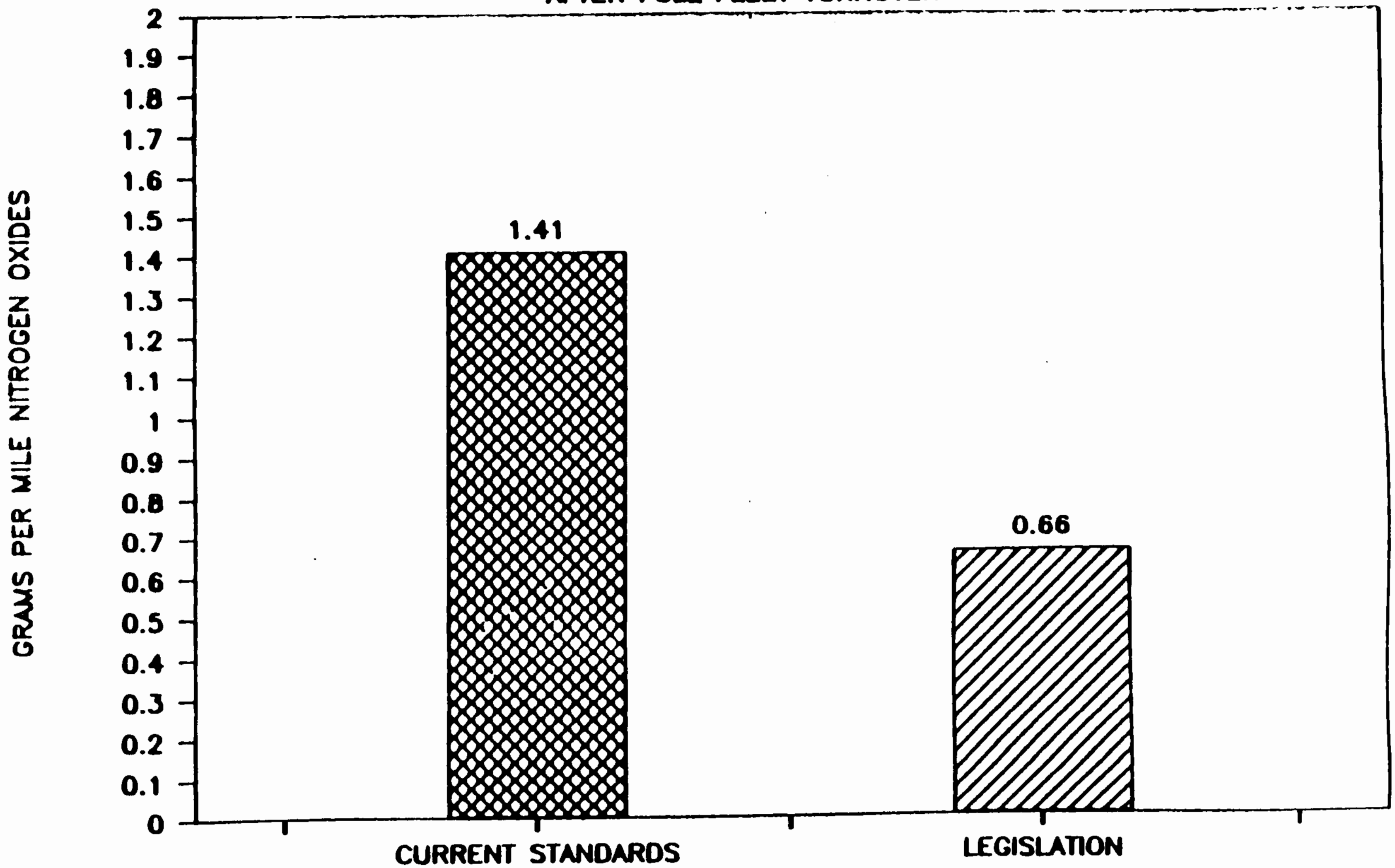


Figure 18

LIGHT TRUCK EMISSIONS IN USE

AFTER FULL FLEET TURNOVER

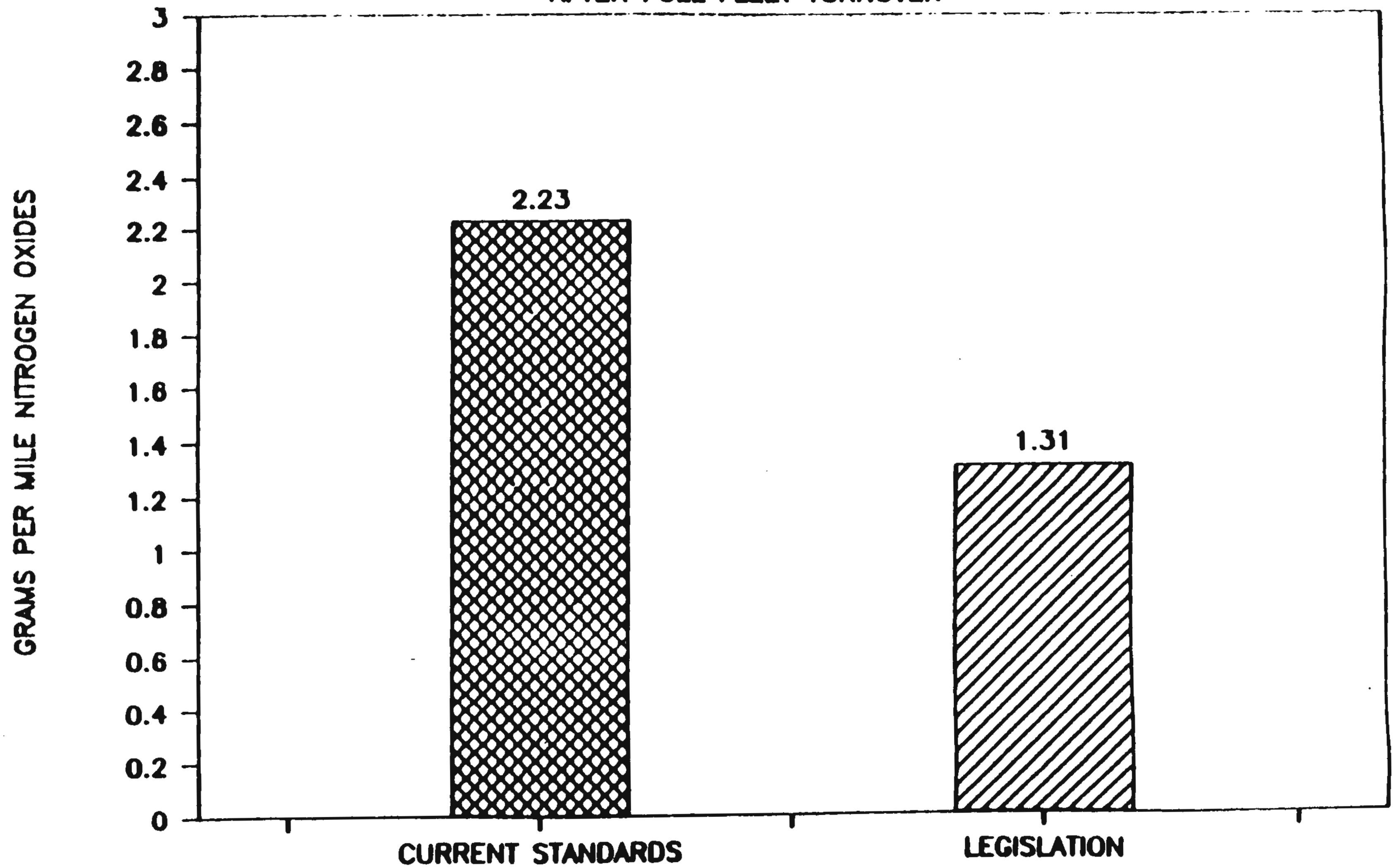


Figure 19

LEGISLATION REDUCTION BENEFITS

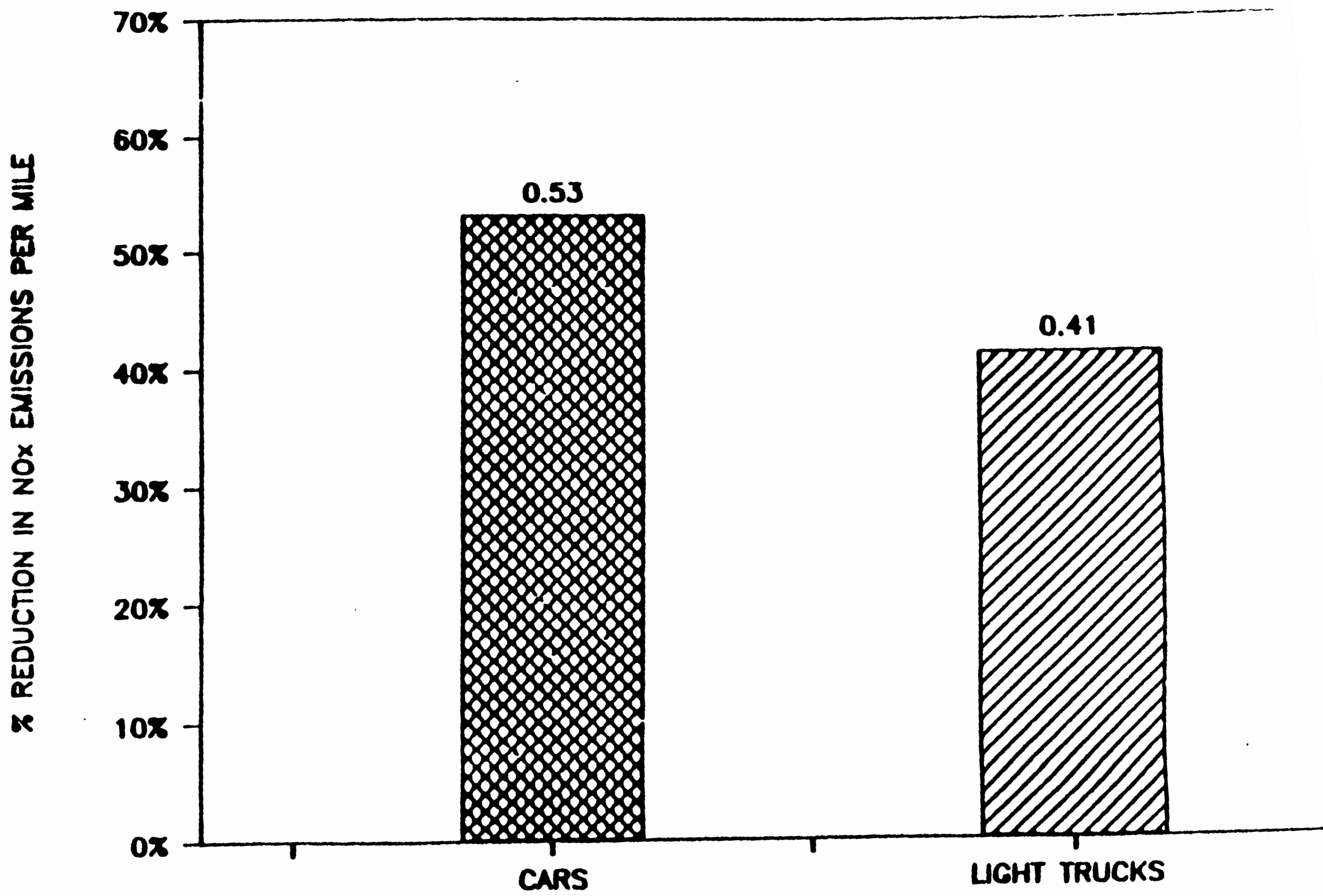


Figure 20

AUTOMOBILE EMISSIONS IN USE

WITH I/M, AFTER FULL FLEET TURNOVER

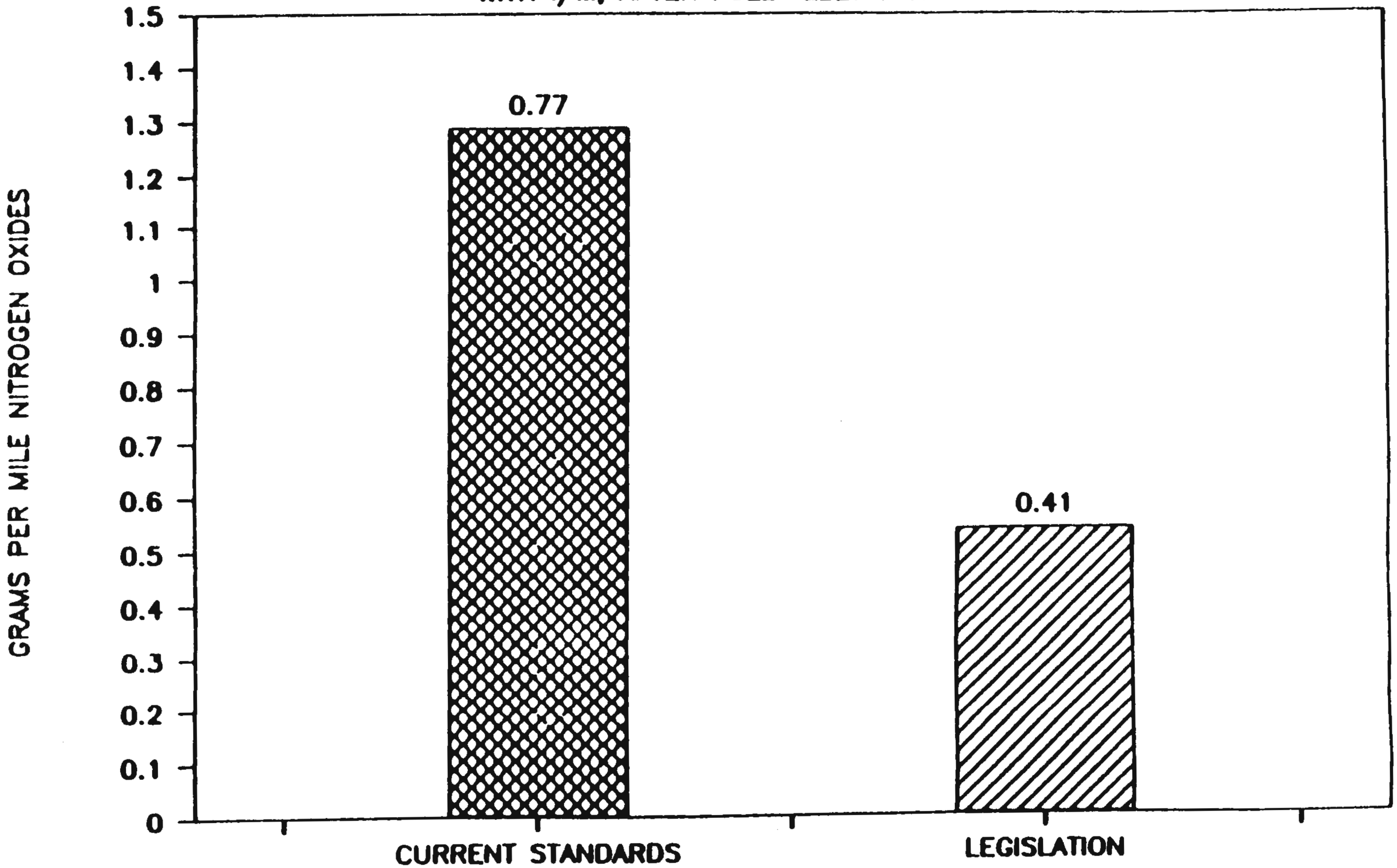


Figure 21

LIGHT TRUCK EMISSIONS IN USE

WITH I/M, AFTER FULL FLEET TURNOVER

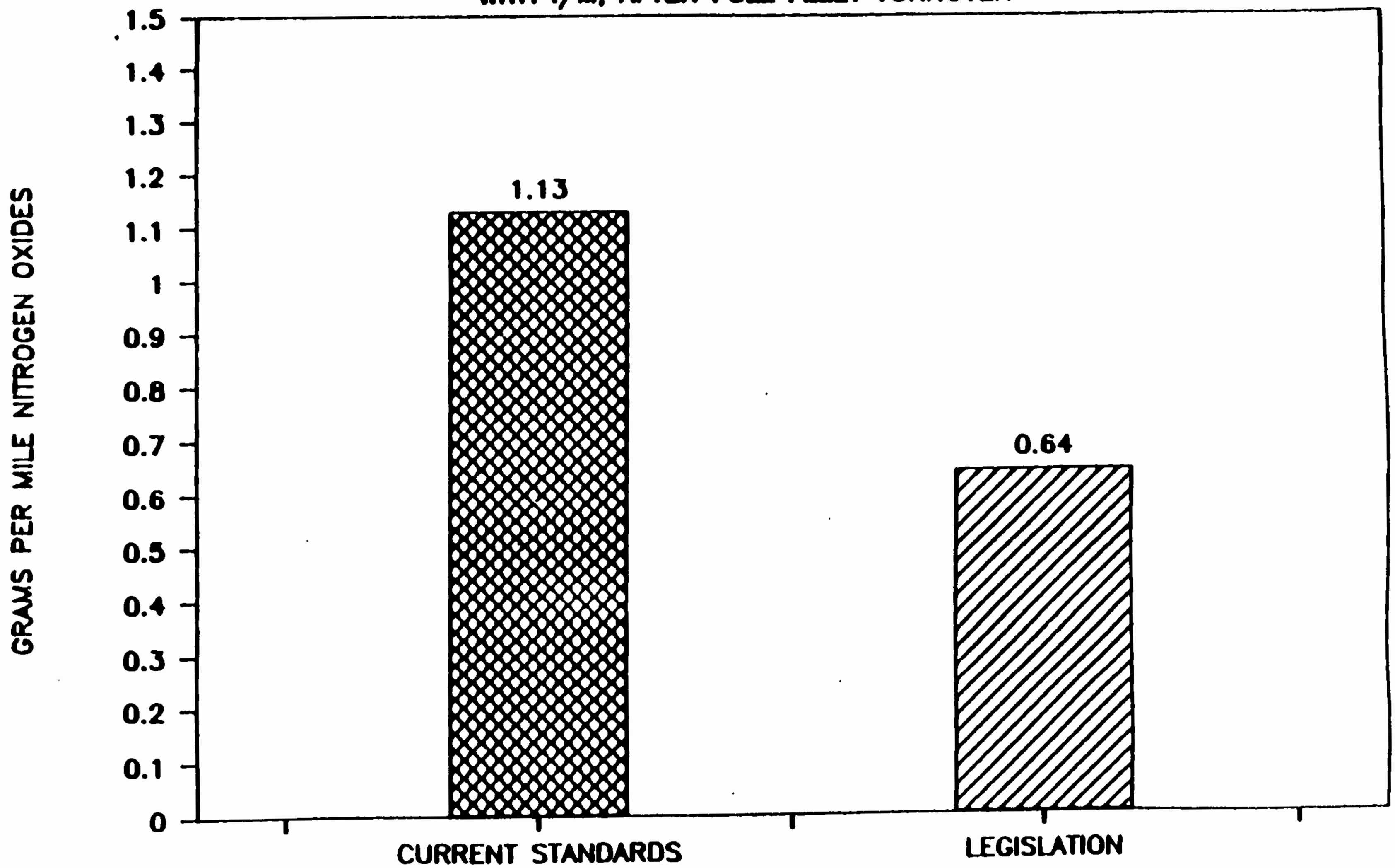


Figure 22

LEGISLATION REDUCTION BENEFITS

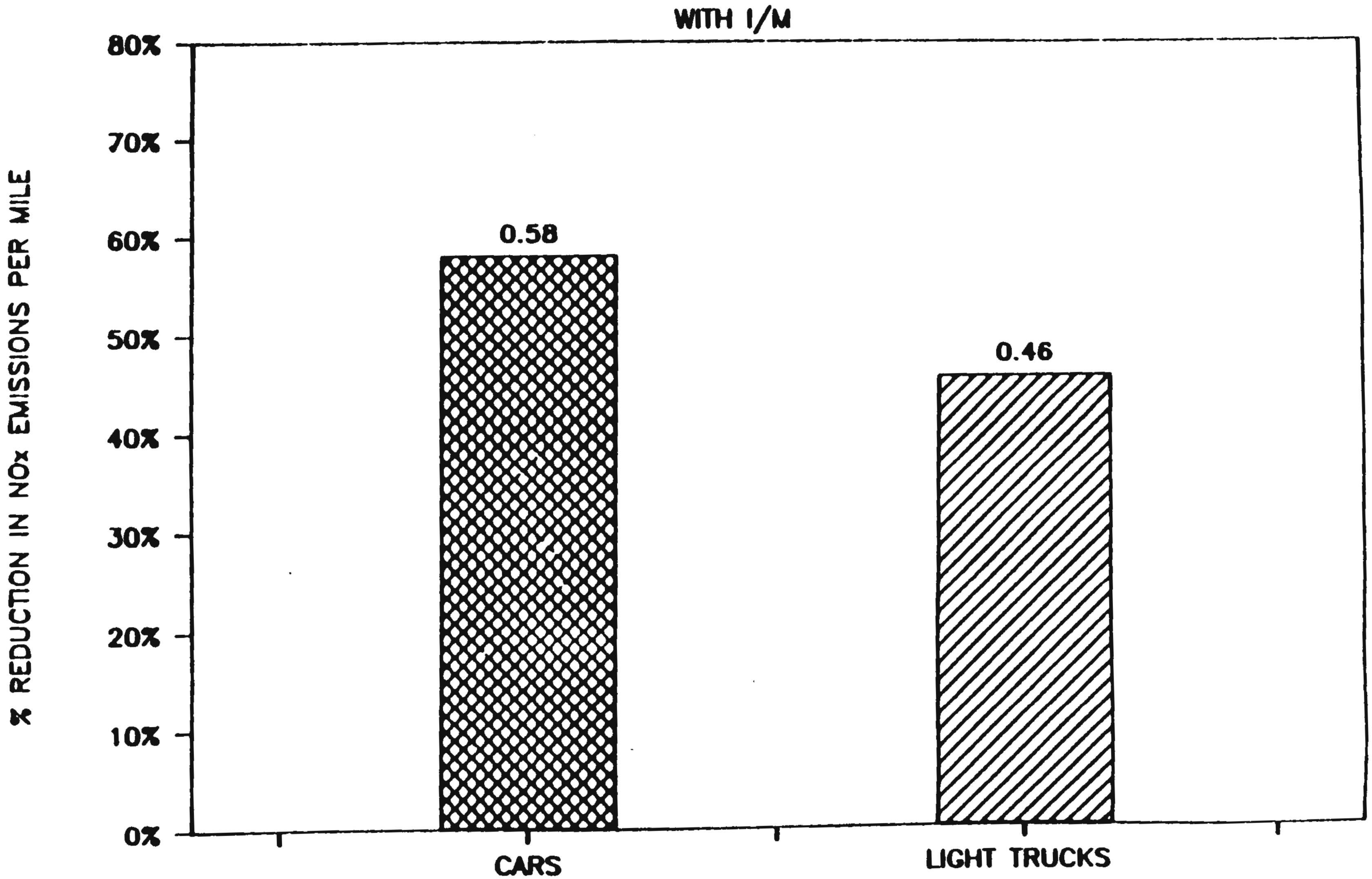


Figure 23

EMISSIONS FROM IN USE VEHICLES

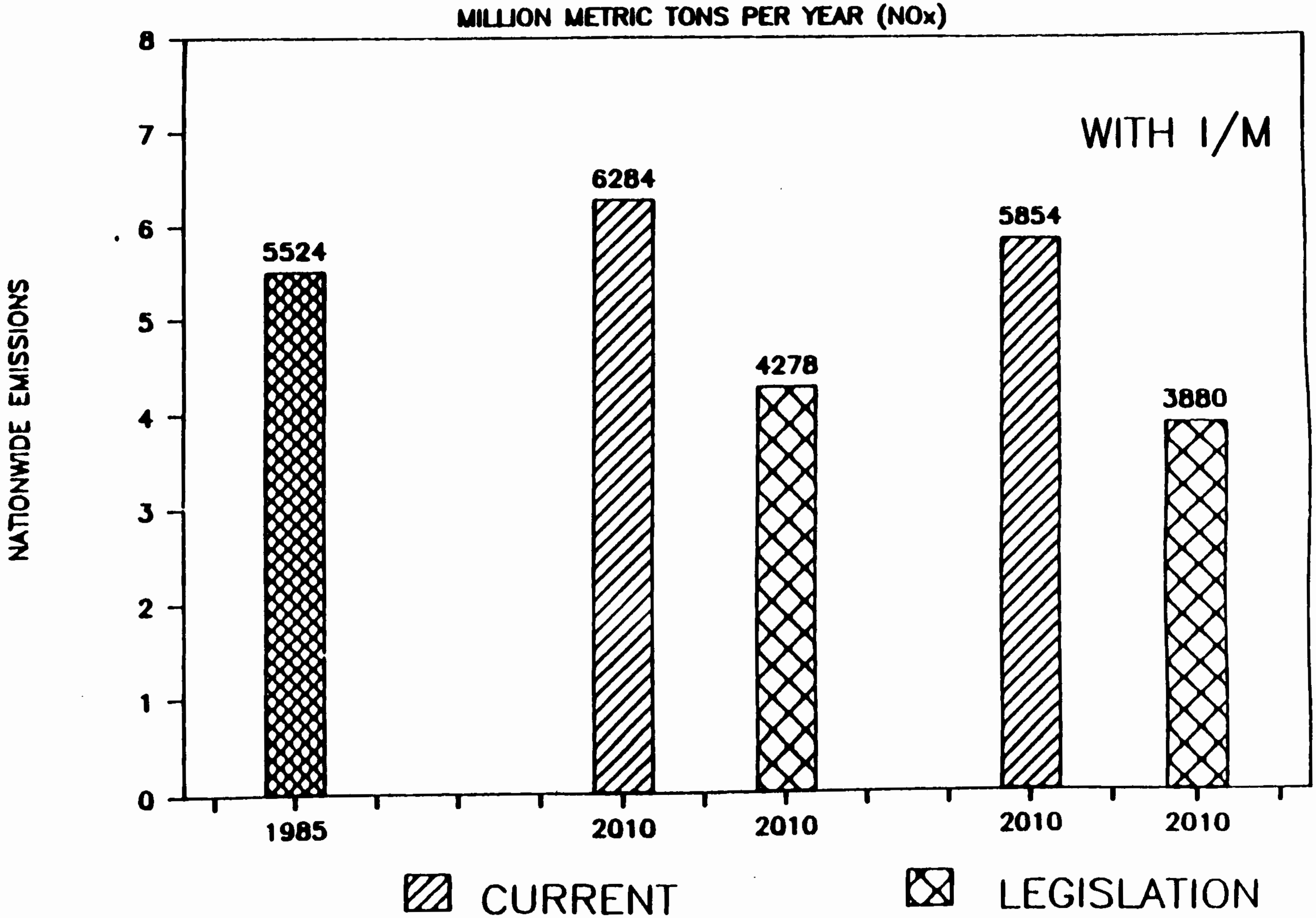


Figure 24

IX. ANALYSIS OF THE IMPACT OF LEGISLATION ON AIR QUALITY

As noted above, more stringent motor vehicle emissions requirements, dealing both with vehicle design and production and operation in use have the potential to significantly lower overall emissions and improve air quality. The following section will analyze this potential in terms of photochemical smog, the most widespread and pervasive air pollution problem which we face.

A. METHODOLOGY

The first step in the process is to select the air quality design values for the urban areas to be included in the study. After careful deliberation, it was decided to use the 1983-4-5 values contained in the EPA analysis of March 1987. Even though limited data has been released by the Agency showing improvement for 1986, a recent study from NESCAUM (see Figure 25) showing even higher values in 1987 indicated that use of 1986 data before its full review and analysis was premature.

After selecting 1985 as the base year, total mobile source emissions were calculated using the Mobile 3 emissions model. Emissions were calculated for each category of vehicle - cars, light trucks, light duty diesels and heavy trucks, both diesel and gasoline - and combined for each urban area. Total VOC emissions for each urbanized area were then calculated. Stationary VOC emissions were estimated by using the ratio between stationary and mobile sources for each area as listed in EPA's Federal Implementation Plan analysis of last year. (34) For NOx, the nationwide split was determined from the recently released NAPAP report and applied uniformly to each urban area.

In projecting future emissions, the first step was to determine projected population growth for each urban nonattainment area under study, using the latest census data. Based on the population trends, three alternative methods were explored to estimate future vehicle miles travelled. In each case, the following equation was used:

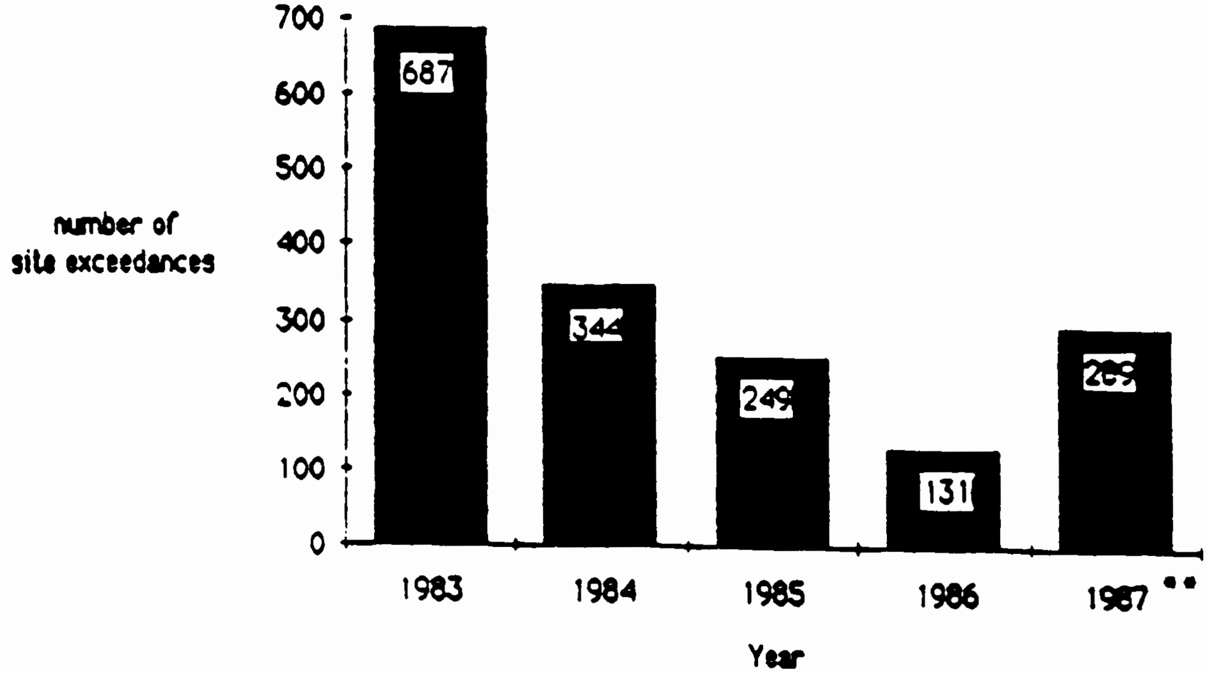
$$VMT = (VMT/POP)_{year\ x} * (POP)_{year\ x}$$

(VMT/POP) for each year under study was estimated three different ways:

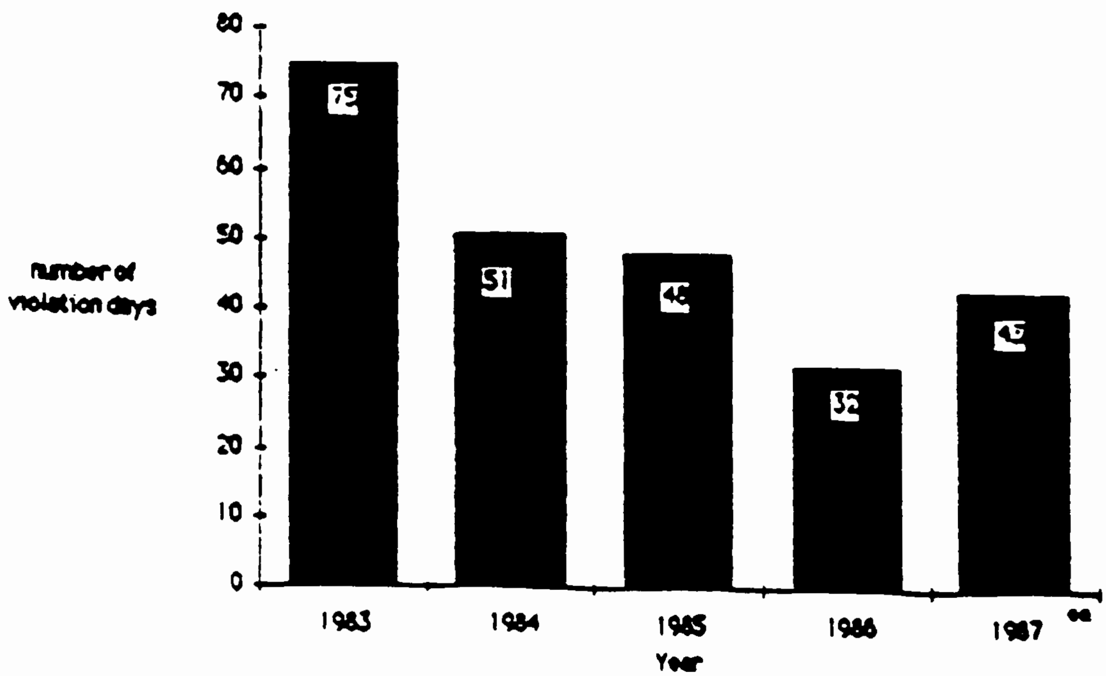
1. VMT was derived from a straight line extrapolation of the number of vehicles and multiplied by a constant VMT per vehicle.

2. A straight line extrapolation of historical VMT/POP trends.

TOTAL NUMBER OF SITE EXCEEDANCES IN THE NORTHEAST*



TOTAL NUMBER OF VIOLATION DAYS IN THE NORTHEAST*



* CT, MA, ME, NH, NJ, NY, RI, VT

** preliminary data

10/15/87; cf Figure 25

3. VMT forecast based on the assumption that average annual growth of VMT from 1960 to 1985 will continue.

In each case, the population (POP) was derived from the Commerce Department (BEA) national estimates for the year 2000. In projecting future mobile source emissions, the second methodology was relied on; this method generally results in lower overall growth projections than the other alternatives.

Results are summarized in Figures 26 through 35. Figure 26 shows that mobile source emissions for the 79 nonattainment areas investigated will go down in the near future but then start to turn up during the 1990's. Adoption of the legislation will significantly lower emissions over the base case. Including stationary emission, as shown in Figure 27, will accelerate the increase and result in higher overall emissions in the future than those which currently exist. (Stationary HC or VOC emissions were estimated to increase in the same ratio in the 79 nonattainment areas studied as EPA estimated they would nationwide in its recent proposal for gasoline volatility controls.) While not the primary focus of this report, the House and Senate legislative proposals will also lower stationary source emissions substantially. Assuming a 47 percent reduction from these sources based on Table V-2 in EPA's FIP report (34) overall VOC emissions can be lowered as shown for Case A in Figure 28. Using the EKMA model to predict the overall improvement in air quality as a result of the VOC reductions leads to the nonattainment predictions summarized in Figure 29. In summary, if stationary source emissions continue to increase as EPA recently estimated they would, and mobile sources follow the trends estimated in this study for the current set of mobile source requirements, the ozone air quality situation will be just as severe in the future as it is today. Conversely if available stationary and mobile source controls are introduced, many areas will attain the current air quality standard for ozone.

