CLEARING THE AIR

The Low-Emission Vehicle II Program and Its Impacts on New Jersey

NJPIRG Law & Policy Center

Tony Dutzik
Dena Mottola

June 2003

Acknowledgments

The authors wish to thank Peter Iwanowicz of the American Lung Association of New York State for providing editorial review and information for this report. Thanks also to Coralie Cooper of Northeast States for Coordinated Air Use Management (NESCAUM) and Chuck Shulock of the California Air Resources Board for their assistance. Special thanks to Rob Sargent of the state PIRGs for his perspective and assistance. Thanks also to Brad Heavner, Jasmine Vasavada and Susan Rakov for their editorial support.

The NJPIRG Law & Policy Center thanks the Energy Foundation and the Geraldine R. Dodge Foundation for their generous financial support of this project.

The authors alone bear responsibility for any factual errors. The recommendations are those of the NJPIRG Law & Policy Center. The views expressed in this report are those of the author and do not necessarily reflect the views of our funders.

The New Jersey Public Interest Research Group (NJPIRG) Law & Policy Center is a nonprofit, nonpartisan 501(c)(3) organization dedicated to protecting the environment, the rights of consumers, and good government in New Jersey.

For additional copies of this report, send $10 (including shipping) to:

NJPIRG Law & Policy Center
11 N. Willow St.
Trenton, NJ 08608

For more information about NJPIRG and the NJPIRG Law & Policy Center, please contact our Trenton office at 609-394-8155 or visit the NJPIRG Web site at www.njpirg.org.

Design by Jon Hofferman/Carissimi Publications

Table of Contents

Executive Summary

New Jersey faces chronic and persistent air pollution problems. In 2002, air pollution monitors in the state recorded 291 exceedances of federal health standards for ozone smog on 44 separate days—the largest number of exceedances since new health standards were proposed in 1998. Levels of toxic chemicals in the state's air continue to pose an excessive cancer risk to millions of New Jersey residents.

These air pollution problems persist despite significant reductions in per-mile emissions from motor vehicles—one of the state's leading sources of air pollution. While individual cars have become significantly cleaner over the last three decades, more vehicles than ever travel longer distances than ever on New Jersey's highways, muting the effects of tougher air pollution standards.

Now, New Jersey faces a clear choice with regard to pollution from automobiles. Beginning in 2006, the state will be eligible to implement California's Low-Emission Vehicle II (LEV II) and Zero-Emission Vehicle (ZEV) standards for automobiles—standards that are more stringent than the comparable federal standards and have already been adopted by several northeastern states.

The debate over the LEV II/ZEV program has involved competing claims from various groups as to the impact the program would have on New Jersey. This report explores ten important questions that have arisen during the debate over the LEV II/ZEV program.

Question #1: Will the LEV II program require the sale of electric cars in New Jersey?

The LEV II/ZEV program, as recently amended in California, does not require the sale of electric vehicles. No "pure" zero-emission vehicles (such as electric or fuel-cell cars) would be required in New Jersey under the program until 2012 at the earliest. Even then, the number of fuel-cell vehicles required would initally be small—representing less than 1 percent of new vehicle sales until 2018.

Question #2: Will the LEV II program affect vehicle choice?

The LEV II/ZEV program primarily requires the sale of vehicles consumers *want* to buy—clean conventional vehicles and hybrid-electric vehicles. The additional cost of complying with LEV II emission standards would be negligible, while the cost of supplying vehicles to meet ZEV program requirements would amount to less than $64 for every new car sold in 2007.

Question #3: Will the LEV II program result in environmental and public health benefits for New Jersey?

Recent studies conducted by the New Jersey Department of Environmental Protection and others have projected that adoption of LEV II would reduce emissions of air toxics and smog-forming chemicals in New Jersey. Many of the studies frequently cited by LEV II opponents questioning the benefits of LEV II rely on outdated or incomplete data. In addition, EPA has issued a waiver for the LEV II program verifying that it is at least as protective of the environment and public health as the federal Tier 2 program.

Question #4: Will New Jersey give up control of its air policy by adopting LEV II?

New Jersey is limited by the Clean Air Act to adopting one of two sets of emission standards—the federal program or the California program. California has historically maintained tighter emission standards than the EPA and regularly reviews the LEV II program to ensure that the program remains relevant and effective. Several states have attempted to tailor the program to

their own needs. And if New Jersey becomes dissatisfied with California's stewardship of the program, it can always leave and revert to federal standards.

Question #5: Will the LEV II program add another layer of costly bureaucracy to state government?

The New Jersey Office of Legislative Services estimates that no additional costs will be incurred by NJ DEP to administer the LEV II program. This is consistent with the experience of other northeastern states that have adopted the program and experienced minimal added administrative burden.

Question #6: Will the LEV II program cost New Jersey jobs?

Assertions that the LEV II program would cause General Motors and Ford to abandon auto manufacturing in New Jersey have no basis. GM and Ford are already suffering—with sales of vehicles of the types manufactured in Linden and Edison dropping by more than 225,000 between 2000 and 2001—but LEV II will not add to their pain. Instead, the LEV II/ZEV programs will encourage the growth of new industries in New Jersey—such as the hydrogen fuel cell industry.

Question #7: Is the LEV II program needed to ensure that cleaner vehicles are sold in New Jersey?

Historically, most American automakers have not introduced new environmental technologies until required to by law. Even today, most manufacturers of ultra-clean vehicles earning partial ZEV program credit are restricting sales of those vehicles to residents of California and other LEV II states. While many automakers are making progress in research on hybrid and fuel-cell vehicles, government stimulus is needed to ensure that these vehicles are put on the road in significant numbers.

Question #8: Will LEV II work in New Jersey without complementary California clean air programs?

New Jersey would still gain environmental benefits from LEV II—even though New Jersey gasoline is dirtier than that sold in California and the state does not have California's aggressive program of financial incentives for zero-emission vehicles. California adopted LEV II at a time when its gasoline standards were similar to those that will be in effect in New Jersey at the time LEV II begins, and federal officials are currently debating incentives for the purchase of hybrid-electric vehicles.

Question #9: What was the impact of the original Zero-Emission Vehicle program in California? Was it a success or a failure?

The original Zero-Emission Vehicle program sparked renewed investments in electric-drive technologies that have made possible the hybrid-electric and fuel-cell vehicles touted by automakers today. Toyota, Honda and GM have all pointed to the value of the technology developed during their electric vehicle projects. Even the electric vehicles that were supplied to California under the ZEV program were met with glowing reviews by many drivers.

Question #10: What would be the economic impact of adopting LEV II?

Implementing LEV II will have minimal costs for New Jersey consumers and automakers, especially in the near term. Meanwhile, LEV II/ZEV vehicles will reduce air pollution that causes asthma and cancer, reduce emissions of global warming gases linked to sea-level rise along the Jersey Shore, and limit the state's dependence on petroleum as a transportation fuel—bringing about significant long-term economic benefits for the state.

Introduction

New Jersey has long grappled with severe air pollution problems. Ozone "smog," particulate soot, and airborne toxic chemicals have posed significant threats to the health of millions of New Jersey residents.

These severe air pollution problems persist today. The year 2002 was the worst smog season in more than a decade in New Jersey. Air pollution monitors in New Jersey registered unhealthy levels of smog 291 times on 44 separate days—53 percent more exceedances than a year earlier, and the most since tighter ozone health standards were proposed in 1998.[1]

Air toxics—though monitored less vigorously than ozone—remain a serious problem. In 1996, levels of soot and 32 toxic chemicals in New Jersey's air posed an excess cancer risk of one new case for every 1,037 people—well above EPA's safety threshold of one cancer case for every million people.[2]

Motor vehicles are major contributors to both the ozone and air toxics problems. Cars and light-duty trucks are responsible for more than 40 percent of all nitrogen oxide (NOx) and volatile organic compound (VOC) emissions to New Jersey's air.[3] NOx and VOCs are the chemical components of smog. Mobile sources were responsible for a significant percentage of the added cancer risk from air toxics in 1996.[4]

Motor vehicle-related air pollution persists in New Jersey despite the adoption of steadily tighter emissions standards over the last three decades. The average car sold in New Jersey today meets emission standards 97 percent tighter than emissions levels typical of vehicles sold in the 1960s. Yet, with more vehicles than ever on New Jersey's roads, more of which are higher-polluting trucks and SUVs, and the total number of miles driven on the rise, these tighter emission standards have not been sufficient to protect New Jersey's environment or the public's health.

New Jersey now faces an important choice regarding how it will respond to motor vehicle air pollution in the future. If the state takes action now, it can adopt standards in place in California—called the Low-Emission Vehicle II, or LEV II program—that are the strongest standards available to improve air quality. Otherwise, New Jersey will, by default, adopt the federal emission standards—called Tier 2—which are themselves a significant improvement, but will not bring about the same air quality gains as LEV II.

