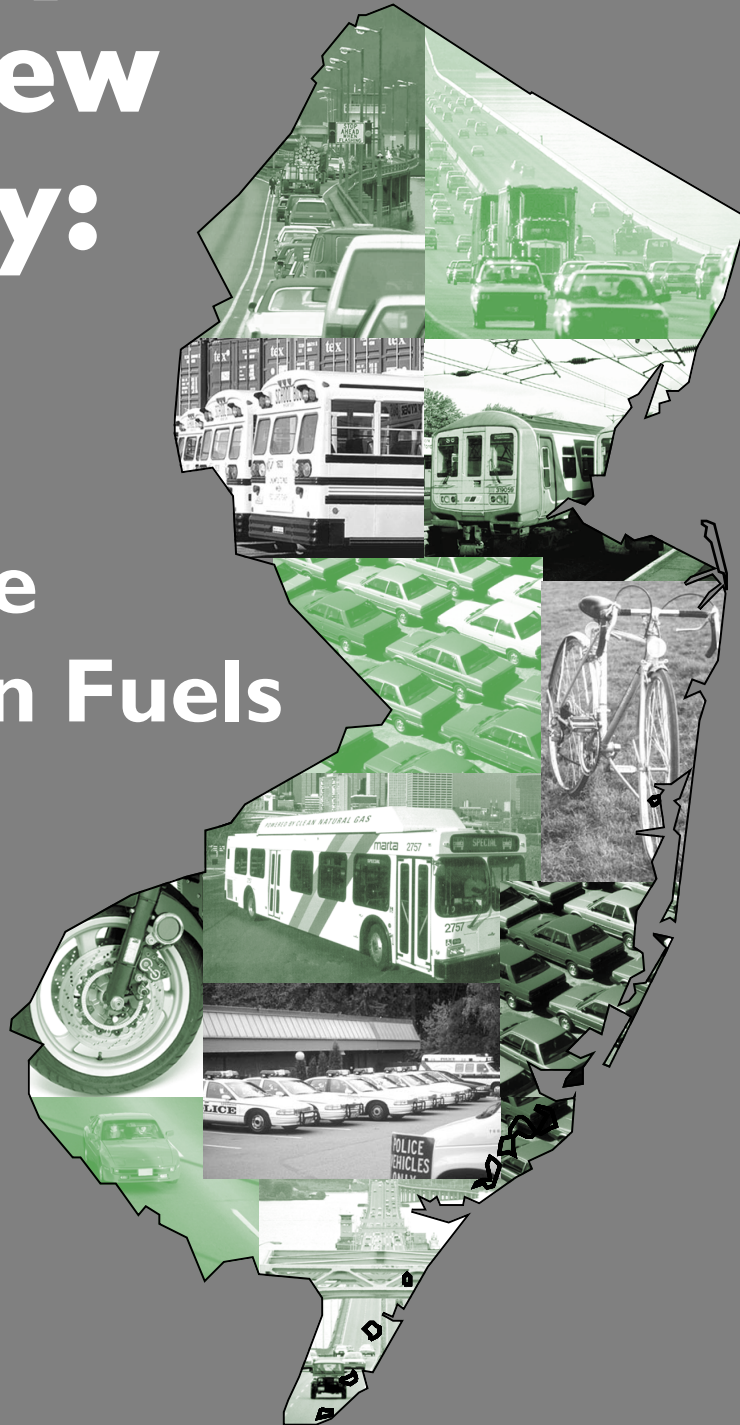


# Green Transportation for New Jersey:

## The Promise of Clean Fuels



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# Foreword

New Jersey's governor and many other government and environmental leaders in this key industrial state have been vocal proponents of putting New Jersey on the path to environmental sustainability. They have espoused, as one key goal, taking advantage of cleaner and more efficient means of transportation. This new INFORM report addresses a central question: to what extent has the commitment to promoting alternative-fuel vehicles (AFVs) produced results?

*Green Transportation for New Jersey: The Promise of Clean Fuels* analyzes the policies and programs now in place, the level of effort they reflect, and the extent to which ideas have been translated into action by putting alternative-fuel vehicles on New Jersey's roads. While changes in fuels and basic technology are not made easily or overnight, our research indicates that sustainable transportation in New Jersey is still largely an unmet promise. And it is the state's residents who are paying the price.

Of some 5.8 million cars, buses, and trucks registered in New Jersey, only several thousand are AFVs – either electric vehicles or vehicles powered by cleaner fuels such as compressed natural gas. Emissions from these millions of conventionally fueled vehicles are a major reason why 95 percent of the state's eight million people live in areas that have been designated as failing to meet federal health-based air quality standards (compared to an average 38 percent of the US population overall). Transportation is responsible for 43 percent of the emissions of volatile organic compounds in New Jersey and 44 percent of the nitrogen oxide emissions – the two main components of ground-level ozone, or smog. Nationwide, transportation contributes more than a quarter of the manmade particulate emissions (soot) that are contributing to soaring rates of asthma in cities throughout the country, especially among the young and the elderly. Additionally, transportation accounts for 38 percent of all hazardous air pollutants in New Jersey.

In researching this report, INFORM identified some innovative programs and interviewed numerous individuals at state departments and agencies who indicated they are working hard on the issue of cleaner-fueled vehicles in the state. Of special note, for the last three years New Jersey has exceeded Energy Policy Act requirements in its purchase of AFVs for the state's light-duty fleet and has mandated that these additional vehicles meet low-emission standards not included in the act's requirements. It has also launched a demonstration station car commuter program involving 21 electric cars and 46 refueling stations in three locations. And it has sought to promote business involvement in developing advanced-technology vehicles, which it has publicized through the

development of two prototype fuel cell electric vehicles, the New Jersey Venturer in 1999 and the New Jersey Genesis in 2000.

Overall, however, New Jersey's initiatives have produced little progress in advancing a transition to cleaner forms of transportation. This report identifies many areas in which programs and policies could be strengthened. It also contains INFORM's recommendations for five essential building blocks that would help create the kind of strong base needed for a truly exemplary alternative-fuel vehicle program—one that bears out the expressed vision of the state's leaders. These include (1) creating a dedicated funding source for advanced- and alternative-vehicle acquisition and infrastructure; (2) developing a system for monitoring the number of cleaner-fueled vehicles on the road; (3) building a significant refueling infrastructure; (4) reducing the incremental costs of acquiring and operating alternative-fuel vehicles through subsidies; and (5) promoting the state's achievements and activities in the AFV field.

Two particular issues merit immediate attention. The first involves land use planning in the state. As pointed out in this report, while New Jersey's population grew just 12.3 percent between 1970 and 1997, vehicle miles traveled increased by almost 36 percent. And between 1985 and 1997, average vehicle miles traveled per capita increased from 7000 to almost 8000 miles. Meanwhile, as auto-dependent office developments quadrupled from 1990 to 1997, the number of transit-accessible developments remained virtually unchanged. This kind of sprawl threatens not only to consume New Jersey's remaining open spaces but also to reinforce its residents' dependency on the automobile and worsen vehicle-related air pollution.

Second, New Jersey Transit, through its procurement decisions, has an enormous opportunity to help improve the quality of the air breathed by New Jersey's citizens, particularly in polluted urban areas. However, instead of leading in the national trend toward buses fueled by clean compressed natural gas (CNG), the agency — with the second largest bus fleet in the country (1950 buses) — is trying to stretch its dollars by replacing highly polluting older models with new buses fueled by diesel. While these buses will significantly reduce the pollution caused by New Jersey Transit's fleet, INFORM's research (presented in our recent report, *Bus Futures: New Technologies for Cleaner Cities*) indicates that the state may be throwing good money after bad, and that greater reductions per bus could be achieved by purchasing buses powered by intrinsically cleaner fuels, especially natural gas.

Compressed natural gas buses are fully commercial and road-ready today, and they can bring much greater emissions reductions on a per bus basis than those obtained by replacing segments of the existing fleet with new diesel buses. This is especially so because, while diesel exhaust has been

found to contain more than three dozen toxic substances, exhaust from CNG buses is virtually toxics-free. Moreover, natural gas can be used in demonstrations of efficient hybrid electric and fuel cell buses, thus paving the way to truly sustainable bus transportation. And the infrastructure developed to fuel CNG buses, if planned effectively, may enable other fleets to convert to natural gas as well.

It is INFORM's hope that the findings and conclusions of *Green Transportation for New Jersey* will cause government, business, and environmental leaders to reflect on what has been accomplished so far in the state, and on what has still to be done in order for New Jersey to achieve the vision of sustainable transportation articulated by its leaders.

Joanna D. Underwood  
*President*  
*INFORM, Inc.*



## I INTRODUCTION

The transition to cleaner transportation fuels is a profound and difficult undertaking. The economic stakes in the current petroleum-based infrastructure are high, with the automotive and oil industries making up a huge economic sector in the United States. Nonetheless, there are compelling air quality, health, environmental, and energy security reasons to make the transition. It will not be simple and it will not be rapid, but by understanding what has been accomplished so far and seeing clearly what remains to be done, it will be easier to take the necessary next steps as effectively as possible.

New Jersey has ample reason to be a leader in this effort. Some 95 percent of its 8.1 million residents live in areas that the US Environmental Protection Agency (EPA) has designated as failing to attain federal air quality health standards. Emissions from gasoline- and diesel-burning vehicles, a major contributor to this air pollution, are rising with ever-increasing vehicle usage. The EPA temporarily imposed economic sanctions on the state because of its delay in meeting federal air quality goals—and New Jersey narrowly avoided the imposition of more severe sanctions by meeting an agency requirement just before the EPA’s deadline.

INFORM has been studying alternative-fuel vehicles, their potential for reducing air pollution, and their increasing use around the world for more than a decade. We have analyzed which vehicle fuels have the most potential, investigated the obstacles to their use, and assessed the progress being made in specific states and countries. In 1997, we published *Spotlight on New York: A Decade of Progress in Alternative Transportation Fuels*, and early in 2000 released a revised assessment (*Clean Transportation for New York: A Long Road Ahead*) of the state and city’s achievements to date. INFORM’s study of New Jersey was undertaken in order to see how this neighboring state, with its own specific problems and programs, is meeting the challenge of reducing vehicle-related air pollution through the use of cleaner transportation fuels.

In this report, INFORM first examines the problems caused by traditional transportation fuels and discusses the promise of alternative fuels; then assesses vehicle-related air pollution in New Jersey; and finally surveys the status of the state’s alternative-fuel vehicle programs, including the number of alternative-fuel vehicles on the roads, the initiatives in place to put them there, the obstacles to more widespread alternative-fuel vehicle use, and steps that could be taken to increase the number of alternative-fuel vehicles in New Jersey.

It should be emphasized that the world of alternative-fuel vehicles is a constantly changing one. New technologies are developed; vehicles go in and out of service; governments and businesses institute new programs, expand existing projects, and change their requirements and strategies; fuel prices rise and fall; and political opportunities come and go. Describing alternative-fuel vehicle programs is therefore analogous to chasing a moving target. This report should be seen as a snapshot of New Jersey's use of alternative-fuel vehicles at one moment in time – the first four months of 2000 during which it was researched and written.

## 2 BACKGROUND AND FINDINGS

### Background: Vehicle Emissions and Air Pollution in New Jersey

- **Some 95 percent of New Jersey’s eight million residents live in areas that have been designated by the Environmental Protection Agency as not attaining federal health-based air quality standards.** These residents live in 18 (out of 21) counties that have designated in nonattainment of federal standards for ground-level ozone (smog).<sup>1</sup> Five of these counties, home to 39 percent of the state’s residents, have also been designated in nonattainment for carbon monoxide (although air monitoring data indicate no recent violations).<sup>2</sup> Of the 18 counties, 12 (Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, and Union) are classified as being in the higher of two levels of “severe” nonattainment of federal standards, just below the “extreme” nonattainment rank that characterizes Los Angeles and Houston. The other six counties are in the lower level of severe nonattainment.

By way of comparison, 38 percent of the population of the United States as a whole lives in designated nonattainment areas for one or more of the six so-called priority pollutants, with more than one-third of the population living in counties designated in nonattainment for ground-level ozone and just over 10 percent living in counties designated in nonattainment for carbon monoxide.<sup>3</sup>

- **A major source of New Jersey’s air pollution is emissions from gasoline- and diesel-burning vehicles.** Ground-level ozone is produced when volatile organic compounds and nitrogen oxides interact on sunny days: in New Jersey, transportation accounts for 43 percent of all volatile organic compound emissions,<sup>4</sup> and on-road vehicles account for an estimated 44 percent of all nitrogen oxide emissions.<sup>5</sup> In the Northeast as a whole, motor vehicles are responsible for 70 percent of all carbon monoxide emissions.<sup>6</sup>
- **Gasoline- and diesel-burning engines also contribute to emissions of particulates and toxic chemicals in New Jersey, although it is difficult to quantify exactly how much.** Nationally in 1997, vehicles accounted for 24 percent of emissions of particulate matter (PM) in the larger PM<sub>10</sub> category from so-called anthropogenic sources (i.e., those that can be regulated, such as transportation, fuel combustion, and industrial processes);<sup>7</sup> however, the EPA has noted that most of the particulates emitted by motor vehicles fall into the smaller PM<sub>2.5</sub> category (and are potentially more dangerous to human health), and that diesel engines, in particular, account for much higher particulate emissions in urban areas than indicated by the national averages.<sup>8</sup> Additionally, 11 out of 25 toxic chemicals that exceed health benchmarks in one or more New Jersey counties come, at least in part, from mobile (i.e., transportation) sources.<sup>9</sup> Overall, transportation accounts for 38 percent of all hazardous air pollutants in New Jersey identified by the Environmental Protection Agency in its 1990 Cumulative Exposure Project analysis.<sup>10</sup>

- **Trends in vehicle use are bringing increased vehicle emissions.** Between 1970 and 1997, vehicle miles traveled in New Jersey increased about 36 percent (with an 11 percent increase between 1985 and 1997),<sup>11</sup> while the state's population increased only 12.3 percent over that entire 17-year period (with a 6.4 percent increase between 1985 and 1997).<sup>12</sup> Vehicle miles traveled increased an additional 1.9 percent from 1997 to 1998. Average annual per capita mileage increased from 7000 miles per person in 1985 to nearly 8000 miles per person in 1997.<sup>13</sup> The number of automobile-dependent office developments in New Jersey quadrupled between 1990 and 1997, while the number of transit-accessible office developments remained virtually unchanged.<sup>14</sup>

The increasing popularity of sports utility vehicles is compounding the problems caused by these increases in vehicle mileage because they attain only 12 to 14 miles per gallon in city travel and only 16 to 18 miles per gallon on the highway, thus emitting 40 percent more pollutants per vehicle than ordinary cars.<sup>15</sup> (In December 1999, President Clinton announced new regulations, to be phased in between the 2004 and 2009 model years, that will set the same emissions limits for light trucks, including sports utility vehicles, as for cars.) Nationally in 1998, sports utility vehicles accounted for 22.4 percent of all new vehicles typically purchased for personal and family use (cars and minivans, as well as sports utility vehicles), up from 10.6 percent in 1992.<sup>16</sup>

- **As part of a major US truck corridor with some of the highest densities of truck traffic, New Jersey is subject to high levels of emissions of nitrogen oxides and particulates from the heavy-duty diesel engines that power these vehicles.** In 1994 (the most recent year for which data are available), trucks traveled 3.58 billion vehicle miles in New Jersey, a very large number relative to the size of the state; many were just traveling through from one out-of-state location to another. (To illustrate the magnitude of this truck traffic, vehicle miles traveled in the state are more than two-thirds that of New York, although New Jersey is less than one-sixth its neighbor's size.<sup>17</sup>) In the Northeast, heavy-duty engines (including those of buses and off-road vehicles such as construction and farm vehicles) are responsible for one-third of the nitrogen oxide emissions and more than 80 percent of the fine particulate emissions from transportation sources.<sup>18</sup>
- **New Jersey's heavy loads of pollution led the Environmental Protection Agency to impose economic sanctions that prevented the state from obtaining important federal transportation funding and restricted new development projects; the state narrowly avoided even more severe sanctions.** Because New Jersey did not implement an enhanced vehicle inspection and maintenance program sufficiently rapidly, the EPA prevented the state from receiving federal funding for new road-related transportation projects for one year; it also required emissions reductions from stationary sources before the state could begin new building projects that would require air quality permits and create new stationary sources of air pollution. This last restriction was lifted in December 1999 when the state implemented the inspection and maintenance program; by doing so just before an EPA deadline, New Jersey also narrowly avoided additional restrictions that would have prevented it from accessing federal funding for existing highway projects. However, difficulties with the new inspection and maintenance program caused the state to suspend implementation shortly after it began; the program is gradually being resumed and is expected to be fully restored by August 2000.

## Use of Alternative-Fuel Vehicles in New Jersey

- **At present, New Jersey has no way of determining how many alternative-fuel vehicles are in use in the state, what types of vehicles are running on alternative fuels, which alternative fuels they are using, and which organizations, businesses, or individuals are buying them.** The state is in the process of upgrading its motor vehicles database to include fuel type; however, because this information is to be captured during the biannual vehicle inspection process, it will not be available until two years after a vehicle's initial registration. This data collection process is part of the new inspection system scheduled to be fully operational by August 2000; thus, the state expects to have comprehensive information about alternative-fuel vehicles purchased before August 2000 by August 2002.<sup>19</sup>
- **There are no accurate national statistics on alternative-fuel vehicle use, so it is impossible to compare the progress of different states in acquiring alternative-fuel vehicles.** The only state-by-state statistics available, from the Department of Energy's Energy Information Administration, are not based on reporting by each state; instead they are estimates, derived from many different sources, that build on an estimated base year. The estimates may include off-road vehicles such as farm equipment and golf carts and the data types gathered may vary from state to state. In some cases, the EIA divided national estimates among the 50 states based on population and other factors; in other cases, it totaled the estimates of individual states to obtain a total national estimate.<sup>20</sup>
- **The best information on alternative-fuel vehicles in New Jersey comes from the North Jersey Clean Cities program (part of the US Department of Energy's Clean Cities program), which compiles data on the number and types of alternative-fuel vehicles acquired by its members (including federal, state, and local governments and agencies, fuel suppliers, and other companies) in the 13-county area covered by the program.** As of the end of 1999, this coalition included 2230 alternative-fuel vehicles (up from 1498 in 1998): 1951 compressed natural gas (CNG) vehicles (1852 cars and light-duty vehicles, 44 medium- and heavy-duty vehicles [other than buses], and 55 buses), 20 light-duty electric vehicles, 148 light-duty propane vehicles, and 111 light-duty ethanol vehicles. The program coordinator believes these figures include almost all of the alternative-fuel vehicles in the program area, and most of those in the state as a whole.<sup>21</sup>

## Refueling Infrastructure in New Jersey

- **New Jersey lacks a publicly accessible refueling infrastructure for alternative-fuel vehicles. This means it is virtually impossible for small businesses and individuals to use such vehicles, since it is impractical or impossible for them to establish their own refueling stations.** As of December 1999, there were a total of 57 alternative-fuel refueling sites in the North Jersey Clean Cities program area, of which 21, for liquefied petroleum gas, mostly serviced farm vehicles, propane distributor fleets, and some utility vehicles (such as forklifts).<sup>22</sup> None of the state's 34 CNG refueling stations is open to the public; privately operated stations are generally open only to the company's own fleet, although some are also open to state and federal fleet vehicles through contractual arrangements.

- **Since New Jersey's highways are important corridors for truck freight traffic heading from the south and west to New York and New England, its lack of publicly accessible refueling stations also has national consequences, presenting an obstacle to alternative-fuel use by vehicles from other parts of the country.** In the western United States, a partnership of federal, state, and local government entities, along with private companies, is creating the Interstate Clean Transportation Corridor, a long-haul truck freight transportation corridor linking Los Angeles, San Francisco, Sacramento, Las Vegas, Salt Lake City, and the San Joaquin Valley, by placing alternative-fuel refueling stations along interstate highways.
- **Planned refueling stations in support of the state's enlarged alternative-fuel vehicle fleet miss an opportunity to serve as a nucleus for a publicly accessible infrastructure that would make a more extensive private alternative-fuel vehicle program possible.** Current plans do not call for these stations to be available to private fleets and the public, although potential legal, tax, and liability issues have been resolved in other states.

## Alternative-Fuel Vehicle Initiatives in New Jersey

- **New Jersey started experimenting with alternative-fuel vehicles as early as 1991, but these programs brought only small numbers of such vehicles into the state.** New Jersey Transit began a demonstration program in 1991 with five compressed natural gas transit buses, and in 1992 the state initiated an Alternative Fuels Demonstration Project with Public Service Electric & Gas and the New Jersey Propane Gas Association. However, by 1997, when the state's demonstration program was converted into a federal Energy Policy Act compliance program, the state's fleet included just 61 CNG vehicles, 13 propane vehicles, one CNG refueling station, and one propane refueling station.<sup>23</sup> New Jersey Transit did not purchase any additional alternative-fuel buses until 1999.
- **Governor Christine Todd Whitman has made several commitments to increase the number of alternative-fuel vehicles in New Jersey, most comprehensively in April 1999, when she announced a series of specific initiatives.** The governor committed the state to (1) acquiring more alternative-fuel vehicles for its fleets than mandated under the federal Energy Policy Act (EPACT); (2) ensuring that the additional vehicles meet low emissions standards (not required by EPACT); (3) creating a refueling infrastructure to service the enlarged state fleet; and (4) encouraging local government and other public fleets to acquire alternative-fuel vehicles. She also proposed a corporate business tax credit for alternative-fuel vehicle acquisition and established an interagency task force to oversee alternative-fuel vehicle and advanced-technology vehicle efforts in the state.
- **Because the Advanced Technology Vehicle Task Force is scheduled to report to the governor on the state's progress in meeting these commitments in August 2000, some state government staff members were unwilling to provide detailed information about the state's activities over the past year.** As a result, INFORM was unable to obtain comprehensive information about some New Jersey programs.

- **Although Governor Whitman proposed specific sources of funding for the programs she announced in April 1999, the state has no ongoing, dedicated source of funding for these and other alternative-fuel vehicle initiatives.** Specifically, the governor committed the following sums from the Petroleum Overcharge Reimbursement Fund (created by the oil companies in settlement of national lawsuits in the 1970s): \$1.1 million to develop a refueling infrastructure, \$1.6 million toward the incremental costs of acquiring alternative-fuel vehicles for the state fleet in model year 2000, and \$1.0 million to assist other public entities in acquiring alternative-fuel vehicles (by covering the incremental costs of about 200 vehicles at \$5000 per vehicle). The state and the North Jersey Clean Cities program have also obtained project funding from various federal sources, including Congestion Mitigation and Air Quality grants from the US Department of Transportation. However, because of the lack of a dedicated source of funds for alternative-fuel vehicle/infrastructure programs, the state must continually, and not always successfully, seek funding from outside sources for any activities that go beyond those funded on a one-time basis. In contrast, for example, California applies an annual vehicle registration surcharge in nonattainment areas to provide more than \$100 million annually for alternative-fuel vehicle projects; New York has earmarked \$55 million from its Clean Water/Clean Air Bond Act for alternative-fuel vehicle acquisition and related programs; and Illinois has instituted a \$20 registration fee on fleets in the Chicago area to fund an alternative-fuels rebate program.
- **New Jersey has exceeded Energy Policy Act requirements for acquiring alternative-fuel vehicles for the state's light-duty fleet for the past three model years and the governor has committed the state to exceeding those requirements by 5 percent a year starting in 1999.** This will translate into 140 additional new alternative-fuel vehicles in the state fleet by 2002. Moreover, these vehicles are to meet California's low-emission vehicle (LEV) standards in model years 1999 and 2000 and its ultra-low-emission vehicle (ULEV) standards in model year 2001 and thereafter (EPACT does not specify emission standards). Finally, the state has acquired 102 compressed natural gas sedans meeting ULEV standards for the Department of Law and Public Safety, even though law enforcement vehicles are not included in EPACT's mandates. (In contrast, New York State exceeded EPACT requirements by 7 percent in model year 1998 and by 15 percent in model year 1999.<sup>24</sup>)
- **While EPACT has been instrumental in increasing the number of alternative-fuel vehicles in the New Jersey state fleet, the program has several drawbacks that actually interfere with its goal of reducing the use of conventional petroleum-based fuels.** First, the program mandates the purchase of certain percentages of alternative-fuel vehicles in the covered fleets, but not the actual use of alternative fuels. Thus, it counts bi-fuel and flexible-fuel vehicles toward the required totals even when these vehicles end up running on conventional fuel. Second, because EPACT only applies to light-duty vehicles, states wishing to acquire alternative-fuel medium- and heavy-duty vehicles (which can significantly reduce not only pollution but also fuel use, since these vehicles use much more fuel per mile than light-duty vehicles) must find additional funding to do so. Finally, EPACT only applies to federal and state government fleets, and to alternative-fuel provider fleets, so local governments and most private fleets are under no federal mandate to acquire alternative-fuel vehicles.

- **Hence, federal requirements meant to bring cleaner-fuel vehicles into the federal fleet are failing to do so in New Jersey.** In the federal 1999 fiscal year, to meet EPACT requirements, the US General Services Agency acquired 158 flexible-fuel ethanol vehicles (and no CNG vehicles) for federal agencies in the state.<sup>25</sup> Together, the General Services Agency and the US Postal Service plan to place a total of 276 flexible-fuel ethanol vehicles in northern New Jersey, even though there are no ethanol refueling stations in either New Jersey or any contiguous state. Thus, these “clean fuel” vehicles will in fact run on 100 percent gasoline 100 percent of the time.
- **Between October 1997 (when the North Jersey Clean Cities program received its official designation) and the end of 1999, the number of alternative-fuel vehicles in this program area increased by almost 79 percent (from 1245 to 2230 vehicles) and the number of refueling stations increased from 52 to 57.** The North Jersey Clean Cities program encompasses a 13-county area, with some 6.1 million residents.
- **Despite these successes, the North Jersey Clean Cities program has limited participation and has not been able to obtain as much funding as some other Clean Cities programs.** Within the 13-county area, participants include only two counties and several cities and municipalities, along with a variety of government agencies and private businesses. The program is staffed by one part-time coordinator and has received less than \$1 million in funding from federal and state sources. In contrast, the very active Greater Long Island Clean Cities Coalition in New York (covering a region of only two counties and 2.7 million people) leveraged more than \$3.5 million in state and federal funds between 1996 and the beginning of 1999, increasing the number of vehicles in the program area from fewer than 500 to more than 2000 in the same period.<sup>26</sup>
- **The North Jersey Clean Cities program does not include several important types of vehicles (such as taxis and school buses); moreover, it does include flexible-fuel ethanol vehicles that end up running exclusively on gasoline.** Alternative-fuel taxis can help reduce emissions in polluted and densely populated urban areas and are well suited to alternative fuels because they can be centrally fueled; a variety of cities, including New York, Atlanta, Chicago, Denver, Los Angeles, Philadelphia, and Salt Lake City, already have alternative-fuel taxis, in many cases thanks to subsidies from taxi manufacturers.