If the stationary source controls are introduced without the mobile source controls there will continue to be a substantial shortfall. The only options then available would be to introduce the legislated mobile source controls, find additional stationary source controls which no one has been able to identify at this time, or drastically reduce the use of vehicles in the nonattainment areas. To put this into perspective, Figure 30 shows that the mobile source emissions reductions which would result from the legislation reflect 38 percent of the additional reductions needed to attain after the stationary controls are introduced along with all currently mandated mobile source controls.

Photochemical smog results from chemical reactions involving <u>both</u> hydrocarbons and nitrogen oxides in the presence of sunlight. Motor vehicles are major sources of both of these precursor pollutants. While historically the major strategy for reducing smog has focused on tight restrictions on hydrocarbon emissions, NOx control is also necessary, particularly with regard to the highest and, therefore, most hazardous levels. This conclusion was verified by a panel of experts convened by the National Commission on Air Quality (NCAQ), which found that, "NOx control as well as HC control is needed." (8)

1. The most severe air pollution periods consist of multi-day episodes during which NOx and other smog precursors have long periods of time to interact; under such conditions, even higher ozone values would result if more NOx were emitted because there would be "a high degree of day to day carry over of such key pollutants as NO_2, peroxyacetyl nitrate (PAN), formaldehyde (HCHO) and higher aldehydes, and nitrous acid (HONO)." These pollutants "are the major early morning sources of hydroxyl radicals (OH) which drive the oxidation processes involved in photochemical smog."

2. Along with ozone, a wide spectrum of hazardous components tends to be associated with photochemical smog episodes. (9) The NCAQ expert panel also expressed concern that higher NOx emission rates would lead to higher ambient concentrations "of other nitrogen bearing pollutants, e.g., NO_2, nitric acid, peroxyacetyl nitrate (PAN), and other nitrates." These latter compounds are traditionally associated with ozone as part of the photochemical smog family.

3. NOx control will also reduce ozone concentrations downwind in transport situations; since many densely populated areas of the United States are "downwind" of other urban centers, NOx <u>and</u> HC control seems the only reasonable course of action to protect public health. As recently noted by a prominent researcher in this field,

> "Recent research results from our research group indicate there is a critical need to consider controls on <u>both</u> nitrogen oxides and reactive hydrocarbons if overall oxidant levels are to be lowered...A critical implication of these findings is that without controls on nitrogen oxides the current control policies will simply change the urban ozone problem into a regional scale one." (10)

The California Air Resources Board in a study which supported that state's adoption of a 0.4 gpm NOx standard for passenger cars, light duty trucks and medium duty vehicles concluded, "Since 1978, a period during which both HC and NOx emissions have decreased, daily peak smog season ozone levels have declined significantly in both the central and eastern portions of the basin. It is in these areas that ozone concentrations are the highest and affect the health of both sensitive and healthy individuals."

Therefore, it is important in assessing future air quality to consider NOx emissions trends. As noted earlier, the NAPAP report estimated substantial future increases in this pollutant. This assessment supports that conclusion. As illustrated in Figure 31, mobile NOx emissions will increase in the future unless additional controls are introduced. The legislative proposals for mobile sources, on the other hand, will significantly lower these emissions. Including stationary NOx sources which are also increasing under current requirements, Figure 32 shows the situation will clearly deteriorate without additional controls. Mobile source controls alone will allow us to basically control the growth at least through 2010 as illustrated in Figures 33 and 34.

An assessment of the carbon monoxide. problem was also carried out and the results are summarized in Figure 35. Since it has now been established that most CO air quality problems across the US tend to be concentrated in winter months and are most severe in congested central business districts, the analysis was carried out under those conditions (20 degrees F, 10 MPH average speed). It is important to emphasize that emissions projections under these conditions are much less reliable than those under standard Federal Test Procedure conditions (75 degrees F, 19.6 MPH); recent data indicates CO emissions may be much worse at low speeds than current mobile 3 model indicates.

Using the current model, however, the analysis indicates that the current air quality situation will continue to improve for several years, but will then start to degrade during the late 1990's. Unless additional controls are introduced, we will likely have almost as serious a CO problem in the future as we do now.