The debate over the potential adoption of the LEV II program in New Jersey has been lively. Supporters have pointed to the program's environmental and public health benefits and to the potential of advanced-technology vehicles like hybrids and fuel-cell cars to reshape New Jersey's transportation system in the decades to come. Opponents have questioned the benefits of the program, and warned of devastating economic consequences. Automakers such as General Motors and Ford have taken an intense interest in the debate, in part because adoption of the LEV II program in New Jersey could have influence over other northeastern states that are considering adoption of the program.

In a series of studies over the past two years, NJPIRG Law & Policy Center has documented the threats posed to New Jersey residents by air toxics emissions from cars and light trucks ("Invisible Threats," November 2001), the potential emissions benefits of the LEV II program in New Jersey ("Clean Cars, Cleaner Air," May 2002), and the feasibility of zero- and near-zero emission vehicle technologies ("Ready to Roll," September 2002). These studies have shown that adoption of the LEV II program in New Jersey would lead to significant

environmental and public health benefits, and that the program is a feasible and prudent public policy option for the state.

This report addresses 10 key questions that have been raised in the debate over LEV II in New Jersey. It contains fresh information on recent revisions to the program and on recent studies of its potential environmental impact. It also explores issues not dealt with in previous reports—including several of the legal and economic issues that have emerged in discussions over the program.

New Jersey's Choice for Cleaning Up Automobile Emissions

The Low-Emission Vehicle II (LEV II) and Zero-Emission Vehicle (ZEV) programs are the latest in a series of vehicle emission standards adopted by the state of California, whose history of regulating vehicle emissions stretches back to the 1960s. Several northeastern states, including Massachusetts and New York, have adopted the LEV II/ZEV standards as they are authorized to do by the Clean Air Act, foregoing implementation of weaker federal standards.

New Jersey now faces the choice between continued reliance on federal emission standards or the adoption of the LEV II/ZEV program. Understanding the implications of this choice requires a little knowledge of history and some knowledge of the intricate, highly technical world of automobile emissions regulation. This section will provide a brief overview of the history of automobile emission controls and a summary of the LEV II/ZEV programs and the comparable federal program, known as Tier 2.

A BRIEF HISTORY OF AUTOMOBILE EMISSION CONTROL

For more than five decades, California has taken a leadership role in the fight against air pollution from automobiles. The state has consistently pioneered new regulatory approaches that have reduced automobile emissions in California and paved the way for similar reductions nationwide.

The 1950s

The postwar boom in automobile sales and use caused automobile emissions to become recognized as a public health problem. Nowhere was the impact of auto emissions felt as strongly as in California, where the unique climate of the Los Angeles region and its car-dominated culture led to major air pollution episodes by the late 1940s and early 1950s.

Experiments in California by Dr. Arie Haagen-Smit first identified the photochemical properties of "smog" and pinpointed automobile emissions as a major contributor to the problem. Increasing concern about air pollution in California led automakers—which faced the real possibility of state regulation—to begin offering emission-control devices on vehicles sold in the state.

The 1960s

In 1960, the state of California created the Motor Vehicle Pollution Control Board to certify emission-control technologies and require their installation on motor vehicles. In 1966, California became the first state to require the installation of pollution-control technology on motor vehicles. A year later, the California Air Resources Board (CARB) was formed to regulate air pollution in the state. And in 1968, the state moved to implement the first-ever standards for smog-forming pollution, to take effect in 1970.

Meanwhile, by the early 1960s, smog was becoming an increasing problem outside of California—particularly along the East Coast. Federal officials began to consider measures to reduce automobile air pollution. Their efforts would culminate in passage of the federal Clean Air Act in 1970.

The 1970s

The 1970 Clean Air Act established National Ambient Air Quality Standards (NAAQS) for smog-forming and other pollutants and required states to come up with plans to meet the standards by 1975. The

act also required automakers to reduce emissions of nitrogen oxides, carbon monoxide and hydrocarbons by 90 percent by 1975-76. Automobile manufacturers attacked the standards. A GM executive told the EPA that requiring catalytic converters on its 1975 model year vehicles would pose "unreasonable risk of business catastrophe" and could conceivably lead to "complete stoppage of the entire production."[5] Ford's Lee Iacocca said that there was "no way" the standards for nitrogen oxides could be met.[6] Chrysler took out a full-page ad claiming that emissions standards would add $1,300 to the price of a new car.[7]

While catalytic converters were introduced on new cars—and auto emissions became significantly cleaner—the ambitious goals of the 1970 Clean Air Act were not met. Many major metropolitan areas continued to suffer from extensive air pollution, and a series of actions pushed back implementation of the original auto emissions standards to the 1980s.

Meanwhile, the Clean Air Act preserved California's ability to maintain its own, tougher automobile emissions standards. In 1977 revisions to the Clean Air Act, Congress also gave other states the ability to adopt California standards if they failed to meet ambient air quality standards.

The 1980s

By the late 1980s, more and more Americans were living in areas with unhealthy levels of air pollution. Automakers continued to make cleaner cars—but only for sale in California. With efforts to revise the Clean Air Act in Congress stalled in the late 1980s, several northeastern states began to discuss exercising their authority to implement California standards. In 1989, eight northeastern states—including New Jersey—moved toward adoption of the California standards.

The 1990s

A year later, however, Congress approved the 1990 Clean Air Act. The law included a host of measures to reduce automobile air pollution and improve air quality—requiring the implementation of "Tier 1" federal standards that would lead to significant reductions in per-car nitrogen oxide and hydrocarbon emissions beginning in 1994 and allowing for the adoption of "Tier 2" standards to take effect in 2004.

At the same time, however, California was planning its next move. In 1990, the state adopted Low-Emission Vehicle (LEV) standards that significantly reduced emission levels below even those proposed in the new Clean Air Act. The LEV standards also included a new provision requiring the sale of 10 percent Zero-Emission Vehicles by 2003.

Northeastern states that had already taken steps toward adoption of the old California standards debated what to do next. In 1991, the Ozone Transport Commission (OTC)—a body created by the Clean Air Act to deal with the interrelated air pollution issues in the Northeast—moved to adopt the California standards regionwide. Three years later, the OTC petitioned the EPA to impose the California LEV standards regionwide, allowing states the option of also adopting the ZEV standards.

Automakers, fearful of the adoption of California standards, and particularly the ZEV program, countered by offering to sell vehicles meeting tighter emissions standards nationwide, in exchange for the northeastern states dropping adoption of the LEV/ZEV programs. In the end, most of the northeastern states agreed to adopt the voluntary National Low Emission Vehicle (NLEV) program. New York, Massachusetts, Vermont and Maine stuck with the LEV program. Under the NLEV program, automakers began selling cars and light-

light-duty trucks meeting emission standards comparable to the California standards in the Northeast beginning in 1999 and nationwide starting in 2001. Heavier light trucks and SUVs were not included in the program.

While the NLEV program was being devised, California was revisiting the zero-emission vehicle part of the program. In 1996, CARB eliminated all ZEV requirements until 2003 in exchange for a commitment from automakers to produce a limited number of advanced battery-electric vehicles for sale in the state between 1998 and 2000. In 1998, CARB adopted standards that allowed automakers to gain ZEV credit for extremely clean conventional vehicles. And in 2001, the board allowed additional partial credit for clean, advanced-technology vehicles such as hybrid-electric cars.

THE TIER 2 AND LEV II PROGRAMS

By 1998, it was becoming obvious that current automobile emission controls were not going to be sufficient to meet the air quality goals of the Clean Air Act. Dramatic increases in vehicle travel—combined with a shift toward increased use of light-duty trucks subject to less stringent emission standards—led to continuing pollution problems in California and across the country.

In 1998, California adopted the LEV II program. In 1999, EPA adopted Tier 2 emission control standards. The programs have many elements in common, and a few key differences.

Similarities

- Both the Tier 2 and LEV II programs measure compliance using *fleet average* emissions. In meeting the fleet averages, automakers may certify their vehicles to one of a number of emissions *bins*, which set standards for emissions of a variety of pollutants. The bins vary in the stringency of their standards, ranging from bins that allow more pollution than the fleet average to those that allow little or no emissions. This system gives manufacturers the flexibility to sell vehicles with varying levels of emissions, as long as they meet stringent fleet averages.

- Both programs phase out the practice of allowing heavier light-duty trucks to meet significantly less stringent emission standards. Under Tier 2, distinctions between cars and light trucks will be phased out completely. LEV II retains slightly different standards to account for the inclusion of cars and lighter light-duty trucks in the Zero-Emission Vehicle program.

- Both programs extend the "useful life" for which vehicles must meet emission standards from 100,000 to 120,000 miles, ensuring greater durability of emissions systems.