The use of alternative-fuel school buses would reduce the exposure of nearly 708,000 young riders in New Jersey<sup>27</sup> to gasoline emissions and diesel-generated fine particulates, to which the developing lungs of children are especially vulnerable. The governor has directed the Division of Motor Vehicles to develop an alternative-fuel school bus inspection program so that school districts interested in using these vehicles will be able to do so. There is also a biodiesel school bus demonstration program in the southern part of New Jersey (outside of the Clean Cities program area).

As noted earlier, the US General Services Agency and US Postal Service plan to acquire 276 flexible-fuel ethanol vehicles for this program area, despite the lack of ethanol refueling stations in New Jersey or in any contiguous state.

- **The New Jersey Clean Fleets Program has several components designed to increase the number of alternative-fuel and advanced-technology vehicles in the state; however, this is not specifically an alternative-fuel vehicle program, and many gasoline-fueled vehicles meet its emissions requirements.** The New Jersey Clean Fleets Program is an EPA-approved substitute for the federal Clean Fuel Fleet Program, which requires public and private centrally fueled fleets to purchase increasing percentages of vehicles that meet specific federal emissions standards. In addition to using Energy Policy Act mandates for light-duty vehicles, the Clean Fleets Program includes an incentive development program that aims to (1) increase the use of medium- and heavy-duty alternative-fuel vehicles by state and local governments; (2) develop an alternative-fuel mechanics training program; (3) promote legislative and regulatory support of alternative fuels and alternative-fuel vehicles; (4) develop a state policy to support the use of alternative-fuel vehicles; (5) educate the public, businesses, and municipalities about the benefits of alternative fuels; and (6) promote alternative-fuel vehicle businesses in New Jersey. The Clean Fleets Program also includes an initiative to build consumer interest in vehicles (not necessarily alternative-fuel vehicles) with emissions lower than those included in the National Low Emission Vehicle Program.

Because of the reluctance of some state staff members to provide INFORM with information about the status of these programs before reporting to the governor in August 2000, it is not clear what progress has been made to date. Furthermore, because vehicles operating on any fuel are considered to meet program requirements as long as they meet or exceed California's low-emission vehicle standards, and because the major auto manufacturers are increasingly producing gasoline-fueled vehicles that meet LEV and even more stringent emissions standards, it is not clear how much New Jersey is relying on alternative-fuel or advanced-technology vehicles to meet the program's requirements.

- **New Jersey has committed itself to the National Low Emission Vehicle (NLEV) program, but this is not specifically an alternative-fuel vehicle program.** NLEV is a voluntary EPA program developed in cooperation with various states and all the major auto manufacturers to spur development of light-duty vehicles with lower emissions, particularly of ozone precursors. Like the New Jersey Clean Fleets Program, it does not require the use of alternative-fuel vehicles to achieve mandated emission reductions.
- **An alternative-fuel vehicle rebate program initiated by the Board of Public Utilities provides \$500,000 for municipalities, counties, boards of education, state colleges and universities, governmental authorities, and other local government agencies to offset the incremental costs of acquiring alternative-fuel vehicles; the program is not open to private businesses or individuals, because its federal Congestion Mitigation and Air Quality funding was specifically targeted to public entities.** In contrast, a rebate program in Illinois is open to private businesses; it is funded by a \$20 registration fee on fleets in the Chicago area.
- **The state has not yet decided whether to continue or expand a demonstration program involving electric cars that shuttle commuters between three railroad stations and their places of work.** The program, involving 21 cars and 46 refueling stations and serving 25 to 75 people per day, was designed to provide information about

the ease, practicality, and effectiveness of electric vehicle use and to foster user acceptance of the new technology. The demonstration ran through May 2000; as of the writing of this report, the Department of Transportation (which established the program in cooperation with New Jersey Transit) was in the process of evaluating it.

- **The state has promoted business involvement in advanced-technology vehicles and has publicized these vehicles around the state through the development of two prototype hydrogen fuel cell electric vehicles, the New Jersey Venturer in 1999 and the New Jersey Genesis in 2000.** Both vehicles were developed through a public-private partnership of government agencies, businesses, and academic institutions. In the 1999 Tour de Sol road rally, the Venturer won an award for engineering excellence, was designated the “greenest” car in the event, and placed second overall in the hybrid category; it also gained publicity when Governor Whitman took a test drive.
- **INFORM has not been able to determine the impact of a variety of other state initiatives on the number of alternative-fuel vehicles in the state.** These include a biodiesel school bus demonstration project (Board of Public Utilities in cooperation with the Medford Township Board of Education), multiple educational and outreach programs (Department of Environmental Protection), assistance for companies that are trying to commercialize technologies that might be useful for advanced-technology vehicles (Office of Sustainable Business), an electric utility vehicle demonstration project in state parks, a compressed natural gas refueling station at Bergen County’s public works facility, site safety assessments that would allow state and county vehicle maintenance facilities to be used for alternative-fuel vehicles, and state contracts for a variety of alternative fuel vehicle-related products and services.

## Initiatives by New Jersey Transit

- **New Jersey Transit (the nation’s second largest transit operation, with some 1950 buses that it operates itself and some 950 more that it provides to other carriers in the state) has a poor record of acquiring alternative-fuel buses, compared to other transit systems.** Although the agency started an alternative-fuel demonstration program with five natural gas transit buses in 1991, it did not take delivery of any more alternative-fuel buses until 1999 and it has not included any alternative-fuel buses in its April 2000 four-year, 1244-bus purchase order. It currently has 55 compressed natural gas buses in operation – the five acquired in 1991 and 50 more delivered during 1999; 27 additional CNG buses are scheduled for delivery in 2000. This represents 11 percent of New Jersey Transit’s 1999 new bus purchases and 10 percent of its 2000 bus purchases, compared to a 31 percent average for planned new bus orders nationwide.<sup>28</sup>

In contrast, several other bus fleets in the region, such as those operated by the New York Metropolitan Transportation Authority’s Long Island Bus division and by the Central New York Regional Transportation Authority (in Syracuse, New York), are committed to 100 percent natural gas fleets. Moreover, bus fleets in Tempe, Arizona, and Thousand Palms,

California (SunLine Transit), are already 100 percent natural gas, and several companies have only CNG buses on order, including those in Los Angeles County, Atlanta, Syracuse, San Bernardino (California), San Diego (California), Springfield (Illinois), Tacoma (Washington), Port Huron (Michigan), Detroit, Tempe, Muskegon (Michigan), Gary (Indiana), Reading (Pennsylvania), and Salem (Oregon).<sup>29</sup> Nationally, 31 transit authorities have fleets in which 20 percent or more of the buses are fueled by natural gas.<sup>30</sup>

- **New Jersey Transit's recent purchase of new diesel transit buses and its forthcoming purchase of new diesel cruiser buses to replace highly polluting older models will significantly reduce the pollution caused by these segments of its bus fleet, but more reductions could be achieved by purchasing natural gas buses.** The agency argues that it would have to spend hundreds of thousands of dollars more to purchase the same number of CNG buses and upgrade its bus facilities to accommodate them. Spending the same amount on CNG buses that it committed in its recent order for diesels would necessitate leaving hundreds of older diesel buses on the road, which would produce higher total emissions than those generated by new diesel replacements for the entire fleet of older diesel models. Thus, the agency claims that its decision is based on achieving the greatest possible emissions reductions per dollar, rather than per bus.

## Other Initiatives in the State

- **The Port Authority of New York and New Jersey has made an effort to convert its non-emergency vehicle fleets to alternative fuels and to promote alternative-fuel vehicle use at its transit, airport, and seaport facilities, but the results have been limited.** Approximately 21 percent of the agency's non-emergency light-duty vehicle fleet currently runs on compressed natural gas; 50 percent of its new non-emergency light-duty vehicle purchases in model year 2000 will be alternative-fuel vehicles.<sup>31</sup> The agency has also made major infrastructure changes at its bus terminal in midtown New York (which handles some 7200 buses daily, many from New Jersey), enabling natural gas buses to use the facility. It is building a CNG refueling station at Newark Airport that will open in the spring of 2001 and is co-sponsoring a Clean Airport workshop in June 2000.

Other efforts at the Port Authority's airports and seaports have focused on facilities in New York rather than New Jersey. It received funding to market alternative-fuel vehicle use and acquisition at Kennedy and LaGuardia airports; two tenants at Kennedy have installed refueling stations for CNG cargo-handling vehicles; and the agency is working with a tenant at one of its New York seaports to convert light-duty vehicles and cargo-handling equipment to compressed natural gas. The Port Authority has not yet established similar programs at Newark International Airport or at its New Jersey seaports. Nor has it undertaken initiatives similar to those at Los Angeles International Airport and the Port of Los Angeles, which encourage the acquisition and use of alternative-fuel vehicles by facility tenants.



## 3 CONCLUSIONS

New Jersey has been slow to move from demonstration to more comprehensive alternative-fuel vehicle programs. The lack of a publicly accessible refueling infrastructure and the absence of dedicated and ongoing funding sources for alternative-fuel vehicles and related infrastructure severely restrict the expansion of alternative-fuel vehicle use in the state.

New Jersey's leaders can protect the health of the 7.7 million people who reside in regions that are in violation of federal health-based pollution standards and expand the market for domestic fuels by taking a variety of steps to build the state's alternative-fuel vehicle program. These may be divided into two categories: those that are essential building blocks for an expanded alternative-fuel vehicle program in the state and those that can promote progress in specific program areas.

### Five Essential Building Blocks

**1 Create a dedicated, ongoing funding source for alternative-fuel vehicle acquisition and infrastructure.** New Jersey has dedicated \$3.7 million from the Petroleum Overcharge Reimbursement Fund to state and local government fleet vehicle acquisition and to infrastructure development, it has made some state funds available to the Clean Cities program, and it has dedicated some federal Congestion Mitigation and Air Quality funding to alternative vehicle fuel programs. In order to obtain additional funding for alternative-fuel vehicle projects, New Jersey has to apply repeatedly for competitive federal grants. Furthermore, the funds in the Petroleum Overcharge Reimbursement Fund are starting to run out. These limited one-time funding sources cannot support the vibrant, growing alternative-fuel vehicle effort New Jersey needs.

One model for obtaining ongoing funding is California, which dedicates more than \$100 million annually from a registration surcharge on vehicles in nonattainment areas to alternative-fuel vehicle programs. The vehemence of the response by New Jersey voters to automobile-related issues in the past unfortunately suggests that such a program may not be politically viable at this time. Instead, a program targeting fleet vehicles for a registration surcharge, as is done in the Chicago area, might be more feasible. Yet another model is New York, which has earmarked \$55 million from an environmentally focused bond act for alternative-fuel vehicle acquisition and related programs.

**2 Develop a significant refueling infrastructure by making existing refueling stations publicly accessible, increasing the number of refueling stations, and rationalizing their distribution.** New Jersey could (1) allow public access to state and local government refueling stations (other states have successfully overcome the associated tax and liability issues); (2) use these existing stations (and any new ones built to serve the state's growing alternative vehicle fleet) as a nucleus for a publicly accessible refueling network; (3) work with utility companies that operate their own refueling stations to make these stations publicly accessible; and (4) evaluate the distribution of refueling stations and establish additional stations along major highways and in urban areas to create effective transportation corridors.

**3 Create a system for monitoring the number and types of alternative-fuel vehicles on the road by asking for information about fuel type on vehicle registration forms.** New Jersey could readily compile data on the number and types of alternative-fuel vehicles and on the organizations, businesses, and individuals that are acquiring them. Currently, the state collects information only on vehicles in its own fleets and in the North Jersey Clean Cities program. Even the revisions being made in the state's motor vehicle database will not enable the capture of information on fuels until after a vehicle's first inspection, two years after it is registered. Including a fuel type/power source section on the vehicle registration form, as is done, for example, in California and New York, would allow the state to monitor alternative-fuel vehicle acquisitions as they occur. The state could then more effectively assess its progress and plan for the future.

Were the federal government to require all states to keep track of alternative-fuel vehicles by including this information on vehicle registration forms, national statistics would be reported in a consistent and comparable manner. Progress in alternative-fuel vehicle use could be monitored and programs evaluated. Currently, however, the US Department of Energy's Energy Information Administration (EIA) collects data only on fleets that are required by the Energy Policy Act to report this information; the rest of the data provided by the EIA is estimated, precluding accurate state-by-state comparisons.

**4 Reduce the incremental costs of acquiring and operating alternative-fuel vehicles through subsidies.** The state motor fuel tax rate on compressed natural gas and propane is already half that that on gasoline. However, the state could provide additional financial incentives by expanding its existing rebate program to include private sector alternative-fuel vehicle acquisition and expanding its proposed tax credit program to include individuals and limited liability partnerships as well as corporations. Publicizing and promoting the availability of these programs are also vital.

**5 Promote the state's achievements and activities in the alternative-fuel vehicle field.** By publicizing successful programs, the state would reaffirm the environmental and health benefits of alternative-fuel vehicles and afford visibility to financial incentives available to potential purchasers.

## Opportunities in Eight Promising Program Areas

**1 Expand alternative-fuel vehicle use by state, county, municipal, and other public fleets.** The state should set ever-increasing goals for alternative-fuel vehicle acquisition by state fleets (beyond its commitment to exceed Energy Policy Act requirements by 5 percent) and provide greater financial assistance for the acquisition of alternative-fuel vehicles by local government fleets. The \$1 million from the Petroleum Overcharge Reimbursement Fund earmarked to help local government entities acquire alternative-fuel vehicles and the \$500,000 in Congestion Mitigation and Air Quality funds to finance a rebate program to offset the incremental costs of acquiring alternative-fuel vehicles are not adequate for such a large-scale effort.

**2 Provide greater support to the state's Clean Cities program.** New Jersey could increase the effectiveness of its North Jersey Clean Cities partnership by expanding the program to the entire state (this is currently under discussion) and encouraging the participation of counties, municipalities, and businesses within the existing Clean Cities area. The program would also benefit from increased staffing: a full-time coordinator position and/or additional staff hired to work in the covered areas. Additionally, the state could use the influence of the Clean Cities partnership to require that alternative-fuel vehicles purchased or leased by federal and other fleets in New Jersey run on alternative fuels available in the state.

**3 Encourage the appropriate state agencies to work with New Jersey Transit to find funding for significant future purchases of alternative-fuel buses, which can bring greater emissions reductions than those obtained by replacing segments of the existing fleet with new diesel buses.** The buses New Jersey Transit buys in the next few years will be on the road for 12 to 15 years thereafter. Alternative-fuel buses dramatically reduce emissions of nitrogen oxides and particulates compared even to today's cleaner diesel buses. Thus, to reduce emissions of these key pollutants as much as possible, the agency's plans should include acquisition of compressed natural gas buses, which are fully commercially available today, as well as demonstrations of efficient hybrid electric and fuel cell buses that can also be fueled by natural gas.

**4 Encourage New Jersey Transit and natural gas utility companies to work together to resolve problems relating to the quality of natural gas in certain areas of the state.** New Jersey Transit has experienced problems with the propane content of natural gas in the northern part of the state. Although the bulk of utility natural gas customers are most likely homeowners and industry, it may be possible for New Jersey to negotiate for the quality of gas it needs, since the propane in natural gas is added to the fuel by the utility.

**5 Encourage the Port Authority to provide incentives for bus companies at its terminal in midtown Manhattan, including New Jersey Transit, to use alternative-fuel buses.** The terminal handles some 187,000 passengers and 7200 buses on a typical weekday (a large proportion of which travel to and from New Jersey).<sup>32</sup> Recently completed major infrastructure changes will enable natural gas buses to use the terminal. The Port Authority could revise its pricing structure to charge more for diesel-fueled buses than for those operating on alternative fuels or other power sources.

**6 Focus procurement on vehicles such as taxis and school buses that have a direct impact on large numbers of people.** The state could facilitate the acquisition of alternative-fuel taxis in densely populated and heavily polluted urban areas by working with manufacturers to provide subsidies (as Ford does in New York City and elsewhere), by providing incentives for vehicle acquisition and the establishment of a refueling infrastructure, and by supporting the creation of a well distributed and publicly accessible refueling network in urban areas.

The state's population of more than 17,000 school buses are used twice daily by some 708,000 students. These vehicles represent an important opportunity to safeguard the health of the children who use them and make an impact on the region's air quality. Governor Whitman has already directed the Division of Motor Vehicles to develop an alternative-fuel school bus inspection program so that school districts interested in using such vehicles will be able to do so, and the Board of Public Utilities and Medford Township have cooperated on a biodiesel school bus demonstration project. But the state could do much more. For example, it could further support local school districts that want to stop exposing children to health-threatening diesel fumes by helping them establish clean vehicle procurement specifications and by providing financial incentives for the purchase of clean natural gas buses.

**7 Target heavy-duty vehicles, especially diesel vehicles and trucks.** New Jersey could provide incentives for New Jersey-based truck fleets to acquire clean-fuel vehicles and for the development of liquid natural gas refueling stations along major truck corridors. It could also work with neighboring states to create an interstate clean-fuel truck corridor similar to the one linking six nonattainment areas in California, Nevada, and Utah. It could promote the purchase of alternative-fuel garbage trucks and other sanitation vehicles, particularly in urban areas, by providing subsidies for vehicle acquisition and refueling infrastructure. Through its representatives on the board of commissioners of the Port Authority of New York and New Jersey, the state could encourage the agency to expand its existing programs and promote the acquisition of alternative-fuel vehicles by tenants at Newark Airport and the New Jersey seaports.

**8 Expand efforts to involve existing businesses in alternative-fuel and advanced-technology vehicle activities and to attract related businesses to the state.** This would increase the visibility of alternative-fuel vehicle programs and support sustainable economic development in New Jersey.

## 4 VEHICLE FUELS IN THE UNITED STATES: THE PROBLEMS AND THE PROMISE

Despite nearly 30 years of effort to reduce tailpipe emissions from gasoline- and diesel-burning vehicles through programs mandated by the 1970 federal Clean Air Act and its 1990 amendments, automotive air pollution remains one of the most intractable environmental problems facing the United States. While many improvements have been made, 102.7 million people nationwide – some 38 percent of the population – continue to live in areas that the Environmental Protection Agency (EPA) has designated as “nonattainment areas” because they persistently exceed health-based air pollution standards for one or more of the six “criteria pollutants” cited in the original Clean Air Act (lead, carbon monoxide, ground-level ozone, particulate matter, sulfur dioxide, and nitrogen oxides). Virtually all of these people (92.5 million, or one-third of the population) live in areas that have been designated in nonattainment of national ground-level ozone (i.e., smog) standards. Just over 10 percent of the total US population live in areas designated in nonattainment of carbon monoxide and particulate standards (30.5 million and 29.8 million, respectively). Smaller numbers live in areas designated in nonattainment of health standards for the other criteria pollutants. These figures reflect all the people living in designated nonattainment areas, and may differ from the number of people actually exposed to unhealthy ambient levels of these pollutants.<sup>33</sup>

With the exception of lead, all of these pollutants come, at least in part, from vehicle emissions. (Leaded gasoline, which is no longer sold in the United States, used to be a major source of lead emissions.) Nationally, motor vehicles are responsible for 49 percent of all nitrogen oxides and 40 percent of all volatile organic compounds (the two components of ground-level ozone), as well as 77 percent of the carbon monoxide.<sup>34</sup> In urban areas, vehicles release 90 percent of the carbon monoxide.<sup>35</sup> On a national average, vehicle emissions are also responsible for 24 percent of all anthropogenic particulates in the larger PM<sub>10</sub> category<sup>36</sup> and 27 percent of all anthropogenic particulates in the smaller PM<sub>2.5</sub> category.<sup>37</sup> (Most particulate emissions come from natural or miscellaneous sources – such as wind erosion, fugitive dust, agriculture, and fires – which the EPA considers not susceptible to regulatory control; in contrast, the anthropogenic category refers to sources such as transportation, fuel combustion, and industrial processes, which *can* be regulated.)

Despite federal mandates and incentives to reduce the use of petroleum-based fuels in transportation, oil use and imports are now higher than ever. In 1992, the year the Energy Policy Act (EPACT) was passed by Congress to reduce this country's dependence on foreign oil (and its associated energy and national security risks), the US transportation sector consumed 139 billion gallons of gasoline and diesel fuel; by 1998, its consumption of these fuels had increased 10.8 percent, to 154 billion gallons. In 1992, net oil imports accounted for 40.7 percent of total consumption; in 1998, imports had grown to 50.6 percent of the total.<sup>38</sup> Since domestic and imported oil are refined together to produce gasoline and diesel fuel, it is not known whether oil for transportation is imported at the same rate as oil used for other purposes; assuming that it is, however, imports of transportation fuels increased 38 percent, from 56.5 billion gallons to 77.9 billion gallons in these six years.

### **PARTICULATES — NOT ALL THE SAME**

Estimating particulate emissions, and their health impacts, is complicated. Particulates refer to very small inhalable particles that encompass material of different sizes from different sources with a range of health effects. For regulatory purposes, the EPA has divided particulates into two size-based categories: the larger PM<sub>10</sub> particulates are 10 microns in diameter or smaller, and the smaller PM<sub>2.5</sub> particulates are 2.5 microns in diameter or smaller. Current regulations set standards for PM<sub>10</sub>. New standards promulgated by the agency for PM<sub>2.5</sub>, which have potentially more serious health effects, are currently under court challenge. Attention is also turning to super-fine particles and the health threats they may pose.

The sources of particulates also have health implications, because different chemicals can be adsorbed onto the particle surface, depending on the source, and enter the respiratory tract when the particles are inhaled. Furthermore, since particulate emissions vary greatly from place to place, national averages are not particularly helpful in quantifying local conditions. In densely populated urban areas, for example, transportation is likely to be responsible for a larger percentage of particulate emissions than in rural or industrial areas.

## **The Problem of Vehicle Emissions**

The exhaust emitted by vehicles burning gasoline or diesel fuel takes a heavy toll on public health. Particulate matter aggravates respiratory conditions such as asthma and contributes to heart and lung disease. Nitrogen oxides and ozone reduce resistance to respiratory ailments and irritate the skin and eyes. Exposure to carbon monoxide can lead to impaired vision, memory, muscle coordination, and concentration; prolonged exposure can cause damage to the heart and high exposure levels can be fatal.

Mobile sources are the predominant source of toxic air pollutants in the United States.<sup>39</sup> The EPA is under court order to meet the Clean Air Act's mandate to assess the public health risks posed by these emissions and to establish standards for reducing them. Exhaust from heavy-duty diesel engines has been classified as a probable human carcinogen by the International Agency for Research on Cancer, the National Institute for Occupational Safety and Health, and the US Environmental Protection Agency.<sup>40</sup>

The health effects of ozone include impaired lung function, particularly in children engaged in outdoor activity; inflammation and possible long-term damage to the lungs; and respiratory symptoms such as coughing and chest pain in sensitive individuals.<sup>41</sup> Ozone is especially harmful to people with asthma, who are advised to stay indoors when ozone levels are high. The National Institutes of Health has reported that asthma symptoms are exacerbated by ground-level ozone, as well as by sulfur dioxide and vehicle emissions such as respirable particulates and nitrogen oxides, leading to increased emergency room visits and hospitalizations.<sup>42</sup>

The toll on the environment is also significant. Particulate matter damages crops, corrodes structures, and reduces visibility. Nitrogen oxides contribute to acid rain, the acidification and eutrophication of water bodies, and visible air pollution. Ground-level ozone interferes with the ability of plants to produce and store nutrients, making them more susceptible to damage from insects, drought, and other pollutants.<sup>43</sup>

Perhaps most serious of all, the burning of oil is a major source of carbon dioxide emissions. Along with other greenhouse gases, carbon

dioxide is implicated in the gradual but potentially catastrophic instability of the earth's atmosphere known as global warming. A series of international conferences (Rio in 1992, Kyoto in 1997, and Buenos Aires in 1998) have focused on the need to avert global warming by reducing industrial and vehicular emissions of these gases. The United States is the world's largest emitter of carbon dioxide, generating 23.7 percent of worldwide emissions, of which transportation fuels account for more than 30 percent of the nation's total.<sup>45</sup> Between 1992

### THE ASTHMA EPIDEMIC

The United States is experiencing a dramatic increase in asthma, especially in children. Between 1980 and 1995, the number of children affected by asthma more than doubled, from 2.3 million to 5.5 million. The number of children who died as a result of the disease more than tripled between 1977 and 1985, from 84 to 280. Among African-American children, the death rate from asthma is more than four times the rate for white American children. Asthma-related problems now account for one-third of all pediatric emergency room visits.<sup>44</sup> While the cause of this chronic disease and the reasons for its increase are still unknown, reducing known "triggers" that set off attacks, such as the vehicle emissions identified by the National Institutes of Health, can reduce the impact of asthma on the children who suffer from it.

and 1997, US emissions of carbon dioxide from vehicles increased by 9.5 percent.<sup>46</sup> Environmental problems associated with oil-derived fuels also include marine spills during fuel delivery, pollution emitted during the refining of oil, and groundwater contamination near leaking storage tanks at refueling facilities.

## The Unmet Promise of Alternative-Fuel Vehicles

In the 1990s, driven primarily by environmental and energy security concerns, the United States embarked on its first serious attempt to replace oil-derived fuels in the transportation sector, shifting from examining the merits of alternative fuels to actually beginning a transition to their use. Spearheading this undertaking at the national level were the federal Clean Air Act amendments of 1990 and the Energy Policy Act of 1992. Both laws include comprehensive and meaningful alternative-fuel use initiatives, with the Clean Air Act amendments ratcheting down tailpipe emissions standards and EPACT focusing on increasing energy efficiency and reliance on domestic fuels.

In the United States, Germany, Japan, and elsewhere, vehicle manufacturers have been producing breakthrough designs, from dedicated compressed natural gas (CNG) vehicles and battery-powered electric vehicles to advanced hybrid electric vehicles, which are two to three times more fuel-efficient than internal combustion engines, and vehicles powered by on-board fuel cells – possibly the ultimate pollution-free transportation option. Other alternative fuels currently in use include liquefied petroleum gas (primarily propane), methanol, and ethanol.

