An Evaluation of Adopting the California Mobile Source Control Program in the Eight Northeast States

Executive Summary

NESCAUM

Northeast States for Coordinated
Air Use Management

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(NESCAUM)

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AN EVALUATION OF ADOPTING THE CALIFORNIA MOBILE SOURCE CONTROL PROGRAM IN THE EIGHT NORTHEAST STATES

Excessive levels of ozone and carbon monoxide (CO) in the ambient air are a persistent public health problem in the northeast states. Motor vehicles are the Northeast's single most significant source of nitrogen oxides (NOx) and hydrocarbons (HC), the two principal ingredients of ozone. In addition, motor vehicles are the largest source of CO emissions. In recent years, the federal motor vehicle emissions control program and state inspection and maintenance (I/M) programs have yielded significant emission reductions. However, ambient pollution levels remain far above the health-based standards. Worse yet, motor vehicle emissions are expected to begin increasing within the next ten years as total vehicle travel continues to increase and no further reductions in new vehicle emissions are required under the current federal emissions control program.

Further measures to eliminate or reduce emissions from motor vehicles, such as those taken and planned by the State of California, could, if adopted by the Northeast states, provide motor vehicle exhaust emissions reductions of 16% for HC, 39% for CO, and 27% for NOx, relative to the current federal standards. In addition to the fact that adoption of the California motor vehicle control program is a technologically feasible means to achieve significant additional emission reductions of HC, CO, and NOx in the Northeast, the cost per ton of emissions reduction associated with adoption of the California program is competitive with other available control measures.

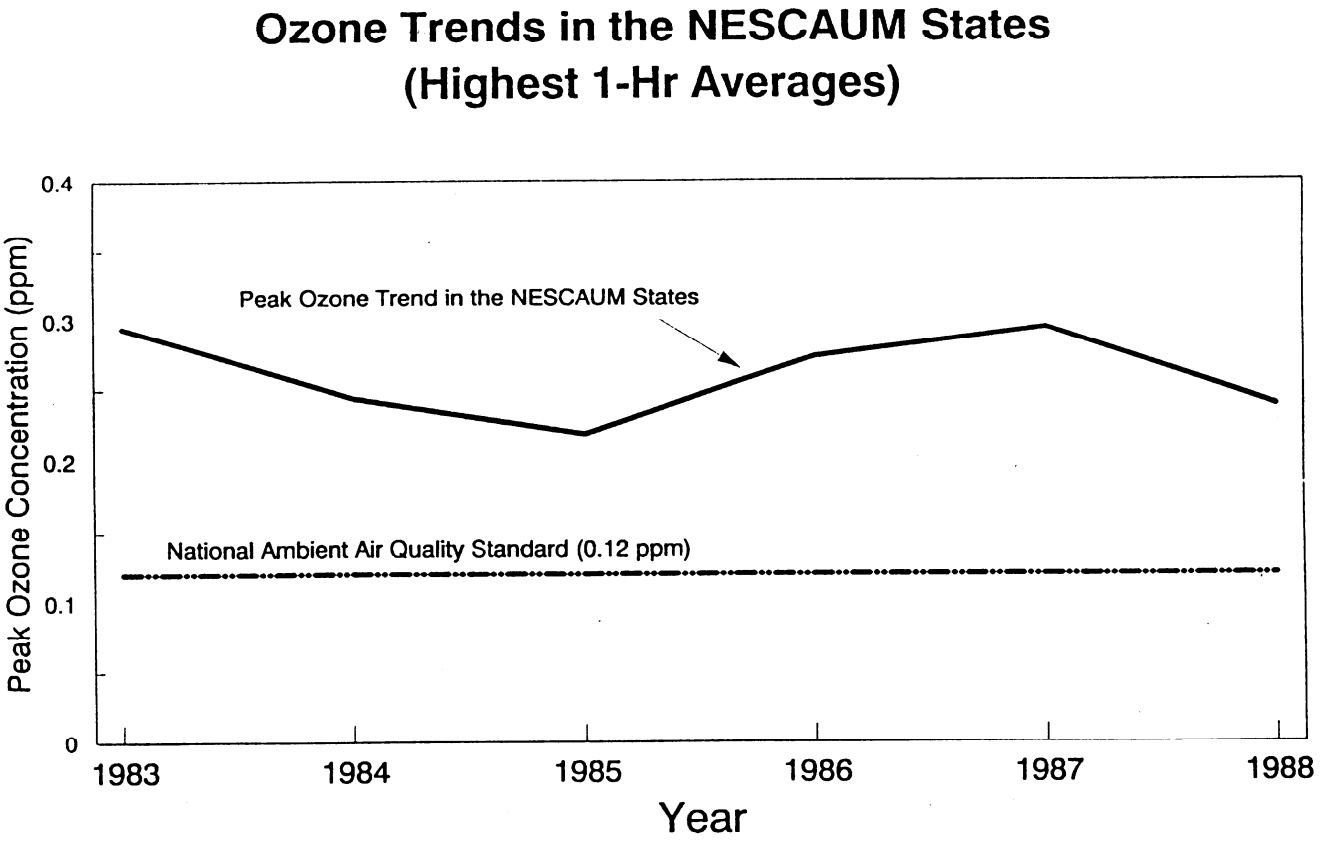
Although the emission reductions projected under the proposed California standards are substantial, the benefits over the EPA program are based on the assumption that there will be no further changes in federal emission standards. Previous proposals for Clean Air Act Amendments have included significant changes to the vehicle emission standards. Tightening of the federal standards would obviously reduce the incentive to adopt the current and proposed California programs. In addition, federal action to require additional CO emissions control under cold weather conditions could be particularly beneficial in the NESCAUM states. On the other hand, there are a number of possible enhancements to the California program that could increase its benefits over the federal program in the future. The ultimate effect of the California vehicle emission program will depend on future changes to both the federal and California programs.