- Both programs call for significant reductions in evaporative emissions of hydrocarbons, which include many volatile organic compounds and air toxics.

Differences

- LEV II and Tier 2 measure compliance with fleet averages of different pollutants. LEV II gauges compliance based on emissions of non-methane organic gases (NMOG—which includes many

volatile organic compounds and air toxics), while Tier 2 gauges compliance based on nitrogen oxide (NOx) emissions. This difference has little practical effect, since emissions bins in both programs are designed to limit releases of a variety of pollutants.

- The Tier 2 program allows some vehicles to be dirtier than any allowed under the LEV II program. Tier 2 retains the use of three bins that allow greater emissions than any bin under LEV II. Automakers must still meet Tier 2's fleet average requirement for NOx, meaning that for every dirtier vehicle they sell, they must also sell a cleaner one. But the Tier 2 bin structure does allow for greater releases of some pollutants (such as particulates) than would be allowed under LEV II, potentially opening the door to greater use of diesel for light-duty vehicles.

- LEV II contains tighter standards for evaporative emissions of hydrocarbons (a class of chemicals that includes many VOCs and air toxics) than the Tier 2 program. Automakers have stated that they will voluntarily meet the LEV II evaporative requirements for all their vehicles nationwide. (This commitment does not, however, extend to the "zero" evaporative emission controls required of vehicles certified under the ZEV program.)

- The fleet average requirements under LEV II are ratcheted down every year from 2004 to 2010, while those in the Tier 2 program remain the same. While emission standards under the two programs are similar initially, upon full phase-in, the fleet average standard under the LEV II program could be as much as 39 to 51 percent lower for NMOG, and 11 to 28 percent lower for NOx than the Tier 2 program.[8]

- LEV II contains the ZEV program. In addition to requiring the sale of "pure" zero-emission vehicles starting in 2005 in California (and 2012 elsewhere), the ZEV program requires all vehicles receiving ZEV credit (including conventional vehicles with ultra-low emissions) to release "zero" evaporative hydrocarbon emissions, be certified to a useful life of 150,000 miles, and carry a 150,000-mile warranty on their emission-control systems.

The ZEV Program

The ZEV program technically requires that 10 percent of all vehicles sold be zero-emission vehicles beginning in 2005. In actuality, though, percentages of vehicles called for under the ZEV program do not represent real percentages of cars sold. Rather, automakers have many opportunities to earn credits toward the ZEV requirements that reduce the actual number of ZEV-compliant vehicles they must produce.

The key elements of the program are as follows:

Pure ZEVs

The latest proposed version of the California ZEV program reduces requirements

for the sale of "pure ZEVs"; those vehicles with no tailpipe or fuel-related evaporative emissions. While final regulations to implement the ZEV program have yet to be published as of this writing, changes approved by CARB in April 2003 would require automakers to sell approximately 250 hydrogen fuel-cell vehicles nationwide between 2005-2008. The fuel-cell vehicle requirement would increase to 2,500 between 2009 and 2011, 25,000 between 2012 and 2014, and 50,000 between 2015 and 2017.[9]

The latest version of the program would not require the sale of any additional fuel-cell vehicles in New Jersey until 2012. However, adopting a ZEV program in New Jersey would allow automakers to claim California credit for fuel-cell vehicles placed in New Jersey, increasing the likelihood that a limited number of fuel-cell vehicles would find their way onto the state's highways. In addition, beginning in 2012, automakers would be required to sell several thousand fuel-cell vehicles per year in New Jersey, with the numbers increasing steadily thereafter.[10]

Automakers still retain the option of providing battery-electric vehicles to meet the pure ZEV requirement by continuing to comply with the terms of the "old" ZEV program. Alternatively, automakers can meet one-half of their fuel-cell vehicle obligations under the new program with the sale of battery-electric vehicles, with 10 battery-electrics earning the same credit as a single fuel-cell vehicle.

Partial ZEV (PZEV) Credits

The law allows manufacturers to meet up to 6 percent of the 10 percent ZEV requirement by marketing ultra-clean conventional, gasoline-powered cars. To receive partial ZEV, or PZEV, credit, vehicles must meet LEV II's strict super-low-emission vehicle (SULEV) emission standards, have "zero" evaporative emissions, and have their emissions control systems certified and under warranty for 150,000 miles.[11] Intermediate volume manufacturers—those that sell fewer than 60,000 light- and medium-duty vehicles in California annually—may meet the entire ZEV percentage requirement with PZEV credits. Each PZEV receives a credit equivalent to 0.2 of a pure ZEV.

Advanced Technology PZEVs (AT-PZEVs)

Under the April 2003 proposed changes to the program, manufacturers would be allowed to satisfy up to 4 percent of the 10 percent ZEV requirement by marketing vehicles that meet basic PZEV criteria, but also include advanced features such as hybrid-electric drive or can run on alternative fuels such as compressed natural gas.

The value of an AT-PZEV under the program is determined by adding credits earned through a variety of advanced technologies to the baseline PZEV credit of 0.2.

- **Hybrids—**Hybrid-electric vehicles, which include an advanced battery integral to the operation of the vehicle, but do not have to be plugged in, are eligible for additional credit. The credits are determined based on the voltage and amount of power provided by the hybrid system. Additional credits for high-voltage hybrid-electric vehicles range from 0.25 to 0.5.

- **All-electric range—**Vehicles that can travel at least 10 miles in electric mode (such as plug-in hybrids) are eligible for credits ranging from approximately 1 to 2.5 for a vehicle with 125-mile all-electric range.

- **Alternative fuel—**Vehicles that run on pressurized gaseous fuel (such as compressed natural gas) are eligible for a credit of 0.2. Vehicles capable of running entirely on hydrogen are eligible for a credit of 0.3.

- **Clean fuels—**Vehicles that operate on fuels with very low emissions over their entire fuel cycles are eligible for a credit of up to 0.3.[12]

If manufacturers fail to fulfill the 4 percent allocated to AT-PZEVs, they must sell pure ZEVs instead.

Other Features

Under the California rules, automakers can also receive credits for placing vehicles in demonstration programs, and can earn additional credit for placing vehicles in programs that allow for shared use of vehicles, use "intelligent" transportation technologies, or are linked to transit use.

In the initial years of the program, the ZEV requirement applies only to passenger cars and the lightest light trucks. Beginning in 2007, heavier sport utility vehicles, pickup trucks and vans sold in California will be phased into the sales figures used to calculate the ZEV requirement.

Another important change adopted by CARB in 2001 is a gradual ratcheting up of the ZEV requirement over the next two decades. By 2018, 5 percent of vehicles made by major manufacturers will be required to be "pure" ZEVs, 5 percent will be AT-PZEVs, and 6 percent PZEVs—although additional credits available to manufacturers will significantly reduce the number of actual vehicles automakers must supply to meet program requirements.

Summary

Both the Tier 2 and LEV II programs represent significant steps toward cleaner air. But the differences between the two programs are significant enough that they pose a real choice for New Jersey. The following section explores some of the frequently cited questions that have arisen in the debate about adoption of the LEV II program for New Jersey.

Common Questions About the Low-Emission Vehicle II Program

QUESTION #1 WILL THE LEV II PROGRAM REQUIRE NEW JERSEY RESIDENTS TO DRIVE ELECTRIC CARS?

As originally adopted in 1990, the Zero-Emission Vehicle portion of the LEV II program was to require 10 percent of automakers' sales by 2003 to be in the form of vehicles with absolutely no emissions. At the time, battery-electric vehicles were considered the only technology capable of meeting such a requirement.

Over the past 13 years, however, both the program and the technological situation have changed. The emphasis on "pure" zero-emission vehicles in the LEV II program has been reduced as new technologies with clear environmental benefits have come on-line. Meanwhile, fuel-cell vehicles have emerged as a long-term competitor with battery-electric vehicles for the mantle of pure ZEV of the future.

Yet, in part because of the publicity surrounding the original California program, many continue to believe that adoption of the LEV II/ZEV program would require the sale of large numbers of battery-electric vehicles in New Jersey. The New Jersey Chamber of Commerce has gone so far as to label the program the "California Electric Car program" on its Web site.[13]

The LEV II program does not require the sale of battery-electric vehicles.

The elimination of the battery-electric vehicle requirement in California is a recent development, having been approved by the California Air Resources Board (CARB) in April 2003. Instead of requiring the near-term sale of electric vehicles, California has opted to promote the development of fuel-cell vehicles through a compliance pathway based on small, incremental steps toward the development of a fuel-cell vehicle market.

Of course, battery-electric vehicles remain a viable transportation alternative for many, if not most, applications. (See Question #9.) For those manufacturers that wish to continue to pursue battery-electric vehicles, two options are available under the ZEV program: they may continue to follow the "old" ZEV rules, or they may substitute battery-electric vehicles for half of their fuel-cell requirement under the new compliance pathway.[14]

No "pure" zero-emission vehicles will be required in New Jersey under the program until 2012 at the earliest. These will likely be fuel-cell vehicles.