Reformulated gasoline, although it can be burned in currently available internal combustion engines and provides modest cuts in some tailpipe emissions, offers no long-term solution to the multidimensional problems associated with oil-based fuels. Furthermore, with the additive MTBE being phased out because it contributes to water pol-

### WHAT ARE ALTERNATIVE VEHICLE FUELS?

**Compressed natural gas (CNG)**, whose main component is methane, is a viable and immediately available alternative transportation fuel with a host of environmental, health, energy security, safety, supply, and other benefits.<sup>47</sup>

**Liquefied natural gas (LNG)**, which is 100 percent methane, offers greater energy density than compressed natural gas, but the on-board infrastructure required to reach and maintain the very low temperature (–258°F) at which natural gas liquefies precludes its use in light-duty vehicles (cars and small trucks). It is practical for larger vehicles, however, such as long-haul trucks.

**Liquefied petroleum gas (LPG)**, primarily propane, is produced only as a by-product of oil or natural gas

lution, it is not clear what could be used in its place in the future. Similarly, the main ingredient of biodiesel (usually a combination of 80 percent diesel fuel and 20 percent fuel derived from such biological sources as soybean or rapeseed oil) continues to be petroleum-based fuel. Biodiesel can be used in existing diesel vehicles with no modification to the engine, thereby reducing particulate emissions. The extent of the reduction depends on the vehicle, with the greatest reductions seen in older, “dirtier” diesel vehicles.

Although these fuels vary in their impact on emissions and energy security, as well as in price, supply, and safety, virtually all government programs promoting alternative fuels have affirmed a “fuel-neutral” position. Yet natural gas appears to have the greatest environmental and health benefits. Compared to standard gasoline-fueled vehicles, natural gas vehicles reduce nitrogen oxide emissions by about 87 percent, nonmethane organic gas emissions by 89 percent, and carbon monoxide by 70 percent. Emissions of hazardous air pollutants (“air toxics”) and greenhouse gases are also lower.<sup>48</sup> (Emissions reductions from natural gas vehicles are lower when compared to the low-emission gasoline-fueled vehicles that auto manufacturers are now producing.) Compared to diesel, the use of CNG in heavy-duty engines (such as buses) reduces particulates by up to 86 percent and nitrogen oxides by up to 58 percent;<sup>49</sup> emissions of carbon monoxide may be higher or lower, depending on the engines being compared, emissions of carbon dioxide are about the same, but emissions of hydrocarbons (especially methane) are generally higher for natural gas.<sup>50</sup> Furthermore, an infrastructure is in place to deliver com-

production and is used mostly in off-road vehicles.

**Ethanol** and **methanol** are alcohols that can be substituted for gasoline in pure form or in a mixture of 85 percent alcohol and 15 percent gasoline. Ethanol reduces carbon monoxide emissions but is costly to produce, in terms of both price and the energy needed to grow the corn from which it is currently made (subsidies for its manufacture have run to \$500 million a year). Efforts are now under way to produce ethanol from other biomass sources. Methanol, mostly made from natural gas, reduces some vehicle emissions, but its production consumes 40 percent of the energy value of the natural gas and its use generates a toxic category of hydrocarbons known as aldehydes.

pressed natural gas, and it can power not only internal combustion engines but also hybrid electric and even hydrogen fuel cell vehicles, thus offering a stepping stone to future transportation technologies.

As we enter a new millennium, the challenge of building a market for alternative-fuel vehicle technologies looms large. The federal Clean Air Act amendments of 1990 and the Energy Policy Act of 1992 created a policy framework for a major shift in transportation, but responsibility for implementing the alternative-fuel vehicle provisions of these laws belongs to the states. It is up to them to pass implementing legislation and/or regulations, to procure fleet vehicles for their own agencies, and to encourage and monitor acquisitions of clean-fuel vehicles by municipalities, utilities, and private fleets.

## BATTERY- AND FUEL CELL-POWERED ELECTRIC VEHICLES

Electric vehicles are currently the only commercially available technology that meet the criteria for “zero emissions.” Today’s electric vehicles are powered by batteries, which must be recharged from an outside electric power supply. Thus, while electric vehicles generate virtually no pollution themselves, their overall environmental impact depends, in part, on how the electricity used to recharge the batteries is generated. If the power is generated by oil- or coal-burning power plants, the full fuel cycle may be far from pollution-free; if it is generated by nuclear power plants, less pollution will be created in the fuel generation process, but the issues associated with nuclear power arise. The environmental impact also depends on how the batteries are disposed of, since batteries are heavy, bulky, and often filled with toxic chemicals. Most electric cars on the road today have a driving range of less than 100 miles, but the latest generation of nickel-metal hydride batteries (which are also less toxic than other types) is expected to double that range. Some hybrid electric vehicles (see box, “What Is an Alternative- or Clean-Fuel Vehicle?”) are also on the market.

In the near future, fuel cells on board the vehicle will provide electricity directly, without the need to recharge the batteries. In a fuel cell, hydrogen — made from splitting a water molecule or separating the element from compounds such as methane (most efficient), methanol, or even gasoline (least efficient) — merges with oxygen from the air, releasing energy as electricity and forming water as the only by-product. Electric vehicles powered by hydrogen fuel cells have a greater driving range than vehicles equipped with batteries, and they are emissions-free. Ford, DaimlerChrysler, General Motors, Toyota, Nissan, and other manufacturers have announced that they will have fuel cell vehicles commercially available within the decade.<sup>51</sup>

Despite national policy commitments made almost a decade ago and the availability of an increasing variety of alternative-fuel vehicles, the use of these vehicles in the United States is still marginal. Alternative-fuel vehicles accounted for an estimated 0.18 percent of the total US vehicle population in 1998,<sup>52</sup> displacing an estimated per gallon equivalent of 0.06 percent of petroleum-based transportation fuels.<sup>53</sup> (These figures come from the Energy Information Administration and are the only national figures available; the limitations of these estimates, including their inclusion of off-road as well as on-road vehicles, are discussed in the box “National Estimates and their Limitations,” page 38.) A higher figure of 3 percent, supplied by the Energy and Transportation Task Force of the President’s Council on Sustainable Development, is inaccurate because it mistakenly includes gasoline additives such as MTBE and other oxygenates among alternative fuels. The disparity between the vehicle population percentage and the fuel percentage probably has a variety of causes, such as the fact that many bi-fuel and flexible-fuel vehicles run on gasoline much of the time because an adequate refueling infrastructure for alternative fuels is lacking.

From 1992 to 1998, the estimated number of alternative-fuel vehicles in the United States, both on- and off-road, grew 53 percent, from 251,352 to 385,358 (again, these are Energy Information Administration estimates).<sup>54</sup> During this same seven-year period, the number of vehicles overall (cars, buses, and trucks) increased 11.5 percent, from 190 to 212 million.<sup>55</sup> In 1998, California and Texas together accounted for an estimated 27 percent of the nation's alternative-fuel vehicles.<sup>56</sup>

### WHAT IS AN ALTERNATIVE-OR CLEAN-FUEL VEHICLE?

Vehicles powered by alternative fuels can be of four types. **Dedicated** vehicles are powered by only one alternative fuel. **Bi-fuel** vehicles can burn either gasoline or an alternative fuel. **Flexible-fuel** vehicles can burn a mixture of gasoline and up to 85 percent ethanol or methanol. **Hybrid** vehicles are electric vehicles in which a small internal combustion engine recharges an electric battery; in some hybrid vehicles, the engine also serves as an auxiliary power source. Gasoline, diesel, or natural gas can power the internal combustion engine of a hybrid electric vehicle.



## 5 SPOTLIGHT ON NEW JERSEY: AIR POLLUTION AND VEHICLE EMISSIONS

Eighteen of New Jersey's 21 counties have been formally designated as not in attainment of federal health standards for ground-level ozone (or smog). In addition, five heavily populated counties have been formally designated as not in attainment of the federal standard for carbon monoxide, although air monitoring data indicate that there have been no recent violations.<sup>57</sup> Federal standards for fine particulates more stringent than existing standards are currently under court challenge, but much of New Jersey may prove to be in nonattainment of these regulations as well, if and when they go into effect.

As previously noted, these pollutants have an impact on the environment as well as on human health. Additionally, pollution is affecting New Jersey's economy, since the state's delay in implementing programs aimed at reducing ozone levels has caused federal regulatory sanctions to be invoked. A major source of this air pollution in New Jersey, and of smog in particular, is exhaust from gasoline- and diesel-burning vehicles. Vehicle emissions also include air toxics and the greenhouse gases implicated in global warming. However, with some exceptions, mobile contributions to these problems are not currently subject to EPA regulation.

### New Jersey's Polluted Air

The EPA sets standards for ozone and carbon monoxide levels, as it does for the four other criteria pollutants; when a county exceeds these levels a specified number of times, it is considered in violation of the standards. Nonattainment designation is based on pollutant concentrations measured over a multiyear period.

Some 95 percent of the 8.1 million residents of New Jersey live in one of the 18 counties that the EPA has designated in nonattainment of federal health-based standards for ground-level ozone (Table 1).<sup>58</sup> The remaining three of the state's 21 counties are in the process of also being designated in nonattainment for ground-level ozone.<sup>59</sup> (By way of comparison, 38 percent of the population of the United States as a whole lives in designated nonattainment areas for one or more of the six criteria air pollutants, with one-third living in counties designated in nonattainment of ground-level ozone standards in particular.<sup>60</sup>) Furthermore, some 3.2 million New Jersey residents, or 39 percent of the state's population, live in five counties (Bergen, Essex, Hudson, Passaic, and Union) that are designated in nonattainment of federal health

standards for carbon monoxide;<sup>61</sup> as noted above, however, New Jersey is currently meeting federal carbon monoxide standards.<sup>62</sup>

**Table I New Jersey Counties: Nonattainment of Federal Ozone and Carbon Monoxide Standards**

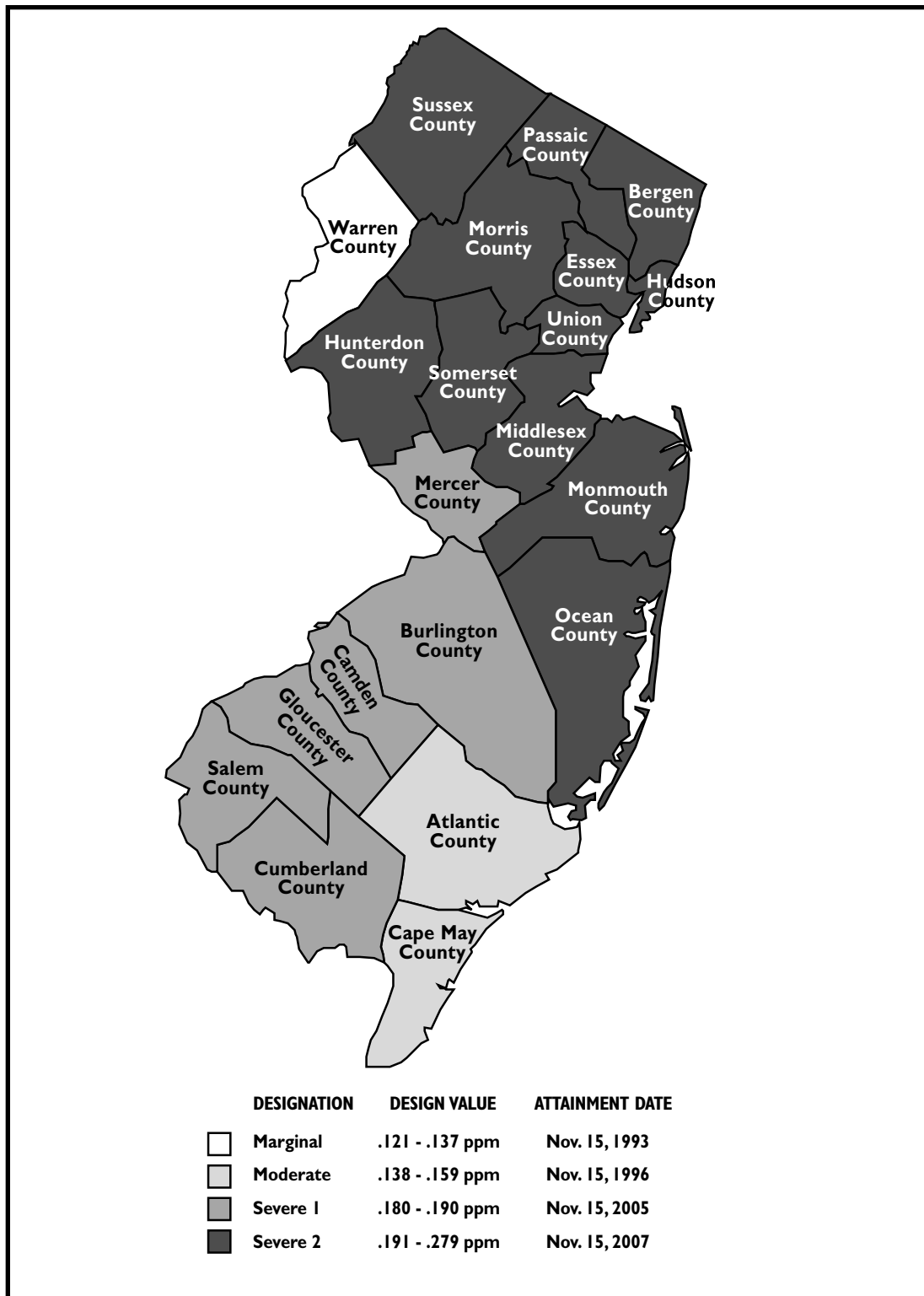
County	Population	Severe-17 Ozone Nonattainment	Severe-15 Ozone Nonattainment	Carbon Monoxide Nonattainment
Atlantic	238,047	In the process of being designated		
Bergen	858,529	x		x
Burlington	420,323		x	
Camden	505,204		x	
Cape May	98,069	In the process of being designated		
Cumberland	140,341		x	
Essex	750,273	x		x
Gloucester	247,897		x	
Hudson	557,159	x		x
Hunterdon	122,428	x		
Mercer	331,629		x	
Middlesex	716,176	x		
Monmouth	603,434	x		
Morris	459,896	x		
Ocean	489,819	x		
Passaic	485,737	x		x
Salem	64,912		x	
Somerset	282,900	x		
Sussex	143,030	x		
Union	500,608	x		x
Warren	98,600	In the process of being designated		
<b>TOTAL</b>	<b>8,115,011</b>			

Sources: US Census Bureau, July 1998 Estimates, [www.census.gov/population/estimates/conty/co-98-1/98C1\\_34.txt](http://www.census.gov/population/estimates/conty/co-98-1/98C1_34.txt); US Environmental Protection Agency, Office of Air and Radiation, [www.epa.gov/oar/oaqps/greenbk/o1hna.html](http://www.epa.gov/oar/oaqps/greenbk/o1hna.html) and [www.epa.gov/oar/oaqps/greenbk/cncs.html](http://www.epa.gov/oar/oaqps/greenbk/cncs.html).

According to the Environmental Protection Agency, 12 of the state's 18 counties in nonattainment for ozone are in the second-highest level of nonattainment, called "severe-17"; this is the level just below "extreme," the Clean Air Act's highest level (which applies only to the smog-filled air of Houston and the Los Angeles basin). The other six counties are in the next most serious level of nonattainment, called "severe-15."<sup>63</sup>

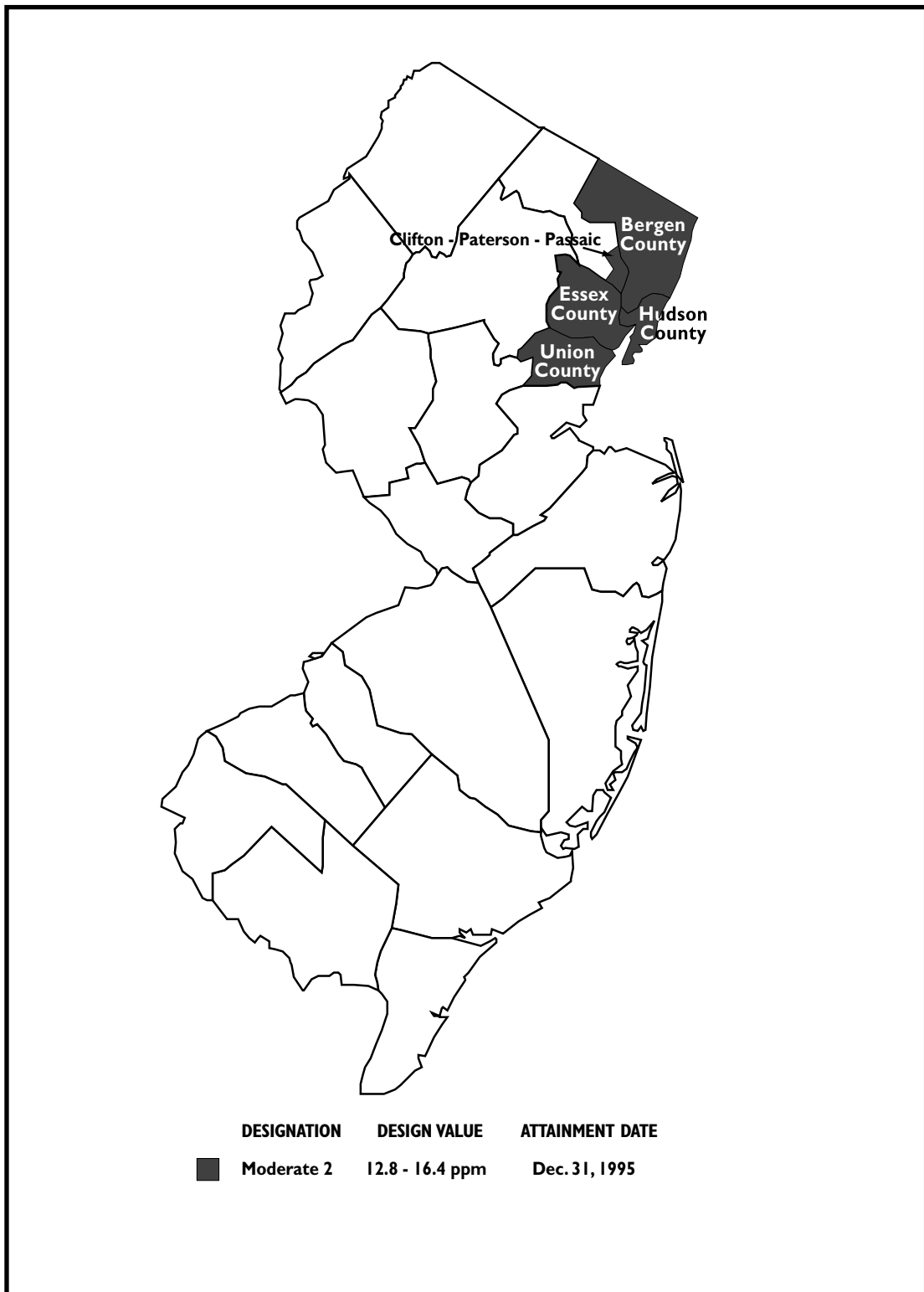
Administratively, these 18 counties fall into two Air Quality Control Regions established by the EPA: the "severe-17" counties are part of the New Jersey-New York-Connecticut Air Quality Region<sup>64</sup> and the six "severe-15" counties are part of the Philadelphia-Wilmington-Trenton Air Quality Region.<sup>65</sup> The five carbon monoxide nonattainment counties all fall within the New Jersey-New York-Connecticut region. (See Figures 1 and 2 for nonattainment counties.)

**Figure 1 Ozone Nonattainment Areas in New Jersey**



Source: NJ Department of Environmental Protection 1998 Air Quality Report, Appendix B, [www.state.nj.us/dep/airmon/nj98aqrp.pdf](http://www.state.nj.us/dep/airmon/nj98aqrp.pdf).

**Figure 2 Carbon Monoxide Nonattainment Areas in New Jersey**



Source: NJ Department of Environmental Protection 1998 Air Quality Report, Appendix B, [www.state.nj.us/dep/airmon/nj98aqrp.pdf](http://www.state.nj.us/dep/airmon/nj98aqrp.pdf).

The current EPA standard for ozone is 0.12 parts per million (ppm) during any one-hour period (meaning that the standard is exceeded when a monitoring station records levels above 0.12 ppm for at least one hour during the course of a day). This standard was exceeded in parts of the nonattainment areas of New Jersey for 10 days in the summer of 1997, 4 days in the summer of 1998, and 10 days in the summer of 1999.<sup>66</sup> (Because ground-level ozone is formed when nitrogen oxides and volatile organic compounds react with sunshine, it is most prevalent on hot summer days; however, the New Jersey Department of Environmental Protection [NJ DEP] reported that some of the worst episodes in 1998 occurred when the temperature did not rise above 90° F.)

In 1997, the EPA issued a new, more stringent ozone standard and gave New Jersey until 2007 to meet it. Based on evidence that longer-term exposures at levels below the existing standard have significant health effects, including the triggering of asthma attacks and other respiratory problems, the new standard was set at 0.08 ppm ozone over eight hours (meaning that the standard is exceeded when a monitoring location records levels above 0.08 ppm for any eight-hour period during the course of a day).

In May 1999, the US Court of Appeals for the District of Columbia Circuit ruled that the EPA did not have the authority to set health standards, and that its revised ozone standard (as well as new standards regulating fine particulates) were therefore unconstitutional. In January 2000, the American Lung Association joined the US Department of Justice and the states of Massachusetts and New Jersey in requesting that the Supreme Court review the lower court decision. The state of New York filed a “friend of the court” brief and was joined by Maine, New Hampshire, Vermont, Connecticut, Rhode Island, Pennsylvania, and Maryland. The Supreme Court agreed to hear the case and a ruling is expected in 2001.

Use of both the one- and eight-hour standards is now in flux, and it is not clear which standard will be used in the immediate future. However, had the proposed eight-hour ozone standard been applied to the nonattainment counties of New Jersey from 1997 to 1999, the state would have exceeded it during 36 days in 1997, 47 days in 1998, and 46 days in 1999<sup>67</sup> (the ozone season runs for 214 days, from April 1 through October 31). In fact, New Jersey would have been out of compliance, in many cases substantially, from 1993 through 1999<sup>68</sup> (exceedences of the eight-hour standard would actually go back at least as far as 1986, and most likely even further, but these data are not currently available on NJ DEP’s public web site<sup>69</sup>). Meeting the proposed standard will not be easy for New Jersey – something that NJ DEP itself acknowledges,<sup>70</sup> and that the EPA believes will require emissions reductions below those specified in existing regulatory implementation plans.

New Jersey meets the current EPA standards for nitrogen dioxide and particulates. According to NJ DEP, the state is preparing to meet the EPA's more stringent fine particulate (PM<sub>2.5</sub>) standard by the 2007 deadline.<sup>71</sup> However, the Northeast States for Coordinated Air Use Management (NESCAUM) has noted that this standard could "dramatically alter" particulate standard attainment in the Northeast, with many areas that currently meet the PM<sub>10</sub> standard being unable to meet the standard for PM<sub>2.5</sub>.<sup>72</sup>

## **Vehicle Emissions: A Major Pollution Source in New Jersey**

In New Jersey, transportation accounts for 43 percent of all emissions of volatile organic compounds, 27 percent from on-road vehicles and 16 percent from off-road vehicles.<sup>73</sup> Nitrogen oxides – the other major source of ground-level ozone – are a regionwide problem because they are carried long distances from sources such as power plants. Nonetheless, on-road vehicles are estimated to contribute about 44 percent of all nitrogen oxide emissions in New Jersey.<sup>74</sup> In addition, motor vehicles are responsible for approximately 70 percent of carbon monoxide emissions in the Northeast as a whole,<sup>75</sup> an amount that probably rises in the winter months.<sup>76</sup>

Vehicles are also a major source of emissions of carbon dioxide and other greenhouse gases. In New Jersey, carbon dioxide makes up 82 percent of all greenhouse gas emissions; 38 percent of this carbon dioxide comes from mobile sources, the largest overall category and the fastest growing. (Mobile sources include on-road vehicles such as cars and trucks and off-road vehicles such as lawnmowers, boats, and dirt bikes.) In fact, New Jersey has the highest percentage of carbon dioxide emissions from transportation of any state. Methane constitutes 9 percent of all greenhouse gas emissions in New Jersey, almost all of which come from landfills and not generally from transportation.<sup>77</sup>

Finally, mobile sources in New Jersey contributed 38 percent of all emissions of air toxics identified by the EPA in its 1990 Cumulative Exposure Project analysis.<sup>78</sup> On-road emissions accounted for 29 percent of these hazardous air pollutants, while off-road emissions accounted for 9 percent.<sup>79</sup>

Of the 148 air toxics included in the Cumulative Exposure Project, New Jersey's Department of Environmental Protection considers 25 to be of special concern because they exceed health benchmarks in at least one county. Eleven of these come, at least in part, from mobile sources; they include acrolein, benzene, 1,3-butadiene, chloroform, ethylene dichloride, formaldehyde, polycyclic organic matter, acetaldehyde, arsenic, chromium, and nickel. All of these air toxics, with the exception of acrolein, are known or probable human carcinogens.<sup>80</sup>

As in the rest of the country, the use of cars and trucks in New Jersey has increased over the past few decades and, if current trends continue, is likely to keep rising, adding directly to emissions through vehicle miles traveled. Between 1970 and 1997, vehicle miles traveled in New Jersey increased about 36 percent, with an 11 percent increase between 1985 and 1997.<sup>81</sup> Between 1997 and 1998, vehicle miles traveled increased another 1.9 percent.<sup>82</sup> Vehicle use from 1970 to 1997 thus increased almost four times as fast as the state's population, which grew 12.3 percent during this period, and nearly twice as fast between 1985 and 1997, when population grew 6.4 percent.<sup>83</sup> Average annual per capita mileage has increased correspondingly, from 7000 miles per person in 1985 to nearly 8000 miles per person in 1997.<sup>84</sup>

Part of the reason for this increase lies in the quadrupling of automobile-dependent office developments in New Jersey between 1990 and 1997, with the number of transit-accessible office developments remaining virtually static.<sup>85</sup> A report from the public policy organization New Jersey Future notes that, in terms of the impact on air pollution, "[t]he location and design of office buildings count perhaps more than any other development decisions we make."<sup>86</sup>

The effects on air quality of this increase in vehicle mileage are further compounded by the increasing popularity of sports utility vehicles, which achieve only 12 to 14 miles per gallon in city travel and only 16 to 18 miles per gallon in highway travel, and which emit 40 percent more pollutants per vehicle.<sup>87</sup> Because sports utility vehicles are classified as a kind of light truck, they have been exempt from the federal gasoline mileage requirements that apply to cars. (However, in December 1999, President Clinton announced new regulations, to be phased in between the 2004 and 2009 model years, that set the same emissions limits for light trucks, including sports utility vehicles, as for cars.)