MOBILE VOC'S -- 79 NONATTAINMENT AREAS

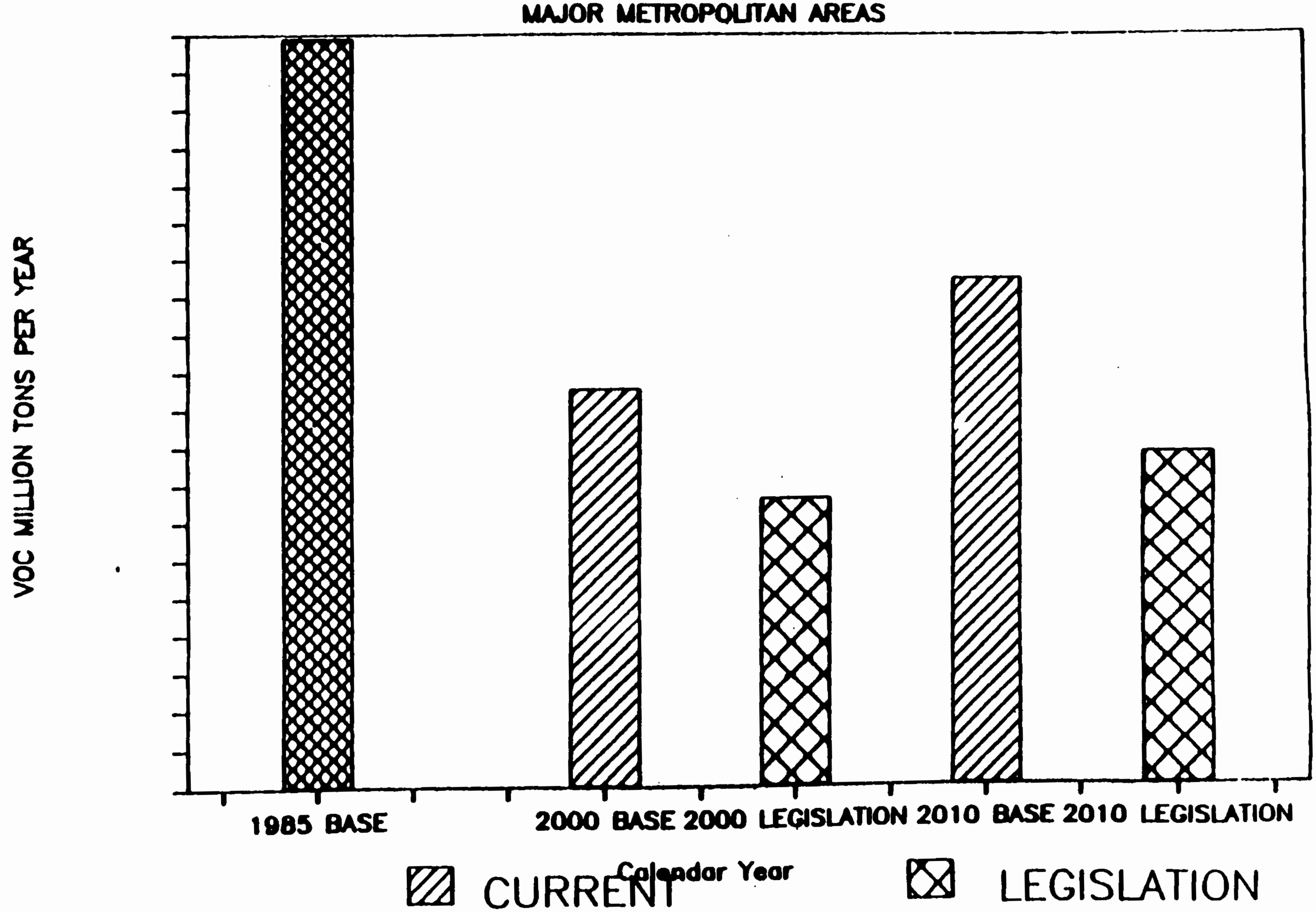


Figure 26

VOC EMISSIONS -- 79 NONATTAINMENT AREAS

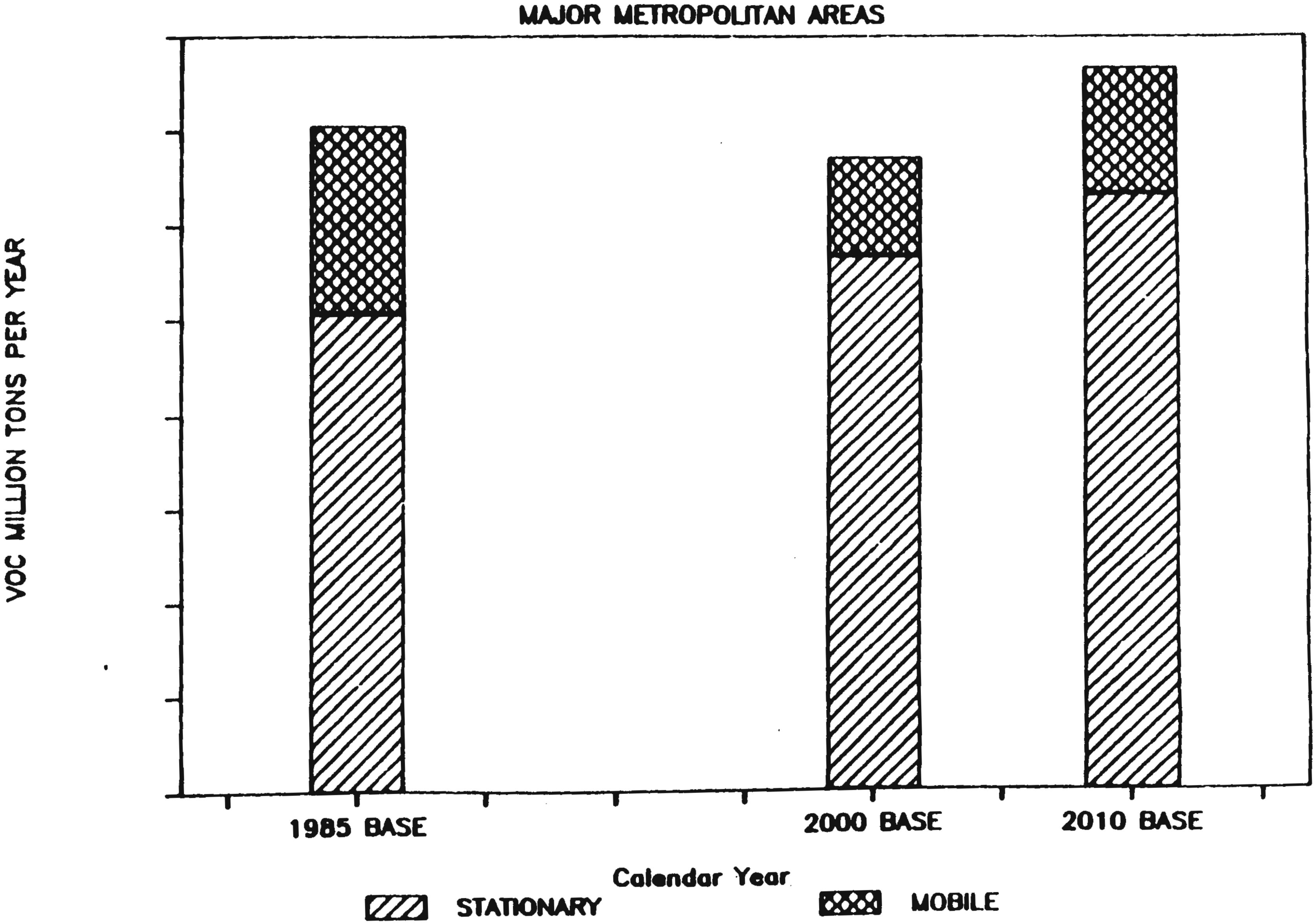


Figure 27

VOC EMISSIONS -- 79 NONATTAINMENT AREAS

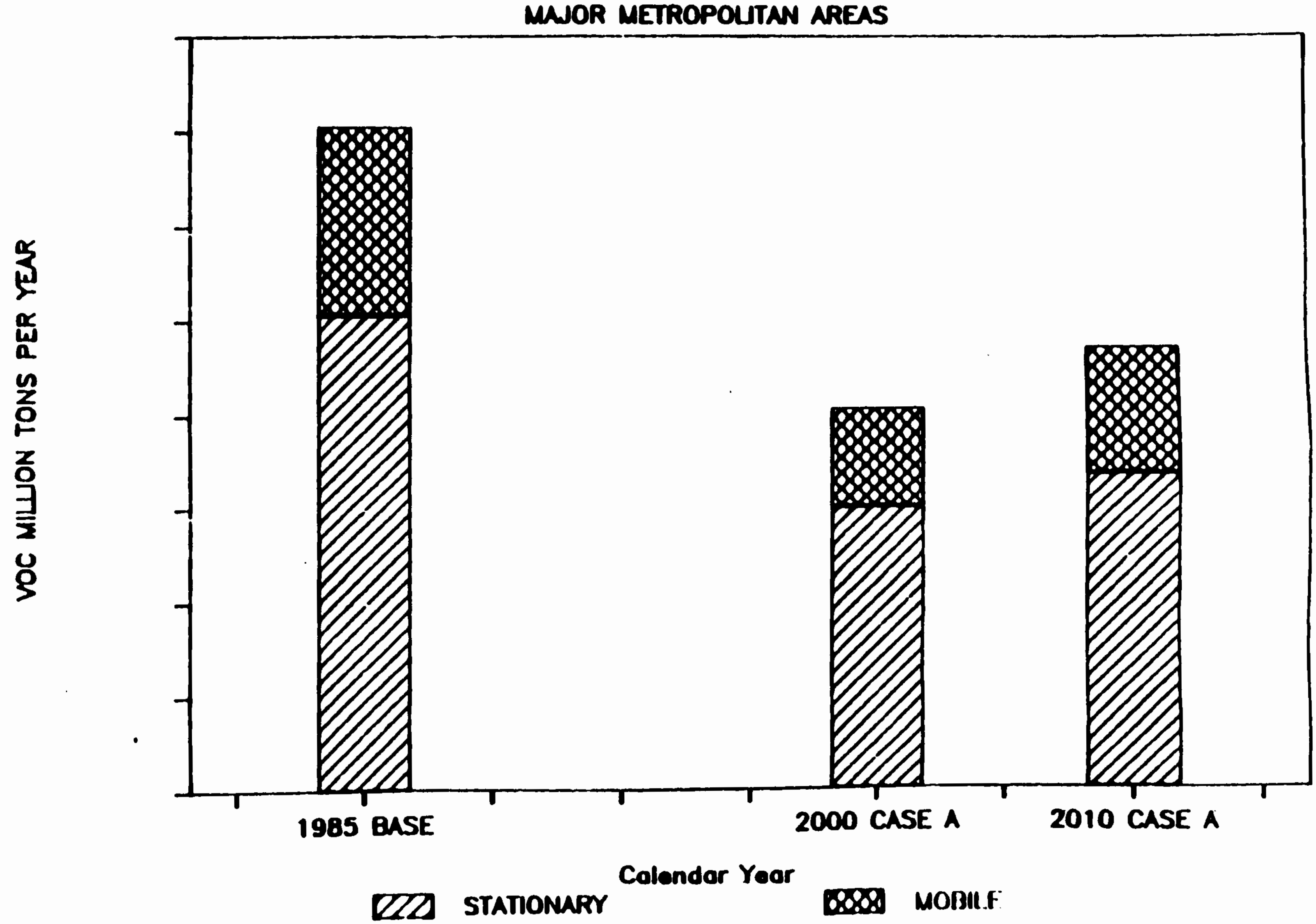


Figure 28

OZONE NONATTAINMENT AREAS

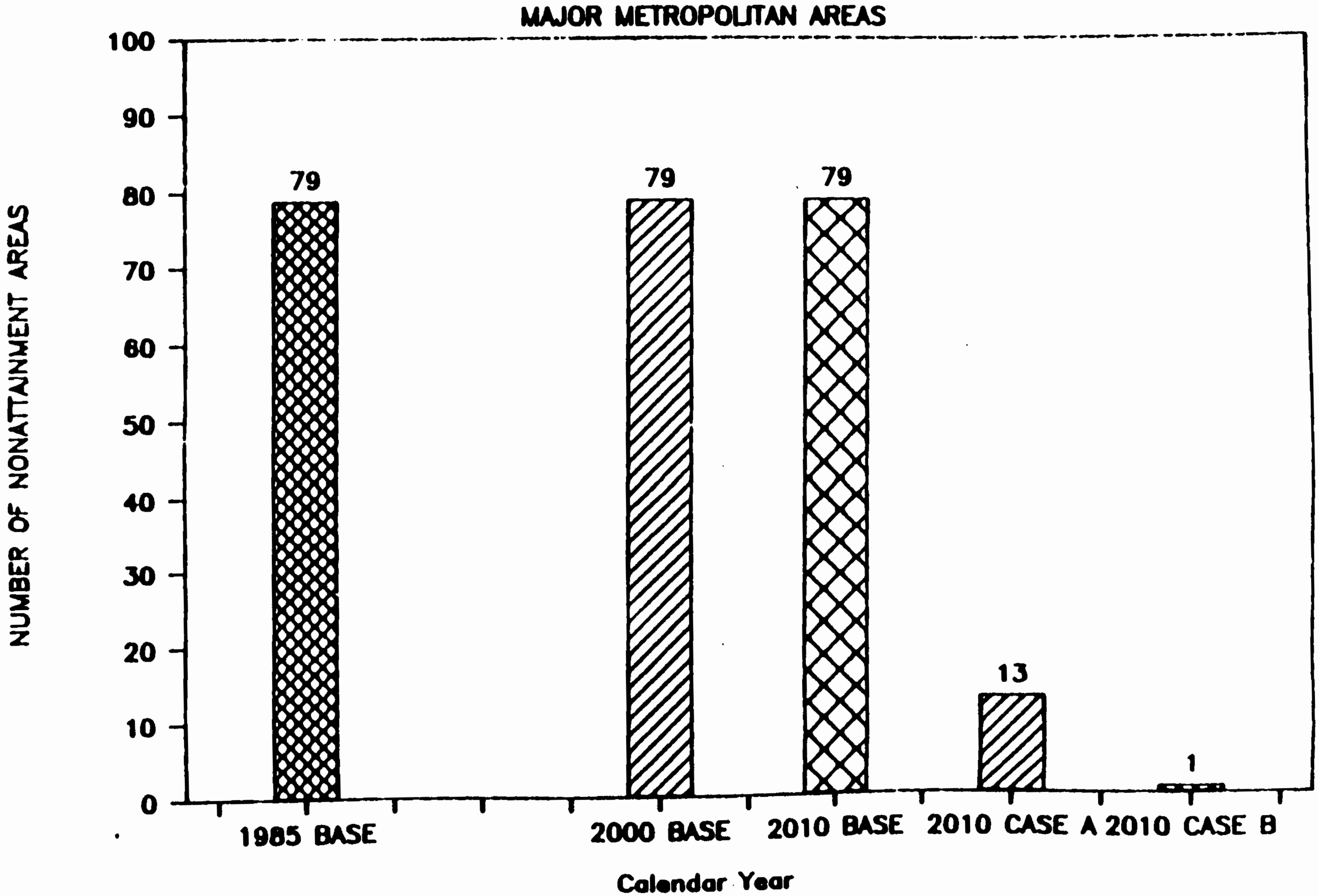


Figure 29

LEGISLATED MOBILE SOURCE CONTROL

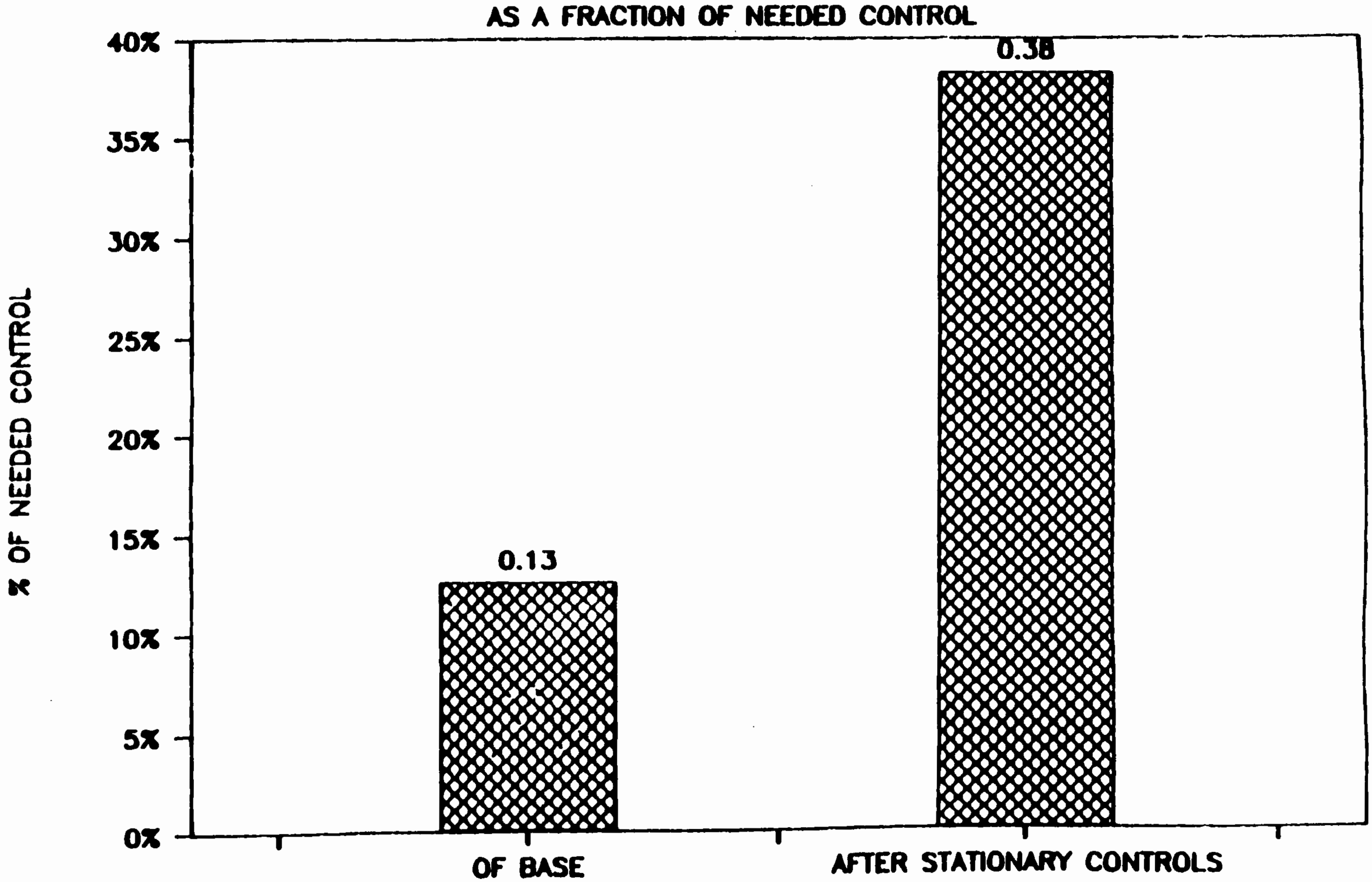


Figure 30

MOBILE NOX -- 79 NONATTAINMENT AREAS

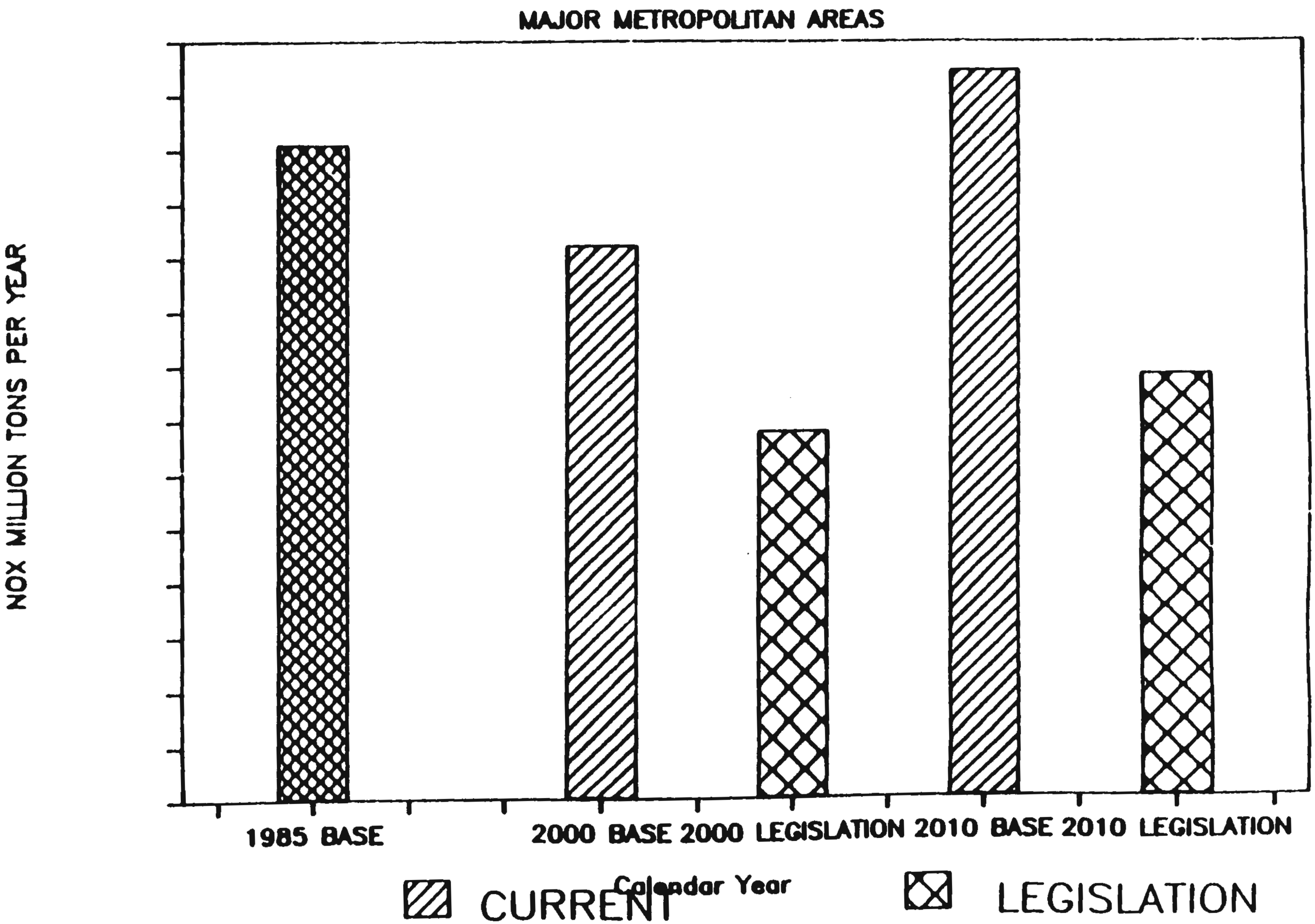


Figure 31

NOx EMISSIONS -- 79 NONATTAINMENT AREAS

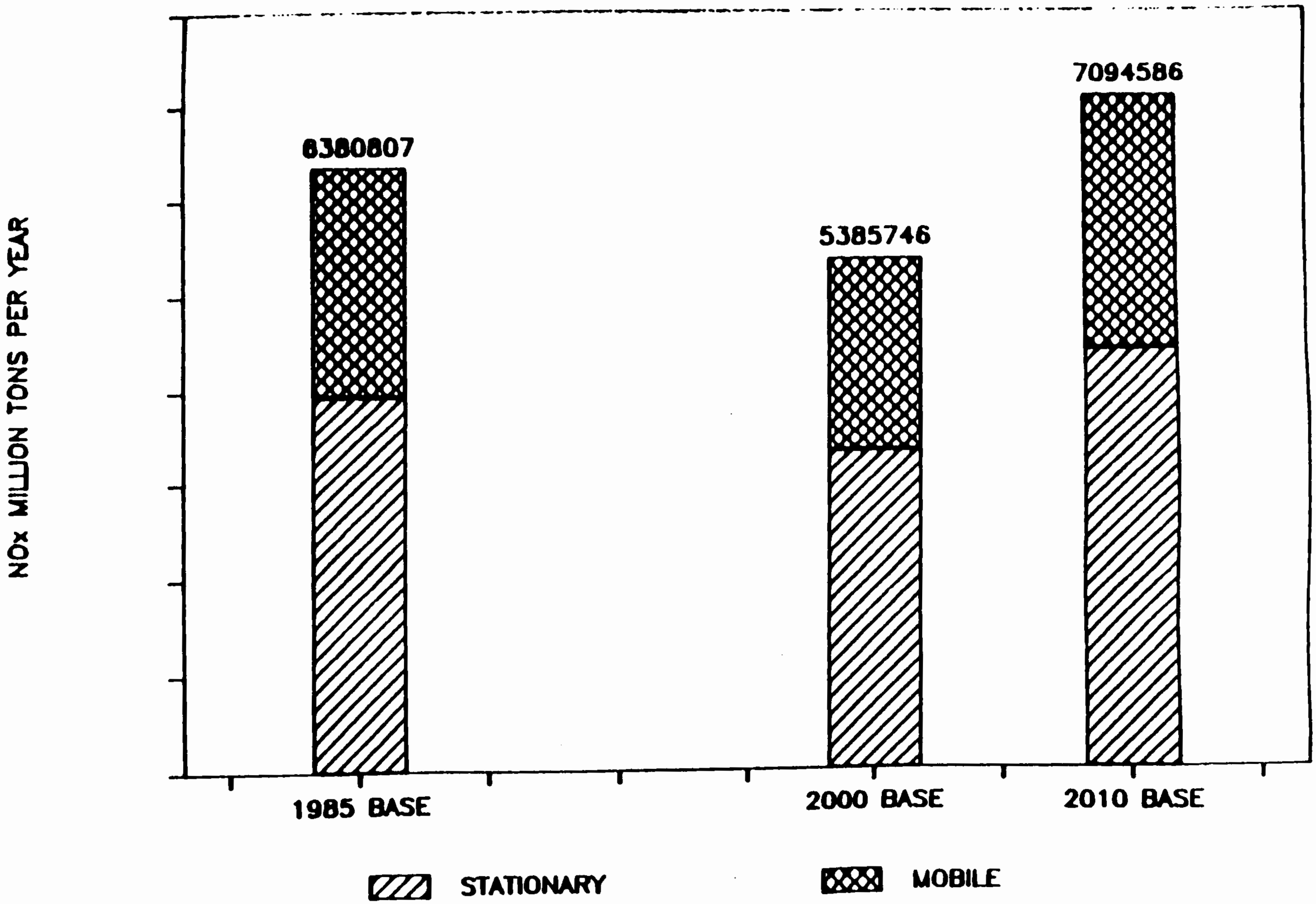


Figure 32

NOx EMISSIONS -- 79 NONATTAINMENT AREAS

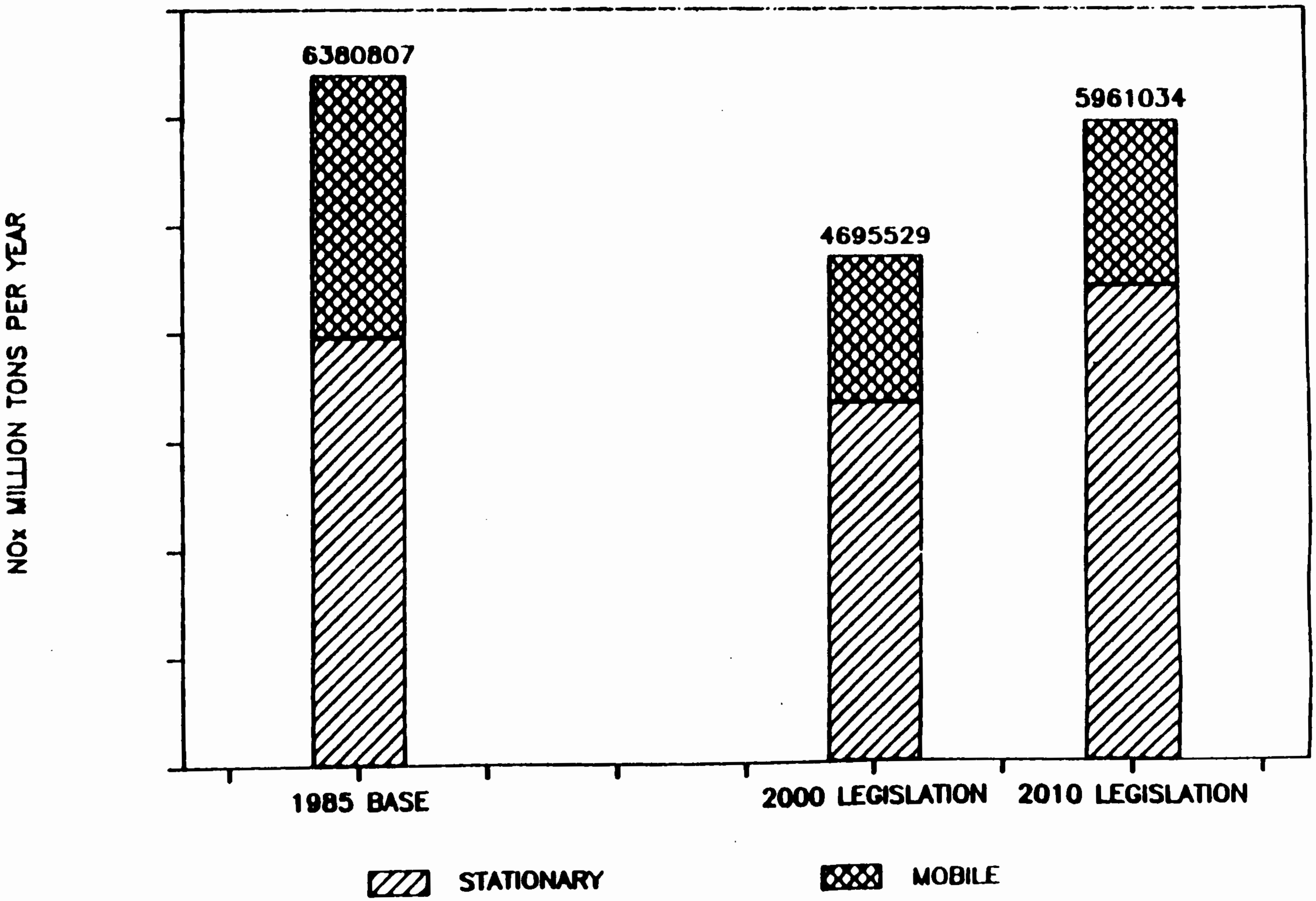


Figure 33

NOx EMISSIONS -- 79 NONATTAINMENT AREAS

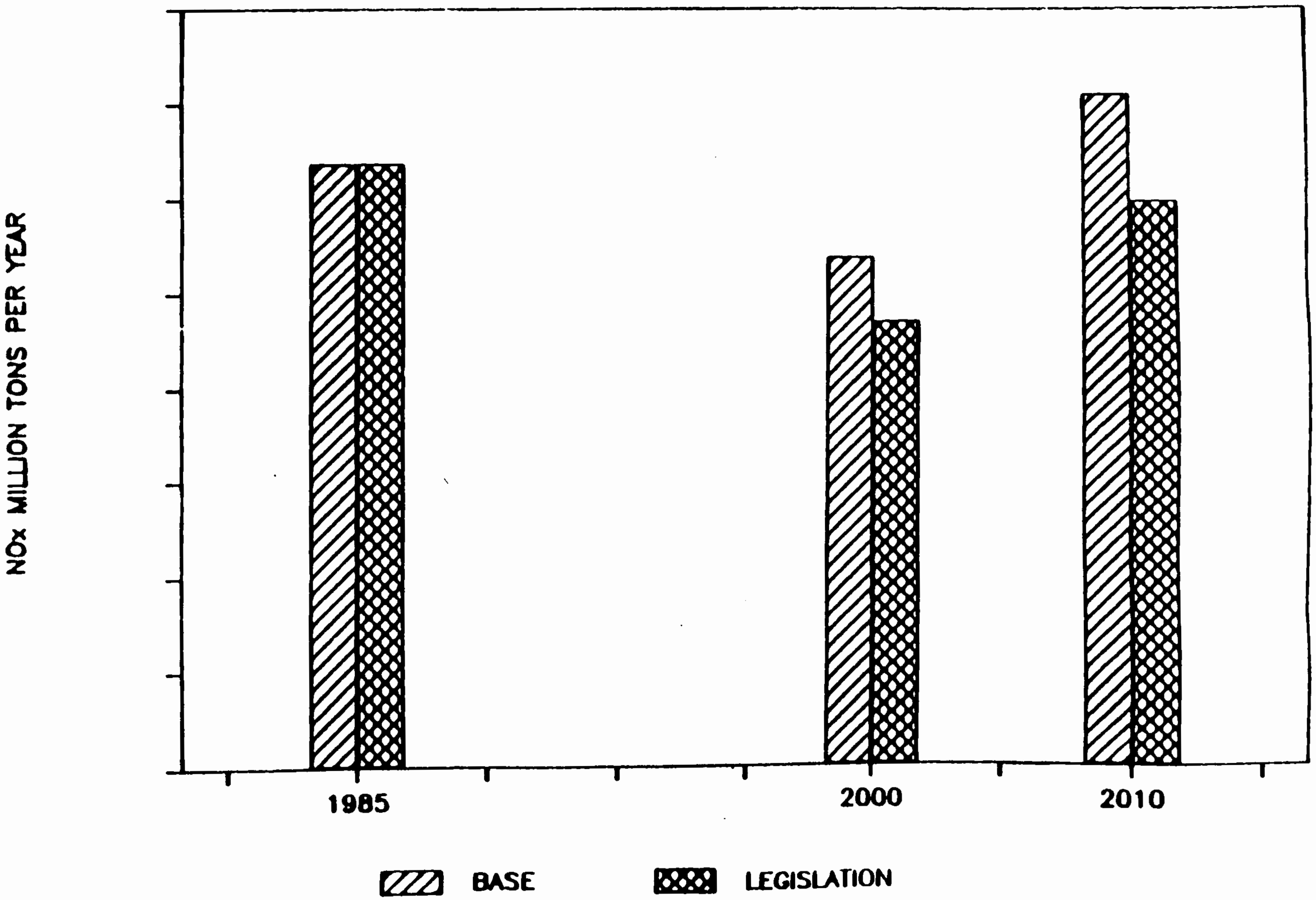


Figure 34

CARBON MONOXIDE TRENDS

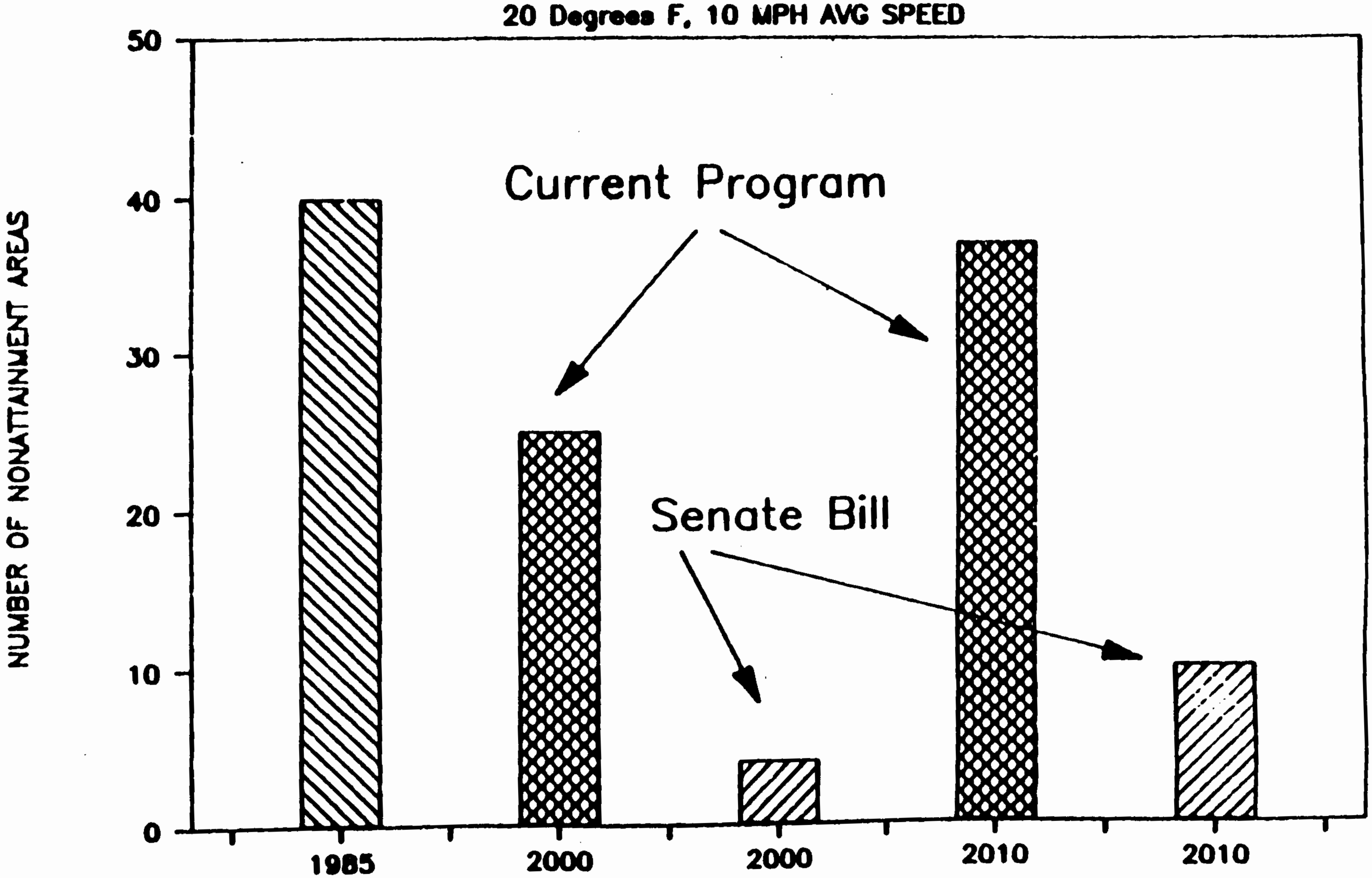


Figure 35

X. CONCLUSIONS

This analysis found that significant nationwide emissions reductions per mile driven are possible based on the standards and extended durability requirements contained in the legislative proposals compared to current levels. For example, it is estimated that the proposed legislation would reduce in use auto HC emissions by 47 percent; for light trucks, the reductions would be 43 percent. The improvements for NOx are even greater, dropping by 58 percent and 46 percent, for cars and light trucks respectively.

Beyond the NOx and HC emissions reductions, the technologies fostered by the tighter standards should also bring about reductions in CO emissions. As recently noted by the state of California Air Resources Board, "We expect that nearly all passenger cars will emit CO emissions at a rate approaching 3.4 grams per mile in use as a result of further NMHC (non methane hydrocarbon) control."

With regard to air quality, the study found that for the 79 ozone nonattainment areas investigated, adoption of the legislation will significantly lower emissions over the current requirements. Without additional controls, beyond those already adopted for stationary and mobile sources, virtually all the areas studied will be in nonattainment in the future. If stationary source emissions continue to increase as EPA recently estimated they would, and mobile sources follow the trends estimated in this study for the current set of mobile source requirements, the ozone air quality situation will be just as severe in the future as it is today. Conversely if available stationary and mobile source controls are introduced, most areas could achieve healthy air.

If the stationary source controls are introduced without the mobile source controls there will continue to be a substantial shortfall. The only options then available would be to introduce the legislated mobile source controls, find additional stationary source controls which no one has been able to identify at this time, or drastically reduce the use of vehicles in the nonattainment areas. To put this into perspective, the study found that the mobile source emissions reductions which would result from the legislation reflect 38% of the additional reductions needed to attain after the stationary controls are introduced along with all currently mandated mobile source controls.