Air Quality Trends

Violations of the national ambient air quality standard for ozone, caused by emissions of HC and NOx, occur over broad regions of the Northeast in the summertime. These violations occur at urban, rural, and remote sites, encompassing densely populated areas as well as more pristine recreational sites. In addition, ambient concentrations of nitrogen dioxide, nitrate particles, atmospheric acidity and acidic deposition may all be expected to worsen as NOx emissions increase.

As illustrated in Figure 1, there has been no clear progress toward attainment of the national ambient air quality standard for ozone throughout the eight states (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont) that are members of Northeast States for Coordinated Air Use Management (NESCAUM). Peak hourly ozone levels have remained at 2 to 2 1/2 times the 0.12 ppm standard.

Figure 1

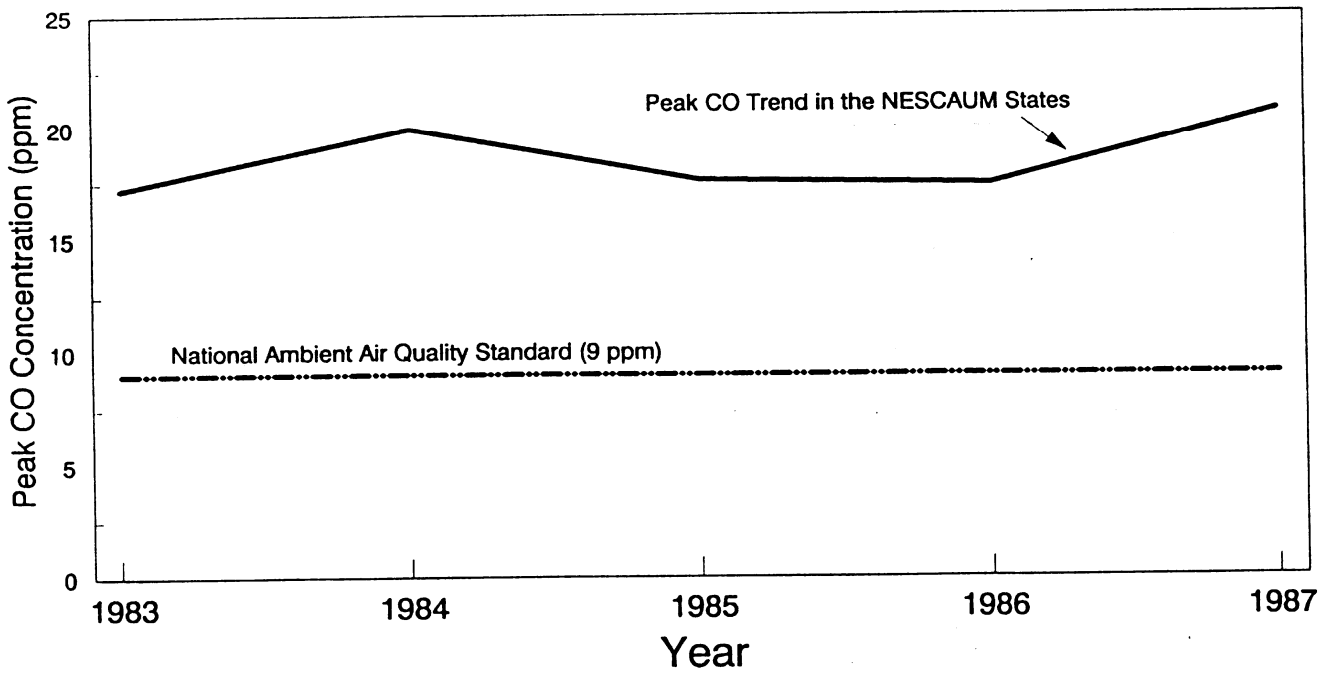


Although some states have relatively low emissions of ozone precursors, ozone is a pollutant that can be transported over long distances. As a result, all eight of the NESCAUM states have recently experienced ozone concentrations in excess of the health-based standard.

As shown in Figure 2, there is a similar lack of progress in peak carbon monoxide concentrations. The highest 8-hour average concentrations being recorded each year are typically twice the health-based standard of 9 ppm. As with the case of ozone precursors, some states have relatively low emissions of carbon monoxide. Unlike ozone, carbon monoxide is not generally transported over long distances. However, high levels of CO can build up in relatively small areas if there is any significant traffic congestion. High ambient CO levels are especially a problem when traffic congestion occurs during periods of low ambient temperature. All of the NESCAUM states except Maine, Rhode Island, and Vermont have recently experienced CO concentrations in excess of the health-based standard.

Figure 2

Carbon Monoxide Trends in the NESCAUM States (Highest 8-Hr Averages)



Vehicle Emissions

Motor vehicles are the largest single source of ozone precursors in the northeast states. Based on estimates for 1987, on-road motor vehicles account for about 61% percent of the HC emissions and 53% percent of the NOx. On-road motor vehicles account for about two-thirds of all CO emissions on an areawide basis, and a much higher portion of CO emissions in areas with the most traffic congestion.

Although significant emission reductions have been achieved in the last decade due to the sale of cleaner new vehicles, it has been almost ten years since the Environmental Protection Agency (EPA) made any significant changes in the emission standards that apply to new cars. In addition, EPA has only a very limited program for assuring compliance with emission standards in customer service. Finally, EPA is precluded from requiring manufacturers to warrant their light-duty vehicle emission control systems for more than 50,000 miles.