In 1992, sports utility vehicles accounted for 8.8 percent of all new light vehicles purchased nationwide (the light-vehicle category includes vans, minivans, pickups and some other trucks, as well as sports utility vehicles); by 1998, they accounted for 18 percent of all light vehicles purchased.<sup>88</sup> Considering only cars, sports utility vehicles, and minivans (that is, the types of light vehicles that are typically purchased for personal and family use), sports utility vehicles increased from 10.6 percent of new purchases in 1992 to 22.4 percent of new purchases in 1998.<sup>89</sup> (INFORM could not obtain the specific percentages for New Jersey.)

At the same time, partly as a result of the increase in low-mileage sports utility vehicles, motor fuel use has been increasing faster than vehicle mileage in New Jersey. Between 1996 and 1997, while vehicle miles traveled increased 1.6 percent, fuel use increased 4.8 percent; between 1997 and 1998, while vehicle miles traveled increased 1.9 percent, fuel use increased 3.7 percent.<sup>90</sup>

The use of heavy-duty trucks is also increasing. This is a particular air quality concern because the heavy-duty engines that power these vehicles (as well as buses and off-road vehicles such as construction and farm vehicles) are responsible for one-third of the nitrogen oxide emissions from transportation in the Northeast.<sup>91</sup> Nationwide between 1980 and 1996, the number of single-unit trucks increased by 20 percent and the number of combination (tractor-trailer) trucks increased by 23 percent.<sup>92</sup> Vehicle miles traveled by trucks increased even more dramatically during this period: 61 percent for single-unit trucks and 73 percent for combination trucks.<sup>93</sup> About half of the nitrogen oxide emissions from heavy-duty engines (49 percent) comes from trucks and buses, and another half (51 percent) from off-road vehicles.<sup>94</sup>

In the Northeast, heavy-duty diesel engines are also responsible for nearly all of the inhalable particulate emissions from mobile sources (more than 80 percent of the larger PM<sub>10</sub> particulates and an even higher percentage of the smaller PM<sub>2.5</sub> particulates), according to NESCAUM.<sup>95</sup>

In May 2000, the EPA announced new draft regulations that would reduce the sulfur content in diesel fuel by 97 percent between 2006 and 2010, thereby reducing nitrogen oxide emissions from diesel engines by 95 percent and particulate emissions by 90 percent. These proposed regulations are opposed by the petroleum industry and may be modified before they are finalized.<sup>96</sup>

In New Jersey, truck traffic and the pollution it causes are particular concerns because the state's highways are a major corridor for trucks traveling to and from other states. Truck traffic density in New Jersey is among the highest in the nation. In 1994, the most recent year for which data are available, vehicle miles traveled by trucks in the state came to 3.58 billion; by contrast, trucks traveled 5.24 billion vehicle miles in New York, a much larger but much less densely populated state.<sup>100</sup> That is, truck vehicle miles traveled in New Jersey are more than two-thirds that of New York, although New Jersey is less than one-sixth its neighbor's size.

## DIESEL ENGINES AND PARTICULATES

Nationwide, diesel vehicles account for 65.2 percent of PM<sub>10</sub> emissions and 70.5 percent of PM<sub>2.5</sub> emissions from transportation (and for 15.4 and 19.4 percent, respectively, of total PM<sub>10</sub> and PM<sub>2.5</sub> emissions from anthropogenic sources).<sup>97</sup> However, these national averages are not particularly helpful in quantifying local conditions. In particular, the EPA has stated that "the contribution from diesels in certain urban areas to PM emissions is much larger than is indicated by the national PM inventories."<sup>98</sup> While much work remains to be done on quantifying the contribution of diesel engines to total particulate pollution, various studies cited by the EPA indicate that diesel exhaust was responsible for 10 percent of total PM<sub>2.5</sub> in certain areas around Denver in 1997, 30 percent of fine particulates (not specifically defined as PM<sub>2.5</sub>) in downtown Los Angeles in 1982, and 13 percent of PM<sub>2.5</sub> and 9 percent of PM<sub>10</sub> in Claremont, California, in 1987.<sup>99</sup> A variety of factors could account for these levels, including higher concentrations of diesel-fueled vehicles and fewer nonmobile sources of particulates (such as industrial processes, industrial fuel combustion, and unpaved road dust).

## The Economic Price of Noncompliance

Under the Clean Air Act amendments of 1990, states are required to submit State Implementation Plans, or SIPs, to the EPA indicating how they expect to improve air quality by reducing concentrations of any of the six criteria pollutants that exceed National Ambient Air Quality Standards. The act also provides for economic sanctions when states fail to submit or implement their plans in a timely fashion.

Because of its nonattainment of standards for ground-level ozone, New Jersey was required to submit a SIP showing how it planned to control volatile organic compounds and nitrogen oxides – the precursors of smog. However, because much of this pollution comes from upwind sources, the EPA requires New Jersey and other affected states in the region to cooperate in addressing ozone formation and movement throughout the eastern United States. The Clean Air Act gives New Jersey until 2005 to meet ozone standards in southern-central New Jersey and until 2007 to meet these standards in northern New Jersey.

New Jersey submitted its Phase I Ozone State Implementation Plan in 1997 and its Phase II plan in 1998.<sup>101</sup> The Phase II submittal included models of the impact of the planned actions on air quality. These models predicted that air quality in the southern-central New Jersey region would be in attainment of federal standards by the 2005 deadline, but that peak ozone levels in northern New Jersey would continue to exceed these standards in the deadline year of 2007, although they would show significant improvement. The EPA determined that both plans provided a “plausible demonstration of attainment” and, in December 1999, asked New Jersey to find ways of achieving additional emissions reductions; the EPA has indicated that it will approve the plans if these additional reductions are made.

A key component of the New Jersey SIP was the implementation of an enhanced vehicle inspection and maintenance plan. Major features of the new inspection procedures, which use advanced technology, include a first-time test for nitrogen oxides and a tougher evaporative system test for emissions from gasoline tank caps.

The EPA initially did not approve the “Rate of Progress” section of New Jersey’s SIP because it relied on the enhanced vehicle inspection and maintenance program, which had not yet been implemented. As a result, it imposed a series of regulatory sanctions that prevented the state from obtaining important federal transportation funding and from starting building projects that would create new stationary emissions sources. In December 1999, New Jersey narrowly avoided imposition of the most extreme sanctions by initiating the inspection and maintenance program just before the cutoff date established by the EPA. However, the state temporarily

suspended the program in January 2000 because it was experiencing problems with software malfunctions, hardware, staffing, and training. Since then, testing stations have been conducting enhanced testing on a lane-by-lane basis, with full-scale implementation scheduled for August 1, 2000. The EPA has approved this schedule.<sup>102</sup>

### **EPA SANCTIONS AND NEW JERSEY**

- In December 1997, the EPA initiated a “conformity freeze” that prevented New Jersey from receiving federal funding for any new road-related transportation projects. This freeze was lifted in April 1998 when the EPA approved a revised “Rate of Progress” plan that did not rely on the enhanced inspection and maintenance program.
- In June 1999, the EPA began requiring New Jersey to reduce emissions of volatile organic compounds and nitrogen oxides from stationary sources before the state could begin major new building projects that would require air quality permits and generate additional emissions of these pollutants (e.g., facilities such as power plants and expanded industrial facilities). The reductions were required to be made on a 2:1 basis; that is, New Jersey had to reduce twice the amount of pollution that the new source would emit. The EPA stayed this requirement in December 1999 when New Jersey began implementation of the enhanced inspection and maintenance program; however, the removal of sanctions is on hold pending the resolution of problems associated with the new inspection program by the end of July 2000.
- More severe restrictions on New Jersey’s receipt of federal highway funding were threatened if it did not implement the enhanced vehicle inspection and maintenance program by December 12, 1999: the state would not have been able to access federal funding for existing highway projects and only exempt projects could have been advanced. However, the state began implementation of the new inspection program just before the cutoff date and has so far avoided these extreme restrictions, again pending the resolution of problems associated with the program by the end of July 2000.



## 6 ALTERNATIVE-FUEL VEHICLE PROGRAMS IN NEW JERSEY

In conducting the research for this report, INFORM's key goals were to determine the number of alternative-fuel vehicles and refueling stations in New Jersey and to examine state programs designed to increase their number: early initiatives, initiatives from the governor's office, initiatives from state departments and agencies, and initiatives by other organizations and the private sector.

### Alternative-Fuel Vehicles and Refueling Stations in the State

A system for gathering and analyzing data on the number and types of alternative-fuel vehicles is essential for evaluating the progress of alternative-fuel vehicle programs. Such a system is not yet in place in New Jersey. Although the state is in the process of upgrading its motor vehicles database to include fuel type, it plans to capture this information during the biannual vehicle inspection process. As a result, it will not be collected until two years after a vehicle is initially registered. This data collection process is part of the new enhanced inspection system that is scheduled to be fully operational by August 2000; thus, the state expects to have comprehensive information about alternative-fuel vehicles purchased before August 2000 by August 2002.<sup>103</sup>

At present, however, New Jersey has no way of determining exactly how many alternative-fuel vehicles are in use in the state, what types of vehicles are running on alternative fuels, which alternative fuels they are using, and which organizations, businesses, or individuals are buying them. Further, under the new inspection system, New Jersey will not be able to obtain this information until two years after an alternative-fuel vehicle is first registered.

The best data on alternative-fuel vehicles in New Jersey comes from the North Jersey Clean Cities program, which covers a 13-county area (see pages 48 to 50 for a discussion of this program). The coalition compiles data on the number and types of alternative-fuel vehicles acquired by its members, including state and local government agencies, fuel suppliers, and other companies. As of the end of 1999, 2230 vehicles had been deployed by the program (up from 1498 in 1998), as illustrated in Table 2. The coordinator of the North Jersey program believes these figures include almost all of the alternative-fuel vehicles in the coalition's program area, as well as most of the alternative-fuel vehicles in the state as a whole (most refueling facilities are in the region covered by the program).<sup>104</sup>

**Table 2 Alternative-Fuel Vehicles in the North Jersey Clean Cities Program, 1999**

Type of Vehicle	CNG	LPG	Ethanol	Methanol	Electric	Total
Cars/light-duty vehicles	1852	148	111	0	20	2131
Medium/heavy-duty vehicles	44	0	0	0	0	44
Buses	55	0	0	0	0	55
School buses	0	0	0	0	0	0
Taxis	0	0	0	0	0	0
<b>Total</b>	<b>1951</b>	<b>148</b>	<b>111</b>	<b>0</b>	<b>0</b>	<b>2230</b>

Source: "1999 Clean Cities Coalition Report," Report from Ellen Bourbon, North Jersey Clean Cities Coordinator, to US Department of Energy Clean Cities Coordinator, March 9, 2000.

## NATIONAL ESTIMATES AND THEIR LIMITATIONS

The Energy Information Administration (EIA) of the US Department of Energy publishes data on alternative-fuel vehicles, broken down by fuel used but not by type of vehicle. Because the EIA's data is state-by-state, it would seem to provide a way of comparing states' progress in acquiring alternative-fuel vehicles. However, these figures are flawed in many ways and provide only the roughest picture of alternative-fuel vehicle use in the United States. Nonetheless, understanding the EIA's procedures provides some insights into the data.

The EIA figures are not based on reporting by individual states. Instead, they are estimates derived from many different sources (such as fuel sales, numbers of vehicles converted or offered for sale by manufacturers, reports from participants in the Clean Cities program, newsletters, and trade association reports), and these estimates build on a base year that is also an estimate. Further, the figures may contain off-road vehicles such as farm equipment and golf carts, and the data types gathered may vary from state to state, making it difficult to compare one state to another. Additionally, in some cases, the EIA has divided national estimates among the 50 states, rather than totaling the estimates of individual states to obtain a total national estimate.<sup>105</sup>

According to the EIA's estimates (Table 3), there were 5951 alternative-fuel vehicles in New Jersey in 1998, up from 5593 in 1997 — a very different figure from the 1498 vehicles reported by the North Jersey Clean Cities program in 1998.

**Table 3 EIA Estimates of Alternative-Fuel Vehicles in New Jersey**

Year	CNG	LPG	Ethanol	Methanol	Electric	Total
1997	1512	3915	10	51	99	5593
1998	1717	3999	41	51	143	5951

*Source:* Energy Information Administration, [www.eia.doe.gov/cneaf/solar.renewables/alt\\_trans\\_fuel97/table4.html](http://www.eia.doe.gov/cneaf/solar.renewables/alt_trans_fuel97/table4.html) and [www.eia.doe.gov/cneaf/solar.renewables/alt\\_trans\\_fuel98/table4.html](http://www.eia.doe.gov/cneaf/solar.renewables/alt_trans_fuel98/table4.html).

It is clear that the largest disparity between these two sets of numbers lies in the population of vehicles fueled by LPG (propane), which make up more than two-thirds of the EIA's total. Further, it is these vehicles that are most likely to be off-road vehicles. However, this is not necessarily true of the agency's estimates for other states. Furthermore, since the EIA estimates include off-road vehicles while state vehicle registration data do not, it is not possible to calculate estimated numbers of alternative-fuel vehicles as a percentage of total vehicle registrations (the statistic needed for state-to-state comparisons).

Despite these limitations, the EIA estimates provide a very general sense of the nation's alternative-fuel vehicle achievements by state. Appendix A provides information by state on the estimated number of alternative-fuel vehicles compared to the total number of registered vehicles. According to these estimated data, in 1998, New Jersey ranked twelfth in number of total vehicle registrations, twenty-first in estimated number of alternative-fuel vehicles, and thirty-sixth in estimated alternative-fuel vehicles as a percentage of total vehicle registrations.

The EIA currently publishes *reported* data on the number of on-road alternative-fuel vehicles in use by federal and state agencies, although the information is not broken down by state. For 2000, the EIA is adding transit bus operators and school bus operators to the reported totals, and hopes eventually to include all local government fleets (inclusion of private fleets is less likely). The EIA initially investigated using state motor vehicle department records to produce a national report, but found that only a few states collected data on fuel type and the quality and ease of obtaining the information varied.<sup>106</sup>

The lack of accurate, consistently reported data on alternative-fuel vehicles by state is a serious impediment in efforts to increase the number of alternative-fuel vehicles nationwide. Without this information, the country lacks the ability to assess progress on a state-by-state basis and to plan effective programs for the future.

The North Jersey Clean Cities program also collects data on alternative-fuel refueling stations. As of December 1999, there were 57 alternative-fuel refueling sites in the coalition's program area: 34 for compressed natural gas, 21 for liquefied petroleum gas, and 2 for electric vehicles.<sup>107</sup> Most of the state's refueling stations are located along or near major highways such as the New Jersey Turnpike (I-95), the Garden State Parkway, and Interstate 80.\* As of the end of 1999, there were no methanol or ethanol refueling stations in New Jersey. However, the Department of Environmental Protection and the Board of Public Utilities have met with representatives of Rutgers University and the state's Farm Bureau to explore the possibility of siting an ethanol production plant in the central part of the state. If such a plant proves economically feasible, it would be several years before it is up and running.<sup>108</sup>

The number of liquefied petroleum gas stations, which mostly service farm vehicles, propane distributor fleets, and some utility vehicles (such as forklifts), is grossly understated, according to the Clean Cities Coordinator. More than 210 LPG retailers in New Jersey are licensed to sell propane as a vehicle fuel. However, most are reluctant to provide information about their customers because of the competitive nature of the business, making it difficult to keep track of which retailers are actually selling LPG as a vehicle fuel.<sup>109</sup>

Of the state's 34 CNG refueling stations, none is open to the public, although one Shell station (in Jersey City near the Holland Tunnel) was publicly accessible in the past.

### WHAT MAKES A REFUELING STATION PUBLIC?

Definitions of "publicly accessible" vary, making it difficult to compare information on refueling stations by state. For example, in data submitted to the US Department of Energy (US DOE), New Jersey considered a refueling station to be publicly accessible if it allows members of the general public to drive up and pay by cash or credit card for fuel, just as they would at a conventional gas station. US DOE, however, considers publicly accessible stations to be those that are available to vehicles belonging to another organization's fleets through contractual arrangements. US DOE has asked New Jersey to review its refueling station data and to report it in accordance with the department's less stringent definition.

Currently, since other states may also be using US DOE's definition in reporting, it may not be accurate to compare New Jersey's statistics to those of other states. For example, US DOE's Alternative Fuels Data Center database shows that nearly two-thirds of CNG stations in New York State are open to the public, either all the time or by prearrangement; since New York may be using US DOE's definition of public access, however, these numbers may not be comparable to those from New Jersey. Further, the absolute numbers are not directly comparable, since New York is a much larger state than New Jersey.<sup>110</sup>

\* A regularly updated map and listing of refueling stations can be obtained from the National Renewable Energy Laboratory's Alternative Fuels Data Center web site at <http://afdmap.nrel.gov/nrel>.

Nearly all of New Jersey's compressed natural gas stations are operated by Public Service Electric & Gas (PSE&G), a utility company; a few are operated by other utility companies or private businesses, New Jersey Transit operates one for its buses, and the Port Authority of New York and New Jersey operates one for its fleet vehicles. The state operates one CNG refueling station at a Department of Transportation facility in Ewing Township. All state departments are free to use this station, and the state is working to resolve various liability, contract, and billing issues so that this station (and yet-to-be-built new ones) can also be used by local government vehicles. The PSE&G stations are open to state and federal fleets through contractual arrangements, as well as to the company's own vehicles, but not to private fleets or individuals.

This lack of publicly accessible compressed natural gas refueling facilities has consequences for alternative vehicle use both state- and nationwide. Unlike government or large private fleet operators, which can find it economically viable to invest in their own refueling stations, smaller fleets and individuals must rely on a publicly available network of refueling stations. For them, it makes no sense to acquire alternative-fuel vehicles if they have no convenient way to refuel them. Further, since New Jersey's highways are important corridors for traffic heading from the south and west into New York and New England, the dearth of publicly available CNG stations presents an obstacle to alternative-fuel vehicles from other parts of the country.

### **THE INTERSTATE CLEAN TRANSPORTATION CORRIDOR**

In the western United States, a partnership of federal, state, and local government entities, along with private companies, is creating the Interstate Clean Transportation Corridor (ICTC), a 2000-mile long-haul truck freight transportation corridor linking the six nonattainment areas of Los Angeles, San Francisco, Sacramento, the San Joaquin Valley, Las Vegas, and Salt Lake City, by placing alternative-fuel refueling stations along I-80, I-5, I-10, I-15, and California Route 99.

The ICTC's goals include installing approximately 20 liquefied natural gas refueling stations along the three legs of the corridor (LNG is currently the most viable and effective commercially available fuel for interstate trucking, according to the ICTC) and deploying 375 new heavy-duty trucks that would use the stations. The ICTC calculates that these achievements will displace more than 3.7 million gallons of diesel fuel annually and reduce nitrogen oxide and particulate emissions by more than 443 tons annually. As of early 2000, two ICTC-supported refueling stations were in operation, with 42 natural gas tractor-style trucks set to utilize them.<sup>111</sup>

Most of New Jersey's propane stations are open to the public but, as noted above, the use of LPG is largely limited to specialized vehicles. The state operates one propane refueling station at its Hammonton Motor Pool facility and is planning to install another in Trenton.

New Jersey also has 46 electric charging facilities (these are not included in the Clean Cities data), all associated with a demonstration station car program conducted by the state Department of Transportation and New Jersey Transit at three commuter railroad stations (see page 52).<sup>112</sup> These facilities are currently available only to the 21 electric cars involved in the demonstration program. Additionally, the Costco company has expressed a willingness to make electric charging stations available to customers free of charge at all new Costco discount club stores (and some existing ones) throughout the country; there are currently 10 Costco stores in New Jersey.<sup>113</sup>

Since there are no ethanol refueling stations in the state, it is unclear why the US General Services (GSA) placed 158 flexible-fuel ethanol vehicles in New Jersey in 1999<sup>114</sup> or why the GSA and the US Postal Service plan to place 276 flexible-fuel ethanol vehicles in northern New Jersey. These vehicles can run on gasoline and up to 85 percent ethanol but, without access to ethanol, they will run on 100 percent gasoline all the time.

## Initiatives from the Governor's Office

Governor Christine Whitman has committed the state on several occasions to increasing the number of alternative-fuel vehicles in New Jersey. In May 1998, she announced the New Jersey Future Investment and Reinvestment in State Transportation (NJ FIRST) initiative, which, among other proposals, sought to replace 1400 aging New Jersey Transit buses “with new ones that run on the best fuel technology.”<sup>115</sup>

### WHAT IS AN ADVANCED-TECHNOLOGY VEHICLE?

In this report, an advanced-technology vehicle is defined as one that does not rely predominantly on an internal combustion engine (ICE); for example, electric vehicles, vehicles powered by fuel cells, and hybrid electric vehicles are all considered to be advanced-technology vehicles. In contrast, New Jersey considers all vehicles that meet certain of the low-emissions vehicle standards promulgated by the California Air Resources Board — including those with ICEs — to be advanced-technology vehicles, regardless of fuel or power source. The standards vary depending on the program, as do other specific requirements.

### CARB STANDARDS

In 1990, the California Air Resources Board (CARB) adopted a series of progressively stricter vehicle emission standards to be introduced in stages over a 15-year period. At each stage, from so-called transitional low-emission vehicles (TLEVs) to low-emission vehicles (LEVs) to ultra-low-emission vehicles (ULEVs) and ultimately to zero-emission vehicles (ZEVs), the California standards exceed those of the EPA.

On April 16, 1999, as part of the state's celebration of Earth Day, Governor Whitman announced a commitment to increasing the number of alternative-fuel vehicles, and particularly advanced-technology vehicles, in the state fleet. Executive Order 94 includes the following provisions.<sup>116</sup>

- The state to exceed by 5 percent annually the requirements of the federal Energy Policy Act (EPACT), which mandates the acquisition of specific percentages of alternative-fuel vehicles by state fleets. Between 1999 and 2002, this translates into 140 additional alternative-fuel vehicles.
- All new state fleet alternative-fuel vehicles in excess of EPACT requirements to meet California Air Resources Board (CARB) low-emission vehicle (LEV) standards for model years 1999 and 2000 and CARB ultra-low-emission vehicle (ULEV) standards for model year 2001 and thereafter. (EPACT itself does not include an emissions component.)
- Dedication of \$1.1 million from the Petroleum Overcharge Reimbursement Fund (created by oil companies in settlement of federal suits against them in the 1970s) to create a refueling infrastructure to service the state fleet. The state plans, to the extent allowed under law, to permit other public entities, such as local governments, to use these refueling facilities and to negotiate with private sector refueling station operators to permit state fleets to use their facilities for refueling.
- Proposed dedication of an additional \$1 million from the Petroleum Overcharge Reimbursement Fund to encourage other public entities to acquire or convert to alternative-fuel vehicles; the funds would cover the incremental cost of about 200 vehicles at \$5000 per vehicle.
- Development by the Division of Motor Vehicles of an alternative-fuel school bus inspection program to allow school districts interested in using such vehicles to do so.
- Establishment of an Advanced Technology Vehicle Task Force, consisting of representatives from the Board of Public Utilities; the Commerce and Economic Growth Commission; the Departments of Environmental Protection, Transportation, Treasury, and Law and Public Safety; and the New Jersey Economic Development Authority.

The Advanced Technology Vehicle Task Force was charged with a variety of responsibilities, including coordinating acquisition and placement plans for alternative-fuel and advanced-technology vehicles in state departments; creating a compliance monitoring program to ensure that bi-fuel vehicles in the state fleet run on the alternative fuel as much as possible; working with state agencies to remove regulatory and other barriers to more widespread use of alternative-fuel and advanced-technology vehicles in public and private fleets; administering an annual Clean Fleet Partner Award for public and private fleets; assisting the Economic Development Authority in evaluating requests for financial assistance from companies wishing to buy alternative-fuel or advanced-technology vehicles; and working with the Treasury Department to establish life-cycle cost analysis guidelines for alternative-fuel and advanced-technology vehicles in state fleets, develop a refueling infrastructure plan, and create an incentive program for other public entities.

The governor also indicated that she would propose to the legislature a corporate business tax credit for 50 percent of the incremental cost of acquiring an alternative-fuel or advanced-technology vehicle, converting a vehicle to alternative fuel, or establishing alternative refueling infrastructure, thereby allowing businesses to reduce their corporate tax liability. (In contrast, New York's tax incentive program allows tax credits for individuals and limited liability partnerships, as well as businesses.)

## Initiatives by State Departments and Agencies

Many departments and agencies within New Jersey's government are involved in alternative-fuel vehicle programs, and they often work together to create and carry out these efforts. This section first examines multi-agency initiatives and then looks at some that are largely run by individual departments.

### *Early Alternative-Fuel Vehicle Activities*

In 1992, New Jersey initiated the Alternative Fuels Demonstration Project, in cooperation with Public Service Electric & Gas (PSE&G) and, later, the New Jersey Propane Gas Association (NJPGA). Under the terms of the agreements, PSE&G installed a compressed natural gas refueling station at the state's Department of Transportation facility in Ewing Township and NJPGA installed a propane refueling station at the state's Hammonton Motor Pool facility. The state agreed to convert at least 100 vehicles to CNG and 20 to propane. The \$1.5 million used for these and some related programs came from the Petroleum Overcharge Reimbursement Fund.

By June 1993, the state had 41 compressed natural gas vehicles in operation. When the demonstration program was converted into an Energy Policy Act compliance program in 1997, the state had a total of 61 CNG vehicles and 13 propane vehicles in operation.<sup>117</sup>

### *Mandates and Commitments*

Some of New Jersey's alternative-fuel vehicle programs are designed to comply with federal mandates (EPACT), to meet commitments made to the federal government (the Clean Fleets program), or to participate in voluntary programs (the National Low Emission Vehicle Program and the US Department of Energy's Clean Cities program).

**Energy Policy Act.** Aimed at reducing US dependence on foreign oil by developing alternative fuels, the federal Energy Policy Act requires state governments, the federal government, and alternative-fuel providers to make alternative-fuel vehicles an increasing percentage of their new, light-duty fleet vehicle purchases. Nationally, EPACT programs are administered by the US Department of Energy. In New Jersey, the Board of Public Utilities is responsible for implementing EPACT programs in cooperation with other departments, such as the Department of Treasury.