The recent changes adopted by CARB include a provision that allows automakers to claim credit in California for fuel-cell vehicles supplied for other ZEV-program states. Because federal law requires all LEV II/ZEV states to adopt regulations that are "identical" to those in California, this so-called "travel" provision represents a de facto national floor for the supply of fuel-cell vehicles.

CARB has proposed that the "travel" provision sunset after the 2011 model year. As a result, New Jersey cannot add to the automakers' national fuel-cell commitment before the 2012 model year—eight model years from now. Adoption of the ZEV program in New Jersey would, however, give automakers an incentive to place fuel-cell vehicles in New Jersey in the interim.

Even when the pure zero-emission requirement takes effect in New Jersey, the

number of fuel-cell vehicles that would be required would be small for the first several years. Under CARB's proposed new rules, automakers would be required to sell 25,000 fuel-cell vehicles in California between 2012 and 2014 and 50,000 vehicles between 2015 and 2017. Prorating these numbers based on the size of the New Jersey automobile market, this translates to an annual requirement of approximately 2,700 fuel-cell vehicles in New Jersey between 2012 and 2014 and 5,400 vehicles between 2015 and 2017.

As a result, even 13 model years from today, automakers will be required to sell less than 1 percent zero-emission vehicles in New Jersey under the most recent CARB rules. And even that requirement will be subject to review by an expert review panel appointed by CARB, which will report to the board on the status of ZEV technologies in time for CARB to review the ZEV rules for the 2009 and subsequent model years.[15]

The ZEV program can help spur the development of fuel-cell vehicles.

Hydrogen fuel-cell vehicles have great promise to reduce harmful vehicle emissions, reduce dependence on fossil fuels for transportation, and limit emissions of global warming gases. While a small number of fuel-cell vehicles are currently on the road in demonstration projects, everyone agrees that we are a long way away from mass commercialization of fuel-cell technology.

The speed with which fuel-cell vehicles become commercially viable depends on several factors: advances in fuel-cell technology, reductions in cost, and the availability of refueling infrastructure. The LEV II/ZEV program can play an important role in achieving each of these goals, by promoting the steady development and deployment of fuel-cell technology over a period of more than a decade. Specifically, the LEV II/ZEV program will assist fuel cell development in three ways:

- **Technology development:** The ZEV program's increasing goals for the sale of fuel-cell vehicles set a goalpost for automakers in their pursuit of fuel-cell technology. Just as the original 1990 ZEV program in California sparked renewed investment in electric vehicles, leading to technological breakthroughs (See Question #9), the ZEV program will encourage automakers to maintain and build upon their already substantial investment in the development of fuel-cell vehicles.

- **Cost reduction:** Regardless of how many advances are made in vehicle technology, fuel-cell vehicles will only become cost competitive with conventional vehicles when they are manufactured in bulk. The ZEV program ensures a market for a steadily increasing number of fuel-cell vehicles, carving a path toward mass commercialization of the technology.

- **Infrastructure:** Alternative-fuel vehicles—such as hydrogen fuel-cell cars—have traditionally been hamstrung by the lack of available refueling infrastructure. This creates a "chicken and egg" situation in which consumers do not purchase alternative-fuel vehicles because there is nowhere to refuel them, while entrepreneurs do not build refueling stations because consumers are not

buying the vehicles. The fuel-cell sales targets in the ZEV program will give assurance to would-be hydrogen providers that significant numbers of vehicles using the fuel will be on the state's roads.

The ZEV program cannot eliminate all the potential hurdles facing fuel-cell vehicles. As opponents of the LEV / ZEV program often argue, "legislators cannot repeal the laws of physics." In the decade-long history of the ZEV program, CARB has shown remarkable flexibility in adapting the program to the latest developments in automotive technology. The creation of the expert review panel to review ZEV technologies is another step in this direction.

QUESTION #2 WILL THE LEV II PROGRAM RESTRICT VEHICLE CHOICE?

Auto dealers and others have expressed concern that consumers will face restrictions in their selection of vehicles as a result of LEV II.

Concerns have been raised on three fronts:

- Will consumers face higher prices on the vehicles they buy?
- Will consumers be able to buy certain types of vehicles (for example, SUVs) under the LEV II program?
- Will consumers purchase the ultra-clean conventional, hybrid and (beginning in 2012) fuel-cell vehicles required under the program?

Most consumers will likely experience no difference in vehicle cost under LEV II.

For the vast majority of New Jersey consumers, the impact of the LEV II program will be barely discernible. They will purchase the cars and light trucks they otherwise would—only those cars and light trucks will be certified to LEV II, rather than federal, emission standards. These will be the same vehicles supplied to residents of New York, Massachusetts and other states that have adopted the LEV II program.

Analysis by CARB suggests that any increase in price of these vehicles will be minimal. CARB concluded that cars and light-light-duty trucks certified to the ultra-low emission vehicle (ULEV) and super-low emission vehicle (SULEV) categories under the LEV II program would cost between $71 and $105 more than vehicles certified to the ULEV category under the LEV I program—an amount comparable to the investment automakers would have to make to improve their cars to Tier 2 standards.[16] These cost data led the Massachusetts Department of Environmental Protection to conclude, in its review of LEV II, that "the additional costs to Massachusetts consumers for vehicles meeting LEV II standards vs. Tier 2 standards are negligible."[17]

The LEV II program will allow consumers to continue to purchase light trucks and SUVs.

New Jersey consumers who wish to buy light trucks or SUVs will still have the ability to do so under LEV II. There is no evidence that SUVs or light trucks will be unable to comply with the standards. In analyzing the potential impact of the LEV II rule, CARB modified two 1998 Ford Expedition SUVs (among the heaviest in their class), outfitting them with an air injection

system and advanced catalysts. The vehicles met LEV II standards.[18]

That is not to say, however, that the LEV II program will not have some impact on how automakers choose to market their light trucks and SUVs. For years, SUVs have been subject to less stringent standards for emissions and fuel economy—providing an incentive for automakers to attempt to shift consumers from purchasing cars to purchasing these larger vehicles. While the fuel economy loophole remains, both the LEV II and Tier 2 programs close the SUV loophole for emissions. The closure of this loophole may remove some of the incentive automakers have had to market SUVs, but it is unlikely that the LEV II program would have a significantly greater impact in this regard than Tier 2. (For more on this topic, see Question #6.)

The ZEV program primarily requires the sale of vehicles consumers want to buy: clean conventional cars and hybrid-electric vehicles.

The vast majority of vehicles required by the zero-emission vehicle program are ultra-clean conventional vehicles that receive partial zero-emission vehicle (PZEV) credit, and hybrid-electric vehicles eligible for advanced-technology PZEV (AT-PZEV) credit. Between 2006 and 2011, all automakers would be allowed to fulfill their entire New Jersey ZEV program requirement with these vehicles.

Clean Conventional Vehicles (PZEVs)

These are cars that incorporate advanced emission-control technologies capable of reducing emissions of smog-forming pollutants by 70 to 90 percent versus 2003 model year vehicles. These vehicles also must carry a 150,000-mile emission system warranty—a potential added source of value to consumers and the environment.

Seven automakers have already certified 10 vehicle models to PZEV standards in California.[19] Toyota, for example, plans to sell 20,000 units of its PZEV Camry in model year 2003 and 40,000 units in 2004.[20] Ford intends to sell 2,500 of its Focus PZEVs per month during 2003.[21] However, with only a couple of exceptions, automakers are limiting the sale of PZEVs to states with LEV II/ZEV programs.[22]

CARB has estimated that the incremental cost of certifying a vehicle to PZEV standards is approximately $100.[23] But early experience shows that consumers purchasing PZEV-certified vehicles are experiencing little to no increase in vehicle price. In California, for example, Toyota sells the same model Camry in both PZEV and non-PZEV versions, with no difference in price. Similarly, Honda markets a PZEV and non-PZEV version of the Accord, with a price differential of only $150.[24] Ford has stated that the PZEV engine in its new Ford Focus is more expensive than its predecessor, but that the company will not charge a premium for it, hoping that the benefits of the engine for emissions, fuel economy and performance will spark increased consumer demand.[25]

Hybrid-Electric Vehicles (AT-PZEVs)

Since their introduction to the United States in 1999, hybrid-electric vehicles such as the Toyota Prius, Honda Insight and Honda Civic have become increasingly popular with consumers. About 36,000 hybrids were sold in the U.S. in 2002, an increase of 73 percent from the previous year.[26]

The early popularity of hybrids is clearly just the tip of the iceberg. All three major American automakers plan to come

out with their first hybrid vehicle models within the next year. Toyota anticipates manufacturing 300,000 hybrids per year by 2005.[27] And a recent J.D. Power and Associates report found that 60 percent of new vehicle buyers would consider buying a hybrid-electric vehicle. Nearly one-third of those said they would still buy a hybrid even if the added cost of the vehicle was not fully offset by fuel savings.[28]

Toyota has announced its intention to certify the 2004 model year Toyota Prius to AT-PZEV standards.[29] Other hybrids, such as the Insight and Civic, are certified to SULEV standards. The only barriers to AT-PZEV certification for these vehicles are the commitment to a 150,000-mile exhaust system warranty and enhanced evaporative emission controls.