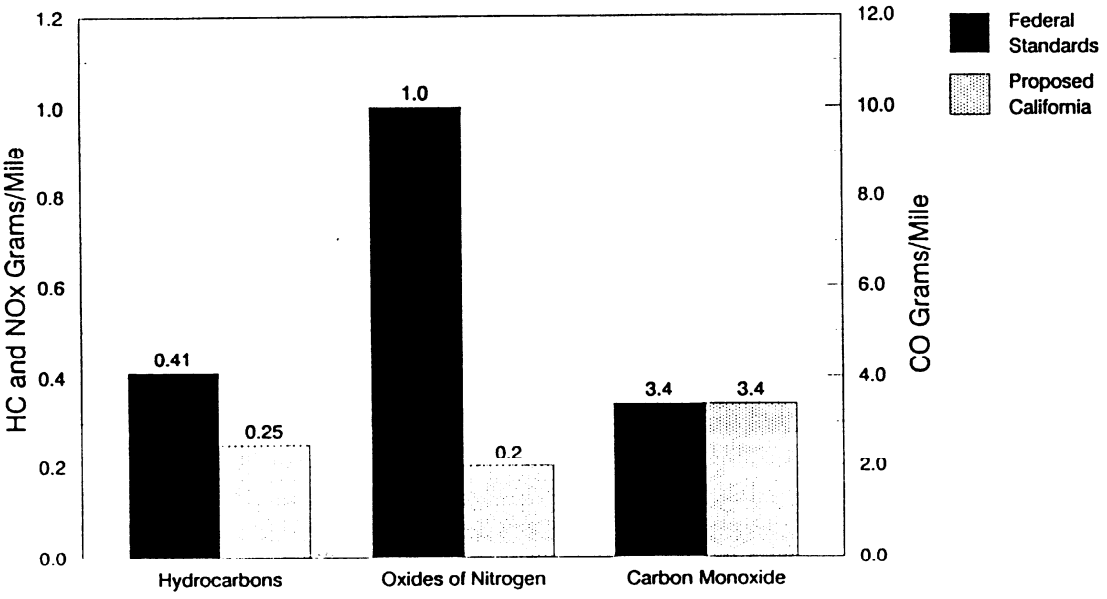
In contrast to the federal program, the State of California is pursuing additional controls on virtually all classes of motor vehicle emissions. As the only state with the authority to establish vehicle emission standards, California has historically required more effective emission controls than EPA. Despite the fact that only about 10% of all new vehicles are sold in California, the level of in-use compliance testing is about the same as that done by EPA. Compared to the federal standards, the current California standards are similar for HC, higher for CO, and lower for NOx. (Knowledgeable staff at EPA and CARB agree that California and federal passenger cars have similar CO emissions despite the numerically higher standard in California.) However, the California Air Resources Board (CARB) staff has recently proposed the adoption of the next generation of emission standards for several vehicle classes.

The proposed California passenger car exhaust emission standards are compared to the current federal standards in Figure 3. The proposed 0.25 gram/mile (g/mi) hydrocarbon and 3.4 g/mi carbon monoxide standards are anticipated to be required beginning with the 1993 model year. The CARB staff has also announced its intention to propose a 0.2 g/mi NOx standard for 1996. Some delay in this standard is likely; however, the current California standard of 0.4 g/mi NOx is still far below the federal standard of 1.0 g/mi. Similar increases in standard stringency are proposed for light-duty, medium-duty, and light-heavy-duty trucks.

In addition to its current and proposed emission standards, CARB presently requires on-board diagnostic (OBD) systems to monitor the performance of the emissions control system. With such OBD systems, a dashboard indicator light is supposed to alert the driver to malfunctions that could cause emissions to exceed the standards. CARB is planning to require upgraded OBD systems during the mid-1990s. The more advanced OBD systems could also be used to detect high-emitting vehicles during the periodic inspections required under state I/M programs. Advanced OBD systems will also have the capability to provide diagnostic information to aid in the proper repair of defects.

Figure 3

Proposed California Standards Compared to Current Federal Standards (Passenger Cars)



Note: Proposed California HC standard is non-methane. Federal standard is total HC.

Potential Benefits of the California Program

Section 209 of the Clean Air Act preempts states other than California from establishing emission standards for new motor vehicles. However, Section 177 of the Act provides the opportunity for other states to require compliance with the California standards. This language was added to the Act with the Clean Air Act Amendments of 1977 (August 7, 1977).