New Jersey implemented EPACT's state fleet component in 1997; since then, it has exceeded the requirements for all three model years (1997, 1998, and 1999) and expects to do so again for model year 2000. As noted above, the governor has committed the state to exceeding federal requirements by 5 percent a year beginning in 1999. This translates into 140 *additional* new alternative-fuel vehicles in New Jersey state fleets between 1999 and 2002, beyond EPACT mandates. Also as noted above, these additional vehicles will meet California's LEV standards in model years 1999 and 2000 and California's ULEV standards in model year 2001. New Jersey also exceeded EPACT requirements by acquiring, in 1999, 102 dedicated compressed natural gas sedans (which meet ULEV standards) for the Department of Law and Public Safety (law enforcement vehicles are not included in EPACT's fleet mandates). By way of comparison, New York State exceeded Energy Policy Act requirements by 7 percent in model year 1998 and by 15 percent in model year 1999.<sup>118</sup>

In model year 1999, the state purchased approximately 400 alternative-fuel vehicles for the state fleet; as of the end of 1999, the state fleet included approximately 545 CNG vehicles, 95 propane vehicles, and 2 electric vehicles. In the 2000 model year, the state purchased approximately 750 alternative-fuel vehicles; when these have all been delivered, the state fleet will

### DRAWBACKS OF EPACT

Congress passed the Energy Policy Act in 1992 to increase energy security by reducing the country's dependence on foreign oil; it therefore focuses on displacing conventional petroleum-based fuel and does not address issues of air quality, vehicle emissions, or health. While EPACT's mandates have increased the number of alternative-fuel vehicles in state government, federal government, and alternative-fuel provider fleets, it has several drawbacks that preclude greater use of alternative fuels.

- Because EPACT requires the purchase of certain percentages of alternative-fuel vehicles, but not the use of alternative fuel, it counts bi-fuel and flexible-fuel vehicles as alternative-fuel vehicles, even when the absence of refueling stations means that these vehicles end up running on gasoline rather than on the alternative fuel in question.
- Because EPACT only pertains to light-duty vehicles, alternative-fuel buses and trucks — vehicles that use much more fuel per mile, as well as generating much more pollution — are not included in its purchasing requirements. As a result, state and federal government agencies that wish to improve energy security and maximize air quality improvements through the acquisition of medium- or heavy-duty alternative-fuel vehicles have to find funding beyond that required to meet EPACT requirements. (They can, however, apply credits for additional vehicle purchases to the following year's EPACT requirements.)
- Because EPACT currently applies only to federal and state government fleets, and to alternative-fuel provider fleets, local governments and most private fleets are under no federal mandate to acquire alternative-fuel vehicles. In early 2000, the US Department of Energy considered issuing a rule that would apply to local government and private sector fleets but decided instead to rely on incentives.

include approximately 1400 alternative-fuel vehicles.<sup>119</sup> New Jersey earmarked \$1.6 million from the Petroleum Overcharge Reimbursement Find for the incremental cost of model year 2000 alternative-fuel vehicles acquired by the state fleet, with the remaining funds coming from individual department budgets and the annual appropriation for the state's Central Motor Pool (Department of Treasury's Bureau of Transportation Services).<sup>120</sup>

**New Jersey Clean Fleets Program.** The federal Clean Fuel Fleet Program, mandated by the Clean Air Act, applies to areas that are in nonattainment of federal ozone or carbon monoxide standards. It requires that public and private centrally fueled fleets with 10 or more vehicles (1) purchase increasing percentages of new light- and heavy-duty vehicles that meet Clean Fuel Fleet emissions standards and (2) ensure that these vehicles actually use the alternative fuel for which they were designed. For light-duty vehicles, the requirements are 30 percent of new purchases in model year 1999, 50 percent in model year 2000, and 70 percent in model year 2001. For heavy-duty vehicles (up to 26,000 pounds), the requirement is 50 percent of new purchases in each of those three model years. States may substitute an alternative program if the EPA determines that it will produce long-term emissions reductions equivalent to those that would be achieved under the federal program.

The federal Clean Fuel Fleet Program is not specifically an alternative-fuel vehicle program, since vehicles operating on any fuel count toward its mandates as long as they meet California's low-emission vehicle standards or better. Increasingly, the major auto manufacturers are producing gasoline-fueled vehicles that meet LEV, ULEV, and even SULEV (super-ultra-low-emission vehicle) criteria. For model year 2000, for example, Acura, Buick, Chevrolet, Dodge, Honda, Mazda, Plymouth, Pontiac, and Toyota produced gasoline-fueled ULEV passenger cars, and Honda and Nissan produced gasoline-fueled SULEVs.<sup>121</sup>

New Jersey chose not to adopt the Clean Fuel Fleet Program because it believed a voluntary, incentive-based program would be more successful. Initially, it attempted to substitute participation in the National Low Emission Vehicle (NLEV) program (see page 48) for the federal program, since states are not required to have both a low-emission vehicle program and a clean-fuel fleet program; however, because of timing issues, it was not permitted to do so. It therefore developed its own New Jersey Clean Fleets Program. In 1997, the state submitted this alternative program to the EPA as part of its State Implementation Plan for reaching the ozone emission levels mandated by the Clean Air Act.<sup>122</sup>

The New Jersey Clean Fleets Program has four components, two of which are unique and two of which involve existing programs. The former — an incentive development program and an advanced-technology vehicle program — are discussed here; the others — which make use of EPACT, Clean Cities, and NLEV — are covered in separate sections on those programs.

The incentive development program was originally developed by a public/private work group organized by the Department of Environmental Protection, the Board of Public Utilities, and the Department of Transportation, in cooperation with representatives from local and national fleet operators, alternative-fuel providers, and municipalities. (Most of the participants later cooperated in establishing the North Jersey Clean Cities program.) It was designed to increase the number of clean alternative-fuel vehicles in New Jersey fleets, with a focus on medium- and heavy-duty vehicles (which are not included in most other programs).<sup>123</sup>

The incentive development program is carried out by individual state departments and agencies, and is coordinated by the Advanced Technology Vehicle Task Force, which includes representatives from a variety of state agencies. Because some state officials were reluctant to provide INFORM with details of their activities and accomplishments before the Advanced Technology Vehicle Task Force presents its progress report to the governor in August 2000, INFORM was unable to determine the full scope of this and other alternative-fuel vehicle efforts in New Jersey.

Planned activities of the incentive development program include meeting the emission reduction goals required in the substitution of the New Jersey Clean Fleets program for the federal Clean Fuel Fleet Program; increasing the use of alternative-fuel vehicles by state and local governments; promoting the Clean Cities program; developing an alternative-fuel mechanics training program; promoting legislative and regulatory support of alternative fuels and alternative-fuel vehicles; developing a state policy to support the use of alternative-fuel vehicles; educating the public, businesses, and municipalities about the benefits of alternative fuels; and promoting alternative-fuel vehicle businesses in New Jersey.<sup>124</sup>

To date, some pilot alternative-fuel training programs have been run at Brookdale Community College (with regular courses scheduled to start in the fall of 2001);<sup>125</sup> the governor has publicly supported alternative-fuel technology through Executive Order 94 and her test drive of the New Jersey Venturer (see pages 52 to 53); various state departments are promoting alternative-fuel businesses in the state through the New Jersey Venturer and New Jersey Genesis programs; legislation has been drafted to create the business tax credit program proposed in the governor's Executive Order; and various state departments have engaged in public education about alternative-fuel vehicles.

The other unique component of the New Jersey Clean Fleets program is an advanced-technology vehicle initiative. In its Clean Fleets State Implementation Plan, New Jersey proposed using the advanced-technology vehicle component of the National Low Emission Vehicle program as a means of promoting the development of an advanced-technology vehicle market. As finalized, however, NLEV did not include such a component, so New Jersey developed its own plan. As

noted above, for the purposes of the New Jersey Clean Fleets Program, the state considers all vehicles that meet ULEV standards or better, regardless of fuel or power source, to be advanced-technology vehicles.

New Jersey's advanced-technology vehicle initiative is designed to encourage vehicle manufacturers to produce vehicles with even lower emissions than those in the NLEV program by creating consumer demand. To that end, the state directs education and outreach to the public, focusing on alternative-fuel vehicles for fleet owners and (because of the lack of alternative-fuel refueling sites) on hybrid and ultra-low-emission gasoline vehicles for individuals.<sup>126</sup>

**National Low Emission Vehicle Program.** New Jersey has also committed itself to the National Low Emission Vehicle program, a voluntary initiative developed by the EPA – in cooperation with various states and all the major auto manufacturers – to spur development of light-duty vehicles with lower emissions, particularly of ozone precursors. (The EPA initiated this program because it is prohibited by the Clean Air Act from imposing more stringent emissions standards on vehicle manufacturers before model year 2004.) By establishing uniform standards for, initially, eight northeastern states, the program enables auto companies to manufacture and sell one version of a car in a larger, regional market rather than having to manufacture a variety of versions to meet different standards in different states.

The program is voluntary in the sense that the automobile manufacturers and the northeastern states had to “opt in” (which New Jersey has done); however, once states and automakers commit themselves to the program, it becomes enforceable, as it did for the participating northeastern states in model year 1999 and as it will for the whole country in model year 2001. Like the Clean Fuel Fleet Program, NLEV is not specifically an alternative-fuel vehicle program, since it is based on meeting California emissions standards rather than on using alternative fuels. It is structured so that manufacturers have to meet an emissions average for the entire fleet of vehicles they sell in the participating states.

**North Jersey Clean Cities.** The US Department of Energy initiated the Clean Cities program in 1993. Cities and communities (including counties and whole states) that apply to become designated Clean Cities pledge to promote local acquisition and use of alternative-fuel vehicles through voluntary public and private sector partnerships. Their members work together to determine which fuels are regionally appropriate based on availability, performance, emissions reductions, and economic factors. Clean Cities partnerships also help with regulatory and siting issues involved in setting up alternative-fuel refueling stations. There are now nearly 80 Clean Cities programs across the United States, involving more than 3000 stakeholders. Participating programs have facilitated the deployment of more than 240,000 vehicles and established more

than 4000 fueling stations.<sup>127</sup> Funding is provided by DOE, by other federal, state, and local agencies, and by the private sector.

New Jersey has one Clean Cities project, called the North Jersey Clean Cities program. It was established by several cities in 1995, a regional coalition held its first meeting in November 1996, and the program was officially designated in October 1997. The program is administered by the Board of Public Utilities, Division of Energy. Its coordinator has other responsibilities within the state's Division of Energy and is based in Trenton, the state capital, rather than in the North Jersey area. Discussions have been held to start a South Jersey Clean Cities program so the entire state could be covered.

Any county, city, municipality, government agency, or company within a 13-county area (containing 6.1 million people)<sup>128</sup> is eligible to participate in the North Jersey Clean Cities program. Its approximately 30 members include two counties (Bergen and Hudson), several cities and municipalities (Elizabeth, Newark, Jersey City, and North Bergen Township), a variety of government entities (including New Jersey Transit, the Port Authority of New York and New Jersey, the New Jersey Departments of Transportation and Environmental Protection, and the local regions of the US EPA, the US General Services Administration, and the US Postal Service), and some utilities and other companies (including Public Service Electric & Gas, New Jersey Natural Gas Company, New Jersey Propane Gas Association, and Kingdom Group LLC).

When the North Jersey Clean Cities program began, there were 1245 vehicles in the coalition area and 52 refueling sites (of which only one compressed natural gas station, a Shell facility near the Holland Tunnel, was open to the public). By the end of 1999, this vehicle population had grown to 2230, an increase of 79 percent (see Table 2 for a breakdown by vehicle fuel and type). The number of refueling stations increased to 57, although the publicly accessible CNG station had closed down. The coalition expects to increase the number of vehicles to 3269 by the end of 2000 and to 5600 by 2004. It also anticipates a total of 60 refueling stations in 2000 and 66 in 2004.<sup>129</sup>

The North Jersey Clean Cities program does not include several important types of vehicles. For example, there are no alternative-fuel taxis in New Jersey. Urban taxi fleets can help reduce vehicle emissions in densely populated and highly polluted urban areas, and they are well suited to alternative fuels because they can be centrally fueled. New York City, Atlanta, Chicago, Denver, Los Angeles, Philadelphia, and Salt Lake City, among other US cities, already have alternative-fuel taxis on the roads, in many cases put there with the help of subsidies from taxi manufacturers such as Ford.

Alternative-fuel school buses are also missing from New Jersey's program, although a biodiesel school bus demonstration program is under way in the southern part of the state (see page 51). However, the governor has directed the Division of Motor Vehicles to develop an alternative-fuel school bus inspection program so that school districts interested in using such vehicles will be able to do so. Nearly 708,000 New Jersey children took twice-daily trips on 17,636 school buses in the 1997-1998 school year, the most recent period for which these data are available.<sup>130</sup> Alternative-fuel school buses would reduce these students' exposure to the health risks associated with gasoline emissions and diesel-generated fine particulates, to which the developing lungs of children are especially vulnerable. School districts in California, Pennsylvania, North Carolina, and Utah, among other states, are acquiring alternative-fuel school buses, often with funding assistance from state or federal sources.<sup>131</sup>

Finally, plans by the US Postal Service and the US General Services Agency for the North Jersey coalition are far from optimal. These agencies plan to place 276 flexible-fuel ethanol vehicles in the coalition area even though ethanol refueling is unavailable in New Jersey or in any contiguous state. (There is no source of ethanol in New Jersey; there have been some discussions about siting an ethanol production plant in the central part of the state, but this would take several years at least.) These vehicles can run on gasoline and up to 85 percent ethanol, but with no access to ethanol, they will run on 100 percent gasoline 100 percent of the time.

As of the first quarter of 1998, the most recent date for which figures are publicly available, the federal government had 440 alternative-fuel vehicles in New Jersey, or 8.2 percent of its total fleet of 5373 vehicles; of these, 429 ran on compressed natural gas, 10 were flexible-fuel ethanol vehicles (running on gasoline), and one was a flexible-fuel methanol vehicle.<sup>132</sup> In the 1999 federal fiscal year, however, 158 of the 860 vehicles acquired by the General Services Agency for federal agencies in New Jersey were flexible-fuel ethanol vehicles; none were CNG vehicles.<sup>133</sup>

Funding for New Jersey's Clean Cities program has come from several sources: \$68,000 from the US Department of Energy; \$252,000 from the state Board of Public Utilities, Division of Energy; and \$500,000 in Congestion Mitigation and Air Quality Improvement (CMAQ) funding to expand the program to areas throughout the state that are in nonattainment of federal air quality standards (CMAQ grants are authorized under the federal Intermodal Surface Transportation Enhancement Act and are administered by the US Department of Transportation). In contrast, a very active program in nearby New York, the Greater Long Island Clean Cities Coalition (covering a region of only two counties and a population of 2.7 million), leveraged more than \$3.5 million in state and federal funds between 1996 and the beginning of 1999, increasing the number of vehicles in the program area from fewer than 500 to more than 2000 during the same period.<sup>134</sup>

### *Initiatives Within Individual Departments*

**Board of Public Utilities.** In addition to coordinating the North Jersey Clean Cities program, administering (along with the Department of Treasury) the state's compliance with the Energy Policy Act, and participating in the governor's Advanced Technology Vehicle Task Force, the Board of Public Utilities – and especially its Division of Energy – manages a variety of other alternative-fuel vehicle projects in New Jersey.

In November 1999, the board initiated an alternative-fuel vehicle rebate program for municipalities, counties, boards of education, state colleges and universities, governmental authorities, and other local government agencies to help them offset the incremental costs of purchasing alternative-fuel vehicles or converting conventional vehicles to alternative fuels. The New Jersey Department of Transportation awarded the board's Division of Energy \$500,000 in Congestion Mitigation and Air Quality program funding to run the program. Participants may receive rebates for a maximum of six vehicles per year, with amounts varying from up to \$2000 toward the incremental cost of a bi-fuel light-duty vehicle to up to \$12,000 toward the incremental cost of a dedicated alternative-fuel heavy-duty vehicle. Recipients are encouraged to join the Clean Cities program.<sup>135</sup> Because this CMAQ funding is available to government entities only, the rebate program is not open to private businesses or to individuals. (In contrast, the rebate program in Illinois, which is funded by a surcharge on fleet vehicle registrations, makes 80 percent of the incremental cost of acquiring an alternative-fuel vehicle, converting a conventional vehicle to alternative fuel, or purchasing a domestic renewable fuel available to businesses and individuals, as well as to government entities.)

In cooperation with the Medford Township Board of Education, the Board of Public Utilities established a biodiesel school bus demonstration program with \$115,000 from the US Department of Energy. The program, which has been under way for about three years, spurred the state's efforts to make biodiesel fuel available on the state contract (meaning that other government entities can purchase the fuel at the price negotiated by New Jersey without going through their own competitive bidding process).<sup>136</sup> As noted earlier, biodiesel is a combination of, usually, 80 percent diesel fuel and 20 percent fuel derived from such biological sources as soybean or rapeseed oil; it reduces particulate emissions (the extent of the reduction depends on the vehicle) and can be used in existing diesel vehicles without engine modification.

**Department of Environmental Protection.** The New Jersey Department of Environmental Protection (NJ DEP) is the agency charged with improving the quality of New Jersey's air, including implementing programs that enable the state to meet the requirements of the federal Clean Air Act. Its mission, therefore, is to reduce air pollution, and it employs a variety of

methods to monitor and reduce emissions, including those caused by vehicles. This report focuses on the department's alternative-fuel vehicle programs, not on its other air quality initiatives.

In addition to its participation in the governor's Advanced Technology Vehicle Task Force and its administration of New Jersey's Clean Fleets and National Low Emission Vehicle programs, NJ DEP promotes the use of alternative-fuel vehicles through a variety of programs, including those focusing on environmental education, ozone action, innovative technology, credit trading, air toxics, and greenhouse gases. Through its Bureau of Transportation Control, it provides educational information at seminars, conferences, ceremonies, workshops, and media events. Its audiences have included local officials (such as the New Jersey Conference of Mayors), car dealers (including a promotional effort with NJ Car, an association of 2000 new car dealerships in the state), and the general public. The bureau has also provided alternative-fuel vehicle training sessions for state science teachers, science trainers (who train teachers), and high school students (many of whom are on the verge of purchasing their first cars) and has reviewed and edited science curriculum packages to ensure that they include accurate information about the state's air quality issues and strategies, including mobile source pollution and alternative-fuel vehicles.<sup>137</sup>

**Department of Transportation.** The commissioner of the New Jersey Department of Transportation (NJ DOT) chairs the governor's Advanced Technology Vehicle Task Force. The department is also involved in several other alternative-fuel vehicle activities.

In May 1997, NJ DOT, in cooperation with New Jersey Transit, established a demonstration station car program, called Project PowerCommute, that was scheduled to run for three years through May 2000. It involved 21 electric cars (converted by Solectria) that shuttled 25 to 75 commuters a day between three New Jersey Transit railroad stations (in Morristown, Woodcrest, and Princeton Junction) and their places of work. The cars had an approximate range of 45 miles and refueled at 46 charging stations located at the railroad stations and work sites. This innovative idea, involving partnerships between communities, businesses, workers, transportation planners, and car manufacturers, was designed to provide information about the ease of electric vehicle use, charging infrastructure, costs and benefits, and safety issues while fostering user acceptance of this new technology and providing publicity for the program through visibility in the communities it served. As of the writing of this report, NJ DOT was in the process of evaluating the program and considering whether and how to prolong it.<sup>138</sup>

The Department of Transportation has also taken the lead role in a partnership of government agencies, businesses, and academic institutions that has produced two prototype hydrogen fuel cell electric vehicles. The first, the New Jersey Venturer, is equipped with a fuel cell power gener-

ator (contributed by H Power of New Jersey) and nickel-cadmium batteries; it was designed to show the potential of advanced-technology vehicles and to publicize that potential among the public. The Venturer was entered in the 1999 Tour de Sol, a 225-mile electric road rally sponsored by the Northeast Sustainable Energy Association, where it won an award for engineering excellence, was designated the “greenest” car in the rally, and placed second overall in the hybrid category (which is dominated by hybrid electric vehicles powered by gasoline). In entering the Tour de Sol, the Venturer became the first fuel cell vehicle to participate in such a competition anywhere in the world. The only emission from this vehicle is pure water, which the rally team drank to demonstrate its purity.<sup>139</sup>

For 2000, a similar partnership headed by NJ DOT is building the New Jersey Genesis, which eliminates the large tanks of hydrogen used in the Venturer through improved hydrogen storage technology, thus opening up the back seat of the car. The chassis of the car is an all-aluminum Mercury Sable donated by Ford Motor Co. The Department of Transportation received a \$150,000 grant from the US Department of Energy to develop the hydrogen-generating system, which was created by a New Jersey company, Millennium Cell.<sup>140</sup> Both the Genesis and the Venturer are scheduled to run in the 2000 Tour de Sol.

**Office of Sustainable Business.** Governor Whitman created the Office of Sustainable Business (within the New Jersey Commerce and Economic Growth Commission) in 1997 to promote and support sustainable businesses in the state by offering technical and financial assistance, including financing through the Sustainable Business Loan Fund. The office considers advanced and cleaner transportation a priority and has provided business assistance (such as helping with grant applications and marketing) to companies involved in these fields, as well as education and outreach to government and individuals about the economic and environmental benefits of alternative-fuel and advanced-technology vehicles. Office of Sustainable Business staff serve on the boards of the Northeast Advanced Vehicle Consortium and the Northeast Sustainable Energy Association (and on the latter’s American Tour de Sol planning committee), as well as on the governor’s Advanced Technology Vehicle Task Force. The office is also a sponsor of the New Jersey Venturer and Genesis projects.<sup>141</sup>

**Other State Initiatives.** Other alternative-fuel vehicle projects in the state include a demonstration of four electric golf cart-type utility vehicles in four state parks; a compressed natural gas refueling station installed by Bergen County at its public works facility (accessible to state as well as county vehicles and, potentially, to other local municipality vehicles); site safety assessments at one county and six state vehicle maintenance facilities (enabling these facilities to be safely used by all kinds of alternative-fuel vehicles); and state contracts for vehicle conversions to alternative fuels, alternative-fuel vehicles from original equipment manufacturers, vehicular

propane for state fleet vehicles, and biodiesel. (As noted earlier, state contracts enable state departments – and often local governments – to obtain products and services at the price negotiated by the state, without going through their own competitive bidding process.)

## New Jersey Transit

New Jersey Transit has the second largest transit bus fleet in the country. A public transit corporation funded by public sources and fares, it is run by an executive director who reports to a board of directors that includes three state officials and four other members appointed by the governor. Through its procurement decisions, New Jersey Transit has the opportunity to be a leader in putting clean-fuel vehicles on the road in New Jersey and in helping to improve the quality of the air breathed by its citizens, particularly in polluted urban areas.

As of the end of 1999, New Jersey Transit operated approximately 1950 buses itself (the total fluctuates as new buses are acquired and older ones are taken out of service) and provided approximately 950 more to private carriers in the state through its allocation and contract services programs (some 600 specialized buses providing feeder service and serving disabled and elderly passengers are not included in these figures).<sup>142</sup> The agency also provides train service within the state and between New Jersey and New York City.

Some 700 of the 1950 transit buses operated by New Jersey Transit are transit buses (typically providing service within New Jersey cities), about 388 are shorter-distance suburban commuter buses, and about 759 are longer-distance (express) suburban commuter and long-haul buses (known as cruisers). In addition, the agency operates 105 double-length articulated buses on both transit and suburban routes.<sup>143</sup> These buses are not interchangeable, as they have different designs and different travel routes. Urban transit buses are designed for lower speeds and frequent stops, with standing as well as seated passengers and with a rear exit door in addition to the front entrance door. Suburban and cruiser buses are designed for highway speeds and longer rides, with comfortable seats for all passengers and, in the case of cruisers, luggage compartments beneath the seating area.

New Jersey Transit first began to use alternative-fuel buses in 1991 when it purchased five natural gas transit buses for a demonstration project. Initially operated in northern New Jersey, these buses experienced serious engine failures that the agency attributed to the presence of excess propane in the natural gas.<sup>144</sup> (Propane is often added by utility companies to “stretch” the amount of gas they provide to customers. In this case, the utility was Public Service Electric & Gas, the area supplier.) New Jersey Transit then moved the five buses to the Trenton area,

where the fuel quality is more consistent and where the buses are still in operation. Between 1994 and 2000, the agency's transit bus orders did not include any additional purchases of CNG buses.

In 1999, New Jersey Transit took delivery of its first CNG cruiser buses – a total of 50 – and is scheduled to receive 27 more in the summer of 2000 (this is the first CNG cruiser program in the United States). Thus, compressed natural gas buses make up about 4 percent of the total fleet operated by the agency itself. New Jersey Transit has spent approximately \$9 million to upgrade a portion of its bus maintenance facility in Howell to accommodate these buses.<sup>145</sup>

Also in 1999, New Jersey Transit took delivery of 405 new diesel-fueled transit buses (184 for its own operations and 221 for other carriers). The 50 CNG cruiser buses delivered in 1999 thus represent approximately 11 percent of all new buses put into service that year. In 2000, the agency expects to receive 245 more diesel-fueled transit buses, in addition to the 27 CNG cruiser buses also scheduled for delivery. Thus, approximately 10 percent of the total buses received in 2000 will be alternatively fueled.<sup>146</sup>

These figures are in stark contrast to the nationwide average for planned purchases of new alternative-fuel buses, which is 31 percent.<sup>147</sup> Several bus fleets, such as those operated by the New York Metropolitan Transportation Authority's Long Island Bus division and the Central New York Regional Transportation Authority in Syracuse, New York, are committed to all-CNG fleets; moreover, transit fleets in Tempe, Arizona, and Thousand Palms, California (SunLine Transit), are already 100 percent natural gas. Additionally, several bus companies have only CNG buses on order, including those in Los Angeles County, Atlanta, Detroit, San Diego, Syracuse, San Bernardino (California), Springfield (Illinois), Tacoma (Washington), Port Huron (Michigan), Tempe, Muskegon (Michigan), Gary (Indiana), Reading (Pennsylvania), and Salem (Oregon).<sup>148</sup> There are also some hybrid electric buses operating in various places in the United States.

Most recently, New Jersey Transit placed an order in April 2000 for 1244 cruiser and transit buses, with an option for an additional 156. The entire order, totaling close to \$475 million, is for diesel-fueled buses.<sup>149</sup> Scheduled for delivery between 2001 and 2004, these buses will expand the agency's fleet in addition to replacing older vehicles.