While hybrid-electric vehicles certainly cost more than conventional vehicles (CARB estimates the short-term incremental cost at about $3,300), they also can save consumers as much as $1,000 over the lifetime of the vehicle in fuel costs.[30] Federal tax breaks now being debated in Congress would defray the costs further. And CARB estimates that, with further technological refinement and mass production, the incremental cost of hybrids could drop as low $700 by the beginning of the next decade.[31]

These and other facts have led even critics of the LEV II program to sing the praises of hybrids. On March 3, Jim Appleton of the New Jersey Coalition of Automobile Retailers told the Assembly Environment and Solid Waste Committee, "There's a demonstrated marketplace demand now for hybrid vehicles and that's where resources ought to be devoted."[32]

Hybrids and clean conventional vehicles are, indeed, where the ZEV program's focus lies. Between 2007 and 2011, a ZEV program in New Jersey would require the sale of nearly 900,000 vehicles certified to PZEV standards and the equivalent of more than 160,000 hybrid-electric vehicles certified to AT-PZEV standards.[33]

There is little data suggesting how consumers will react to the introduction of fuel-cell cars when they come onto the market in limited numbers in New Jersey beginning in 2012. Early fuel-cell vehicle prototypes, such as those that have been introduced in California, have yielded greater range than battery-electric vehicles—although not as great a travel range as conventional vehicles. It is also likely that fuel-cell vehicles will come at a significant cost premium during early introduction. CARB has estimated the incremental cost of fuel cell vehicles at $9,300 for the 2012-2020 period.[34]

Of course, as with all projections about any technology that is at an early stage of its development, the estimates of fuel cell cost and performance are highly speculative. As noted above, CARB is slated to conduct an in-depth review the state of fuel cell and ZEV technology prior to the onset of any pure ZEV requirement in New Jersey. Consumer acceptance will be one of the topics to be studied.

With the potential exception of fuel-cell vehicles—which are several years away from widespread commercial introduction—there is little reason to believe that, under the LEV II program, "Dealers are going to sit there with these vehicles on their lots."[35] If anything, requiring automakers to provide these vehicles for sale will give New Jersey residents greater opportunities to purchase advanced-technology cars and trucks.

QUESTION #3
WILL THE LEV II PROGRAM RESULT IN ENVIRONMENTAL AND PUBLIC HEALTH BENEFITS FOR NEW JERSEY?

It seems intuitive that a program with tighter emission standards that requires the sale of thousands of ultra-clean, advanced-technology vehicles would bring environmental benefits to any state that adopts it. In the debate over LEV II in New Jersey, however, the program's potential environmental benefits have been the source of heated disagreement.

Opponents of LEV II have cited documents that support their point of view that the program will bring minimal environmental benefits. One opponent—Jim Sinclair of the New Jersey Business and Industry Association—has stated that "It's silly and everybody knows it's silly. There is no environmental benefit."[36]

Supporters of the program have pointed to other studies—carried out on behalf of the New Jersey Department of Environmental Protection (NJ DEP) and other environmental officials—that show significant benefits from the program. A more detailed analysis of both sets of evidence suggests that LEV II will likely lead to significant air quality benefits for New Jersey in the future.

Recent studies have confirmed the environmental benefits of the LEV II program.

Studies by several organizations—including the NJ DEP—have confirmed the environmental benefits of the LEV II program. Each of these studies is based on emissions modeling software used by the U.S. EPA to estimate future emissions from motor vehicles. The MOBILE6 model—used as the basis for the New Jersey and NESCAUM studies described below—is the most current version of this software and is recognized as the best available tool to estimate future automobile emissions.

Massachusetts

Massachusetts law requires the state's Department of Environmental Protection to assess which automobile emission standards—the federal or California standards—are more protective of public health and to adopt the more protective of the two.A 1999 study commissioned by the Massachusetts Department of Environmental Protection found that adoption of LEV II (along with LEV I standards for medium-duty vehicles) in that state would lead to a 20 percent reduction in motor vehicle NOx emissions, 19 percent reductions in NMOG emissions, and 23 to 26 percent reductions in emissions of several air toxics versus the Tier 2 standards by 2020.[37]

NESCAUM

Northeast States for Coordinated Air Use Management (NESCAUM), an association of air quality control divisions in the Northeast states, commissioned its own review of LEV II in 2003. NESCAUM's draft report found that the LEV I/LEV II programs in Massachusetts, New York and Vermont would lead to a 25 percent reduction in motor vehicle emissions of four air toxics, a 15 percent reduction in total hydrocarbon emissions, and a 2 percent reduction in carbon dioxide emissions versus the Tier 2 program by 2020.[38]

New Jersey

Testimony presented by NJ DEP suggests that volatile organic compound emissions under LEV II would be between 2.7

Is LEV II a superior control strategy for air toxics?

In written testimony submitted to the Assembly Environment and Solid Waste Committee in September 2002, the Alliance of Automobile Manufacturers addressed the issue of air toxics. "Environmental representatives claimed at last year's hearing (November 19, 2001) and have put out press information this year stating that the California program would achieve substantially greater air toxic emission reductions. Given that the Federal and California control programs are virtually identical in 2004 and later years, this make (*sic*) no sense."[41]

A more detailed understanding of the LEV II regulations indicates that the superiority of LEV II for air toxics control makes perfect sense. First, as noted above, the two programs are not identical — in fact, the LEV II fleet average emission standards for NMOG (which includes many air toxics) will eventually be as much as 51 percent lower than the maximum NMOG emissions permitted under Tier 2 for cars and the lightest light-duty trucks and as much as 38 percent lower for heavier light-duty trucks.[42]

Second, the LEV II program includes tighter standards on evaporative emissions of NMOG. Auto manufacturers have since stated that they will include LEV II evaporative controls on all vehicles they supply nationwide — providing yet another example of how stronger California standards have helped spark changes that reduce emissions nationwide.

Third, the ZEV portion of the program requires all vehicles receiving ZEV credit to attain "zero" evaporative emissions of NMOG. There is no parallel to this requirement in federal regulations. Because automakers would likely certify tens of thousands of vehicles per year to the ZEV program (mostly through the PZEV option), the evaporative emission benefits would be significant.

These three differences between the two programs suggest that NMOG emissions — and, therefore, air toxics emissions — would be significantly lower under LEV II than under Tier 2.

tons per summer day (tpsd) and 10.8 tpsd less than under Tier 2 standards by 2025.[39] NOx emissions would be approximately 2.3 tpsd less under LEV II. These reductions translate to a 7 to 28 percent reduction in VOC emissions and an 8 percent reduction in NOx emissions versus the Tier 2 program by 2025.[40]

While the exact results of the Massachusetts, NESCAUM and New Jersey analyses differ, the three studies offer the same general conclusion: New Jersey would achieve significant environmental benefits under the LEV II program, including modest reductions in NOx and carbon dioxide emissions, and greater reductions in emissions of VOCs and air toxics.

Many studies that discount the environmental impact of the program are either incomplete or out-of-date, or their results have been misrepresented.

Opponents of LEV II have cited the New Jersey Institute of Technology (NJIT), the Office of Legislative Services (OLS), and the U.S. Environmental Protection Agency (EPA) to bolster their claims that the LEV II program will not bring environmental benefits to New Jersey.[43] Each of these claims must be addressed separately:

The NJIT Study

In 1993, two researchers at NJIT conducted a study on the California Low Emis-

sion Vehicle program at the request of the Legislature. The NJIT study is irrelevant to the debate over LEV II for three reasons:

- **The study is a decade old.** In effect, the NJIT study compares a program that is now in its last year of life (California LEV I) with a program that no longer exists (the federal Tier 1 standards). Any conclusions reached by comparing these two programs is irrelevant to the debate over whether the current California program (LEV II) is superior to the current federal program (Tier 2).

- **The NJIT study reached no conclusions about the efficacy of California standards.** The study's key recommendation was, "The considerable uncertainties in the state's emission reduction needs and in the costs and benefits anticipated from adopting the California LEV program lead the authors to recommend that the Legislature consider delaying the implementation of the program for up to two years."[44] The study did not state that the LEV program would not produce "a significant environmental benefit" or that the program would not be cost-effective—only that, in the authors' view, the uncertainty over the program's impact made immediate adoption unwise.