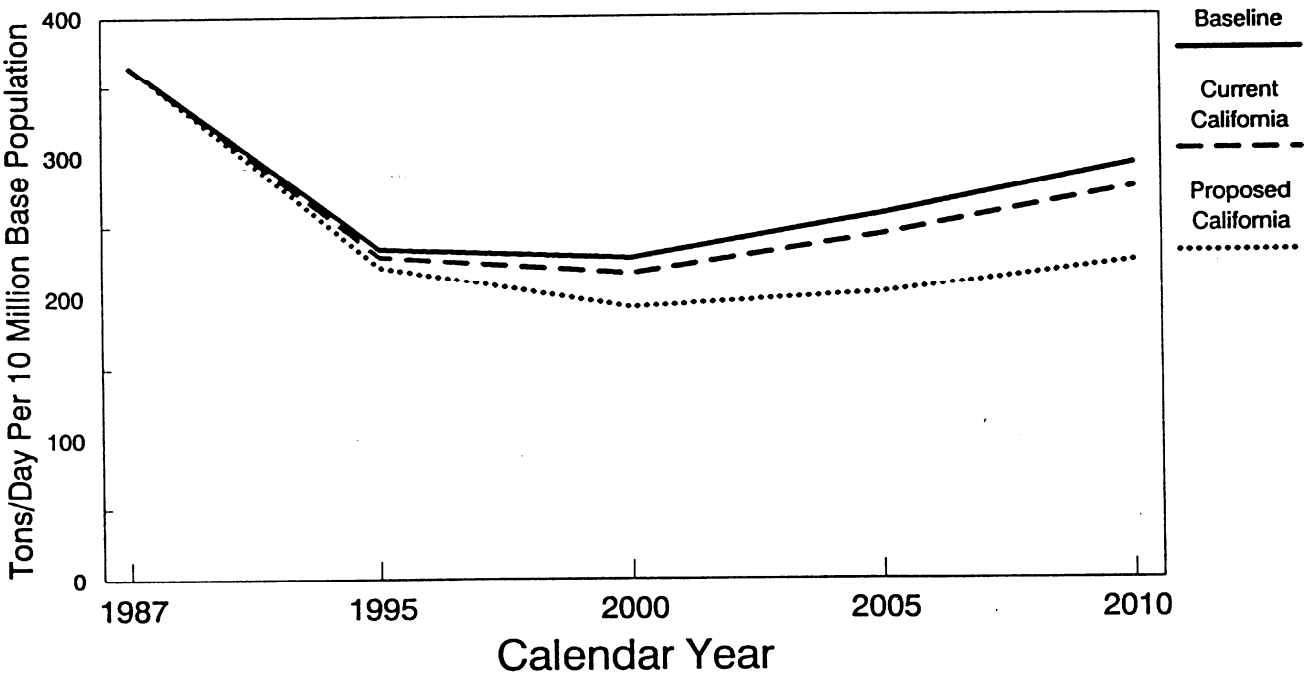
Figures 4-6 present a forecast of on-road vehicle exhaust emissions under the federal, current California, and proposed California standards.* As the figures show, there are relatively small differences in HC and CO emissions projected when the current California program is compared to the federal program. However, significant reductions in NOx would be associated with the current

* The units in the figures are tons/day per 10 million population in the 1980 Census. For a state with a population of 7 million in the 1980 Census, the estimated emissions would be 70% of the values shown in the figures.

California NOx standards. When the proposed California program is compared to the current federal standards, it is apparent that reductions in all three of the principal vehicle pollutants are projected to occur. By calendar year 2010, the projected motor vehicle exhaust emissions reductions are 16% for HC, 39% for CO, and 27% for NOx, relative to the federal standards.