Over the years, federal regulations have dramatically reduced the emissions permitted from new diesel engines. As a result, New Jersey Transit's purchase of new diesel buses to replace older vehicles will significantly reduce polluting emissions from its bus fleet. The national standard for buses is 12 years of useful life. Since some 1300 of the agency's 2900 buses were

put into service in 1988 or earlier (some as long ago as 1980 and 1983),<sup>150</sup> they are definitely due for replacement.

New Jersey Transit's procurement decisions have been based on its estimate that purchasing new diesel buses will reduce more emissions per dollar spent than purchasing compressed natural gas buses, which cost more. That is, for the same finite amount of money, the agency can acquire more diesel than CNG buses, thus achieving its goal of replacing older buses and improving air quality in the most cost-effective way possible.

The agency reached this conclusion by looking at how much it would cost to replace all its aging cruiser buses with new diesel buses and calculating the emissions reductions that would result. It then calculated how many CNG buses it could buy for the same amount of money, taking into account both the higher cost of the buses and the cost of upgrading its facilities to accommodate them. The calculations indicated that just over half as many CNG as diesel buses could be purchased for the same amount of money, which would mean leaving some 550 older diesel buses still on the road.

When New Jersey Transit calculated emissions of carbon monoxide, hydrocarbons, particulate matter, and nitrogen oxides under this scenario, it discovered that it could reduce more of all four pollutants by completely replacing its old cruiser fleet with new diesel cruisers than by replacing part of the old fleet with CNG cruisers and keeping the remainder on the road. That is, although the reductions in particulate and nitrogen oxide emissions achieved by natural gas buses are greater than those achieved by new diesel buses on a per bus basis, purchasing diesel buses would allow New Jersey Transit to reduce more emissions on a per dollar basis because it could buy more for the same amount of money.<sup>151</sup>

Like other transit agencies around the country – including those in Boston, Chicago, Denver, Hawaii, Los Angeles, Tampa (Florida), and Tempe<sup>152</sup> – New Jersey Transit has been exploring other advanced and alternative-fuel vehicle programs. Starting in 1997, it examined and developed specifications for hybrid electric buses; a bid was awarded but the buses that were built exceeded the agency's specifications for axle weight limits and were purchased instead by New York's Metropolitan Transportation Authority. New Jersey Transit is now keeping track of a different manufacturer's efforts to develop a new hybrid electric bus, and sees this as a potentially important technology for the future, as costs come down. It is also close to implementing a biodiesel demonstration program.<sup>153</sup>

New Jersey Transit does not view the purchase of alternative-fuel buses as the only way to reduce air pollution caused by vehicles. As a transit agency, it is committed to the idea that the best way to reduce individual vehicle use, and the pollution and other problems associated

with it, is to provide ever-improving public transportation services to ever-increasing numbers of people at a reasonable price. Hence, it views all investments in transit quality and availability as a means of improving air quality in the state, including the replacement of older buses and the expansion of routes and services.<sup>154</sup>

## Initiatives by Other Organizations

### *The Port Authority of New York and New Jersey*

The Port Authority of New York and New Jersey, a bi-state transportation agency that operates within a 25-mile radius of the Statue of Liberty, could provide real leadership in the use of clean-fuel vehicles in a region that is in nonattainment of federal air pollution standards. The Port Authority administers the bridges and tunnels that connect New York and New Jersey, as well as a rail transit system, facilities for buses that travel between the two states, three major international airports (including Newark International Airport in New Jersey), and an international seaport (including ports in Newark and Elizabeth, New Jersey).

Because of these diverse facilities and services, the Port Authority has a variety of opportunities to increase alternative-fuel vehicle use: it can acquire vehicles for its own use; it can encourage their use by bus companies that use its facilities; and it can help its airport and seaport tenants establish alternative-fuel vehicle programs themselves. So far, however, its accomplishments have been limited.

The Port Authority is run on a day-to-day basis by an executive director, but is ultimately governed by a board of commissioners. Half of the board's members are appointed by the governor of New York and half by the governor of New Jersey; thus, the governor of New Jersey can have an impact on Port Authority alternative-fuel vehicle policies.

**The Authority's Own Vehicle Fleet.** The Port Authority owns 152 alternative-fuel light-duty vehicles (including vans, minivans, sedans, and pickup trucks), approximately 21 percent of its total fleet of 723 light-duty vehicles eligible for alternative-fuel use (eligible vehicles do not include emergency and law enforcement vehicles). Approximately two-thirds of these are dedicated natural gas vehicles; the rest are bi-fuel vehicles that can use either CNG or gasoline (INFORM has not been able to determine how often the bi-fuel vehicles run on the alternative fuel).

Fifty of the agency's 152 alternative-fuel vehicles are pool vehicles based at the World Trade Center in New York City; many are driven back and forth between the two states. The remaining 102 are located at Port Authority facilities in both New York and New Jersey (including Newark Airport, the Lincoln and Holland Tunnels, the seaports, and the Technical Center in

Jersey City); however, the Port Authority did not provide data on the number of vehicles in New Jersey and New York, respectively. The agency has stated that, in the 2000 model year, 50 percent of its new non-emergency light-duty vehicle purchases will be alternative-fuel vehicles; most of these will be dedicated natural gas vehicles. The Port Authority's natural gas fleet uses a refueling station at its facility at Port Elizabeth (as well as four in New York City); the agency plans to open another natural gas refueling site at Newark Airport in the spring of 2001.<sup>155</sup>

**The Bus Terminal.** The agency operates the Port Authority Bus Terminal in midtown Manhattan, a facility that handles some 7200 buses and 187,000 passengers on a typical weekday; many of these are commuters from New Jersey.<sup>156</sup> It recently completed major infrastructure changes that make it possible for natural gas buses to use the terminal (it is up to the various bus companies that use the facility what kind of buses they want to operate).

**The Airports.** Airports have been described as emissions "bubbles," with emissions from many mobile sources concentrated in a small area; these include airplanes, vehicles that service the air transport industry, and cars, vans, and buses bringing travelers to and from the airport. If airports were considered point (nonmobile) sources, Kennedy International and LaGuardia would rank sixth and eighth, respectively, as sources of smog-generating emissions in the New York metropolitan area.<sup>157</sup>

In New Jersey, the Port Authority has seven alternative-fuel vehicles at Newark International Airport, and anticipates increasing that fleet when it opens a CNG refueling station at the airport in 2001. Over the past five years, it has focused on reducing air pollution at the airports by establishing mass transit alternatives to entice travelers out of their cars. At Newark, this has included a rail link from a new station two miles south of Newark Penn Station on the Amtrak/New Jersey Transit rail lines, scheduled to open by the end of 2001.<sup>158</sup>

The agency has also received a Congestion Mitigation and Air Quality Improvement grant from the US Department of Transportation to promote alternative-fuel vehicle use and acquisition at the New York airports. Two tenants at Kennedy International, British Airways and Nippon Cargo, have already installed fueling stations for CNG cargo-handling vehicles. As of October 1999, British Airways had converted its entire fleet of cargo-handling vehicles to compressed natural gas.<sup>159</sup>

In June 2000, the Port Authority co-sponsored a Clean Airports workshop (in cooperation with the not-for-profit Clean Airports Partnership and various state and local agencies) at which airport operators and tenants from around the Northeast discussed steps they can take to expand the use of alternative-fuel vehicles at airports.

Other parts of the United States have addressed the problem of air pollution generated at airports by converting vehicle fleets at these facilities to clean fuels. For example, 200 vehicles at Los Angeles International Airport – 32 percent of the airport agency’s total fleet – run on CNG, and additional liquefied natural gas buses and compressed natural gas pickup trucks and sedans are on order.<sup>160</sup> The airport also provides free parking for electric vehicles. Recently, Congress passed legislation directing the US Department of Transportation to issue grants of up to \$20 million to 10 airports for the acquisition of alternative-fuel vehicles and supporting infrastructure, with the recipient airports required to match the grant on a 50-50 basis. To qualify for grants, airports must be located in nonattainment areas.

**The Seaport.** The Port of New York and New Jersey is the third largest seaport in the United States, and the largest one on the East Coast. It includes two ports in New Jersey (Port Elizabeth and Port Newark), as well as some sites in New York. Goods are increasingly shipped in large containers, which are transported to and from the seaport on heavy-duty diesel trucks. By 2010, the number of containers passing through the Port of New York and New Jersey is expected to double, from 2.5 million to 5 million a year.<sup>161</sup>

In New York, the Port Authority (and a tenant at the Howland Hook seaport on Staten Island) has applied for a New York State Energy Research and Development Authority grant to convert light-duty vehicles and cargo-handling equipment to compressed natural gas. The Port Authority intends to wait until this project is under way before initiating other projects at other port facilities.<sup>162</sup> Another model is the Port of Los Angeles, which recently launched a Clean Engines and Fuels Program that focuses on vehicle acquisitions and offers a workshop for tenants on alternative-fuel vehicle technologies and available funding for acquisition.<sup>163</sup>

### ***Public Utilities***

Several public utility companies operate in New Jersey; those that produce alternative fuels are required by the Energy Policy Act to purchase increasing percentages of alternative-fuel vehicles for their own fleets. Several of these, including Public Service Electric & Gas, New Jersey Natural Gas Co., Elizabethtown Gas Co., and Gary’s Propane are members of the North Jersey Clean Cities program.

As of early 2000, Public Service Electric & Gas (PSE&G) had 561 natural gas vehicles in its fleet.<sup>164</sup> (The company did not break this figure down, but in data supplied to the North Jersey Clean Cities program for October 1997, it indicated that 243 of these were dedicated vehicles and 238 were bi-fuel vehicles.<sup>165</sup>) PSE&G also operates many of the state’s CNG refueling stations. These are open to the utility’s own vehicles and to state and federal fleets, but the company is unable to sell to private fleets because it is not licensed by the state to sell CNG

at the retail level.<sup>166</sup> Furthermore, since most of PSE&G's refueling stations were established to service its own vehicles, they are generally not located on public roads or set up in a way that facilitates retail use.<sup>167</sup> The company also works with outside customers that want to use alternative-fuel vehicles, such as municipalities and private fleets, by supplying information and training classes.<sup>168</sup>

Also as of early 2000, Elizabethtown Gas Co. operated 103 on-road alternative-fuel vehicles (42 dedicated CNG, 51 bi-fuel CNG, and 10 dedicated propane vehicles)<sup>169</sup> and the New Jersey Natural Gas Co. operated 116 alternative-fuel vehicles (2 dedicated CNG and 114 bi-fuel CNG vehicles).<sup>170</sup>

## Business Initiatives

The transition to cleaner sources of energy – for transportation and for other uses – is gaining momentum around the world and is creating a growing market for new technologies and fuels. In the European Union, 150 cities (including Milan, Stockholm, Athens, Lisbon, Florence, Barcelona, and Oxford) have jointly committed themselves to replacing their municipal fleets with low- and zero-emissions vehicles and, in some cases, to restricting their city centers to clean-fuel vehicles (in Europe, these are largely electric, CNG, or LNG vehicles).<sup>171</sup> Even China, whose exploding economic growth has brought increasingly severe air pollution related to transportation and energy use, has begun to make commitments to alternative-fuel vehicles.<sup>172</sup>

In this country, states that embrace new technologies and remove regulatory and other obstacles to their use are attracting companies involved in developing alternative-fuel and advanced-technology vehicles. California has initiated a program to acquire and test 50 fuel cell vehicles from a variety of manufacturers over the next five years,<sup>173</sup> and is directing more than \$100 million annually toward alternative-fuel and advanced-technology vehicle programs.

New Jersey is already home to several companies that could contribute to state alternative-fuel vehicle or advanced-technology vehicle programs. By working with the high technology/sustainable business sector,<sup>174</sup> the state has additional opportunities to develop its economy, improve its environment, and become a technology leader.

There is no statewide database of private sector alternative-fuel vehicle/advanced-technology vehicle activities in New Jersey, and INFORM's study did not focus on private sector involvement in these activities. However, some companies that were identified in the course of INFORM's research are described below.

**H Power Corp.** H Power,<sup>175</sup> based in Belleville, makes proton-exchange membrane fuel cells for both stationary and transportation applications. (This technology is considered promising for vehicular use because the fuel cells have long estimated lifetimes, operate at moderate temperatures, can be started very quickly, are relatively light and compact, can operate on ambient air rather than pure oxygen, and can be operated over a wide and rapidly changing range of power outputs.) Made for the New Jersey Venturer, the company's fuel cells were also purchased by the New Jersey Department of Transportation in 1999 to provide backup power for solar-powered highway signs.

**Millennium Cell LLC.** Millennium Cell,<sup>176</sup> based in Eatontown, has developed a hydrogen generation system using water and sodium borohydride that will be used in the New Jersey Genesis, as well as in a demonstration project using a 1991 Ford Explorer.

**Recon Industrial Control Corp.** This Englewood company provides control and instrumentation products and services to manufacturers of fuel cell systems. Its controls are being used in the New Jersey Genesis and Venturer.<sup>177</sup>

**Air and Gas Technologies.** This company, based in Cliffwood Beach and a member of the North Jersey Clean Cities program, has installed compressed natural gas conversion systems in New Jersey and elsewhere.<sup>178</sup>

**Propane Equipment Co.** This Tinton Falls company, along with its ProEnergy Corp. subsidiary, has been in the alternative-fuel conversion business for 37 years. It also distributes propane and natural gas systems around the world.<sup>179</sup>

**Carteret Packaging.** In 1999, working with the alternative fuel company Kingdom Group, this company converted its 16 forklifts from propane to compressed natural gas and installed a refueling station at its Woodbridge plant. Carteret Packaging converted to natural gas because it is cheaper and environmentally safer, because refueling with CNG is faster than with propane, and because it encountered problems storing enough propane to meet its needs.<sup>180</sup>



# APPENDIX A

## State-by-State Alternative-Fuel Vehicle Data

Appendix A presents state-by-state data on total vehicle registrations and estimated numbers of alternative-fuel vehicles in the 50 states and the District of Columbia. As noted in this report, the method used by the Energy Information Administration (EIA) to estimate numbers of alternative-fuel vehicles makes state-to-state comparisons problematic; furthermore, since the EIA's estimates include off-road vehicles and state motor vehicle registration data do not, the estimated percentage figures are higher than the actual percentages. However, these are the only state-by-state data currently available.

Table A1 lists the data alphabetically by state; Table A2 lists the data sorted by the estimated number of alternative-fuel vehicles in 1998; Table A3 lists the data sorted by the estimated number of alternative-fuel vehicles as a percentage of total vehicle registrations, again for 1998.

**Table A1 Vehicle Registrations and Estimated Number of Alternative-Fuel Vehicles, by State, 1997 and 1998 (sorted by state)**

State	Vehicle Registrations, 1997	Estimated AFVs, 1997	Estimated AFVs as % of Total Vehicles, 1997	Vehicle Registrations, 1998	Estimated AFVs, 1998	Estimated AFVs as % of Total Vehicles, 1998	Estimated % Change in AFVs, 1997 - 1998
Alabama	3,669,439	3057	0.08%	3,858,928	3120	0.08%	2.06%
Alaska	542,398	113	0.02%	545,865	316	0.06%	179.65%
Arizona	3,143,143	5804	0.18%	2,944,016	7441	0.25%	28.20%
Arkansas	1,633,830	1493	0.09%	1,754,215	1616	0.09%	8.24%
California	24,944,976	62,975	0.25%	25,600,250	65,779	0.26%	4.45%
Colorado	3,522,590	8016	0.23%	3,466,094	9065	0.26%	13.09%
Connecticut	2,659,518	2219	0.08%	2,700,633	2325	0.09%	4.78%
Delaware	613,701	513	0.08%	616,492	565	0.09%	10.14%
District of Columbia	233,670	960	0.41%	228,716	1201	0.53%	25.10%
Florida	10,874,031	10,625	0.10%	11,276,389	10,809	0.10%	1.73%
Georgia	6,242,207	11,078	0.18%	6,893,319	11,504	0.17%	3.85%
Hawaii	692,804	390	0.06%	703,836	399	0.06%	2.31%
Idaho	1,081,052	1986	0.18%	1,118,893	2016	0.18%	1.51%
Illinois	8,442,822	18,591	0.22%	9,306,710	19,184	0.21%	3.19%
Indiana	5,345,776	9798	0.18%	5,371,653	10,386	0.19%	6.00%
Iowa	2,851,383	6019	0.21%	3,053,135	7203	0.24%	19.67%

Kansas	2,152,107	1721	0.08%	2,121,410	1760	0.08%	2.27%
Kentucky	2,780,806	4020	0.14%	2,844,612	4373	0.15%	8.78%
Louisiana	3,411,023	3747	0.11%	3,430,717	3805	0.11%	1.55%
Maine	1,058,599	508	0.05%	929,605	497	0.05%	-2.17%
Maryland	3,786,054	4991	0.13%	3,750,275	4497	0.12%	-9.90%
Massachusetts	5,070,432	4284	0.08%	5,159,168	4152	0.08%	-3.08%
Michigan	8,023,731	16,280	0.20%	8,128,150	16,899	0.21%	3.80%
Minnesota	3,927,249	2657	0.07%	4,177,841	3210	0.08%	20.81%
Mississippi	2,233,797	4464	0.20%	2,255,744	5154	0.23%	15.46%
Missouri	4,350,544	5182	0.12%	4,377,520	6043	0.14%	16.62%
Montana	979,700	1573	0.16%	988,277	1678	0.17%	6.68%
Nebraska	1,506,996	3308	0.22%	1,525,998	3877	0.25%	17.20%
Nevada	1,145,656	3270	0.29%	1,220,277	4094	0.34%	25.20%
New Hampshire	1,127,387	435	0.04%	1,038,465	515	0.05%	18.39%
<b>New Jersey</b>	<b>5,816,580</b>	<b>5593</b>	<b>0.10%</b>	<b>5,780,336</b>	<b>5951</b>	<b>0.10%</b>	<b>6.40%</b>
New Mexico	1,514,499	3919	0.26%	1,594,792	4474	0.28%	14.16%
New York	10,873,248	13,705	0.13%	10,422,033	14,082	0.14%	2.75%
North Carolina	5,785,533	8995	0.16%	5,861,830	9289	0.16%	3.27%
North Dakota	695,106	985	0.14%	672,158	1011	0.15%	2.64%
Ohio	10,107,651	17,920	0.18%	10,039,488	18,723	0.19%	4.48%
Oklahoma	2,883,719	14,847	0.51%	2,919,186	14,778	0.51%	-0.46%
Oregon	2,890,952	7613	0.26%	2,980,064	7768	0.26%	2.04%
Pennsylvania	8,824,947	12,935	0.15%	8,978,814	12,906	0.14%	-0.22%
Rhode Island	709,680	703	0.10%	715,017	707	0.10%	0.57%
South Carolina	2,850,361	3831	0.13%	2,893,061	3951	0.14%	3.13%
South Dakota	718,403	1152	0.16%	768,507	1174	0.15%	1.91%
Tennessee	4,534,842	8749	0.19%	4,469,065	8939	0.20%	2.17%
Texas	12,923,253	39,296	0.30%	13,324,167	37,781	0.28%	-3.86%
Utah	1,529,509	4927	0.32%	1,532,253	4781	0.31%	-2.96%
Vermont	495,716	310	0.06%	496,153	365	0.07%	17.74%
Virginia	5,708,991	5309	0.09%	5,818,294	5618	0.10%	5.82%
Washington	4,702,152	7275	0.15%	4,823,987	7233	0.15%	-0.58%
West Virginia	1,354,992	1793	0.13%	1,377,835	1927	0.14%	7.47%
Wisconsin	4,232,731	8652	0.20%	4,203,319	9250	0.22%	6.91%
Wyoming	553,374	1218	0.22%	558,991	1167	0.21%	-4.19%
<b>TOTAL</b>	<b>207,753,660</b>	<b>369,804</b>	<b>0.18%</b>	<b>211,616,553</b>	<b>385,358</b>	<b>0.18%</b>	<b>4.21%</b>

Sources: Vehicle registrations: Federal Highway Administration, Highway Statistics 1997 and Highway Statistics 1998, [www.fhwa.dot.gov/ohim/hs97/mv1.pdf](http://www.fhwa.dot.gov/ohim/hs97/mv1.pdf) and [www.fhwa.dot.gov/ohim/hs98/tables/mv1.pdf](http://www.fhwa.dot.gov/ohim/hs98/tables/mv1.pdf). AFVs: Energy Information Administration, "Estimated Number of Alternative Fueled Vehicles in US, by State and Fuel Type," for 1997 and 1998, [www.eia.doe.gov/cneaf/solar.renewables/alt\\_trans\\_fuel97/table4.html](http://www.eia.doe.gov/cneaf/solar.renewables/alt_trans_fuel97/table4.html) and [www.eia.doe.gov/cneaf/solar.renewables/alt\\_trans\\_fuel98/table4.html](http://www.eia.doe.gov/cneaf/solar.renewables/alt_trans_fuel98/table4.html).

**Table A2 Vehicle Registrations and Estimated Number of Alternative-Fuel Vehicles, by State, 1997 and 1998 (sorted by number of AFVs, 1998)**

State	Vehicle Registrations, 1997	Estimated AFVs, 1997	Estimated AFVs as % of Total Vehicles, 1997	Vehicle Registrations, 1998	Estimated AFVs, 1998	Estimated AFVs as % of Total Vehicles, 1998	Estimated % Change in AFVs, 1997 - 1998
California	24,944,976	62,975	0.25%	25,600,250	<b>65,779</b>	0.26%	4.45%
Texas	12,923,253	39,296	0.30%	13,324,167	<b>37,781</b>	0.28%	-3.86%
Illinois	8,442,822	18,591	0.22%	9,306,710	<b>19,184</b>	0.21%	3.19%
Ohio	10,107,651	17,920	0.18%	10,039,488	<b>18,723</b>	0.19%	4.48%
Michigan	8,023,731	16,280	0.20%	8,128,150	<b>16,899</b>	0.21%	3.80%
Oklahoma	2,883,719	14,847	0.51%	2,919,186	<b>14,778</b>	0.51%	-0.46%
New York	10,873,248	13,705	0.13%	10,422,033	<b>14,082</b>	0.14%	2.75%
Pennsylvania	8,824,947	12,935	0.15%	8,978,814	<b>12,906</b>	0.14%	-0.22%
Georgia	6,242,207	11,078	0.18%	6,893,319	<b>11,504</b>	0.17%	3.85%
Florida	10,874,031	10,625	0.10%	11,276,389	<b>10,809</b>	0.10%	1.73%
Indiana	5,345,776	9798	0.18%	5,371,653	<b>10,386</b>	0.19%	6.00%
North Carolina	5,785,533	8995	0.16%	5,861,830	<b>9289</b>	0.16%	3.27%
Tennessee	4,534,842	8749	0.19%	4,469,065	<b>8939</b>	0.20%	2.17%
Wisconsin	4,232,731	8652	0.20%	4,203,319	<b>9250</b>	0.22%	6.91%
Colorado	3,522,590	8016	0.23%	3,466,094	<b>9065</b>	0.26%	13.09%
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Washington	4,702,152	7275	0.15%	4,823,987	<b>7233</b>	0.15%	-0.58%
Iowa	2,851,383	6019	0.21%	3,053,135	<b>7203</b>	0.24%	19.67%
Arizona	3,143,143	5804	0.18%	2,944,016	<b>7441</b>	0.25%	28.20%
<b>New Jersey</b>	<b>5,816,580</b>	<b>5593</b>	<b>0.10%</b>	<b>5,780,336</b>	<b>5951</b>	<b>0.10%</b>	<b>6.40%</b>
Virginia	5,708,991	5309	0.09%	5,818,294	<b>5618</b>	0.10%	5.82%
Missouri	4,350,544	5182	0.12%	4,377,520	<b>6043</b>	0.14%	16.62%
Maryland	3,786,054	4991	0.13%	3,750,275	<b>4497</b>	0.12%	-9.90%
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South Carolina	2,850,361	3831	0.13%	2,893,061	<b>3951</b>	0.14%	3.13%
Louisiana	3,411,023	3747	0.11%	3,430,717	<b>3805</b>	0.11%	1.55%
Nebraska	1,506,996	3308	0.22%	1,525,998	<b>3877</b>	0.25%	17.20%
Nevada	1,145,656	3270	0.29%	1,220,277	<b>4094</b>	0.34%	25.20%
Alabama	3,669,439	3057	0.08%	3,858,928	<b>3120</b>	0.08%	2.06%

Minnesota	3,927,249	2657	0.07%	4,177,841	<b>3210</b>	0.08%	20.81%
Connecticut	2,659,518	2219	0.08%	2,700,633	<b>2325</b>	0.09%	4.78%
Idaho	1,081,052	1986	0.18%	1,118,893	<b>2016</b>	0.18%	1.51%
West Virginia	1,354,992	1793	0.13%	1,377,835	<b>1927</b>	0.14%	7.47%
Kansas	2,152,107	1721	0.08%	2,121,410	<b>1760</b>	0.08%	2.27%
Montana	979,700	1573	0.16%	988,277	<b>1678</b>	0.17%	6.68%
Arkansas	1,633,830	1493	0.09%	1,754,215	<b>1616</b>	0.09%	8.24%
Wyoming	553,374	1218	0.22%	558,991	<b>1167</b>	0.21%	-4.19%
South Dakota	718,403	1152	0.16%	768,507	<b>1174</b>	0.15%	1.91%
North Dakota	695,106	985	0.14%	672,158	<b>1011</b>	0.15%	2.64%
District of Columbia	233,670	960	0.41%	228,716	<b>1201</b>	0.53%	25.10%
Rhode Island	709,680	703	0.10%	715,017	<b>707</b>	0.10%	0.57%
Delaware	613,701	513	0.08%	616,492	<b>565</b>	0.09%	10.14%
Maine	1,058,599	508	0.05%	929,605	<b>497</b>	0.05%	-2.17%
New Hampshire	1,127,387	435	0.04%	1,038,465	<b>515</b>	0.05%	18.39%
Hawaii	692,804	390	0.06%	703,836	<b>399</b>	0.06%	2.31%
Vermont	495,716	310	0.06%	496,153	<b>365</b>	0.07%	17.74%
Alaska	542,398	113	0.02%	545,865	<b>316</b>	0.06%	179.65%
<b>TOTAL</b>	<b>207,753,660</b>	<b>369,804</b>	<b>0.18%</b>	<b>211,616,553</b>	<b>385,358</b>	<b>0.18%</b>	<b>4.21%</b>

Sources: Vehicle registrations: Federal Highway Administration, Highway Statistics 1997 and Highway Statistics 1998, [www.fhwa.dot.gov/ohim/hs97/mv1.pdf](http://www.fhwa.dot.gov/ohim/hs97/mv1.pdf) and [www.fhwa.dot.gov/ohim/hs98/tables/mv1.pdf](http://www.fhwa.dot.gov/ohim/hs98/tables/mv1.pdf). AFVs: Energy Information Administration, "Estimated Number of Alternative Fueled Vehicles in US, by State and Fuel Type," for 1997 and 1998, [www.eia.doe.gov/cneaf/solar.renewables/alt\\_trans\\_fuel97/table4.html](http://www.eia.doe.gov/cneaf/solar.renewables/alt_trans_fuel97/table4.html) and [www.eia.doe.gov/cneaf/solar.renewables/alt\\_trans\\_fuel98/table4.html](http://www.eia.doe.gov/cneaf/solar.renewables/alt_trans_fuel98/table4.html).