- **Subsequent studies have demonstrated the environmental benefits of the original California standards.** It is important to remember that California cars have been sold in New Jersey since 1999 under the National Low Emission Vehicle (NLEV) program. Even prior to the adoption of the NLEV standards, there was much debate and study of the potential impact of implementing the California LEV I standards (with or without the ZEV program) in the Northeast.

  In 1994, the EPA reviewed a proposal by the Ozone Transport Commission (OTC) to implement standards similar to California LEV throughout the Northeast without an accompanying ZEV requirement. The EPA's Regulatory Impact Analysis found that the OTC region would experience a 23 percent reduction in highway emissions of non-methane organic gases (NMOG) and a 25 percent reduction in emissions of nitrogen oxides (NOx) by 2015 under the OTC-LEV program versus a base case in which only two states (NY and MA) implemented LEV I standards.[45]

  In 1995, EPA approved a revision to Massachusetts' Clean Air Act State Implementation Plan that substituted its LEV program for another federal program, the Clean Fuel Fleet program. EPA's approval cited Massachusetts estimates that the LEV I program would lead to reductions in NOx and VOC emissions "far in excess" of what would be required under the federal program.[46] EPA approved a similar revision for New York State.[47]

  In announcing the adoption of the NLEV program in 1997, EPA estimated that partial implementation of standards similar to California LEV nationwide would

> reduce NOx emissions 496 tons per day by 2007 and NMOG emissions by 311 tons per day. The added cost of NLEV vehicles was estimated at $95 per car.[48]
>
> Even the Whitman administration NJ DEP acknowledged the benefits of the "California cars" required by the NLEV program. "The NLEV program negotiated with auto manufacturers puts cars 70 percent cleaner than current models on sale beginning this year," read a 1998 DEP press release.[49]

In sum, the NJIT study is irrelevant to the current policy choice facing New Jersey, its findings have been misrepresented, and—even if the study said what LEV II opponents claim that it said—history and subsequent research have proven the benefits of the original California program.

The OLS Memo

In a May 21, 2002 memorandum, Carrie Anne Calvo-Hahn, a senior research analyst with OLS, addressed several aspects of the LEV II/ZEV program. Other issues raised in this memo will be addressed elsewhere in this report. Only one section of the memo, however, directly addresses the environmental impact of the LEV II/ZEV program:

> ... the State may not get any real air quality benefit ... (C)omparative study of the programs indicates that Tier 2 is better than LEV II in reducing emissions during the first three years of implementation, up to model year 2007. From 2007 into the future, California LEV II exceeds Tier 2 reductions.[50]

The OLS memo ignores the fact that New Jersey cannot implement the LEV II standards any earlier than the 2006 model year. As a result, even if Tier 2 is stronger in the near term (an assertion that will be discussed in the following section on the EPA's findings), New Jersey would experience only one year of weakened standards before moving to the stronger LEV II standards.

Further, the finding that, for 2007 and after, the LEV II program "exceeds Tier 2 reductions" contradicts the memo's earlier assertion that the state "may not get any real air quality benefit." No further information is provided in the memo to support this assertion.

The EPA Letters

Reference to EPA findings in testimony opposing LEV II apparently relates to a series of memos from EPA officials submitted by Robert Babik, director of vehicle emission issues for General Motors, to the Assembly Environment and Solid Waste Committee for its September 30, 2002 hearing on the LEV II program. The memos do not provide enough details on the methodology of the EPA's research to permit an informed analysis. Nonetheless, three issues stand out.

First, the December 16, 1999 memo from Karl J. Simon to Chuck Mueller of the Texas Natural Resource Conservation Commission notes that light-duty trucks of the LDT2 and LDT4 categories faced more stringent standards under Tier 2 than the LEV II program. This was true at the time the memo was written. However, in 2001, CARB adopted "follow-up" amendments to the LEV II program that closed this loophole, requiring the sale of Tier 2-certified vehicles any time the federal standard for a given vehicle is stronger than the applicable California standard.[51]

Second, Mr. Simon's assertions as to the superiority of the Tier 2 program are limited to one pollutant: nitrogen oxides. The letter makes no reference to volatile organic compounds (VOCs), air toxics, particulate matter, or any other pollutants.

Third, Mr. Simon writes that "for comparison purposes our analysis did not assume any ZEV sales mandates in either program."[52] Because many of the benefits achieved by the LEV II/ZEV program accrue from the increasing requirements for the sale of hybrid-electric and clean, conventional vehicles, this omission is an important one.

Mr. Babik also submitted a letter from EPA Administrator Christine Todd Whitman to Assemblyman Thomas Kean, dated August 14, 2002, that made similar assertions. Citing an analysis conducted by the Alliance of Automobile Manufacturers (AAM), with which she expresses agreement, Administrator Whitman writes that, "That analysis indicates very little marginal benefit from the adoption of LEV II standards particularly if ... the program is not adopted until 2006 and *does not include the zero-emission vehicle requirement*."[53] (emphasis added) Again, ignoring the Zero-Emission Vehicle portion of the LEV II program is an important omission.

One final note on the EPA's findings: federal law prohibits California, or any other state, from adopting automobile emissions requirements that are not as least as protective of health and the environment as the federal standards. On April 22, 2003, the EPA granted a waiver for California's implementation of the LEV II program. The EPA found the following:

> CARB determined that its LEV II Amendments do not cause California's standards, in the aggregate, to be less protective of public health and welfare than the applicable Federal standards. *No information has been submitted to demonstrate that California's standards, in the aggregate, are less protective of public health and welfare than the applicable Federal standards.* Thus, EPA cannot make a finding that CARB's determination that its LEV II Amendments are, in the aggregate, at least as protective of public health and welfare, is arbitrary and capricious.[54] (emphasis added)

Several months earlier, EPA had approved a State Implementation Plan (SIP) revision submitted by the state of Massachusetts that incorporated projected benefits from the LEV II program.[55] These facts suggest that, if the EPA did determine, on the basis of credible evidence, that Tier 2 was more protective of public health than LEV II, that finding was likely based on information that is now out of date. EPA's issuance of a waiver for implementation of the LEV II program in California, and its approval of the use of LEV II as part of Massachusetts' strategy to achieve the air quality goals of the Clean Air Act, both suggest that the agency now views the LEV II program as more protective of the environment and public health than the current federal standards.

QUESTION #4 WILL NEW JERSEY GIVE UP CONTROL OF ITS AIR POLICY BY ADOPTING LEV II?

Opponents of LEV II have often suggested that California would control New Jersey's air policy if the state adopts LEV II. Their claim is exaggerated, but it contains kernels of truth. Should New Jersey

adopt the LEV II program, the federal Clean Air Act requires the state to maintain regulations "identical" to those in California. In other words, should California change its program, New Jersey would have to follow. While New Jersey officials would have input into this process, California officials would make the ultimate decision.

Yet, the same can be said of federal emissions standards, which are dictated as much by the needs of states like Wyoming as they are by conditions in the Northeast. The example of New Source Review regulations—in which New Jersey is now suing a federal EPA run by the state's former governor over relaxation of rules for the cleanup of dirty power plants that pollute New Jersey's air—is one case in which New Jersey's needs have not been protected by federal environmental officials.

Should New Jersey decide that the LEV II program is preferable to the federal program, three questions with regard to state governance present themselves: 1) What is California's track record in managing the program? 2) Do the Clean Air Act and LEV II allow New Jersey any flexibility in tailoring the program to the state's needs? 3) What recourse does New Jersey have if it disagrees with California's implementation of the program?

California regularly reviews and revisits the LEV II program to ensure that it remains relevant and effective.

California's track record in updating and maintaining the LEV II/ZEV programs to meet changing conditions is solid.

For example, since the adoption of the ZEV program in 1990, the program has undergone four major revisions. Each time, the regulation has been revised to allow greater flexibility to automakers in meeting the requirements of the program. In 1996, CARB dropped any pure zero-emission vehicle requirement from 1998-2003 in exchange for an agreement from automakers to market a limited number of advanced-technology vehicles. In 1998, CARB added an allowance for partial ZEV credits to allow automakers manufacturing ultra-clean conventional vehicles to gain credit for their achievement. In 2001, CARB allowed automakers to receive extra credit for PZEVs that include advanced technology such as hybrid-electric drive. And, most recently, in April 2003, the board moved to reduce the near-term zero-emission vehicle requirement again in exchange for a greater long-term focus on fuel-cell vehicles and near-term focus on hybrids.

However, CARB has also shown the ability to react to developments that threaten the efficacy of the LEV II/ZEV standards. As noted above, CARB adjusted the LEV II standards in 2001 to require the sale of Tier 2 vehicles when they are cleaner than those required in California. And, in 2001, CARB reacted to the increased prevalence of heavier sport utility vehicles (SUVs) by adding them into the ZEV program and ramping up the ZEV percentage requirement in future years.