Figure 4

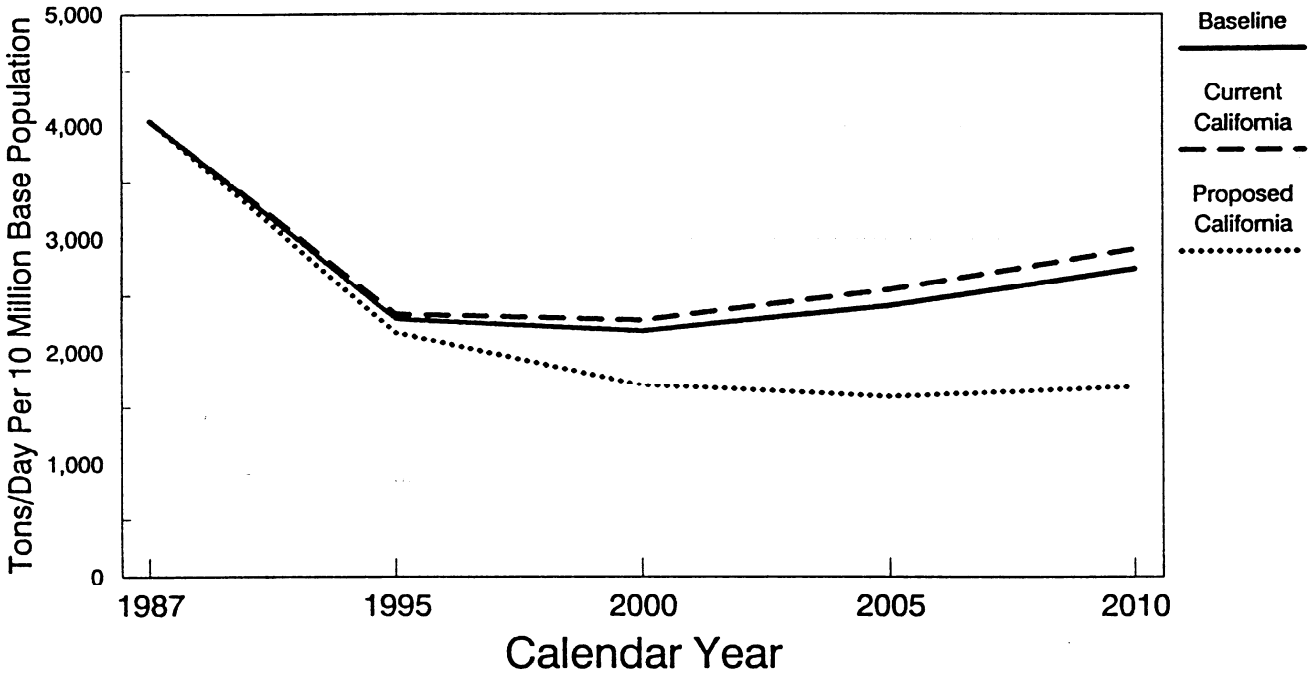
On-Road Vehicle HC Exhaust Emission Forecasts for a Typical NESCAUM State



Note: California forecasts include