**Table A3 Vehicle Registrations and Estimated Number of Alternative Vehicles, by State, 1997 and 1998**  
(sorted by estimated AFVs as % of total vehicles, 1998)

State	Vehicle Registrations, 1997	Estimated AFVs, 1997	Estimated AFVs as % of Total Vehicles, 1997	Vehicle Registrations, 1998	Estimated AFVs, 1998	Estimated AFVs as % of Total Vehicles, 1998	Estimated % Change in AFVs 1997 - 1998
District of Columbia	233,670	960	0.41%	228,716	1201	<b>0.53%</b>	25.10%
Oklahoma	2,883,719	14,847	0.51%	2,919,186	14,778	<b>0.51%</b>	-0.46%
Nevada	1,145,656	3270	0.29%	1,220,277	4094	<b>0.34%</b>	25.20%
Utah	1,529,509	4927	0.32%	1,532,253	4781	<b>0.31%</b>	-2.96%
Texas	12,923,253	39,296	0.30%	13,324,167	37,781	<b>0.28%</b>	-3.86%
New Mexico	1,514,499	3919	0.26%	1,594,792	4474	<b>0.28%</b>	14.16%
Colorado	3,522,590	8016	0.23%	3,466,094	9065	<b>0.26%</b>	13.09%
Oregon	2,890,952	7613	0.26%	2,980,064	7768	<b>0.26%</b>	2.04%
California	24,944,976	62,975	0.25%	25,600,250	65,779	<b>0.26%</b>	4.45%
Nebraska	1,506,996	3308	0.22%	1,525,998	3877	<b>0.25%</b>	17.20%
Arizona	3,143,143	5804	0.18%	2,944,016	7441	<b>0.25%</b>	28.20%
Iowa	2,851,383	6019	0.21%	3,053,135	7203	<b>0.24%</b>	19.67%
Mississippi	2,233,797	4464	0.20%	2,255,744	5154	<b>0.23%</b>	15.46%
Wisconsin	4,232,731	8652	0.20%	4,203,319	9250	<b>0.22%</b>	6.91%
Wyoming	553,374	1218	0.22%	558,991	1167	<b>0.21%</b>	-4.19%
Michigan	8,023,731	16,280	0.20%	8,128,150	16,899	<b>0.21%</b>	3.80%
Illinois	8,442,822	18,591	0.22%	9,306,710	19,184	<b>0.21%</b>	3.19%
Tennessee	4,534,842	8749	0.19%	4,469,065	8939	<b>0.20%</b>	2.17%
Indiana	5,345,776	9798	0.18%	5,371,653	10,386	<b>0.19%</b>	6.00%
Ohio	10,107,651	17,920	0.18%	10,039,488	18,723	<b>0.19%</b>	4.48%
Idaho	1,081,052	1986	0.18%	1,118,893	2016	<b>0.18%</b>	1.51%
Montana	979,700	1573	0.16%	988,277	1678	<b>0.17%</b>	6.68%
Georgia	6,242,207	11,078	0.18%	6,893,319	11,504	<b>0.17%</b>	3.85%
North Carolina	5,785,533	8995	0.16%	5,861,830	9289	<b>0.16%</b>	3.27%
Kentucky	2,780,806	4020	0.14%	2,844,612	4373	<b>0.15%</b>	8.78%
South Dakota	718,403	1152	0.16%	768,507	1174	<b>0.15%</b>	1.91%
North Dakota	695,106	985	0.14%	672,158	1011	<b>0.15%</b>	2.64%
Washington	4,702,152	7275	0.15%	4,823,987	7233	<b>0.15%</b>	-0.58%
Pennsylvania	8,824,947	12,935	0.15%	8,978,814	12,906	<b>0.14%</b>	-0.22%
West Virginia	1,354,992	1793	0.13%	1,377,835	1927	<b>0.14%</b>	7.47%
Missouri	4,350,544	5182	0.12%	4,377,520	6043	<b>0.14%</b>	16.62%
South Carolina	2,850,361	3831	0.13%	2,893,061	3951	<b>0.14%</b>	3.13%

New York	10,873,248	13,705	0.13%	10,422,033	14,082	<b>0.14%</b>	2.75%
Maryland	3,786,054	4991	0.13%	3,750,275	4497	<b>0.12%</b>	-9.90%
Louisiana	3,411,023	3747	0.11%	3,430,717	3805	<b>0.11%</b>	1.55%
<b>New Jersey</b>	<b>5,816,580</b>	<b>5593</b>	<b>0.10%</b>	<b>5,780,336</b>	<b>5951</b>	<b>0.10%</b>	<b>6.40%</b>
Rhode Island	709,680	703	0.10%	715,017	707	<b>0.10%</b>	0.57%
Virginia	5,708,991	5309	0.09%	5,818,294	5618	<b>0.10%</b>	5.82%
Florida	10,874,031	10,625	0.10%	11,276,389	10,809	<b>0.10%</b>	1.73%
Arkansas	1,633,830	1493	0.09%	1,754,215	1616	<b>0.09%</b>	8.24%
Delaware	613,701	513	0.08%	616,492	565	<b>0.09%</b>	10.14%
Connecticut	2,659,518	2219	0.08%	2,700,633	2325	<b>0.09%</b>	4.78%
Kansas	2,152,107	1721	0.08%	2,121,410	1760	<b>0.08%</b>	2.27%
Alabama	3,669,439	3057	0.08%	3,858,928	3120	<b>0.08%</b>	2.06%
Massachusetts	5,070,432	4284	0.08%	5,159,168	4152	<b>0.08%</b>	-3.08%
Minnesota	3,927,249	2657	0.07%	4,177,841	3210	<b>0.08%</b>	20.81%
Vermont	495,716	310	0.06%	496,153	365	<b>0.07%</b>	17.74%
Alaska	542,398	113	0.02%	545,865	316	<b>0.06%</b>	179.65%
Hawaii	692,804	390	0.06%	703,836	399	<b>0.06%</b>	2.31%
Maine	1,058,599	508	0.05%	929,605	497	<b>0.05%</b>	-2.17%
New Hampshire	1,127,387	435	0.04%	1,038,465	515	<b>0.05%</b>	18.39%
<b>TOTAL</b>	<b>207,519,990</b>	<b>368,844</b>	<b>0.18%</b>	<b>211,387,837</b>	<b>384,157</b>	<b>0.18%</b>	<b>4.15%</b>

Sources: Vehicle registrations: Federal Highway Administration, Highway Statistics 1997 and Highway Statistics 1998, [www.fhwa.dot.gov/ohim/hs97/mv1.pdf](http://www.fhwa.dot.gov/ohim/hs97/mv1.pdf) and [www.fhwa.dot.gov/ohim/hs98/tables/mv1.pdf](http://www.fhwa.dot.gov/ohim/hs98/tables/mv1.pdf). AFVs: Energy Information Administration, "Estimated Number of Alternative Fueled Vehicles in US, by State and Fuel Type," for 1997 and 1998, [www.eia.doe.gov/cneaf/solar.renewables/alt\\_trans\\_fuel97/table4.html](http://www.eia.doe.gov/cneaf/solar.renewables/alt_trans_fuel97/table4.html) and [www.eia.doe.gov/cneaf/solar.renewables/alt\\_trans\\_fuel98/table4.html](http://www.eia.doe.gov/cneaf/solar.renewables/alt_trans_fuel98/table4.html).

# APPENDIX B

## Shifting to Clean Fuel Vehicles: A Program for New Jersey

Step	What New Jersey has already done	What New Jersey could do
<p><b>Acknowledge</b> that New Jersey cannot meet air quality standards without significantly increasing its population of alternative-fuel vehicles (AFVs)</p>	<p>Governor Whitman committed the state to increasing the number of AFVs in her 1999 Earth Day message</p>	<p>Expand the governor's commitment to include privately owned vehicles, as well as those in state and local government fleets</p>
<p><b>Exceed</b> the requirements of the federal Energy Policy Act (EPACT) by mandating greater acquisition and use of AFVs by state government fleets and by supporting efforts of local government fleets to acquire alternative-fuel vehicles</p>	<p>Committed to exceeding EPACT requirements by 5% a year starting in 1999</p> <p>Committed to meeting California LEV standards for AFVs in the state fleet that exceed EPACT requirements in 1999 and 2000 model years, and its ULEV standards for the 2001 model year</p> <p>Earmarked \$1.6 million from the Petroleum Overcharge Reimbursement Fund (PORF) to help cover the incremental costs of acquiring alternative-fuel vehicles for the state fleet for 2000</p>	<p>Set a goal of ever-increasing AFV acquisitions for the state government fleet</p> <p>Mandate the actual use of the clean fuel in bi-fuel vehicles, and the use of the maximum amount of the clean fuel (85 percent) in flexible-fuel vehicles</p> <p>Provide an ongoing funding source for AFV acquisition and refueling station development</p>
<p><b>Use</b> the Clean Cities program to encourage acquisition of AFVs by public and private fleets</p>	<p>Established the North Jersey Clean Cities partnership in October 1997</p> <p>Increased the number of AFVs in the Clean Cities program by 79% between the start of program and the end of 1999</p> <p>Provided \$252,000 from the state Board of Public Utilities to the Clean Cities program</p>	<p>Expand the Clean Cities program to the entire state (under discussion)</p> <p>Encourage counties, municipalities, and businesses within the Clean Cities area to participate in the program</p> <p>Increase staffing for the program by making the coordinator a full-time position and/or by hiring additional staff to work in the geographical areas covered by the program</p> <p>Use the influence of the Clean Cities partnership to require that AFVs acquired by federal and other fleets in NJ run on alternative fuels available in the state</p>
<p><b>Establish</b> an alternative-fuel infrastructure in urban areas and along major highway corridors accessible to both private and public AFVs</p>	<p>Directed \$1.1 million from PORF for creating refueling stations to service the growing state AFV fleet</p> <p>Exploring ways to open state refueling stations to local governments and other public entities, and negotiating with private refueling stations for access for state fleet vehicles</p>	<p>Allow public access to existing state and county refueling stations (overcome tax and liability obstacles)</p> <p>Use the new refueling stations being built to serve the state fleet as the nucleus of a publicly accessible refueling network</p> <p>Evaluate the distribution of refueling stations and encourage the establishment of additional stations along major highways and in urban areas to create effective transportation corridors</p>

## Shifting to Clean Fuel Vehicles: A Program for New Jersey

Step	What New Jersey has already done	What New Jersey could do
5 <b>Create</b> dedicated funding sources for AFV acquisition and infrastructure	<p>Using PORF to fund state fleet vehicle program (however, the fund is running out of money)</p> <p>Applying (though not always successfully) for limited, competitive federal funding</p>	<p>Levy an annual vehicle registration surcharge on regions that are in nonattainment of air pollution standards (possibly focusing on fleet vehicles if it is not now politically feasible to levy a surcharge on all vehicles); use the revenues for AFV acquisition, infrastructure, and related projects</p>
6 <b>Provide</b> subsidies for AFV acquisition and infrastructure	<p>Established an AFV rebate program for the public sector with funding from a federal Congestion Mitigation and Air Quality grant</p> <p>Proposed a tax credit program for the purchase or lease of AFVs by businesses</p>	<p>Expand the rebate program to include private sector AFV acquisition (need funding source)</p> <p>Establish a dedicated and ongoing funding source for the rebate program</p> <p>Expand the tax credit program to include individuals and limited liability partnerships</p> <p>Publicize and promote the availability of the rebate and tax credit programs</p>
7 <b>Focus</b> on shifting buses (particularly in urban areas) to clean fuels	<p>NJ Transit has acquired 50 CNG buses for suburban routes</p> <p>Governor's NJ FIRST program, announced in 1998, sought to replace 1400 aging NJ Transit buses with buses running on "best fuel technology"</p>	<p>Provide funding to enable NJ Transit to purchase significant numbers of alternative-fuel buses, both in its current 4-year, 1244-bus cruiser procurement plan and in the future so that it can replace aging, heavily polluting buses and achieve still greater reductions in emissions of particulates and nitrogen oxides</p> <p>Ensure that only alternative-fuel buses are acquired for NJ Transit's urban routes in the future</p>
8 <b>Target</b> urban taxis		<p>Facilitate acquisition of alternative-fuel taxis in urban areas by working with manufacturers to provide subsidies (as Ford does in NYC and elsewhere) and by providing incentives for vehicle acquisition and the establishment of a refueling infrastructure</p>
9 <b>Target</b> school buses and paratransit for the elderly and disabled	<p>Governor Whitman directed the Department of Motor Vehicles to develop an alternative-fuel school bus inspection program</p> <p>Board of Public Utilities and Medford Township School District carrying out a biodiesel school bus demonstration project</p>	<p>Establish local clean vehicle procurement specifications for school buses and paratransit</p> <p>Provide financial incentives for the purchase of clean-fuel school buses and paratransit</p> <p>Enact legislation mandating the statewide phase-in of clean-fuel school buses and paratransit</p>

## Shifting to Clean Fuel Vehicles: A Program for New Jersey

Step	What New Jersey has already done	What New Jersey could do
<p><b>Target</b> heavy-duty vehicles, especially diesel vehicles and trucks</p>		<p>Set goals for acquisition of alternative-fuel garbage trucks and related sanitation vehicles, particularly in urban areas, and provide subsidies for vehicle acquisition and the establishment of a refueling infrastructure</p> <p>Provide incentives for NJ-based truck fleets to acquire clean-fuel trucks</p> <p>Provide incentives to establish liquid natural gas refueling stations along major truck corridors</p> <p>Work with neighboring states to create an interstate clean-fuel truck corridor analogous to the one in CA, NV, and UT</p> <p>Encourage the Port Authority, through the governor's representatives on the board, to expand programs and incentives for acquisition of alternative-fuel vehicles by its tenants at Newark Airport and at the New Jersey seaports</p>
<p><b>Monitor</b> the state's achievements in shifting to clean fuels</p>	<p>Tracks acquisitions of vehicles through North Jersey Clean Cities programs, by fuel type</p> <p>Expanding the state motor vehicles database to include fuel type (however, this information will not be collected until a vehicle's first inspection, 2 years after it is first registered)</p>	<p>Track acquisition of all AFVs, throughout the state and by all sectors, by fuel type and by type of vehicle, by including this information on vehicle registration forms</p> <p>Track clean-fuel use throughout the state</p> <p>Use the information acquired through tracking to develop future AFV programs</p>
<p><b>Promote</b> and publicize AFVs and the state's clean-fuel vehicle programs</p>	<p>Governor Whitman highlighted the state's clean transportation initiatives in her Earth Day messages in 1998 and 1999</p> <p>The governor publicized the NJ Venturer, a demonstration fuel cell vehicle created in a public-private partnership</p>	<p>Ensure that information about new programs is publicized throughout the state and is promoted to sectors that could benefit from them</p> <p>Work with the business sector to involve existing NJ businesses in AFV activities, and to attract related businesses to the state</p> <p>Increase the visibility of New Jersey's AFV acquisitions by affixing stickers to all clean-fuel vehicles used by state, county, and municipal agencies</p>



# Notes

- 1 New Jersey Department of Environmental Protection, "Proposed State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standards: Meeting the Requirements of the Alternative Ozone Attainment Demonstration Policy. Phase II Ozone SIP Submittal," November 23, 1998, and US Census Bureau, [www.census.gov/population/estimates/county/co-98-1/98C1\\_34.txt](http://www.census.gov/population/estimates/county/co-98-1/98C1_34.txt).
- 2 Environmental Protection Agency, Office of Air and Radiation, [www.epa.gov/airprog/oar/oaqps/greenbk/aycl.html](http://www.epa.gov/airprog/oar/oaqps/greenbk/aycl.html).
- 3 Environmental Protection Agency, [www.epa.gov/airs/nonattn.html](http://www.epa.gov/airs/nonattn.html).
- 4 New Jersey Department of Environmental Protection, "Revision to the State Implementation Plan (SIP). Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standards: Proposed Revision to the New Jersey 15 Percent Rate of Progress Plan," November 23, 1998, see p. 6, [www.state.nj.us/dep/aqm/sip-15.htm](http://www.state.nj.us/dep/aqm/sip-15.htm).
- 5 Personal communication, Bob Stern, Bureau of Air Quality Planning, New Jersey Department of Environmental Protection, March 29, 2000, based on unreviewed data. The official number projected in New Jersey's Phase I State Implementation Plan (SIP) was 29 percent, but preliminary unreviewed data indicate that the number is closer to 44 percent because emissions from point sources are lower than initially projected, thus making mobile sources a larger contributor to the total.
- 6 Northeast States for Coordinated Air Use Management, "Why Clean Air?" [www.nescaum.org/cleanair.htm](http://www.nescaum.org/cleanair.htm).
- 7 Environmental Protection Agency, Office of Air and Radiation, "National Air Quality and Emissions Trends Report, 1997," Table A-6, [www.epa.gov/oar/aqtrnd97/appenda.pdf](http://www.epa.gov/oar/aqtrnd97/appenda.pdf).
- 8 Environmental Protection Agency, Office of Air and Radiation, Office of Mobile Sources, "Draft Regulatory Impact Analysis: Control of Emissions from Highway Heavy-Duty Engines," draft, August 1999, chapter 2, "Health and Welfare Concerns," [www.epa.gov/oms/regs/hd-hwy/1999nprm/99ria15.pdf](http://www.epa.gov/oms/regs/hd-hwy/1999nprm/99ria15.pdf).
- 9 New Jersey Department of Environmental Protection, "Air Toxics of Special Concern," undated, [www.state.nj.us/dep/airmon/airtoxics/concern.htm](http://www.state.nj.us/dep/airmon/airtoxics/concern.htm).
- 10 New Jersey Department of Environmental Protection, [www.state.nj.us/dep/airmon/airtoxics/sources.htm](http://www.state.nj.us/dep/airmon/airtoxics/sources.htm).
- 11 New Jersey Future, "Living with the Future in Mind: Goals and Indicators for New Jersey's Quality of Life," 1999 Sustainable State Project Report (1999).
- 12 US Census Bureau, *Statistical Abstract of the United States 1998*, [www.census.gov/80/prod/3/98pubs/98statab/sasec1.pdf](http://www.census.gov/80/prod/3/98pubs/98statab/sasec1.pdf).
- 13 New Jersey Future, "Living with the Future in Mind: Goals and Indicators for New Jersey's Quality of Life," 1999 Sustainable State Project Report (1999).
- 14 *Ibid.*
- 15 John DeCicco and Martin Thomas, *Green Guide to Cars and Trucks Model Year 1999* (Washington, DC: American Council for an Energy-Efficient Economy, 1999).
- 16 Wards AutoInfoBank, 1999 (used with permission).
- 17 Federal Highway Administration, "1994 Truck VMT by State," in *1997 USDOT Comprehensive Truck Size and Weight Study*, June 1997, Table III-5, [www.fhwa.dot.gov/reports/tswstudy/v2chap3.pdf](http://www.fhwa.dot.gov/reports/tswstudy/v2chap3.pdf).

- 18 Northeast States for Coordinated Air Use Management, "Heavy-Duty Engines in the Northeast," May 1997, [www.nescaum.org/pdf/hdengine.pdf](http://www.nescaum.org/pdf/hdengine.pdf).
- 19 Personal communication, William Wanschura, New Jersey Department of Transportation, April 20, 2000.
- 20 Energy Information Administration, *Alternatives to Traditional Transportation Fuels, 1998*, Appendix A, "Estimation Methods and Data Quality," [www.eia.doe.gov/cneaf/solar.renewables/alt\\_trans\\_fuel/attf.pdf](http://www.eia.doe.gov/cneaf/solar.renewables/alt_trans_fuel/attf.pdf), and personal communication, Mary Joyce, Energy Information Administration, March 30, 2000.
- 21 Personal communication, Ellen Bourbon, New Jersey Board of Public Utilities, Division of Energy, and Coordinator, North Jersey Clean Cities, March 6, 2000.
- 22 Alternative Fuels Data Center, National Renewable Energy Laboratory, [www.afdc.nrel.gov/refuel/state\\_tot.shtml](http://www.afdc.nrel.gov/refuel/state_tot.shtml) and <http://afdcmap.nrel.gov/nrel>. Additionally, the number of LPG service stations changes rapidly; propane tank distributors go in and out of the LPG service station business. (Personal communication, Ellen Bourbon, Project Manager, NJ Board of Public Utilities, July 14, 1999.)
- 23 Personal communication, Ellen Bourbon, New Jersey Board of Public Utilities, Division of Energy, and Coordinator, North Jersey Clean Cities, March 6, 2000.
- 24 Personal communication, Jerry King, Clean Fuel Program Coordinator, New York State Office of General Services, December 1, 1999.
- 25 Personal communication, Thomas J. Ryan, US General Services Agency, with Roberta Weisbrod, INFORM, Inc., December 28, 1999.
- 26 *Greater Long Island Clean Cities Coalition News*, June 1999.
- 27 School Transportation News Online, [www.stnonline.com/stn/statesprovinces/unitedstates/2-nj.htm](http://www.stnonline.com/stn/statesprovinces/unitedstates/2-nj.htm).
- 28 Natural Gas Vehicle Coalition, "Natural Gas Growing as Transit Fuel Option," November 2, 1999, [www.ngvc.org/transitpr.html](http://www.ngvc.org/transitpr.html).
- 29 Natural Gas Vehicle Coalition, *APTA 1999 Transit Vehicle Data Book* (Washington, DC: American Public Transit Association, 1999).
- 30 *Ibid.*
- 31 Personal communication, Lynn Steinberg, Project Manager, Office of Policy and Planning, Port Authority of New York and New Jersey, March 27 and 30, 2000.
- 32 Port Authority of New York and New Jersey, [www.panynj.gov/tbt/pabframe.htm](http://www.panynj.gov/tbt/pabframe.htm).
- 33 Environmental Protection Agency, [www.epa.gov/airs/nonattn.html](http://www.epa.gov/airs/nonattn.html). Based on actual air monitoring data collected by the EPA, the agency has estimated that, in the single year of 1997, 107 million people lived in counties that did not meet national air quality standards for one or more of the six criteria pollutants: 101.6 million for ground-level ozone, 9.7 million for particulates, 9.1 million for carbon monoxide, and lesser levels for the other pollutants. It is not clear why these air monitoring figures differ from the nonattainment area figures. See Environmental Protection Agency, Office of Air and Radiation, *National Air Quality and Emissions Trends Report, 1997*, chapter 2, [www.epa.gov/oar/aqtrnd97/chapter2/pdf](http://www.epa.gov/oar/aqtrnd97/chapter2/pdf).
- 34 Environmental Protection Agency, Office of Air and Radiation, *National Air Quality and Emissions Trends Report, 1997*, Appendix A, [www.epa.gov/oar/aqtrnd97/appenda.pdf](http://www.epa.gov/oar/aqtrnd97/appenda.pdf).
- 35 Environmental Protection Agency, "The Plain English Guide to the Clean Air Act," [www.epa.gov/oar/oaqps/peg\\_caa/pegcaa04.html](http://www.epa.gov/oar/oaqps/peg_caa/pegcaa04.html).

- 36 Environmental Protection Agency, Office of Air and Radiation, *National Air Quality and Emissions Trends Report, 1997*, Appendix A, [www.epa.gov/oar/aqtrnd97/appenda.pdf](http://www.epa.gov/oar/aqtrnd97/appenda.pdf).
- 37 Environmental Protection Agency, *National Air Pollutant Emission Trends Update 1970 - 1997*, Appendix A, Table A-6, [www.epa.gov/ttn/chief/trends97/appendA.pdf](http://www.epa.gov/ttn/chief/trends97/appendA.pdf).
- 38 Energy Information Administration, 3-4, [www.eia.doe.gov/pub/energy.overview/monthly.energy/mer](http://www.eia.doe.gov/pub/energy.overview/monthly.energy/mer).
- 39 State and Territorial Air Pollution Program Administrators and Association of Air Pollution Control Officials (STAPPA/ALAPCO), Letter to EPA Administrator, February 16, 2000, [www.4cleanair.org/comments/Letter-Feb2000.pdf](http://www.4cleanair.org/comments/Letter-Feb2000.pdf).
- 40 Northeast States for Coordinated Air Use Management, "Heavy-Duty Engine Emissions in the Northeast," May 1997, EX2-3, [www.nescaum.org/pdf/hdengine.pdf](http://www.nescaum.org/pdf/hdengine.pdf).
- 41 New Jersey Department of Environmental Protection, "Proposed State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standards: Meeting the Requirements of the Alternative Ozone Attainment Demonstration Policy. Phase II Ozone SIP Submittal," June 30, 1998, [www.state.nj.us/dep/aqm/sip-ph2.htm](http://www.state.nj.us/dep/aqm/sip-ph2.htm).
- 42 National Institutes of Health, *Guidelines for the Diagnosis and Management of Asthma*, National Heart, Lung and Blood Institute, Expert Panel Report 2, Clinical Practice Guidelines, July 1997.
- 43 New Jersey Department of Environmental Protection, "Proposed State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standards: Meeting the Requirements of the Alternative Ozone Attainment Demonstration Policy. Phase II Ozone SIP Submittal," June 30, 1998, [www.state.nj.us/dep/aqm/sip-ph2.htm](http://www.state.nj.us/dep/aqm/sip-ph2.htm).
- 44 President's Task Force on Environmental Health Risks and Safety Risks to Children, "Asthma and the Environment: A Strategy to Protect Children" (no date, post-April 1998), 8.
- 45 Energy Information Administration, "World Carbon Dioxide Emissions from the Consumption of Petroleum, 1988-1997," March 25, 1999 update, [www.eia.doe.gov/emeu/iea/tableh2.html](http://www.eia.doe.gov/emeu/iea/tableh2.html), and Transportation Research Board, National Research Council, *Toward a Sustainable Future: Addressing the Long-Term Effects of Motor Vehicle Transportation on Climate and Ecology* (Washington, DC: National Academy Press, 1997), chapter 3.
- 46 Energy Information Administration, [www.eia.doe.gov/oiaf/1605/gg98rpt/carbon.html](http://www.eia.doe.gov/oiaf/1605/gg98rpt/carbon.html) and [www.eia.doe.gov/oiaf/1605/gg98rpt/tbl10.html](http://www.eia.doe.gov/oiaf/1605/gg98rpt/tbl10.html), November 6, 1998.
- 47 See James S. Cannon, *Paving the Way to Natural Gas Vehicles* (New York: INFORM, Inc., 1993).
- 48 Natural Gas Vehicle Coalition, "Questions and Answers about Natural Gas Vehicles," [www.ngvc.org/qa.html](http://www.ngvc.org/qa.html).
- 49 James S. Cannon and Chyi Sun, *Bus Futures: New Technologies for Cleaner Cities* (New York, INFORM, Inc., 2000).
- 50 National Renewable Energy Laboratory, US Department of Energy, "Update from the NREL Alternative Fuel Transit Bus Evaluation Program," paper presented at the American Public Transit Association Bus Conference, Cleveland, OH, May 1999.
- 51 For continuing updates, see the Fuel Cells 2000 web site at [www.fuelcells.org](http://www.fuelcells.org).
- 52 Federal Highway Administration, *Highway Statistics 1998*, [www.fhwa.dot.gov/ohim/hs98/tables/mv1.pdf](http://www.fhwa.dot.gov/ohim/hs98/tables/mv1.pdf), and Energy Information Administration, Department of Energy, [www.doe.gov/cneaf/solar.renewables/alt\\_trans\\_fuel98/table4.html](http://www.doe.gov/cneaf/solar.renewables/alt_trans_fuel98/table4.html).
- 53 Bureau of Transportation Statistics, US Department of Transportation, *Transportation Statistics Annual Report 1998: Long-Distance Travel and Freight* (1998), Table 4-6, "Estimated Consumption of Alternative and Replacement Fuels for Highway Vehicles," [www.bts.gov/btsprod/nts/chp4/tbl4x6.html](http://www.bts.gov/btsprod/nts/chp4/tbl4x6.html).