Photochemical smog results from chemical reactions involving both hydrocarbons and nitrogen oxides in the presence of sunlight. Motor vehicles are major sources of both of these precursor pollutants. While historically the major strategy for reducing smog has focused on tight restrictions on hydrocarbon emissions, NOx control is also necessary in many areas.

Therefore, it is important in assessing future air quality to consider NOx emissions trends. This study also finds that NOx emissions will increase in the future unless additional controls are introduced. The legislative proposals for mobile sources, on the other hand, will significantly lower these emissions. Including stationary NOx sources which are also increasing under current requirements, the situation will clearly deteriorate without additional controls. Mobile source controls alone will not substantially lower NOx emissions from current levels but they will offset the growth that would otherwise occur.

An assessment of the carbon monoxide problem was also carried out. Since it has now been established that most CO air quality problems across the US tend to be concentrated in winter months and are most severe in congested central business districts, the analysis was carried out under those conditions (20 degrees F, 10 M.P.H. average speed). The analysis indicates that the current air quality situation will continue to improve for several years, but will then start to degrade during the late 1990's unless additional controls are introduced. With controls as contained in the legislative proposals, CO can be virtually eliminated; without them, we will likely have almost as serious a CO problem in the future as we do now.

XI. REFERENCES

1. MacKenzie, James J., The Oil Rollercoaster: Planning Beyond Oil, World Resources Institute, December 15, 1986

2. US Environmental Protection Agency, "National Air Quality and Emissions Trends Report, 1985," April 1987.

3. NAPAP, Interim Assessment The Causes and Effects of Acidic Deposition, U.S. Government Printing Office, September 17, 1987

4. Heavenrich, R.M., J.D. Murrell, & J.P. Cheng, Light-Duty Automotive Fuel Economy and Technology Trends Through 1987, SAE Paper No. 871088, SAE, May 18-21, 1987

5. US Environmental Protection Agency, "Air Quality Criteria For Ozone And Other Photochemical Oxidants", April 1978.

6. Thomas, Lee M., Testimony before the Subcommittee on Health and the Environment, Committee on Energy and Commerce, Washington, DC, February 19, 1987

7. Biniek, "Air Pollutant Impacts on Agriculture and Forestry," Congressional Research Service, The Library of Congress, Spring 1982.

8. Shutler, "Report of the Photochemical Oxidant Panel To The National Commission On Air Quality", May 28, 1980.

9. Pitts, Winer, Atkinson and Carter, "Correspondence To Environmental Science and Technology", accepted for publication - March 22, 1982.

10. McRae, Gregory J., Written Statement Prepared for U.S. House of Representatives Committee on Energy and Commerce, Subcommittee on Health and the Environment, February 9, 1987

11. Stern, Frank B., et al., Heart Disease Mortality Among Bridge and Tunnel Officers Exposed to Vehicular Exhaust, NIOSH

12. Ozkaynak, H. and J. D. Spengler, Health Effects of Airborne Particles, February 1986

13. Schenker, Smith, Munoz, Woski, Speizer, Lung Cancer Among Diesel Exposed Railroad Workers, Harvard School of Public Health

14. Schenker, Oral Statement, American Lung Association Convention, May 1984

15. Toxicological Effects of Emissions from Diesel Engines. International Symposium, July 26-28, 1986

16. Brightwell, et al, Neoplastic and Functional Changes in Rodents After Chronic Inhalation of Engine Exhaust Emissions, July 1986

17. Carhart, Bruce S. and Michael P. Walsh, Potential Contributions to Ambient Concentrations of Air Toxics by Mobile Sources, presented at the Annual Meeting of the Air Pollution Control Association, June 24, 1987.

18. Lindvall, "Health Effects of Nitrogen Dioxide and Oxidants," Department of Environmental Hygiene, National Institute of Environmental Medicine and Karolinska Institute, March 17, 1982.

19. Orehek, et. al., "Effect of Short-Term, Low-Level Nitrogen Dioxide Exposure on Bronchial Sensitivity of Asthmatic Patients", The Journal of Clinical Investigation, Volume 57, February 1976.

20. Mostardi et al, "The University Of Akron Study on Air Pollution and Human Health Effects", Archives of Environmental Health, September/October 1981.

21. Whetstone and Rosencranz, "Acid Rain In Europe And North America", Environmental Law Institute, 1983

22. Bellinger, et. al., Longitudinal Analysis of Prenatal Lead Exposure and Early Cognitive Development, New England Journal of Medicine, April 23, 1987

23. National Research Council, "Atmosphere-Biosphere Interactions: Toward a Better Understanding of the Ecological Consequences of Fossil Fuel Combustion, Committee on the Atmosphere and the Biosphere, 1981.

24. Stockholm Conference on Acidification of the Environment, Conclusions and Recommendations, 1982.

25. International Conference of Ministers on Acid Rain, Ottawa, Canada, March 1984.

26. "World Resources 1986 - An Assessment of the Resource Base that Supports the Global Economy". World Resources Institute and the International Institute for Environment and Development. New York: Basic Books, Inc., 1986.

27. MacDonald, Gordon J., The Greenhouse Effect and Climate Change, Presented to Environment and Public Works Committee, January 28, 1987

28. MVMA, Stratospheric Ozone and Motor Vehicles, JAPCA, Air Pollution Control Association, September 1987

29. Pomerance, Rafe, We Must Help Earth Keep Its Cool, The Chicago Tribune, August 15, 1987

30. Pomerance, Rafe, Has the Greenhouse Effect Begun?, The Denver Post, August 14, 1987

31. Walsh, Michael P., The I/M Success Story: Where Do We Go From Here?, SAE Paper No. 870623, SAE, Feb. 23-27, 1987.

32. Walsh, "The Need For and Benefits From Inspection and Maintenance Programs", The Environmental Forum, Volume 1, Number 3, Sept. 1982.

33. Work, C.P., G. Witkin, L.J. Moore, S. Golden, Jam Sessions, U.S. News & World Report, September 7, 1987

34. US, EPA, "Implications of Federal Implementation Plans (FIP's) For Post - 1987 Ozone Nonattainment Areas", March 1987.

THE WHITE HOUSE

WASHINGTON

October 23, 1987

MEMORANDUM TO WILLIAM L. BALL, III

THROUGH: PAMELA J. TURNER

FROM: LARRY HARLOW

SUBJECT: Senator Simpson and the Clean Air Act

For your telephone call today to Senator Simpson:

1. He voted for the Clean Air Act Amendments as reported yesterday by the Environment and Public Works Committee.

2. He stated yesterday his desire and intention to continue to work with Senator Mitchell for a compromise on the acid rain provisions.

3. His main concern with the bill's acid rain provisions is the amount of sulfur dioxide emission reduction required. He wants less, Mitchell wants more.

4. Suggested talking points:

   - We strongly oppose the Clean Air bill reported yesterday.
   - The bill will place enormous costs on American business and the American economy.
   - The deadlines in the bill for emission compliance and standards attainment are unreasonable.
   - The Clean Air Act simply could be reauthorized, and we would support a simple extension of the ozone attainment dates as well.
   - We know of his strong interest in the acid rain provisions, and how important it is for Wyoming.
   - But we hope he won't agree to a compromise that will clear the way for this bill to come up on the Senate floor without first talking to us about alternatives.

Clean air

Major Fights on Clean-Air Measure Still Loom

House and Senate committees inched ahead on tightening the air-pollution law the week of Sept. 28 in what has become a siege war between environmentalists and industry.

A third week of on-again-off-again markups in the Senate Environment Committee yielded no breakthroughs on major issues, while hearings in two House subcommittees droned on for three days. Talks among members and staff in both the House and Senate to settle key disputes have not borne much fruit.

A comprehensive reauthorization and overhaul of the Clean Air Act of 1977 (PL 95-95), the nation's main air-pollution control law, has been overdue since 1982. Deadlock between environmentalists and industry over pollution controls, and between the Northeast and the Midwest over acid rain, have kept any bill from reaching the floor of either chamber.

Action this year is being driven by a Dec. 31 deadline for cities and counties to meet health-based standards for carbon monoxide and ozone. More than 60 areas will fall short of each standard. They face loss of federal grants and a ban on construction of certain new industrial plants.

Most members of Congress want to extend the deadline to keep that from happening. The disagreement is over what, if any, other legislative provisions ought to be added to the bill.

Senate Markup

The Senate Environment Committee held a markup session Oct. 2 on an unnumbered draft bill that is being pushed by George J. Mitchell, D-Maine, chairman of the Environmental Protection Subcommittee. *(Weekly Report p. 2352)*

Mitchell's bill would tighten controls on acid rain, toxic pollution, auto emissions and urban smog, while setting a new timetable and prescribing stronger remedies for cities, like Los Angeles, with stubborn pollution problems that will keep them from meeting health standards.

The committee on Oct. 2 adopted by voice vote five amendments to the bill. Two dealt with the process by which the Environmental Protection Agency (EPA) sets health-based air quality standards. One, by Harry Reid, D-Nev., made the timing of scientific work to back up the standards more flexible. Another, by Dave Durenberger, R-Minn., loosened bill language (itself a tightening of law) by giving EPA more leeway in issuing new standards for ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide and other pollutants. The bill required EPA to issue the standards by certain deadlines, but the amendment allowed EPA not to issue them if it finds them unnecessary to protect health.

Mitchell's bill requires emissions of pollutants that cause acid rain to be cut to roughly half their 1980 levels by Jan. 1, 1996 — a cut of 12 million tons of sulfur dioxide and 4 million tons of nitrogen oxides per year.

One of four on the 16-member committee with doubts about the bill is Alan K. Simpson, R-Wyo., who opposes the acid-rain provisions and has been holding private talks with Mitchell, both in person and through staff, seeking a compromise. So far, none has emerged.

Even if Mitchell and Simpson manage to agree on acid rain and the committee reports a clean-air bill, the real fight in the Senate will only have begun. Majority Leader Robert C. Byrd, D-W.Va., has opposed tighter controls on sulfur dioxide. His state produces coal that is often high in sulfur, which produces sulfur dioxide when burned. Instead of controls, Byrd has proposed $3.5 billion in federal aid to develop technology for burning high-sulfur coal more cleanly.

As majority leader, Byrd can prevent the clean-air bill from being called up on the Senate floor. Mitchell has put authorization for $2.5 billion in clean-coal technology funds into his bill, but Byrd is still resisting it. Talks between the two aimed at resolving the issue have not even begun.

House Hearings

Meanwhile, in the House Energy Committee, the Health and Environment Subcommittee held hearings on clean-air legislation Sept. 23, 28 and 30. The focus was on two bills (HR 3054, HR 2666) introduced by subcommittee Chairman Henry A. Waxman, D-Calif. They would tighten controls on ozone, carbon monoxide and acid-rain precursors.

Some 50 witnesses testified. The list was swollen by witnesses suggested by John D. Dingell, D-Mich., chairman of the full Energy Committee, and ranking subcommittee Republican Edward R. Madigan, Ill. Both have opposed Waxman's proposals. Dingell's district is a bastion of the auto industry, and Madigan's state mines and burns high-sulfur coal.

Dingell held his own hearings Oct. 2 in the Subcommittee on Oversight and Investigations, which he chairs. That hearing showcased a report by the National Acid Precipitation Program (NAPAP), the umbrella for federal acid-rain research. That report said acid rain is unlikely to make Northeastern lakes any more acidic in the next few decades than they already are, although some Southeastern lakes could worsen.

"There appears to be no emergency," Dingell said at the hearing. Waxman has disputed the findings as "propaganda."

The NAPAP report also prompted one of the amendments approved by Senate Environment Oct. 2 — setting aside $1 million for an independent review of its conclusions by the National Academy of Sciences.

Waxman told Dingell in August that the starting point for discussion should be the two bills he introduced. Neither of those bills has shown it can win a majority in Waxman's subcommittee. Dingell and ranking Energy Committee Republican Norman F. Lent, N.Y., have asked Waxman to work with them to forge a bill a broad majority of the committee could support, but Waxman has resisted.

At the Sept. 30 hearing, Bruce F. Vento, D-Minn., and Bill Green, R-N.Y., unveiled a letter signed by 170 House members calling for action this year. They want deadline relief and tighter pollution controls. ∎

—*By Joseph A. Davis*

clean air file

87-751 S

CRS REPORT FOR CONGRESS

OZONE AND CARBON MONOXIDE NONATTAINMENT
AN ANALYSIS OF TITLE I OF THE PROPOSED CLEAN AIR STANDARDS ATTAINMENT ACT

by
David E. Gushee
Senior Specialist in Environmental Policy

September 10, 1987

CONGRESSIONAL RESEARCH SERVICE
THE LIBRARY OF CONGRESS

The Congressional Research Service works exclusively for the Congress, conducting research, analyzing legislation, and providing information at the request of committees, Members, and their staffs.

The Service makes such research available, without partisan bias, in many forms including studies, reports, compilations, digests, and background briefings. Upon request, CRS assists committees in analyzing legislative proposals and issues, and in assessing the possible effects of these proposals and their alternatives. The Service's senior specialists and subject analysts are also available for personal consultations in their respective fields of expertise.

ABSTRACT

The Senate Committee on Environment and Public Works is considering an extensive set of amendments to the Clean Air Act. At the request of many Senators, the Congressional Research Service is analyzing the five titles of the bill entitled Clean Air Standards Attainment Act of 1987, which is serving as a markup vehicle. This report deals with Title I: Requirements for Nonattainment Areas and includes estimates of costs of attainment. Four other CRS Reports deal with Titles II through V.

CONTENTS

INTRODUCTION TO OZONE/CO ATTAINMENT TITLES (I AND III) 1

REQUIRED OF ALL NONATTAINMENT AREAS AND OZONE TRANSPORT REGIONS
Vehicle Inspection/Maintenance Programs 2
Stage II Vapor Recovery 5
Alternative Fuels 6
Reducing Emissions from Stationary Sources of VOC and NO_x 8

REQUIRED OF NONATTAINMENT AREAS WITH DESIGN VALUES >150% OF STANDARD
Transportation Control Measures 10
Stationary Source and Area Source Controls 11
Emissions Fee 12

TABLE 1
ESTIMATED COSTS FOR TITLE I OZONE/CO ATTAINMENT 13

INTRODUCTION TO OZONE/CO ATTAINMENT TITLES (I AND III)

The Clean Air Act currently mandates that National Ambient Air Quality Standards (NAAQS) for ozone and carbon monoxide be attained and maintained. In one sense, therefore, the Senate committee bill will not require anything above and beyond that already explicitly or implicitly mandated. The details of control and enforcement mechanisms and pace of progress, however, are at issue in Title I.

Almost every initiative in the bill is already available to the Environmental Protection Agency (EPA) under either explicit or implicit authority in the Act. EPA is already requiring some steps, has proposed several others, is considering whether or not to propose still others, and has thought about the rest but has put them aside for now. Some States have proposed and/or implemented some measures more stringent than EPA has required.

In another sense, the issue underlying Titles I and III is the cost of attainment and maintenance of the ozone and CO NAAQS and how that cost would be affected by changes in the definitions of the goals, the pace at which attainment would be sought, and variations in the mix of control actions to be taken (that is, on the one hand, the ability to "fine tune" a strategy to a particular area and, on the other hand, the extent to which individual lifestyle changes are mandated vs. the extent to which point and area sources are controlled).

This report (one of five on the five titles of the Senate bill) will seek to estimate the costs of attainment as a function of the approach taken in Title I of the Senate bill. It will not discuss alternative approaches.

The potential benefits of increased ozone control are discussed in the reports on Title IV and Title V for health benefits and on Title II for secondary benefits.

TITLE I

OZONE/CARBON MONOXIDE NONATTAINMENT
AN ANALYSIS OF TITLE I OF THE PROPOSED CLEAN AIR STANDARDS ATTAINMENT ACT

Title I elaborates the ozone and carbon monoxide (CO) control strategies for nonattainment already embodied in the Clean Air Act. It requires for all nonattainment areas a set of strengthened controls on in-use motor vehicles and stationary sources. For nonattainment areas at pollutant levels less than 150% of the standard, it extends the compliance deadline for five years. For nonattainment areas at levels of more than 150% of the standard, it specifies an additional set of requirements designed to yield a certain percentage of emission reduction each year with ultimate attainment to occur as soon as practicable given the extent of nonattainment, extends stationary source coverage to ever smaller sources, requires consideration of transportation control measures (TCMs), justification for not using them, and evidence of additional controls used in their stead. It also establishes an emissions fee for emissions that are legal and an excess emissions fee for emissions above the legal standard.

To address the problem of migration of ozone from areas where its precursors are emitted to downwind areas, the bill establishes two ozone transport regions (roughly the Northeast U.S. states and the Great Lakes States) and requires the same range of controls within those regions even where the air quality controls areas are in attainment.

The bill's impacts are assessed by major provision. The estimated impacts are collected in Table 1.

REQUIRED OF ALL NONATTAINMENT AREAS AND OZONE TRANSPORT REGIONS

Vehicle Inspection/Maintenance Programs

All nonattainment areas and ozone transport regions would have to implement vehicle inspection/maintenance (I/M) programs for emissions of hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NO_x), and diesel particulates. These programs would cover all vehicles regularly operating in the area, would include all of a Metropolitan Statistical Area with a population of over 100,000 which contains a nonattainment area plus all counties in ozone transport regions (even if those counties are themselves in attainment), would require annual emission inspections, would require direct inspection of components of emission control systems, would be operated on a centralized (sites dedicated only to inspections) or computerized basis, and would have a repair cost waiver of at least $200.

Inspection Costs. Of the 76 or so areas currently not in attainment for ozone, about half now have vehicle I/M programs. These vary in frequency and intensity, so that the requirements posed in the bill would be for most an enhancement. In addition to the other half of the nonattainment areas, all the counties in the proposed regions which now are in attainment do not now have I/M programs.

EPA has estimated[1] that 40 inspection stations could handle about 1 million cars on a biennial inspection frequency, would cost about $10 million ($250,000 each) to set up, and could be contractor-operated for about $4 per inspection. Since some 40 areas already have I/M and inspect some 55 million cars already, additional costs for these areas will result from inspection of additional vehicles (trucks and buses) and from increased intensity and/or frequency of inspection for those cars already being inspected.

The additional frequency will apply to perhaps one fourth of those cars now subject to inspection (California, among others, has had a biennial schedule). At, say, 14 million cars going from every other year to every year at $4 per inspection, the added fee cost from a frequency increase would be $56 million per year.

One can assume that the increased intensity adds no additional cost for fees in existing inspection stations (current inspection fees range from less than to more than the hypothesized $4 per car). Or, one can assume that fees would go up because inspection intensity has gone up. In that case, assuming 41 million inspections every year and 14 million every other year, a $2 per inspection fee increase would add $120 million per year in fee costs for cars currently being inspected.

There are about 180 million vehicles in the country[2]. If one assumes ab ut half (90 million) would be in no attainment areas or ozone transport areas, and therefore subject to inspection, then subtracting the 55 million already being inspected leaves 35 million additional vehicles subject to inspection. The annual fee cost at $4 per inspection for this 35 million vehicles would be $140 million. At $6 per inspection, the fees would total about $210 million.

Some added cost would be necessary to upgrade a percentage of existing stations to cope with the additional intensity and scope of inspections. In the absence of specific data to the contrary, assume the large number of existing stations of all types are equivalent to 3840 (80 per million for 41 million cars inspected annually plus 40 per million for 14 million cars

---

[1] U. S. Environmental Protection Agency. "Implications of Federal Implementation Plans for Post-1987 Ozone Nonattainment Areas" (Draft Report). March 1987. This draft report was used only as a convenient source of data for estimating purposes.

[2] MVMA Motor Vehicle Facts and Figures '87. Motor Vehicle Manufacturers Association. 1987

inspected every other year)[3] centralized stations. They would require computerization or other upgrade at, say, 40% of the cost of building a new inspection station, or $100,000 each. This would total $384 million. Assuming this process will be charged off over 10 years, the annualized cost would be $38 million, ignoring interest and the time value of money, among other things.

New inspection stations would have to be built to handle the additional 35 million vehicles. At 80 inspection stations per million (to adjust EPA's numbers to account for the bill's requirement of an annual inspection), an additional 2800 stations would be needed, at a set-up cost of about $700 million. Writing this off over 10 years gives an estimated annualized cost of $70 million.