increased I/M benefits due to OBD systems.

Figure 5

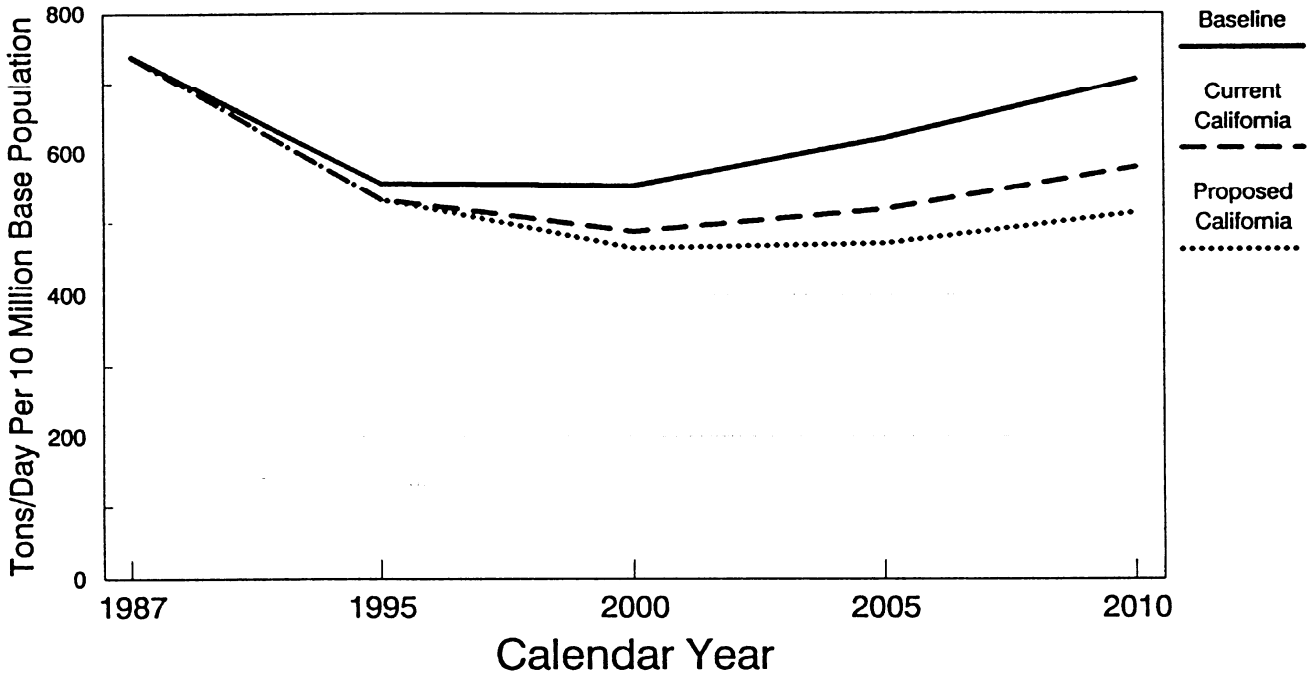
On-Road Vehicle CO Emission Forecasts for a Typical NESCAUM State