- 54 Energy Information Administration, [www.eia.doe.gov/cneaf/solar.renewables/alt\\_trans\\_fuel98/table1.html](http://www.eia.doe.gov/cneaf/solar.renewables/alt_trans_fuel98/table1.html).
- 55 Federal Highway Administration, *Highway Statistics Summary to 1995*, [www.fhwa.dot.gov/ohim/Summary95/mv230.pdf](http://www.fhwa.dot.gov/ohim/Summary95/mv230.pdf), and *Highway Statistics 1998*, [www.fhwa.dot.gov/ohim/hs98/mv1.pdf](http://www.fhwa.dot.gov/ohim/hs98/mv1.pdf).
- 56 Energy Information Administration, [www.eia.doe.gov/cneaf/solar.renewables/alt\\_trans\\_fuel98/table1.html](http://www.eia.doe.gov/cneaf/solar.renewables/alt_trans_fuel98/table1.html).
- 57 Personal communication, Christopher Salmi, Bureau of Air Quality Planning, New Jersey Department of Environmental Protection, March 22, 2000.
- 58 Environmental Protection Agency, Office of Air and Radiation, Ozone Nonattainment Report, [www.epa.gov/oar/oaqps/greenbk/oycs.html#NEW\\_JERSEY](http://www.epa.gov/oar/oaqps/greenbk/oycs.html#NEW_JERSEY), and US Census Bureau, [www.census.gov/population/estimates/county/co-98-1/98C1\\_34.txt](http://www.census.gov/population/estimates/county/co-98-1/98C1_34.txt).
- 59 Personal communication, Christopher Salmi, Bureau of Air Quality Planning, New Jersey Department of Environmental Protection, March 29, 2000.
- 60 Environmental Protection Agency, [www.epa.gov/airs/nonattn.html](http://www.epa.gov/airs/nonattn.html).
- 61 Environmental Protection Agency, Office of Air and Radiation, Carbon Monoxide Nonattainment Report, [www.epa.gov/oar/oaqps/greenbk/cnccs.html](http://www.epa.gov/oar/oaqps/greenbk/cnccs.html), and US Census Bureau, [www.census.gov/population/estimates/county/co-98-1/98C1\\_34.txt](http://www.census.gov/population/estimates/county/co-98-1/98C1_34.txt).
- 62 Personal communication, Christopher Salmi, Bureau of Air Quality Planning, New Jersey Department of Environmental Protection, March 22, 2000.
- 63 US Environmental Protection Agency, [www.epa.gov/oar/oaqps/greenbk/o1hna.html](http://www.epa.gov/oar/oaqps/greenbk/o1hna.html).
- 64 Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, and Union Counties.
- 65 Burlington, Camden, Cumberland, Gloucester, Mercer, and Salem Counties.
- 66 New Jersey Department of Environmental Protection, Bureau of Air Monitoring, "Historical Data: Ground Level Ozone, 1-Hour Exceedences," <http://www.state.nj.us/dep/airmon/oz1tbl.htm>.
- 67 New Jersey Department of Environmental Protection, Bureau of Air Monitoring. For 1997 data, "1998 Ozone Report," Figure 2, [www.state.nj.us/dep/airmon/98ozone.pdf](http://www.state.nj.us/dep/airmon/98ozone.pdf); for 1998 and 1999 data, "1998 Ozone Report," Figure 2.1, [www.state.nj.us/dep/airmon/98o3rpt.htm](http://www.state.nj.us/dep/airmon/98o3rpt.htm), and "Historical Data: Ground-Level Ozone, 8-hour Exceedences," <http://www.state.nj.us/dep/airmon/oz8tbl.htm>.
- 68 New Jersey Department of Environmental Protection, "Proposed State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standards: Meeting the Requirements of the Alternative Ozone Attainment Demonstration Policy. Phase II Ozone SIP Submittal," June 30, 1998, Figure 37, [www.stat.nj.us/dep/aqm/sip-ph2.htm](http://www.stat.nj.us/dep/aqm/sip-ph2.htm).
- 69 Personal communication, Charles Pietarinen, New Jersey Department of Environmental Protection, April 28, 2000.
- 70 New Jersey Department of Environmental Protection, "New Jersey's Environment 1998," undated.
- 71 New Jersey Department of Environmental Protection, [www.state.nj.us/dep/dsr/aqr.pdf](http://www.state.nj.us/dep/dsr/aqr.pdf).
- 72 Northeast States for Coordinated Air Use Management, *Heavy-Duty Engine Emissions in the Northeast*, May 1997, EX2, [www.nescaum.org/pdf/hd-engine/pdf](http://www.nescaum.org/pdf/hd-engine/pdf).
- 73 New Jersey Department of Environmental Protection, "Revision to the State Implementation Plan (SIP). Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standards: Proposed Revision to the New Jersey 15 Percent Rate of Progress Plan," November 23, 1998, see 6, [www.state.nj.us/dep/aqm/sip-15.htm](http://www.state.nj.us/dep/aqm/sip-15.htm).

- 74 Personal communication, Bob Stern, Bureau of Air Quality Planning, New Jersey Department of Environmental Protection, March 29, 2000, based on unreviewed data. The official number projected in New Jersey's Phase I State Implementation Plan (SIP) was 29 percent, but preliminary unreviewed data indicate that the number is closer to 44 percent because emissions from point sources are lower than initially projected, thus making mobile sources a larger contributor to the total.
- 75 Northeast States for Coordinated Air Use Management, "Why Clean Air?" [www.nescaum.org/cleanair.html](http://www.nescaum.org/cleanair.html).
- 76 Personal communication, Christopher Salmi, Bureau of Air Quality Planning, New Jersey Department of Environmental Protection, March 29, 2000.
- 77 Personal communication, Stuart Nagourney, New Jersey Department of Environmental Protection, March 29, 2000.
- 78 New Jersey Department of Environmental Protection, "Sources of Air Toxics," updated spring 1999, [www.state.nj.us/dep/airmon/airtoxics/sources.htm](http://www.state.nj.us/dep/airmon/airtoxics/sources.htm).
- 79 *Ibid.*
- 80 *Ibid.*
- 81 New Jersey Future, "Living with the Future in Mind: Goals and Indicators for New Jersey's Quality of Life," 1999 Sustainable State Project Report (1999).
- 82 Federal Highway Administration, *Highway Statistics 1997*, [www.fhwa.dot.gov/ohim/hs97/vm2.pdf](http://www.fhwa.dot.gov/ohim/hs97/vm2.pdf), and *Highway Statistics 1998*, [www.fhwa.dot.gov/ohim/hs98/tables/vm2.pdf](http://www.fhwa.dot.gov/ohim/hs98/tables/vm2.pdf).
- 83 US Census Bureau, *Statistical Abstract of the United States 1998*, [www.census.gov/80/prod/3/98pubs/98statab/sasec1.pdf](http://www.census.gov/80/prod/3/98pubs/98statab/sasec1.pdf).
- 84 New Jersey Future, "Living with the Future in Mind: Goals and Indicators for New Jersey's Quality of Life," 1999 Sustainable State Project Report (1999).
- 85 *Ibid.*
- 86 *Ibid.*
- 87 John DeCicco and Martin Thomas, *Green Guide to Cars and Trucks Model Year* (Washington, DC: American Council for an Energy-Efficient Economy, 1999).
- 88 Wards AutoInfoBank, 1999 (used with permission).
- 89 *Ibid.*
- 90 Federal Highway Administration, *Highway Statistics 1996*, *Highway Statistics 1997*, and *Highway Statistics 1998*. For mileage, [www.fhwa.dot.gov/ohim/hs96/vm2.pdf](http://www.fhwa.dot.gov/ohim/hs96/vm2.pdf), [www.fhwa.dot.gov/ohim/hs97/vm2.pdf](http://www.fhwa.dot.gov/ohim/hs97/vm2.pdf), and [www.fhwa.dot.gov/ohim/hs98/tables/mv2.pdf](http://www.fhwa.dot.gov/ohim/hs98/tables/mv2.pdf); for fuel use increase, [www.fhwa.dot.gov/ohim/hs97/mf21.pdf](http://www.fhwa.dot.gov/ohim/hs97/mf21.pdf) and [www.fhwa.dot.gov/ohim/hs98/tables/mf21.pdf](http://www.fhwa.dot.gov/ohim/hs98/tables/mf21.pdf).
- 91 Northeast States for Coordinated Air Use Management, *Heavy-Duty Engines in the Northeast*, May 1997, [www.nescaum.org/pdf/hdengine.pdf](http://www.nescaum.org/pdf/hdengine.pdf).
- 92 Bureau of Transportation Statistics, *National Transportation Statistics 1998*, chapter 1, Table 1-25, [www.bts.gov/btsprod/nts/chp1/tbl1x25.html](http://www.bts.gov/btsprod/nts/chp1/tbl1x25.html).
- 93 Bureau of Transportation Statistics, *National Transportation Statistics 1998*, chapter 1, Table 1-9, [www.bts.gov/btsprod/nts/chp1/tbl1x9.html](http://www.bts.gov/btsprod/nts/chp1/tbl1x9.html).
- 94 Northeast States for Coordinated Air Use Management, *Heavy-Duty Engines in the Northeast*, May 1997, [www.nescaum.org/pdf/hdengine.pdf](http://www.nescaum.org/pdf/hdengine.pdf).

- 95 *Ibid.*
- 96 “EPA to Issue Tougher Rules on Diesel Fuel,” *The New York Times*, May 17, 2000.
- 97 Environmental Protection Agency, *National Air Pollutant Emission Trends Update 1970 - 1997*, Tables A-5 and A-6, [www.epa.gov/ttn/chief/trends97/appendA.pdf](http://www.epa.gov/ttn/chief/trends97/appendA.pdf).
- 98 Environmental Protection Agency, Office of Air and Radiation, Office of Mobile Sources, “Draft Regulatory Impact Analysis: Control of Emissions from Highway Heavy-Duty Engines,” draft, August 1999. [www.epa.gov/oms/regs/hd-hwy/1999nprm/99ria15.pdf](http://www.epa.gov/oms/regs/hd-hwy/1999nprm/99ria15.pdf).
- 99 *Ibid.*, chapter 2, “Health and Welfare Concerns.”
- 100 Federal Highway Administration, “1994 Truck VMT by State,” in *1997 USDOT Comprehensive Truck Size and Weight Study*, June 1997, Table III-5, [www.fhwa.dot.gov/reports/tswstudy/v2chap3.pdf](http://www.fhwa.dot.gov/reports/tswstudy/v2chap3.pdf).
- 101 New Jersey Department of Environmental Protection, “Proposed State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standards: Meeting the Requirements of the Alternative Ozone Attainment Demonstration Policy. Phase II Ozone SIP Submittal,” June 30, 1998, [www.state.nj.us/dep/aqm/sip-ph2.htm](http://www.state.nj.us/dep/aqm/sip-ph2.htm).
- 102 Personal communication, Dave West, New Jersey Department of Environmental Protection, March 17, 2000.
- 103 Personal communication, William Wanschura, New Jersey Department of Transportation, April 20, 2000.
- 104 Personal communication, Ellen Bourbon, New Jersey Board of Public Utilities, Division of Energy, and Coordinator, North Jersey Clean Cities, March 6, 2000.
- 105 Energy Information Administration, *Alternatives to Traditional Transportation Fuels, 1998*, Appendix A, “Estimation Methods and Data Quality,” [www.eia.doe.gov/cneaf/solar.renewables/alt\\_trans\\_fuel/attf.pdf](http://www.eia.doe.gov/cneaf/solar.renewables/alt_trans_fuel/attf.pdf). Also, personal communication, Mary Joyce, Energy Information Administration, March 30, 2000.
- 106 *Ibid.*, Mary Joyce.
- 107 North Jersey Clean Cities Coalition, “1999 Clean Cities Coalition Report,” March 9, 2000.
- 108 Personal communication, Ellen Bourbon, New Jersey Board of Public Utilities, Division of Energy, and Coordinator, North Jersey Clean Cities, March 6, 2000.
- 109 *Ibid.*
- 110 Alternative Fuels Data Center, National Renewable Energy Laboratory, [www.afdc.nrel.gov/refuel/state\\_tot.shtml](http://www.afdc.nrel.gov/refuel/state_tot.shtml) and <http://afdcmap.nrel.gov/nrel>. The New York State Energy Research Development Agency provides slightly different figures for alternative-fuel refueling stations at [www.nyserda.org/afvfuel.html](http://www.nyserda.org/afvfuel.html), but the NREL figures are used here for more direct comparison with New Jersey.
- 111 Personal communication, Erik Neandross, ICTC Project Manager, Gladstein & Associates, Santa Monica, CA, April 2, 2000. Some information is also available from [www.calstart.org/ictc](http://www.calstart.org/ictc), but this web site has not been updated recently.
- 112 Personal communication, Don Borowski, Manager, Bureau of Transportation Technologies, New Jersey Department of Transportation, with Roberta Weisbrod, INFORM, Inc., December 1999.
- 113 Personal communication, Costco Member Services, 800-774-2678.
- 114 Personal communication, Thomas J. Ryan, US General Services Agency, with Roberta Weisbrod, INFORM, Inc., December 28, 1999.

- 115 “Governor Commits \$30 Billion, Announces Strategic Transportation Plan for 21st Century,” press release, Trenton, NJ, May 18, 1998. [www.state.nj.us/governor/news/p80518b.htm](http://www.state.nj.us/governor/news/p80518b.htm).
- 116 “Governor Whitman Takes a Spin in Electric Car, Announces Incentive Package to Increase ‘Clean’ Vehicles,” press release, Trenton, NJ, April 16, 1999, [www.state.nj.us/governor/news/p90419e.htm](http://www.state.nj.us/governor/news/p90419e.htm).
- 117 Personal communication, Ellen Bourbon, Division of Energy, New Jersey Board of Public Utilities, and Coordinator, North Jersey Clean Cities, February 15 and March 6, 2000.
- 118 Personal communication, Jerry King, Clean Fuel Program Coordinator, New York State Office of General Services, December 1, 1999.
- 119 Personal communication, Ellen Bourbon, New Jersey Board of Public Utilities, Division of Energy, and Coordinator, North Jersey Clean Cities, February 15 and April 14, 2000.
- 120 *Ibid.*, February 15 and March 6, 2000.
- 121 California Air Resources Board, “2000 Model Year Guide to Passenger Cars,” January 20, 2000, [www.arb.ca.gov/msprog/ccbg/2000pc.htm](http://www.arb.ca.gov/msprog/ccbg/2000pc.htm).
- 122 Personal communication, Sharon Haas, Department of Environmental Protection, March 23 and 30, 2000.
- 123 New Jersey Department of Environmental Protection, “New Jersey Clean Fleets (NJCF) SIP: Meeting the Clean Fuel Fleet Requirements of the Clean Air Act,” March 6, 1997.
- 124 *Ibid.*
- 125 Personal communication, Fred Allen, Brookdale Community College, May 1, 2000.
- 126 Personal communication, Sharon Haas, Bureau of Transportation Control, New Jersey Department of Environmental Protection, April 26, 2000.
- 127 US Department of Energy, [www.ccities.doe.gov/documents/Game99.pdf](http://www.ccities.doe.gov/documents/Game99.pdf).
- 128 The counties are Bergen, Hudson, Essex, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Union, Warren, Hunterdon, and Sussex. Population figures from the US Census Bureau, [www.census.gov/population/estimates/county/co-98-1/98C1-34.txt](http://www.census.gov/population/estimates/county/co-98-1/98C1-34.txt).
- 129 “1999 Clean Cities Coalition Report,” obtained from Ellen Bourbon, North Jersey Clean Cities Coordinator to Department of Energy Clean Cities Coordinator, March 9, 2000.
- 130 School Transportation News Online, [www.stnonline.com/stn/statesprovinces/unitedstates/2-nj.htm](http://www.stnonline.com/stn/statesprovinces/unitedstates/2-nj.htm).
- 131 For some examples, see the US Department of Energy’s Energy Smart Schools project, [www.eren.doe.gov/energysmartschools/story-bus.html](http://www.eren.doe.gov/energysmartschools/story-bus.html), and the California Energy Commission’s Safe School Bus Demonstration Program, <http://www.energy.ca.gov/afvs/schoolbus/index.html>.
- 132 Federal Vehicle Policy Division, General Services Agency, “Keeling Report,” May 1998, <http://policyworks.gov/org/main/mt/homepage/mtv/keelingreport.htm>.
- 133 Personal communication, Tom Ryan, General Services Administration, December 28, 1999.
- 134 *Greater Long Island Clean Cities News*, June 1999.
- 135 New Jersey Board of Public Utilities, “Announcing...New Jersey’s Alternative Fuel Vehicle Rebate Program,” brochure, November 1999.

- 136 Personal communication, Ellen Bourbon, New Jersey Board of Public Utilities, Division of Energy, and Coordinator, North Jersey Clean Cities, February 15 and March 6, 2000.
- 137 Personal communication, Sharon Haas, Bureau of Transportation Control, New Jersey Department of Environmental Protection, March 30 and April 3, 2000.
- 138 Personal communication, Donald Borowski, Manager, Bureau of Transportation Technology, New Jersey Department of Transportation, December 9, 1999, February 24, 2000, and March 31, 2000. See also the National Station Car Association web site, [www.Stncar.com/nj.html](http://www.Stncar.com/nj.html), and, for information about the demonstration in Morris County, the McRides web site, [www.mcrides.org/e-car.htm](http://www.mcrides.org/e-car.htm).
- 139 For more information, see the Venturer web site at [www.venturer.rutgers.edu](http://www.venturer.rutgers.edu). The partnership included New Jersey Department of Transportation (Technology Bureau), New Jersey Board of Public Utilities, New Jersey Department of Environmental Protection, New Jersey Commerce Commission, H Power Corporation and eight other companies, Rutgers Center for Advanced Infrastructure Technology, Rowan University, Burlington County College, New Jersey Institute of Technology, Cinnaminson High School, Hunterdon County Polytech, and Hunterdon Central High School.
- 140 For more information, see the Genesis web site at [www.genesis.rutgers.edu](http://www.genesis.rutgers.edu). Partners include the New Jersey Department of Transportation, the New Jersey Board of Public Utilities, the New Jersey Department of Environmental Protection, the New Jersey Commerce and Economic Growth Commission, the US Department of Energy; Millennium Cell, H Power, and a variety of other companies; Rutgers Center for Advanced Infrastructure Technology, Hunterdon Central Regional High School, Hunterdon County Polytech, Mercer County Technical School, Burlington County College, and the New Jersey Institute of Technology.
- 141 Personal communication, Cassandra Kling, Program Manager for Alternative Energy and Sustainable Construction, New Jersey Office of Sustainable Business, March 6 and April 24, 2000.
- 142 Personal communication, Peter Garino, Policy and Legislative Analysis, New Jersey Transit, March 31, 2000.
- 143 *Ibid.*
- 144 Personal Communication, Marianne Stock, Senior Director of Policy and Legislative Analysis, New Jersey Transit, February 29, 2000.
- 145 *Ibid.*
- 146 Personal Communication, Peter Garino, Policy and Legislative Analysis, New Jersey Transit, March 31, 2000.
- 147 Natural Gas Vehicle Coalition, "Natural Gas Growing as Transit Fuel Option," November 2, 1999, [www.ngvc.org/transitpr.html](http://www.ngvc.org/transitpr.html).
- 148 Natural Gas Vehicle Coalition, "APTA 1999 Transit Vehicle Data Book" (Washington, DC: American Public Transit Association, 1999).
- 149 Personal communication, Peter Garino, Policy and Legislative Analysis, New Jersey Transit, March 31 and April 13, 2000.
- 150 *Ibid.*, March 31, 2000.
- 151 *Ibid.*, May 1, 2000.
- 152 *Ibid.*, May 2, 2000.
- 153 *Ibid.*, April 28, 2000.
- 154 Personal communication, Marianne Stock, Senior Director of Policy and Legislative Analysis, New Jersey Transit, March 29, 2000.

- 155 Personal communication, Lynn Steinberg, Port Authority of New York and New Jersey, March 27 and 30, 2000.
- 156 Port Authority of New York and New Jersey, [www.panynj.gov/tbt/pabframe.htm](http://www.panynj.gov/tbt/pabframe.htm).
- 157 Natural Resources Defense Council, [www.nrdc.org/find/trairpov.html](http://www.nrdc.org/find/trairpov.html).
- 158 Personal communication, Lynn Steinberg, Port Authority of New York and New Jersey, March 31 and April 3, 2000.
- 159 Port Authority of New York and New Jersey, "British Airways World Cargo to Convert Entire Fleet of Vehicles Handling Cargo to Cleaner-Burning Compressed Natural Gas at JFK," press advisory, September 30, 1999, [www.panynj.com/pr/prframe.htm](http://www.panynj.com/pr/prframe.htm).
- 160 "LA Port Commits to Clean Engines, Fuels," *NGV News*, June 1999.
- 161 Port Authority of New York and New Jersey, Port Commerce Department, "Port Investment Options," [www.panynj.com/commerce/pcfframe.htm](http://www.panynj.com/commerce/pcfframe.htm).
- 162 Personal communication, Christopher Zeppie, Chief Environmental Policy Officer, Port Authority of New York and New Jersey, February 23, 2000.
- 163 "Port of LA Launches Clean Engines, Fuels Effort," *CALSTART News Notes*, April 9, 1999.
- 164 Personal communication, Kathleen Ellis, Manager, Communications, Public Service Electric & Gas, April 13, 2000.
- 165 Personal communication, Ellen Bourbon, New Jersey Board of Public Utilities, Division of Energy, and Coordinator, North Jersey Clean Cities, February 15, 2000.
- 166 Personal communication, Kathleen Ellis, Manager, Communications, Public Service Electric & Gas, April 13, 2000.
- 167 Personal communication, Ellen Bourbon, New Jersey Board of Public Utilities, Division of Energy, and Coordinator, North Jersey Clean Cities, April 26, 2000.
- 168 Personal communication, Dick Duffy, Public Service Electric & Gas, March 24, 2000.
- 169 Personal communication, Steven Cook, Elizabethtown Natural Gas Co., April 26, 2000.
- 170 Personal communication, Bill Wells, New Jersey Natural Gas Co., April 26, 2000.
- 171 "European cities plan green vehicle fleets," *Financial Times*, June 21, 1999.
- 172 Roberta E. Weisbrod, "Solving China's Urban Crisis: China's Transportation Energy Future," *Journal of Urban Technology*, Vol. 6, No. 1 (1999), 89-100; James S. Cannon, *China at the Crossroads: Energy, Transportation, and the 21st Century* (New York: INFORM, Inc., 1998); and US Department of State, China Embassy, "China's Development of Alternative Fuel Vehicles," December 1998.
- 173 California Fuel Cell Partnership, [www.drivingthefuture.org](http://www.drivingthefuture.org).
- 174 New Jersey Commerce and Economic Growth Commission, "Greening the Garden State: A Report on Sustainable Business Actions in New Jersey," 1999.
- 175 See [www.hpower.com](http://www.hpower.com).
- 176 See [www.millenniumcell.com](http://www.millenniumcell.com) and [www.genesis.rutgers.edu/Partners/millennium.html](http://www.genesis.rutgers.edu/Partners/millennium.html).
- 177 See [www.genesis.rutgers.edu/Partners/recon.html](http://www.genesis.rutgers.edu/Partners/recon.html).

178 Personal communication, Ellen Bourbon, New Jersey Board of Public Utilities, Division of Energy, and Coordinator, North Jersey Clean Cities, February 15, 2000.

179 See [www.propanequipment.com](http://www.propanequipment.com).

180 "Fuel of the Future Gets a Tryout at Carteret Plant," *The Star Ledger* (Newark), August 10, 1999.

# Publications and Membership

## Related Publications

*Bus Futures: New Technologies for Cleaner Cities*

James S. Cannon and Chyi Sun (2000, 76 pp., \$30)

*Clean Transportation for New York: A Long Road Ahead*

Roberta Weisbrod and Gina Goldstein (2000, 42 pp., \$30)

*China at the Crossroads: Energy, Transportation, and the 21st Century*

James S. Cannon (1998, 32 pp., \$30)

*Gearing Up for Hydrogen: America's Road to Sustainable Transportation*

James S. Cannon (1998, 11 pp., \$10)

*Spotlight on New York: A Decade of Progress in Alternative Fuels*

James S. Cannon (1997, 28 pp., mss copy only, \$5)

*Harnessing Hydrogen: The Key to Sustainable Transportation*

James S. Cannon (1995, 360 pp., \$30)

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