The frequent revisions to the LEV II/ZEV programs may occasionally be frustrating, but their end result is positive: a regulatory program that keeps current with the times.

New Jersey may have some flexibility in adapting the LEV II program to its needs.

As noted above, states adopting LEV II must have regulations "identical" to those in California. Yet, some states have imposed additional flexibility on the program. In 2002, New York and Massachusetts imple-

mented Alternative Compliance Plans (ACPs) for the ZEV portion of the program to add flexibility for automakers seeking to comply with the program. (Three automakers—DaimlerChrysler, General Motors and Isuzu—have sued New York over implementation of the ACP, in part due to the "identicality" issue. No judgment in the case has been reached. Meanwhile, all major automakers, except for Toyota, have submitted plans indicating their intention to comply with the New York ACP.[56])

Should the New York ACP—which is not a mandatory regulation, merely an alternative "compliance path"—be upheld in the courts, it would signal that states would have the ability to add flexibility to the California requirements. It must be noted, however, that this flexibility only goes one way—a state could implement an ACP to weaken the requirements, but not to strengthen them.

If New Jersey becomes dissatisfied with the direction California is taking, it can always leave the LEV II program.

Adopting LEV II/ZEV will not tie New Jersey's air regulations to those of California forevermore. If the state should determine, at some future date, that the federal program better serves its needs, it can always "vote with its feet" by reverting to the federal standards. In fact, a strict reading of the Clean Air Act suggests that states could revert to federal standards as soon as the next model year.[57]

Invariably, there will be aspects of both the federal and California programs that fail to perfectly meet New Jersey's needs. Congress has given New Jersey the flexibility to choose between two approaches for the regulation of motor vehicle emissions. Given the state's history of air quality problems that have at times rivaled those of California, it appears to make sense for New Jersey to adopt the more rigorous of the two approaches.

QUESTION #5 WILL THE LEV II PROGRAM WILL ADD ANOTHER LAYER OF COSTLY BUREAUCRACY TO STATE GOVERNMENT?

Any new program requires some effort to administer. The same is true of LEV II. However, some opponents of the program have raised the specter that a costly government bureaucracy would be needed in New Jersey to implement the program. "California employs roughly 1,200 state workers supporting the California Air Resources Board, which manages their LEV II program. New Jersey would be required to implement timely and costly reporting procedures, which would place a significant burden on state government," wrote Scott Mackey, on behalf of the Alliance of Automobile Manufacturers, in testimony submitted before an Assembly committee last year.[58]

At a time when state budgets are tight, it is useful to take a look at estimates of the potential administrative burden of LEV II and at the experiences of other northeastern states that have implemented the program.

Adopting LEV II will require only a minimal administrative burden for the state.

In testimony before the Assembly Environment and Solid Waste Committee, NJ DEP Assistant Commissioner Sam Wolfe estimated that DEP would have to devote about two full-time staffpeople to the administration of the LEV II/ZEV program.[59] Meanwhile, the Office of Legislative Services has estimated that "no additional

funding or costs will be needed or incurred by the DEP" as a result of the adoption of LEV II.[60]

This is consistent with the experience of other LEV states—such as Massachusetts, New York and Vermont—where the administrative burdens of the program have been minimal. In Connecticut, where the state is also considering the adoption of LEV II/ZEV, the Connecticut General Assembly Office of Fiscal Analysis estimated that the program would "require an additional employee and associated expenses (at the Connecticut DEP) at a cost of approximately $75,000 per year or divert current staff away from their present responsibilities."[61]

Any comparison of the size of staff that would be required in New Jersey with the size of the CARB staff is inappropriate. CARB sets air policy and manages many air pollution reduction programs for a variety of sources in California, of which LEV II is only one. In addition, CARB manages those programs for a state with four times the population of New Jersey.

QUESTION #6 WILL THE LEV II PROGRAM COST NEW JERSEY JOBS?

The issue of the jobs impact of LEV II has most often been raised in connection with the future of the General Motors and Ford vehicle assembly plants in Linden and Edison. There have been many suggestions that GM and Ford—both of which strongly oppose the LEV II program—would be more inclined to close the two plants should New Jersey move forward with the adoption of more stringent emission standards.

To explore this claim, one must ask: "What is it about the LEV II program that would lead the automakers to make such decisions?"

Nothing inherent in the LEV II program threatens the future of the Ford Edison and General Motors Linden plants.

In theory, there are two possible ways in which a program such as LEV II might affect the viability of the GM and Ford plants—by reducing the competitiveness of the manufacturers involved or by reducing demand for the particular type of vehicle built at a specific plant. Neither concern holds up under scrutiny.

Competitiveness

There is no doubt that GM and Ford are facing serious competitiveness problems. But emission standards such as LEV II appear to be the least of their worries. A much larger problem is their eroding competitive position versus other manufacturers, who

Table 1. Sales and Market Segment Share of Vehicles Produced in Linden and Edison[62]

Model (Plant)	Sales 2000	Segment Share 2000	Sales 2001	Segment Share 2001	Sales Change	Segment Share Change
Ford Ranger (Edison)	330,125	10.4%	272,460	8.5%	- 57,665	- 1.9%
Mazda Pickup (Edison)	30,124	0.9%	26,131	0.8%	- 3,993	-0.1%
GMC Jimmy (Linden)	79,489	2.7%	30,825	1.0%	- 48,664	-1.7%
GMC Sonoma (Linden)	51,093	1.6%	42,062	1.3%	- 9,031	-0.3%
Chevy S-10 (Linden)	211,587	6.6%	162,181	5.1%	- 49,406	-1.5%
Chevy Blazer (Linden)	225,948	7.6%	149,195	5.1%	-76,573	-2.5%

are increasingly competitive in the marketplace for the types of vehicles supplied by Linden and Edison—pickup trucks and SUVs.

Table 1 shows the startling decline in sales and market share of the vehicles produced in Linden and Edison between 2000 and 2001. In all, consumers purchased more than 245,000 fewer vehicles of the types produced in Linden and Edison in 2001 than they did the year before.

Clearly, something is happening to the market for these specific types of vehicles. It is beyond the scope of this report to speculate as to what the cause of GM and Ford's troubles might be. But the fundamental problems affecting demand for products produced in Linden and Edison obviously have much more to do with other factors in the automobile marketplace than they have to do with emission standards.

Light Truck Market Share

A somewhat more cogent argument might be made for the proposition that LEV II will reduce demand for light-duty trucks across all manufacturers, thereby reducing demand for vehicles produced in Linden and Edison. The share of trucks, vans and SUVs within the light-duty vehicle market has skyrocketed over the last several decades. In 1975, only 19% of new light-duty vehicles sold in the United States were vans, pickups or SUVs. By 2001, these vehicle types accounted for 47% of all new light-duty vehicle sales.[63] It is widely speculated that the tighter emission and fuel-economy rules facing passenger cars have acted as an incentive for auto manufacturers to intensively market SUVs and other light-duty trucks, which face less rigorous standards.

While LEV II retains some distinctions between cars and heavier light-duty trucks, the program requires significant emission reductions from both types of vehicles. But so does Tier 2. Indeed, with the marginal additional costs of complying with LEV II standards, it appears that any disincentive for the purchase or sale of light-duty trucks would be no greater or less under LEV II than it would be in states that retain the Tier 2 program.

The same is true of the Zero-Emission Vehicle program. The ZEV program currently applies only to passenger cars and the lightest light-duty trucks. Beginning in 2007, heavier light trucks will begin to be phased into the sales base used to calculate manufacturers' obligations under the Zero-Emission Vehicle program. The phase-in of this requirement, however, will not be complete until the 2012 model year.

As a result, there is little reason to believe that the LEV II/ZEV program will, on its own, encourage manufacturers to shift consumers away from light trucks and toward automobiles. To the extent that such "mix shifting" effects do occur, they would likely be similar under the Tier 2 and LEV II programs. The more relevant issue for GM and Ford is whether they can retain their market share amid increasing competition in the light-duty truck sector. As noted above, their ability to do so has little, if anything, to do with the vehicle emission standards in effect in New Jersey.

Retribution

Of course, a third possibility exists: that GM or Ford would close the two plants in retribution for New Jersey's decision to adopt the LEV II program. We raise this possibility only because—given the analysis above—it is the only logical explanation for LEV II opponents' claims that the LEV II program would somehow "cost jobs" at the two plants.

GM and Ford are both large companies with long histories in the automobile industry. It is unlikely that these corporations

would put their long-term bottom line in jeopardy in order to exact retribution for a perceived slight. We believe (and hope) that GM and Ford would evaluate the future of the Linden and Edison plants based on market factors and their history of successful operations at those two facilities—regardless of New Jersey's decision on the LEV II standards.