Note: California forecasts include increased I/M benefits due to OBD systems.

Figure 6

On-Road Vehicle NOx Emission Forecasts for a Typical NESCAUM State



Note: California forecasts include increased I/M benefits due to OBD systems.

The estimates plotted in Figures 4-6 were prepared by Sierra Research, Inc. (Sierra). (It should be noted that Sierra projects somewhat greater emission reductions associated with the California program than does EPA.) Sierra's projected emission reductions for the current and proposed California programs in calendar year 2010 are presented in tabular form in Tables 1 and 2. Table 1 contains estimates for on-road vehicles only. Table 2 shows Sierra's forecast of how adoption of the California program would affect overall emissions (from all sources). When stationary sources and other mobile sources are added in, the net benefits of the proposed California program are about 6% for HC, 23% for CO, and 12% for NOx.

Table 1

Calendar Year 2010
On-Road Vehicle Exhaust Emission Changes
for a Typical NESCAUM State

	Hydrocarbons	Carbon Monoxide	Oxides of Nitrogen
Current California Standards	-4.0%	+6.2%	-18.0%
Proposed California Standards	-16.2%	-38.7%	-27.2%

Table 2

Calendar Year 2010 Total Emission Changes
(Mobile and Stationary Sources)
for a Typical NESCAUM State

	Hydrocarbons	Carbon Monoxide	Oxides of Nitrogen
Current California Standards	-1.6%	+3.7	-8.1%
Proposed California Standards	-6.3%	-22.8%	-12.3%

Costs and Cost/Effectiveness

The price premium for the passenger cars and light trucks meeting the proposed California requirements has been estimated at about $150 per vehicle.* No fuel economy differences are anticipated. Other costs might include an independent compliance and enforcement testing program. If such a program were conducted under a regional agreement, its annual cost is estimated at $1 million. However, total reliance on the vehicle testing conducted by the state of California is an option that would minimize the staffing required to implement the California vehicle standards. Some local program to ensure compliance with a requirement to sell California-certified vehicles would be required. Administrative and compliance costs would vary by state. On a regional basis, another $2 million would be required to maintain a reasonable compliance program.

On an annual basis, the total vehicle purchase costs plus the costs of adopting and enforcing the proposed California program would be under $20 per vehicle (assuming a ten-year vehicle life). Cost per ton of hydrocarbon and NOx reduction is estimated at about $600. This is significantly less than many other hydrocarbon and NOx control measures, some of which exceed $5,000 per ton.

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* This does not include an estimate for the 0.2 g/mi NOx standard because of the uncertain feasibility of that proposal.