EPA already plans to require I/M in the remaining nonattainment areas and to require strengthening of existing I/M programs in a number of areas whose programs don't inspect enough older cars, whose rejection rates are not high enough, or other factors which limit their ability to reduce emissions from in-use cars[4].

Maintenance Costs. Should repair costs be included? One can argue that the vehicles would eventually be maintained without the stimulus of the emission inspection. On the other hand, one can argue that, given the penchant of so many drivers to delay repair work on the basis of either expense or inconvenience, at least some of the repairs required on the basis of failure to pass emission inspection would not otherwise be made.

Current rejection rates vary widely but average somewhere around 10% or less. Average repair costs are about $50 per failed car[5]. At these levels, 3.5 million newly inspected vehicles would incur repair costs of $175 million.

A case can be made that the increased inspection stringency and frequency required by the bill, coupled with its repair cost cap of $200 rather than the current State-set maxima of $50, $75, or whatever, and coupled further with EPA's regulatory approach which specifies the emission reductions to be claimed as a function of the rejection rate (the higher the rejection rate, the greater the allowable reductions to be claimed), might well lead to both higher failure rates and higher repair costs per failure. If this turns out to be the case,

---

[3] Many areas with I/M programs do not use the centralized approach, using instead gasoline service stations. It is assumed that the capital cost of one centralized station will equal the capital cost of many decentralized inspection stations. Centralized inspections are assumed here to simplify the process of estimation.

[4] See, for example, "EPA Sends Directive to Four States With Inadequate I/M Programs", Air/Water Pollution Report, April 27, 1987. Page 162.

[5] Telephone conversation with Phil Lorang, EPA Office of Mobile Sources, Sept. 10, 1987.

then the repair costs might well be higher than these estimates. For example, if one assumes a 20% failure rate and a $100 average repair bill, repair costs would total $700 million for the 35 million cars newly inspected plus $550 million for the 5.5 million cars already being inspected but newly failed, plus $275 million for the 5.5 million cars already failing but now incurring $50 in additional repair cost. The total: $1.53 billion.

On the other hand, since a case can be made that the repair costs would eventually be incurred even in the absence of emission inspections, then repair costs assignable to the bill should be limited to those which otherwise would not be made. The lower limit could approach zero.

Stage II Vapor Recovery

Ozone nonattainment areas and all areas in ozone transport regions would be required to impose Stage II recovery systems to capture hydrocarbon emissions from vehicle refueling.

Current EPA Situation. Stage II recovery systems are applied at gasoline service stations. EPA has not yet established or formally proposed it as a primary method of reducing VOCs. Even so, Southern California, the District of Columbia, and the St. Louis area require it, and several other States are in the administrative process of requiring it.

Estimated Costs. EPA, in its recent proposal to require on-board vapor recovery controls[6], included a description of Stage II costs for the 61 nonattainment areas not now using it. It would be applied to independent service stations pumping over 50,000 gallons per month and to non-independents pumping over 10,000 gallons per month (about 75% of the gasoline and 25% of the outlets). About 43,000 outlets would be affected.

The EPA estimate is $58 to $92 million per year annualized direct cost. EPA also developed an "inconvenience cost" to take note of consumer reactions in the form of, among other things, hard treatment of the apparatus and resulting increased maintenance costs. At 10 cents per refueling event, according to EPA, the inconvenience cost would add up to some $200 to $300 million per year.

To these costs for the 61 nonattainment areas not now using Stage II must be added the cost for Stage II in attainment areas in the ozone transport regions. The regions make up the northeast quadrant of the U.S. plus the Great Lakes area--about half the people and presumably half the gas stations. The nonattainment areas in the regions include perhaps two thirds of the people in the region. Assuming that gas stations are proportional to population, then two thirds of the stations would add Stage II under the nonattainment area provision; the costs for these are already included in the EPA estimate. The other third would add Stage II under the transport region requirement. Since there are about 39,000 stations in the regions, 13,000 would be affected. Using

---

[6] 52 FR 31162. August 19, 1987.

a 13/43 ratio and the EPA cost estimates, bringing the 13,000 additional stations under control would add $17 to $27 million in direct costs and $60 to $90 million in inconvenience costs.

For the nonattainment areas plus the transport regions, therefore, the total, including inconvenience costs, would be $335 to $509 million.

Alternative Fuels

Centrally fueled fleets of over 50 vehicles would have to convert to alternative fuels or power sources with lower emission characteristics in both nonattainment areas and in the attainment parts of the ozone transport regions.

The most frequently mentioned alternative fuels are compressed natural gas (CNG) and methanol. Alcohol/gasoline blends (oxygenated fuels) are assumed not to be relevant to this requirement. Since so many of the major U.S. metropolitan areas are nonattainment or in ozone transport regions, we will assume that major fleets congregate disproportionately in these areas, so that 75% of all fleet vehicles would be affected.

Trucks. Some 2 million trucks (about 6% of all trucks) are operated in fleets of 20 or more[7]. The number in fleets of 50 or more would be smaller, but would contain a disproportionate number of trucks. Assuming 80% in fleets of 50 or more would give 1.6 million trucks. Three fourths of that number would give 1.2 million affected trucks.

Optimists predict that new vehicles designed for methanol can be produced in volume at no additional cost compared to existing engines and for natural gas at perhaps $400 per vehicle[8].

Should the alternate fuel requirement be applied only to new vehicles entering fleets, setting aside questions of the feasibility of doing so in the bill's time frame, and assuming that the average truck lasts 10 years, some 120,000 trucks per year would be affected. Were they all to be designed for methanol, there would optimistically be no increase in first cost but an increase in operating cost based on the probable future price for methanol being higher than that for gasoline, diesel fuel, or natural gas. Assuming a 10 cent price differential per gallon of gasoline displaced[9] and a total fuel consumption of 2000 gallons equivalent per year per truck, the incremental fuel cost would be about $200 per year per truck or $24 million per year more

---

[7] MVMA Motor Vehicle Facts and Figures 1987. Page 49.

[8] Ford Motor Co. Responses to Questions from Subcommittee on Fossil and Synthetic Fuels, Committee on Energy and Commerce. Reprinted in Hearing Serial No. 99-91. 1986. Page 180.

[9] See discussion in companion CRS Report dealing with Title III, in section dealing with Oxygenated Fuels in Attainment Areas.

each year until the fleet turned over, for an ultimate total of $240 million per year over the cost of current fuels in the tenth year and beyond.

Were the new trucks all CNG-fueled, at $400 per truck, first cost would be $64 million per year. The natural gas fuel would be less expensive than methanol and probably competitive with gasoline or diesel fuel. On the other hand, the refueling infrastructure requires a multitude of large compressors to push the CNG into the vehicle fuel tanks. These will cost something like

$50,000 each and must be installed in some significant fraction, perhaps 10%, of service stations. That would be 9,000, or some $450 million, to which perhaps $50 million for ancillary installation costs should be added. A total of $500 million for fuel delivery results, installed over 10 years, or $50 million per year. Total for CNG conversion would be $110 million per year.

Although these rough estimates appear to indicate that CNG holds an economic advantage over methanol, the uncertainties in assumptions, technological and economic forecasts, and social response patterns lead one to have little analysis-based confidence in either alternative over the other at this time. It looks like converting trucks to CNG or methanol will cost somewhat more than not converting; using the numbers generated here results in an increase of at least $114 million and perhaps $240 million per year, given optimistic assumptions about the cost effectiveness of the future engine designs and middle-of-the-road estimates of future fuel prices.

Estimates of the cost to retrofit trucks for CNG use range from $1500 to $5000 per vehicle[10]. The average could be perhaps $3000 per vehicle. Costs to retrofit methanol trucks are estimated to be about $2000 each[11]. Should local authorities require retrofits of existing trucks, the costs would be higher still by up to $2000 per truck retrofitted for methanol and $3000 per truck retrofitted for CNG. Since the bill does not require retrofit, no costs are assigned for it.

<u>Government Vehicles.</u> There are about 3 million vehicles in government service (exclusive of the military but including school and public transit buses) at all levels[12]. As with trucks, the number in fleets of 50 or more is not known. At 5% (the same proportion as for trucks), some 150,000 government vehicles would be involved. This is probably low; an upper bound might be 20% or 600,000 vehicles.

---

10 Compressed Natural Gas (CNG) Vehicles. Gas Energy Review, vol. 15, no. 3, March 1987, page 15.

11 Letter B. I. Robertson, Director of Powertrain Engineering for Chrysler Corp., to Rep. Philip Sharp, December 19, 1985. Reprinted in Hearing Serial No. 99-91. House Committee on Energy and Commerce, page 175.

12 MVMA. op. cit. Page 50.

For simplicity's sake, and recognizing the uncertainty in any of these estimates, if 1.2 million trucks affected would incur costs of $114 to $240 million per year, then by analogy and ignoring differences in cost factors between the two fleets, converting government vehicles would cost $11 million (10% as many vehicles times the lower end of the range) to $96 million (40% as many vehicles times the high end of the range).

Private Buses. There are about 300,000 privately owned buses[13]. Using the same proportionalities as for trucks and government vehicles, from 15,000 to 60,000 would be affected. Estimated cost, also by proportionality, would be from $1 million to $10 million.

Taxis. There were over 200,000 taxis in fleets of 10 or more five years ago[14]. Assuming no change and discounting this to fleets of 50 or more would yield perhaps 100,000 to 125,000 subject to the bill's requirement. Estimating again by analogy leads to costs of $7 to $22 million per year.

Adding these all together gives a cost range of $118 million to $454 million per year for converting fleets of 50 or more vehicles in theaffected areas to CNG or methanol.

Reducing Emissions from Stationary Sources of VOCs and NO_x

Under current law, nonattainment areas must inventory all sources of the relevant emissions, both mobile and stationary. From mathematical modeling, the extent to which these emissions must be reduced to reach attainment is calculated. Each major source for which EPA has issued appropriate guidance on reasonably available control technologies (RACT) and costs is negotiated with and brought under a compliance schedule until (in concert with other control actions such as I/M) enough reductions have been achieved to bring the area into compliance.

EPA has defined RACT for 22 categories of sources but at least a score of additional categories with significant VOC emissions have not been so treated[15]. Local authorities tend to believe that EPA's RACT definitions, most of which were issued almost a decade ago, need to be brought up to date to take into account recent technological advances in control capabilities. Local authorities also report that requiring reductions from sources in categories where EPA has not issued RACT guidelines is at the least very difficult.

---

13 MVMA. op. cit. Page 21.

14 Transportation Energy Data Book. Noyes Data Corp. 1982. Page 82.

15 For lists of these two sets of categories and a discussion of the potential for further emissions reductions from stationary sources, see CRS Report 87-343 RCO, "Summary of Hearings on State and Local Government Control Efforts in Nonattainment Areas," by David E. Gushee, April 17, 1987.

Title I would apply, at a minimum, reasonably available control technology (RACT), prohibit netting or bubbling among sources, apply lowest achievable emission rate (LAER) controls to new sources, and require "such other measures as may be necessary to provide for attainment of the applicable national primary air quality standard not later than December 31, 1992, in both nonattainment areas and ozone transport regions. Areas which certify that they cannot meet the standard(s) by December 31, 1992, or which have ozone design values at least 50% higher than the standard will be subject to additional requirements.

The Context. There are about 60 areas with ozone design values and about 55 areas with carbon monoxide design values less than 150% of the standards. Some fraction of these areas will undoubtedly determine that they are unable to meet the standards by 1992 and will therefore become subject to stricter requirements than those cited above. Compliance costs for each such area will be higher than if it meets the standards with these steps. However, to be on the conservative side, in terms of cost estimation, we will assume that all of these regions come into compliance.

As has been said many times, ozone formation is a complex process. There is general agreement that volatile organic compounds (VOCs) and nitrogen oxides (NO_x) are the major precursors. The basic control strategy practiced to date has been to reduce VOC emissions; only modest attention has been paid to NO_x emissions, and there is a strong body of opinion that, unless the ratio of VOCs to NO_x in the area's air is relatively high, NO_x control might lead to increased ozone levels. Nonetheless, there are probably some areas where NO_x control would be constructive and less expensive than the next more stringent level of VOC control. In the absence of any quantitative data on where NO_x control would be helpful, this cost estimate will assume that compliance will be the result of VOC control.

VOC Control Costs. In the approximately 60 areas with ozone design values less than 150% of the standard, EPA has estimated[16] that total VOC reductions of about 2 million tons are required. Assuming that Title III controls will account for half of the necessary emission reductions, 1 million tons of VOC reductions would come from stationary sources. In EPA's work on VOC control technology, costs of up to $1000 per ton of VOC removed have been common; higher costs for future requirements are expected, and current agency thinking is that $2000 per ton would not be unusual. Since these 60 areas are close to attainment and will become closer through on-board controls on cars, Stage II vapor recovery, and the bill's stricter new car standards, an assumption of $1000 per ton seems reasonable. In that case, total cost for VOC reduction would be $1 billion per year. On the other hand, assuming that the easy VOC's have already been controlled, an average cost of $2000 per ton removed would be more appropriate, for a total cost of $2 billion per year.

---

[16] EPA's FIP Draft Study. Op. cit. page V-8.

Most of these steps are already in the Clean Air Act via amendments in 1977. They reflect, with some exceptions, more an impatience with EPA's administrative follow-through than new statutory initiatives.

With respect to carbon monoxide, the new car emission standards already in place, coupled with the bill's increased warranty period and increased stringency of a 90% pass rate (instead of the current 60%), plus fleet turnover, will reduce CO emissions steadily for the next decade or more. It seems reasonable to assume that no further efforts would be needed for the 60 areas to come into compliance, and, if they were, they would consist primarily of the oxygenated fuels option in Title III.

REQUIRED OF NONATTAINMENT AREAS WITH DESIGN VALUES MORE THAN 150% OF STANDARD

These are the areas with the most difficult problems. The bill presumes that they cannot meet the standards by 1992 under any circumstances and therefore places them under a requirement to show steady progress in reducing emissions. It specifies a series of additional requirements, most of which are already at least implicitly in the Clean Air Act, but which are either painful to local authorities or expensive to those affected and thus have not up to now been applied extensively enough to cause emission reductions at the rate the Senate Subcommittee seeks.

Transportation Control Measures (TCMs)

Under Title I, each such area is required to adopt control strategies and measures to offset any growth in vehicle miles traveled (VMT) or increases in emissions associated with growth in VMT. The area is required to consider limiting vehicle use in locales of emission concentration such as downtown, using tolls, parking surcharges, vehicle restricted zones or periods, limitations of certain roads or lanes to common carriers or high occupancy vehicles, improved public transit, employer programs to encourage carpooling, public transit, and staggered work hours, controls on fleet operators (including cleaner engines or fuels), traffic flow improvements, trip reduction ordinances, and programs for areawide ridesharing.

The Act already requires consideration of these strategies and options. Experience has shown that only marginal emission reductions have been attained through TCM's, and unit costs per ton of reduction are high, once the straightforward steps which reduce traffic congestion have been taken. State SIPs, where they have quantified the results of TCMs, show costs significantly in excess of $2000 per ton of emission reduction, as high as $830,000 per ton in one case[17]. (Since there are transportation sector benefits associated with this type of expenditure, there is always a question of how to allocate costs.)

---

[17] Report, Assessment Project, State Implementation Plan for Attainment of the Ozone Standard in the Houston Area (Harris County), Texas. Prepared for American Lung Association, San Jacinto Area, by Maura P. O'Connell. September 1986. The cost is for added transit buses.

VOC Reductions. The 15 nonattainment areas with ozone design values over 150% of standard have to reduce emissions of VOCs by some 2.8 million tons[18] or about 65% of the estimated total of over 4.3 million tons being emitted in those areas. SIPs over the years have claimed a good bit less than 1% reduction of VOC emissions from TCMs. To get even 1% would apparently require unit reduction costs of well over $2000 per ton, based on the sparse evidence available. Assuming that these areas felt driven to get 1% from TCMs, the 43,000 tons reduction would cost, at $5000 per ton (a rather modest figure for TCMs), $215 million. Were public transit systems to be built or substantially enlarged or bus systems significantly upgraded, expenditures in the billions of dollars would be necessary. At $5 billion per city for transit system construction and/or added bus service, and 10 cities required to usethis option, the cost would be $5 billion per year over 10 years.

It is possible that TCMs would not prove to be meaningful sources of VOC reductions, particularly since the bill permits substitution of other emission-reducing measures.

CO Reductions. For carbon monoxide, however, there are fewer alternatives to TCMs. CO is mostly a product of vehicle fuel combustion (over 70% as a national average and up to 90% in some areas), and exceedances are mostly in pockets of high traffic density. Therein lies the appeal of oxygenated fuels, which appear to offer an alternative to major traffic overhauls.

Some 25 areas have CO design values over 150% of standard. Only half a dozen or so are at high altitudes, where oxygenated fuels have their greatest impact on CO emissions. Those areas would be fortunate, indeed, if the combination of oxygenated fuels, alternate fuels for fleet vehicles, and the new tougher emission standards for new cars reduced CO emissions enough to bring them into compliance. And the effectiveness of oxygenated fuels drops off over time, as the older cars, from which the greatest benefit is realized, are retired.

Therefore TCMs loom as the most likely source of CO reductions beyond those from the vehicles and fuels. At unit costs as high as those already experienced, there would be potential costs in the billions of dollars per affected area for transit improvements, plus significant local political concern over the extent to which trip reduction ordinances and other measures to limit VMTs would be viewed as negatively affecting personal mobility. On the other hand, if the CO exceedances occur in highly localized "hot spots", some additional congestion-relieving road changes might suffice to bring the areas under control. Should this turn out to suffice, then costs would probably end up at tens to hundreds of millions per affected area. Assuming that 10 areas would need TCMs for CO control, total cost would be from about $100 million to $1 billion.

---

[18] EPA FIP Study, Op. Cit. Page V-7.

Stationary Source and Area Source Controls

Each affected area must develop a plan to reduce emissions year by year, with milestones set for 1991, 1994, and 1997 and continual reductions thereafter until the standard is met. Within this over-all structure, each major stationary source is required to meet at least the same percentage reductions as the area as a whole. A major source is redefined as one which emits 25 tons or more per year (current level is 100 tons per year), and the standards for defining RACT and LAER are tightened.

Reduction Costs. Total VOC emission reductions required in these severe nonattainment areas are currently estimated to be about 2.8 million tons.[19] TCM's won't have any measurable effect on this total.

With the tougher definitions of RACT and LAER, the increased range of sources, and the large number of smaller sources to be controlled, the cost per ton controlled will be higher than for the areas closer to attainment. Assuming $2000 per ton and assuming as before that mobile sources will account for half of the necessary reductions, total cost would be about $2.8 billion.

This assumption is probably conservative, in that, for the worst-case areas such as Southern California, controls might have to be extended to ever-smaller and ever-more-difficult-to-control sources. The number of such sources would have to be large to have any effect on total emissions, so the average cost would go up measurably as the controls were extended step by step. Were the cost to reach $3000 per ton removed, the total cost would be $4.2 billion.

Emissions Fee

For areas not reaching attainment by 1993, an emissions fee of no less than $100 per ton of hydrocarbons, NO_x, and CO would be imposed on stationary sources subject to emission limitations.

Revenues Generated. Emission totals in the top 15 areas at attainment are estimated by EPA to be about 1.5 million tons per year. Assuming continued nonattainment in 1993 and thereafter, total legal emissions would be higher than 1.5 million tons per year. Assuming 2 million tons per year, half from stationary sources, the fee would generate $100 million per year.

---

19 EPA's FIP Study. Op. cit. Page V-7.

ESTIMATED COSTS FOR TITLE I OZONE/CO ATTAINMENT*

Provision	Low Estimate** ($ Billions)	High Estimate** ($ Billions)
Inspection/Maintenance Programs		
Inspection Fees		
Existing Stations	0.03	0.12
New Stations	0.14	0.21
Inspection Stations		
Upgrade Existing	0.03	0.03
Build New	0.07	0.07
Maintenance Costs	0.17	1.53
Stage II Vapor Recovery		
Direct Costs	0.08	0.12
Inconvenience Costs	0.26	0.39
Alternative Fuels		
Trucks	0.11	0.24
Government Vehicles	0.01	0.10
Privately Owned Buses	***	0.01
Taxis	0.01	0.02
Stationary Sources		
In Areas <150% of Standard	1.00	2.00
In Areas >150% of Standard	2.80	4.20
Transportation Control Measures		
For VOCs	0.00	0.22
For CO	0.10	1.00
Total	$4.81	$10.26

* Since many provisions of Title I are modifications or restatements of current law, these estimates reflect more the costs of attainment of ozone and CO standards than incremental costs resulting specifically from the bill.

** See text for assumptions and limitations

*** At about $1 million, too small to count

Clean Air file

CRS REPORT FOR CONGRESS

MOBILE SOURCE AND OTHER FEDERAL CONTROLS
AN ANALYSIS OF TITLE III OF THE PROPOSED CLEAN AIR STANDARDS ATTAINMENT ACT

by
David E. Gushee
Senior Specialist in Environmental Policy

September 14, 1987

ABSTRACT

The Senate Committee on Environment and Public Works is considering an extensive set of amendments to the Clean Air Act. At the request of many Senators, the Congressional Research Service is analyzing the five titles of the bill entitled Clean Air Standards Attainment Act of 1987, which is serving as a markup vehicle. This report deals with Title III: Mobile Source and Other Federal Controls and includes order-of-magnitude cost estimates. Four other CRS Reports deal with Titles I, II, IV, and V.

CONTENTS

INTRODUCTION TO OZONE/CO ATTAINMENT TITLES (I AND III) 1

EMISSION STANDARDS
Cars 2
Trucks 7
Motorcycles 10

ON-BOARD TECHNOLOGY TO CAPTURE FUELING EMISSIONS 10

REGULATION OF FUELS
Sulfur Content of Diesel Fuel 11
Fuel Volatility 12
Oxygenated Fuels in Nonattainment Areas 12

MOTOR VEHICLE MARKET IMPACTS 13

SENSITIVITY OF COSTS TO SEVERITY OF REQUIREMENTS
Cars and Light Duty Trucks 14
Heavy Duty Trucks 16
Other Provisions 16

TABLES
Table 1. Estimated Annual Domestic Cost Impacts from Title III Provisions 18

Table 2. Estimated Potential Impacts on Domestic Producer Markets 19

INTRODUCTION TO OZONE/CO ATTAINMENT TITLES (I AND III)

The Clean Air Act currently mandates that National Ambient Air Quality Standards (NAAQS) for ozone and carbon monoxide be attained and maintained. In one sense, therefore, the Senate committee bill will not require anything above and beyond that already explicitly or implicitly mandated. The details of control and enforcement mechanisms and pace of progress, however, are at issue.

Almost every initiative in the bill is already available to the Environmental Protection Agency (EPA) under either explicit or implicit authority in the Act. EPA is already requiring some steps, has proposed several others, is considering whether or not to propose still others, and has thought about the rest but has put them aside for now. Some States have proposed and/or implemented some measures more stringent than EPA has required.

In another sense, the issue underlying Titles I and III is the cost of attainment and maintenance of the ozone and CO NAAQS and how that cost would be affected by changes in the definitions of the goals, the pace at which attainment would be sought, and variations in the mix of control actions to be taken (that is, on the one hand, the ability to "fine tune" a strategy to a particular area and, on the other hand, the extent to which individual lifestyle changes are mandated vs. the extent to which point and area sources are controlled).

This report (one of five on the five titles of the Senate bill) undertakes a rough estimate of the costs of attainment under the approach taken in Title III of the Senate bill. It does not discuss alternative approaches.

The potential benefits of increased ozone control are discussed in the sections on Title IV and Title V for health benefits and Title II for secondary benefits.

MOBILE SOURCE AND OTHER FEDERAL CONTROLS
AN ANALYSIS OF TITLE III OF THE PROPOSED CLEAN AIR STANDARDS ATTAINMENT ACT

This title of the bill addresses emissions of hydrocarbons, nitrogen oxides and carbon monoxide from motor vehicles and hydrocarbons from a group of "area sources" using solvents in their activities. It also addresses sulfur content in diesel fuel and mandates use of oxygenated gasoline blends in the winter months in carbon monoxide nonattainment areas.

In this report, CRS estimates the costs of the provisions in the Senate bill dealing with motor vehicles and their fuels, without differentiating between steps the Environmental Protection Agency might take under current law and those mandated in the bill. The estimated costs are summarized in Table 1, at the end of the report. Costs of emission controls from the area sources treated in Title III are subsumed in the analysis of Title I[1]

EMISSION STANDARDS

Data from Federal and State air pollution control programs indicate that motor vehicles contribute nationally, directly and indirectly, about half of the ozone precursors and about two thirds of the carbon monoxide emissions; in many nonattainment areas the proportions are higher. Automobile emission standards at the current level of stringency have been in place since 1981; emissions in use of late model cars have been improving as a result of feedback from operating experience into design changes. Light duty trucks have been on a path of increasing stringency, and heavy duty trucks are only this model year (1988) having to meet emission standards of comparable toughness.

Cars

The bill as reported from subcommittee would reduce the standard for hydrocarbons (HC) from 0.41 grams per mile (gpm) to 0.25 gpm (about a 40% reduction), for nitrogen oxides (NO_x) from 1.0 to 0.4 gpm (a 60% reduction), and for particulates from 0.20 gpm to 0.08 gpm (the current California standard). The carbon monoxide standard would not change. An emission standard

---

[1] Ozone and Carbon Monoxide Nonattainment: An Analysis of Title I of the Proposed Clean Air Standards Attainment Act by David E. Gushee. CRS Report 87-751 S. September 10, 1987.

for formaldehyde would be established. The emission control system performance warranty period would be increased from 5 years/50,000 miles to 10 years/100,000 miles. The certification test would apply to each engine rather than to averages of the performance of various vehicles, engines, engine families, or models. Testing at the factory via the Selective Enforcement Audit (SEA) would be changed from 60% pass to 90% pass. A new idle test would be added to the Federal Test Procedure (FTP). A new cold start test would also be added to the FTP. The definition of level of maintenance required of an in-use car for its performance data to be relevant to the manufacturer's warranty, to the manufacturer's obligations under State inspection/maintenance (I/M) programs, and to EPA's recall decisions is broadened from "properly maintained" to "normally maintained." And emissions performance data from State inspection/maintenance programs would be added to EPA's data on in-use performance over the warranted life as input to recall decisions.

Cost Estimates. Auto manufacturers have all testified[2] that these new requirements collectively pose a grave challenge to their ability to profitably produce a full line of cars. They see no technological breakthroughs on the R&D horizon to help them. The new requirements would therefore probably be met through "fine tuning" existing technological approaches, including perhaps additional catalyst loadings in the converters, some additional small pieces of hardware, and more demanding specifications on parts.

The producers have presented no estimates of costs for these changes. However, on the basis of industry comments and experience over the years, an estimate of $100 per car would seem reasonable. For the purpose of this exercise, a low side assumption of $50 per car seems defensibly moderate, while an assumption of $150 per car on the high side would seem to provide a reasonable upper bound. Over a 12 million car per year sales volume (comparable to recent sales volumes), the low side estimate would total $600 million; the high side estimate would be $1.8 billion. Other assumptions can also defensibly be made; the cost might in the long term, through some as-yet-unforeseen technological improvements, end up low enough to be undetectable. Yet if the combination of new requirements turns out to be harder to live up to in use, it might even go higher than $1.8 billion. However, both of these extreme scenarios seem rather improbable at this writing.

Certification. Once the car has been designed, it (a) must pass a series of tests to prove that it will meet the emission standards (certification tests), (b) is subject to random testing at the end of the production line (the selective enforcement audit [SEA]) and (c) random selection by EPA as it

---

[2] Auto industry witnesses testified February 19, 1987, before the Subcommittee on Health and the Environment, House Committee on Energy and Commerce, and on April 9 and June 24, 1987, before the Subcommittee on Environmental Protection of the Senate Committee on Environment and Public Works. Industry views on the impacts of these provisions are extracted from testimony given at these hearings or in supplemental submissions.

goes through its useful life (in-use sampling), (d) must satisfy the customer (source of warranty claims), and (e) must pass I/M tests in nonattainment areas (source of emissions warranty claims).

Although current certification test results show significant percentages of the various models meeting the bill's proposed emission standards, such data are not evidence that the models would be able to meet a 90% pass rate off the production line (SEA) at emission levels low enough to provide assurance that they would give satisfactory in-use performance over the longer warranty period. Preparing to meet a pass rate of 90% in samples off the production line requires that emissions during certification be at a smaller percentage of the standard than would be necessary when the production line test is for 60% pass. The industry estimates that a 90% pass rate requires certification test results about 30% lower than a 60% pass rate requires, in order for producers to have a 95% confidence factor that the vehicle would pass an SEA[3]. Further, preparing to meet a warranty of 5 years/50,000 miles is less severe than preparing to meet a warranty of 10 years/100,000 miles. The net result of each of these changes is that cars must be certified to a smaller percentage of the standard than is currently the case.

These two impacts on how low the automakers must go in the certification tests to ensure being able to meet both the SEA and the in-use tests are not additive. Nonetheless, certification test results will have to be significantly better than the best of those now being realized, the auto makers have testified, in order to provide enough margin for car-to-car variability, test-to-test variability, and performance deterioriation to hold down certification suspensions, certification revocations, and recall rates to tolerable levels. Again assuming no technological breakthroughs, one can predict that, to the extent that the auto makers' concerns are valid, suspensions and revocations might rise, while recalls and warranty claims would rise, particularly in the first years of the new standards.

<u>Recalls.</u> Industry witnesses have stated that, although producers will probably be able to certify their full lines with fine-tuned current technology and may be able to pass production line testing (the SEA), they would have real concern that they would experience (1) an increased rate of recall for repairs under warranty as a result of in-use test data from EPA and the various I/M programs over the increased warranty period, and (2) increased costs of honoring their warranties for both normal experience and for repair of cars failing I/M tests.

---

[3] Auto parts and systems are not precise replicas of each other (product variability). Similarly, performing the same test many times on one car will give results which "scatter" around an average (testing variability). Statistically, therefore, if the manufacturer seeks a level of emissions from the certification test vehicle of, say, 60% of the standard (0.24 grams per mile for a standard of 0.41 gpm, for example) to ensure that he has a 95% probability that 60% of vehicles tested in an SEA would pass, he would seek a lower emission level in the certification test vehicle to have the same 95% probability that 90% of vehicles tested in an SEA would pass.

With respect to recalls, three factors will contribute to an increased rate: the doubled warranty period, the feedback of data from State I/M programs, and the change from "proper" to "normal" maintenance as a requirement on the owner to maintain warranty coverage by the manufacturer. Current experience shows a recall rate of about 10% and a cost per recalled car of about $50. Assuming for illustrative purposes that an additional 10% of any one year's sales of about 12 million cars would have to be recalled some time during the 10 year warranty period and that each recall would cost $100 per recalled car for parts and labor, then the additional cost would be about $120 million per year.

Should some fraction of production fail to pass end-of-assembly-line tests as a result of the shift from 60% pass to 90% pass or some other factor, the assembly line would have to be shut down, technical changes made in the vehicles, and cars retested to assure that subsequent production would pass the test. Even if the technical changes were inexpensive and could be made quickly, the cost of lost production would be great for the particular manufacturer. On the other hand, if one assumes that total car sales would be unchanged, the overall social cost of such a failure might be relatively small.

A more costly scenario would be that a significant fraction of the larger cars (6- and 8-cylinder family cars, for example) would fail the assembly line (SEA) test and be unable to be modified to meet the standards in the current model year. According to auto company witnesses at recent hearings, such a scenario is probable, particularly in the first years the new requirements would be in force. According to EPA, such a scenario is unlikely, in that, in its view, even if emissions from the 6- and 8-cylinder models are more difficult to control (a premise that some observers question), the auto companies will be able to make enough modifications to pass the SEA.

About half of domestic production is larger cars. Assuming that the automakers' pessimism is justified, should 10% of these, or 5% of total domestic production, go out of production from failure to pass the 90% test, this would be some 400,000 cars over a year. Since the shutdowns would be more likely to occur early in the model year, a reasonable assumption would be that three fourths of this production would be lost, or some 300,000 cars. As with the more temporary losses from suspensions rather than revocations of certification, some of these losses would be made up from increased sales of other, larger domestic cars. But, as a result of reduced choice, some would-be buyers of larger cars would probably opt for smaller cars, for which the foreign manufacturers have an admitted advantage compared to U.S. producers.

Such a shift would lead to an increase in imports; for example, if one fourth of the 300,000 would-be large car buyers buy imported smaller cars instead, net loss to U.S. producers would be about 75,000 cars. The average wholesale car price is about $10,000. Assuming that it is the larger ones of these which are most likely to be involved, a worst case estimate would be $20,000 per car sale lost, for a total sales loss of $1.5 billion. At an average of 20 industry jobs per $1 million of wholesale output, some 30,000 domestic job-years would be lost. Further, each such purchase would represent an unquantifiable probability of lost future sales as well, in that the buyer's loyalty to American-made cars would have been reduced.

Driveability. Another possible impact would be reduced vehicle performance (driveability) as evidenced, for example, by hard starting, loss of engine performance and reliability, and increased fuel consumption. In terms of how they will meet the standards, the producers view the first several years under the new standards as probably like 1973-4, when performance of larger cars suffered noticeably. The change was noticeable enough to consumers, the industry believes, that significant numbers either bought smaller cars or delayed their purchases. The impact of decisions to buy smaller cars is discussed above. The impact of decisions to buy later are the same--that is, domestic production goes down and jobs are lost. Assuming a loss of domestic production from delayed purchases equal to the loss to import sales, another $1.5 billion/30,000 jobs would be lost. These impacts, whatever their size, would be expected to decrease over time as producers improved their ability to meet the new requirements, although even now, 14 years after the 1973-4 driveability issue, owners are keeping cars longer (15% over 12 years old vs. 5% over 12 in 1970).

Many observers question the industry's interpretation of the events of 1973-4, believing that other factors such as economic cycles and changes in fuel prices, were much more important. If they are right, these postulated negative effects would not occur--or at least would not occur as severely or directly as a result of the bill's requirements.

Warranty Work. Another effect of the doubled warranty period would be greater frequency of warranty work and, probably, more warranty work for some of the more expensive components such as catalytic converters and electronic controls. Thus, one would expect the effect from a doubled warranty period to be more-than-doubled warranty costs. If one assumes that warranty frequency and costs are equivalent to recall experience (such data are not published by the industry), then the increased warranty costs would be more than the increased recall costs, which were earlier assumed to have doubled (page 2). The estimate would thus be "more than $120 million." How much more? Since converters and electronics are so expensive, a doubling of average warranty cost is a reasonable guess: $240 million.

Again, other observers doubt that warranty failures of the more expensive components would occur at such a high rate. If they are right, then a reasonable guess might be a number similar to the increased recall costs: $120 million.

Infrastructure Costs. The new requirements could reasonably be expected to impose added industry infrastructure requirements. To certify for 10 years/100,000 miles will require a somewhat longer lead time compared to that needed to certify for 5 years/50,000 miles. Further, for models in which difficulties surface late in the certification process, introduction to market would be delayed as prototypes after modification to deal with the problems found go back through the longer test procedures. The mix of added test duration and added recyle times will add cost to all producers, and delayed introductions will probably reduce sales for those producers affected.

The 90% pass rate will require testing of a higher proportion of production--exactly how many is not known, as the test protocol has not yet been specified.

The added idle test in the Federal Test Procedure will incur cost; it is an added step in the procedure.

The cold start test will require construction of new facilities, in addition to the initial development cost and the added testing cost.

The bill's requirement of a formaldehyde standard is assumed to add little cost, as EPA is already in process of developing the necessary information base to establish one. From data available to date, at most only minor variations of existing technology would be required.

These costs are estimated as being negligible both in the order-of-magnitude context used here and relative to those discussed earlier.

Trucks

The bill would require that light and intermediate weight light duty trucks (less than 6000 lb.) meet the same standards as cars. These are emissions reductions of about 65-75% from current mandated levels. The standards for heavy light duty trucks (6000-8500 lb.) would be reduced about 40% for hydrocarbons, 50% for carbon monoxide, and 70% for NO_x.

For heavy duty trucks, both gasoline and diesel, the NO_x standards would be reduced by statute from the current 5 grams per brake horsepower hour (g/bhp-hr) (defined by regulation) to 1.7 g/bhp-hr. Particulate standards, also currently defined by regulation, would be put into the statute at current levels. By making future deadline delays less likely, putting these requirements into the statute in effect increases the technology-forcing nature of the requirements.

Light Duty Trucks. Some 3 to 4 million light duty trucks are sold each year (the number of lighter trucks and specialized vehicles on truck chassis has been rising rapidly in recent years, as has been the number of trucks imported). The proposed light duty tru requirements have generated industry comments similar to those for cars. According to industry testimony, the impacts would be comparable to those expected of the heavier cars--increased cost per vehicle, increased rates of suspension and revocation of certification, increased rates of recall, and reduced performance.

Given that these vehicles are heavier on the average than cars, one might assume that the average added cost per truck to meet the new standards might be higher than that for cars. On the other hand, it is possible, if not likely, that most of the added cost in both cases is from added hardware, so that there would not be a direct correlation of cost to vehicle weight. Assuming the cost range to be 25% higher than that for cars, and assuming 3.5 million light duty trucks sold, the total cost would range from $200 million to $520 million.

For recalls, the same assumption as for cars of an added 10% would be 350,000 trucks. Average cost per recall would be expected to be somewhat higher than for cars, as the emission control devices would be larger, if not more complex, than on lighter vehicles; assume $125 per recalled truck or $44 million.

For warranty costs, using the same assumptions for trucks as was done for cars (double the estimated recall impact) yields $88 million.

For revoked certificates of conformity, the worst case rate assumed for cars of 10% would probably not apply to light duty trucks, since a greater proportion would be heavier. Should the rate be 15% (to account for the effect of weight on difficulty of meeting the new requirements), some 500,000 trucks would be affected. However, as with cars, domestic production includes more of the heavier light duty trucks, so that such sales loss would hit domestic producers more heavily than importers. If one half buy other domestic trucks, one fourth buy imported trucks, and one fourth delay purchases, that would represent about 125,000 more imported trucks and reduced overall sales of another 125,000, for a total loss of domestic production of 250,000 trucks. At an average cost of $15,000 per truck, this would be a loss of $3.7 billion/75,000 jobs.

<u>Heavy Duty Trucks.</u> Some 200,000 heavy duty trucks are sold each year. Producers claim even more vigorously than for cars that they do not know how to meet the bill's requirements, primarily tougher NO_x levels. They expect great difficulties in use with performance, fuel economy, catalyst failure, and (for diesels) particulate trap failure. And they doubt that they can meet the ultimate NO_x standard by any currently-perceived combination of technologies. They predict added costs of at least several hundred dollars, if not several thousands of dollars per truck for the mix of control technologies added.

Some of these difficulties and costs will be present in any event just to meet the requirements currently in place as a result of implementing EPA's heavy duty truck regulations issued in 1985, which are taking effect over the next decade. Producers have been working hard on particulate trap technology in particular, while they have been at the same time accelerating their work on alternative fuels such as methanol and compressed natural gas. The tougher NO_x standard in the bill, difficult enough to meet in its own right according to both the industry and the EPA, makes the particulate trap problem even more difficult, as it is characteristic of diesel engines to produce more particulates as they are tuned to reduce NO_x and vice versa.

The crystal ball is even murkier here than for other vehicle classes, for which the costs of meeting existing standards are fairly well known by now. The base assumption is that there will be three effects:

. An additional cost per truck of some magnitude.

. Reduced performance and thus reduced sales of new units.

. An acceleration toward alternative fuels which, because of the limited market experience, will further reduce sales of new units for a time.

Additional Costs. The industry claims that, even if the new standards are met, there will be significant losses in fuel economy (10-15%) and poorer performance overall. Given that operators of heavy duty trucks usually already own trucks and compare the cost of a new one to the cost of major overhaul of existing units, the industry believes that there is a high probability of significant drops in sales in favor of overhauls so long as these impacts on operation persist. And, since the industry sees no technological fixes in sight, the drop in sales may last for many years.

If one assumes that sales will be affected by 20% (a "significant drop in sales" compared to earlier assumptions of 10% drop in car sales), some 160,000 units would be sold. If one assumes an additional cost of $500 per truck for the pollution control equipment (above and beyond that already required under existing regulations), total cost would be $80 million per year. Cost of lost production would be, at $100,000 per truck, about $4 billion/80,000 jobs. Total would be $4.08 billion. It must be emphasized that, soft as the previous estimates have been, this one is even further into the realm of "best guess."

The industry also believes that some of its trucks will not meet the standards, and nonconformance penalties (NCP's) will be assessed. EPA in its rulemaking[4] sought to set the NCP formula in a way that will limit its impact to less than $100 million per year by limiting its applicability and setting the rates high enough to discourage NCP's and encourage spending money to make the vehicles conform. For estimating the bill's impact, because the requirements are so stringent, it is reasonable to assume that NCP's will be near the upper limit, or for the sake of ease of calculation, $80 million (160,000 trucks at $500 per truck).

With respect to alternative fuels, the bill would accelerate expenditures which might be made in due course anyway, if one assumes that such fuels would be the wave of the future based on some mix of energy, environmental, and geopolitical benefits. However, even though there are some favorable indications for increased use of alternative fuels, there appears to be substantial sentiment in Congress that additional legislation[5] is needed in order to ensure that the transition occurs. Therefore, for this report, the cost of such a transition is considered.

Assuming that 10% of the diesel-fueled heavy-duty trucks change to methanol as an alternative fuel, that the engines do not cost any more than

---

[4] 50 FR 35385, August 30, 1985.

[5] cf, for example, H.R. 1595 (Glickman et al) and S. 1510 (Rockefeller) et al, which seek to stimulate use of alternative fuels through modifications to fuel economy standards.

diesels once the R&D has been done, and that the cost penalty is 10 cents per gallon of diesel fuel displaced[6], the ultimate annualized cost, estimated on the basis of current diesel fuel usage of 1 million barrels per day, would be about $150 million per year. To be offset against this is the reduced need to desulfurize diesel fuel[7] which costs up to 7.7 cents per gallon. Net conversion cost would thus be perhaps 2.3 to 8.7 cents per gallon, or $35 million to $130 million per year. This conversion cost would not be borne all at once, as a transition from diesel engines to alternative engines would take decades.

Motorcycles

Motorcycles would have to meet exhaust and evaporative emissions levels equivalent to those applied to cars.

Potential Costs. No hearings have been held on motorcycle emissions or on the industry's ability to respond to the requirements specified in the bill. The industry has submitted statements for the record which indicate that it does not know how to meet the standards other than that catalyst technology would be involved, that the market impact of adding the necessary cost, bulk, and complexity to their product in light of the weakness of the motorcycle market today (sales have declined by more than 55% in the past 10 years to less than 300,000 per year) is of great concern, that catalyst technology might create safety problems on vehicles as compact as motorcycles, and that the contribution of motorcycle exhaust emissions to air pollutant levels is very small (less than 1% of all transportation VOCs). In sum the industry predicts that sales would plummet further and, for those sales made, there would be an increased risk of tampering with the pollution control system.

Most motorcycles are imported. The major domestic producer is Harley Davidson, headquartered in Wisconsin. It produces about 30,000 motorcycles/All Terrain Vehicles per year. Assuming a $2000 average wholesale cost per vehicle, some $60 million/1200 domestic jobs might be involved. With so little testimony on the record, there is little basis on which to estimate the extent to which these jobs might be at risk. Assuming that half of this production is motorcycles and that the impact might range from one third to all of this production, the cost would be from $10 million to $30 million.

ON-BOARD TECHNOLOGY TO CAPTURE FUELING EMISSIONS

The bill would require on-board technology to capture refueling emissions of "all available fuels."

---

6 See section on Oxygenated Fuels, page 12. To simplify the calculation, methanol is assumed as the alternative fuel.

7 See section on Sulfur Content of Diesel Fuel, page 11.

Potential Costs. This requirement has been proposed by EPA, which estimates that the cost would be about $20 per car[8]. At 12 million cars and 4 million trucks sold per year, this would add up to about $320 million per year.

Some auto producers contest the cost estimate of $20 or so per car. One, Toyota, maintains[9] that cost will be closer to $100 per car, because of the changes in physical layout, valving, and the like involved. If Toyota is right, total cost would be around $1.6 billion.

REGULATION OF FUELS

Sulfur Content of Diesel Fuel

Sulfur content of diesel fuel would be limited to 0.05% by weight. Currently, the industry sets its own specifications based on market considerations.

Potential Costs. Sulfur in diesel fuel contributes to particulate formation in diesel engine exhausts. This requirement would thus improve the effectiveness of particulate traps on diesel engine exhaust systems. EPA is already considering such a requirement by regulation.

National Petroleum Refiners Association has estimated, on the basis of a survey of its members in late 1986,[10] that this requirement would require about $3.3 billion in capital expenditures in refineries, and would add about 7.7 cents per gallon to the manufacturing costs of diesel fuel. The report also points out that the needed capacity could not be put in place by mid-1990, the date specified in the bill.

Consumption of highway diesel fuel is about 1 million barrels per day. However, according to NPRA, highway diesel fuel is refined and distributed as a common fuel with distillate fuels, with a total consumption rate of about 2.4 million barrels per day, and the whole volume would have to be desulfurized. Annual cost in this scenario would be about $2.8 billion, probably an upper limit for the provision's impact.

EPA's first estimate was much lower; its contractor assumed that diesel and distillate fuels could be segregated from each other in the production and distribution systems, so that only the diesel fraction would have to be desulfurized to 0.05%. Should that be the case, additional desulfurizing

---

[8] 52 FR 31162, August 19, 1987.

[9] Testimony to the Subcommittee on Environmental Protection, Senate Committee on Environment and Public Works, April 9, 1987. S. Hrg. 100-54, page 445.

[10] "U.S. Refining Industry Capability to Manufacture Ultra Low Sulfur Diesel Fuels." National Petroleum Refiners Association, 1986.

capacity could be held to a minimum, and average incremental cost would be 1.3 cents per gallon.[11] Given both of these assumptions, the incremental cost would be $200 million per year.

EPA is concerned that this estimate is too low, so it is funding another contract study; results are expected early next year. Preliminary indications are that the cost will come out around $1 billion, give or take 50%.

Fuel Volatility

The bill would require that gasoline volatility be limited during warm weather months in 1990 and thereafter to a Reid vapor pressure (RVP, a standard method of measuring volatility) of 9 psi. Regional commissions created by this bill could request EPA to set lower volatility limits within their regions; Since some 10% of the total hydrocarbon emissions come from vehicle refueling operations or evaporation from cars themselves, this provision might make it possible for some areas exceeding the ozone standard by only slightly to come into compliance to avoid some of the more expensive control actions.

Potential Cost. EPA has issued a proposed rule on volatility which is in some respects tougher than this bill's provision.[12] The Agency's cost estimate is about $450 million per year, partially offset from reduced evaporative fuel losses. Cost increases result from required changes in fuel composition and associated changes in refinery operation.

Oxygenated Fuels in Nonattainment Areas

Oxygenated gasolines would be required from October through March in carbon monoxide nonattainment areas, oxygen content to be phased in in two stages to a minimum of 3.7% oxygen by weight. EPA would be authorized to waive this requirement if it would lead to increases in other pollutants.

Cost Estimates. Oxygen can be added to gasoline by adding methanol, ethanol, or other oxygen-containing compounds, the most likely of which has been methyl tertiary butyl ether (MTBE). MTBE is probably foreclosed, however, by the bill's specified ultimate limit of at least 3.7% oxygen in the gasoline[13]. The Denver area has just this summer adopted a regulation similar

---

[11] Telephone conversation on 8/10/87 with Thomas Darlington, EPA Office of Mobile Sources, who cited figures from "Diesel Fuel Quality and Its Impacts on Durability, Emissions, and Performance," 1985, a study viewed by EPA as preliminary. A subsequent study is currently under way, scheduled for completion by Spring 1988.

[12] 52 FR 31274. August 19, 1987.

[13] Most work on MTBE in gasoline has been at concentrations of up to 10-11%, which corresponds to about 2% oxygen.

to this provision, but with a lower ultimate oxygen content, effective this coming winter[14].

All three of the leading contenders cost more than gasoline (the currently available waiver of the highway gasoline tax is critical to the fortunes of ethanol as an additive to gasoline). Estimates of long-term cost differentials are controversial[15] and vary widely. Ethanol is estimated to cost about 50 cents to $1 per gallon more than gasoline[16]. For methanol, the difference is 20 cents less to 20 cents more per gallon than gasoline. But the alcohols have lower energy contents than does gasoline, so that, for example, it takes about 1.8 gallons of methanol and about 1.6 gallons of ethanol to go the distance 1 gallon of gasoline delivers.

Methanol is added at about 5% to gasoline, while ethanol is added at about 10%. Assuming cost differences for ethanol of $1.20 per gallon of gasoline displaced and a difference for methanol of 10 cents per gallon of gasoline displaced, assuming that the market ends up evenly split between these two, and assuming further that one sixth of current total gasoline consumption is affected by this provision (half of the year for one third of the country), the cost would be about $680 million in added fuel costs. To get low and high estimates, assume the costs are off by 50% in either direction; the resultant numbers would be $340 million on the low side and $1.02 billion on the high side.

There would also be associated infrastructure costs (transportation, tankage, changeovers, and management). These latter costs are unknown, but some reactions to the Denver initiative indicate they will be substantial.[17] No attempt will be made here to estimate them.

Estimates of all the various Title III costs are collected in Table 1.

MOTOR VEHICLE MARKET IMPACTS

Estimates of possible impacts on domestic motor vehicle producers are collected in Table 2. The $12.5 billion impact from reductions in domestic vehicle production derives from estimates of the extent to which the new emission standards proposed in the bill cannot be met without adverse impacts

---

14 Colorado Department of Health. Regulation No. 13, "The Regulation of Carbon Monoxide Emissions from Gasoline Powered Motor Vehicles through the use of Oxygenated Fuels."

15 The controversy stems from lack of agreement on assumptions about future technological improvements, future raw material costs, and effect of volume of production on production cost.

16 For current prices, see, for example, Alcohol Outlook, August 1987, page 3.

17 See, for example, Alcohol Week, August 3, 1987, pp 3-4.

on the domestic industry's ability to produce vehicles that both meet the standards and meet customer requirements. The estimates are based on three industry positions: (1) that it is more difficult for the heavier, non-luxury cars powered by 6- and 8-cylinder engines to meet emission standards than it is for cars powered by 4-cylinder engines or luxury cars where cost constraints have less impact and that, even when the standards would be met the driveability would be adversely affected; (2) that some buyers of these larger vehicles will decide to buy smaller ones, where importers have advantages in both performance and price, and (3) that some other buyers will decide to postpone purchases of new vehicles.

Would this happen? Many in the auto industry believe that it did happen in 1973 and 1974. Meeting these new proposed standards is like meeting those then, they believe. Since there was no new technology to use, driveability had to be sacrificed, and the bigger the vehicle, the greater the sacrifice. Catalyst technology came forward in 1975; the industry says there is no equivalent new technology in the wings this time around.

Others do not interpret the past this way nor do they view the proposed requirements in the bill the same way, except perhaps for the 1.7 NO_x provision for heavy duty trucks. Almost all observers say this is a tough one which the industry probably will not be able to meet on the bill's timetable or even near it.

SENSITIVITY OF COSTS TO SEVERITY OF REQUIREMENTS

Cars and Light Duty Trucks

The bill's purpose in reducing vehicle emissions is straightforward. Vehicles contribute a major fraction of the ozone precursors and CO--fractions ranging from 40% to over 90% depending on the pollutant and the area. Cars contribute the major portion of vehicle pollution, except for particulates. The proposed standards are designed to cut new vehicle emissions in half, more or less, while the associated changes are designed to ensure that the vehicles stay low-polluting during their useful lives.

Although the estimate of $1.33 to $2.00 billion dollars per year in direct costs to the auto industry is not small, its order of magnitude compared to that from possible sales losses (in the $10 billion range) reveals that one key issue is whether any of the requirements lead to major increases in risk to the domestic industry's market position more than others do.

Although the industry has not embraced any of the bill's provisions, its level of rhetoric implies that the car provisions of greatest concern are the coupling of lower emission standards with doubled warranty life and the change from "proper" to "normal" maintenance in the warranty provisions. These latter two provisions, in the face of more stringent standards, are claimed to put the industry at risk in both market position and in an almost open-ended warranty commitment over the costs of which they would have very little control.

These two provisions are designed to push the industry toward cars needing less maintenance to operate at peak performance over their whole useful lives and at the same time to get owners to improve their maintenance habits. The industry is making progress toward the "maintenance-free" vehicle, and one can infer that it thinks it can produce a full line meeting the bill's emission requirements if the warranty period is 5 years/50,000 miles and if the owner is required to "properly" maintain it. Given the state of the engineering art, the industry is saying, to ask for a "maintenance-free" vehicle for 10 years/100,000 miles while at the same time tightening the emission standard is asking too much at this time. From this, industry implies, it follows that, were the bill to do one or the other, but not both, the level of risk to which the domestic industry would be put would be much reduced.

What effect would removing these two provisions have on emission levels? Perhaps none. If one believes the industry that it cannot do better than it says it can do, then instituting the proposed emission standards alone will lead to cars that get certified, pass the SEA tests, and end up with in-use emission levels considerably higher than the standards. Recalls will be made, and the industry will gradually fine tune its engineering and gradually bring the in-use performance closer and closer to the design goal.

This is the experience of the past seven years while the standards have been stable. In-use performance of recent-model cars is approaching the current standard, an improvement by a factor of about three since 1981 when cars certified to this standard first went into use.

In this scenario, adding the warranty extension and the change in maintenance definition would not reduce emissions but would increase performance problems, tampering, sales losses, and costs--in sum, minimal environmental benefits and maximum risk and costs.

On the other hand, if one believes that the industry will do only as well as it is forced to, then adding the warranty extension and the definition change to the requirement for lower emission standards will immediately lead to lower certification test results and lower in-use emissions throughout the car's life, and will cause an intensified feedback of field experience to engineering so as to reduce in-use emissions and system performance problems and hence recall and warranty problem frequencies and costs.

In this second scenario, new car emissions would immediately be reduced more (perhaps by 30%) and in-use emissions reduced more rapidly from two to three times higher than the standard over the car's lifetime to at or perhaps a bit below the standard. EPA has estimated[18] that the new standards and durability requirements would each ultimately reduce emissions by about 0.1 g/mi. or about 1.25% of total emissions, requiring 15-20 years for full effect.

Thus, one way of looking at the durability requirements is a reduction in total emissions over 15-20 years of a range from none to 1+% at modestly increased recall and warranty costs and an allegedly sharp increase of risk of significant damage to the domestic industry's competitive position.

---

[18] From modeling studies.

Heavy Duty Trucks

For heavy duty trucks, the gut issue is the proposed statutory NO_x emission standard of 1.7 g/bhp-hr. compared to the current regulatory standard of 5.0 g/bhp-hr. The industry claims very serious problems of cost and performance, and few think such a standard is readily achievable in less than a decade without major changes in fuels or engine design or both.

In EPA's rulemaking on heavy duty trucks, it projected total NO_x emissions from HDT's at an emission standard of 5.0 g/bhp-hr in the year 2000 to be about 2.3 million tons out of a projected total of 26.2 million tons, or about 9%[19]. The current ultimate standard is not scheduled for implementation until 1994; the bill would implement the 1.7 standard in 1995.

By the year 2000, some 40% or so of the fleet would be emitting at a lower level than would be the case in the absence of the bill. The lower level would undoubtedly not be one third of the EPA calculated case, because in-use emissions so soon after a tight new standard would probably be much higher than the standard itself. If one believes the industry that the standard would not be met, and that the 5.0 standard itself will be stretching technology, then one would conclude that there would be no significant emission reductions by the year 2000. On the other hand, assuming that the standard was met, then by the time the heavy duty truck fleet turned over fully, say 2010, HDT-NO_x would be reduced by about 90% from 1982 levels (about 17 g/bhp-hr) instead of being reduced by about 70%. The difference of 20% would be about half a million tons per year (plus or minus, depending on HDT VMTs). By the year 2000, however, the impact would at most be around 1% of total NO_x emissions.

In sum, NO_x emissions by the end of this century would be reduced between 0 and 1%. This gain would come at some cost to the heavy duty truck industry. In this regard, industry notes that with today's state of incomplete technical understanding of ozone formation, NO_x plays only a minor role in control strategies and urges delaying the time frame for NO_x reductions for heavy duty trucks.

Other Provisions

On-board vapor recovery and fuel volatility requirements have both been proposed by EPA. Cost factors are extensively discussed in the Notices of Proposed Rulemaking cited earlier. For the on-board system, costs rise as percentage of control rises. For volatility, costs rise as the standard set for Reid Vapor Pressure (RVP) goes down. The bill leaves the required level of control for on-board controls to EPA's administrative discretion, so that costs would remain a part of the administrative deliberations. The same is generally true for volatility control, although the level of 9 psi RVP is specifically mentioned, along with a requirement to grant an ozone transport region commission's request for a lower level.

With respect to oxygenated fuels, the evidence indicates that alcohols are and will continue to be more expensive than the gasoline they replace. A

[19] 50 FR 10613. March 15, 1985.

legislated requirement to increase their use will probably increase this cost differential. Even in high altitude areas, their value in carbon monoxide reduction will decline over time as newer cars replace the older ones for which the oxygen in the fuel has the greatest beneficial effect.

Colorado is experimenting with this approach; a few other urban areas are considering doing so. The issue is whether the option should be legislated or merely fostered, in light of the uncertainties surrounding cost, benefits over time, and possible operational difficulties.

TABLE 1

ESTIMATED ANNUAL DOMESTIC COST IMPACTS FOR TITLE III PROVISIONS*

Provision	Low Estimate**	High Estimate**
	($Billions per Year)	
Car Emission Standards		
Hardware	$0.60	$1.80
Increased Recall Rate	0.12	0.12
Increased Warranty Costs	0.12	0.24
Light Duty Truck Emission Standards		
Hardware	0.20	0.52
Increased Recall Rate	0.04	0.04
Increased Warranty Costs	0.09	0.09
Heavy Duty Truck Emission Standards		
Hardware	0.08	0.08
Non-Conformance Penalties	0.08	0.08
Alternative Fuels	0.03	0.13
Subtotal	$1.36	$3.10
Added Industry Infrastructure	Not Estimated	Not Estimated
Motorcycles	0.01	0.03
On-Board Vapor Recovery	0.32	1.60
Diesel Fuel Desulfurization	0.20	2.80
Fuel Volatility Control	0.45	0.45
Oxygenated Fuels	0.34	1.02
Total	$2.68	$9.00 billion

* These estimates include costs for steps EPA might take under current law and thus do not represent incremental costs due to the subcommittee bill.

** See text for assumptions and limitations

TABLE 2

ESTIMATED POTENTIAL IMPACTS ON DOMESTIC PRODUCER MARKETS*

	Low Estimate	High Estimate**
Car Production Reductions		
Lost to Imports	None	$1.5 billion/yr
Lost to Decisions to Not Buy	None	1.5
Light Duty Truck Production Reductions		
Lost to Imports	None	1.8
Lost to Decisions to Not Buy	None	1.8
Heavy Duty Truck Production Reductions	None	4.0
Total	None	$10.6 billion/yr

* First year impact; impact would decline over time

** The high estimate is based on a worst case scenario in which 6- and 8-cylinder cars sacrifice performance to reach the emission standards the first several years of their applicability