Other New Jersey industries stand to benefit from the LEV II program.

The long-term focus of the Zero-Emission Vehicle program on the development of hydrogen fuel-cell vehicles could be a boon to a number of New Jersey businesses that are poised to take advantage of the growth potential of fuel cells.

The state Department of Transportation, in partnership with local educational institutions and businesses, has helped forward fuel-cell technology through the development of two prototype fuel-cell vehicles, the New Jersey Venturer and New Jersey Genesis. Fuel Cells 2000 lists nearly 30 New Jersey fuel cell-related businesses and organizations.[64] Among the companies is Eatontown-based Millennium Cell, which is working with DaimlerChrysler to develop fuel cells for transportation use, and also develops fuel cell technologies for use in consumer electronics and stationary applications. The company currently employs 40 people.[65] Johnson Matthey Fuel Cells, a multinational corporation, also produces catalysts for low-temperature fuel cells at its facility in West Deptford. (Part of the Johnson Matthey West Deptford facility was recently damaged by fire.)

While these and other companies pioneering fuel cell technology may be small, their potential for growth is huge. By encouraging the development of fuel cells for transportation through adoption of the ZEV program, New Jersey could provide a significant incentive for the future growth of these businesses and encourage their location in the state.

QUESTION #7 IS THE LEV II PROGRAM NEEDED TO ENSURE THAT CLEAN CARS ARE SOLD IN NEW JERSEY?

Over the past several years, automakers have made significant strides in the development of advanced-technology vehicles. Representatives of both Ford and General Motors have told New Jersey lawmakers that automakers will sell advanced-technology vehicles such as hybrid cars in the state, regardless of how New Jersey acts on LEV II. "You don't have to adopt the ZEV mandate to get these vehicles," said Ford's Nancy Homeister.[66]

There is, however, much historical precedent for automakers restricting their cleanest vehicle offerings for sale in California and in states with more stringent vehicular emissions standards. Indeed, at this writing, several automakers are selling ultra-clean partial ZEV credit vehicles — but only to customers in California and other LEV II program states. This, and other episodes in recent history, show that New Jersey has many reasons to doubt automakers' commitment to selling their cleanest, most advanced vehicles to consumers in the Garden State.

History has shown that manufacturers will not offer advanced-technology vehicles in great numbers without governmental requirements.

Fuel Economy vs. Emissions—A Study in Contrasts

Nothing better illustrates automakers' response to governmental regulation than

the diverging trends in vehicle fuel efficiency and tailpipe emissions.

Automakers frequently boast about the success they have achieved in reducing emissions from cars and light trucks. They are justified in doing so. Since the 1960s, automakers have succeeded in reducing emissions from the average passenger car by more than 90 percent—and further reductions have already been shown to be possible in vehicles being manufactured today. However, automakers commonly fail to point out that *virtually all reductions in vehicle emissions have been driven by government emission standards*—standards which automakers have frequently said could not be met at the time they were adopted. Time and time again, government has challenged the automobile industry to improve the environmental performance of its vehicles and the industry has responded to the challenge. Rarely, however, have automakers introduced technology to reduce emissions without the presence, or perceived threat, of a government mandate.

Not too long ago, automakers could take similar pride in bringing about a dramatic increase in automobile fuel economy. In the 1970s, the federal government imposed Corporate Average Fuel Economy (CAFE) standards on automakers. In the decade-and-a-half following enactment of the CAFE standards, the "real world" fuel economy of passenger cars nearly doubled—from 13.5 MPG in 1975 to 24.4 MPG in 1988. Similarly, light trucks experienced an increase in real-world fuel economy from 11.6 MPG in 1975 to 18.4 MPG in 1987.[67]

But, with CAFE standards having remained stagnant for cars since 1990 and for light trucks since 1996, automakers' progress toward more efficient vehicles has not only stopped, it has actually reversed. Due to stagnating fuel economy and a recent shift toward greater purchases of SUVs and other light trucks, the average fuel economy of a light-duty vehicle sold in 2002 was *lower than at any time since 1980* and down by nearly 8 percent from the historical peak in 1987 and 1988.[68]

This peformance is all the more discouraging given the development of many technologies that could improve fuel economy. A 2002 National Research Council report found that automakers could cost-effectively boost the fuel economy of their fleets by 12 to 42 percent, with the greatest potential increases coming in the fuel economy of light trucks.[69] Other analysts, such as the American Council for an Energy-Efficient Economy, have estimated that fleetwide fuel economy of 36 to 41 MPG would be achievable by 2012 using technologies projected to be available within the next decade.[70]

History has shown that, without strong CAFE standards, there is no guarantee that automakers will provide more fuel-efficient vehicles to consumers. The same has historically been true with regard to the introduction of advanced-technology vehicles.

PZEVs and Battery-Electric Vehicles

The early introduction of vehicles attaining partial ZEV (PZEV) credits is another example of automakers' refusal to supply vehicles that meet advanced environmental standards. As noted above, seven manufacturers have certified 10 different vehicles to PZEV standards—which include compliance with the stringent SULEV emission standard. However, based on information from the automakers' Web sites, only the natural gas-powered Honda Civic GX and two models of the Ford Focus either are, or will soon be available to consumers in New Jersey. The others appear to be restricted for sale in California and other states with ZEV programs. (See Table 2.)

Table 2: Model Year 2003 Partial ZEV Credit (PZEV) Vehicles[71]

Mfr.	Model	Fuel	Availability
BMW	325i	Gasoline	CA, MA, ME, NY, VT
Ford	Focus	Gasoline	Std. in CA, MA, NY
Ford	Focus Wagon	Gasoline	Std. in CA, MA, NY
Honda	Accord EX/LX	Gasoline	CA
Honda	Civic GX	CNG	Nationwide
Nissan	Sentra XE/GXE	Gasoline	CA
Toyota	Camry	Gasoline	CA
VW	Jetta	Gasoline	CA
Volvo	S60 FWD	Gasoline	CA
Volvo	V70 FWD	Gasoline	CA

Another example of the refusal of automakers to supply advanced-technology vehicles where they are not required to do so was in the electric vehicle program in California. There are many misconceptions about the program's history (See Question #9), but one fact is not in doubt—most automakers restricted leasing or sale of their electric vehicles to California purchasers. While small numbers of vehicles were placed in state government fleets and demonstration projects outside of California, only California residents generally had the ability to go to a local dealership of a major manufacturer and sign up for a full-function electric vehicle. It is no surprise, then, that of the 11,800 electric vehicles in use in the U.S. in 2000, 3,800—or about one third—were in California. Another 1,300 were on the road in Massachusetts and New York—both ZEV-program states. Only 146 were in use in New Jersey.[72]

This bodes poorly for those who might want to drive a fuel-cell vehicle when they first come onto the market, but do not have the good fortune of living in a state with a ZEV program. The electric vehicle experience in California shows that automakers are perfectly willing to restrict the supply of advanced-technology vehicles to only those areas in which government requires them to be sold.

Hybrids

Automakers have not withheld hybrid-electric vehicles from consumers in New Jersey or any other state. In fact, the technological and environmental promise of hybrids represents an uncommon area of agreement between supporters and opponents of the LEV II standards.

With all their promise, however, it is fair to ask why there aren't more hybrids on New Jersey's highways today—and when the hybrids that have been so vigorously touted by manufacturers might be arriving. Six years and more than 100,000 vehicles after the successful introduction of the first hybrid-electric vehicle in Japan, the three major American automakers have yet to sell a single hybrid. New Jersey consumers seeking to drive a hybrid currently have a choice among only three models of vehicles, supplied by two foreign manufacturers.

There are signs that this may soon change. All three major American automakers have pledged to introduce hybrid vehicles within the next two years. These vehicles range from those that will

represent significant environmental improvements (the Ford Escape and Saturn VUE full hybrid SUVs) to those that will provide minimal environmental gains (GM's "muscle hybrid" Silverado and Sierra pickups, which provide only modest gains in fuel efficiency).

But for virtually every much-ballyhooed announcement of a new hybrid introduction from an American automaker, it seems, there has been a less-ballyhooed delay.

The Ford Escape SUV, which will get between 35-40 MPG, was originally to be made available to consumers in 2003. Now, however, it will only be made available to fleets in 2003, with individual consumers having to wait until late-summer 2004.[73] Dodge has dropped plans to manufacture a hybrid version of its Durango pickup truck (although the company remains on track to produce a hybrid Ram Contractor Special pickup in 2004).[74] And Ford has withdrawn its highly publicized 2000 pledge to improve the fuel economy of its SUV fleet by 25 percent by mid-decade.[75]

As the Big Three have waited, the pioneers of hybrids—Honda and Toyota—have been refining and expanding the availability of the technology. In 2002, Honda included a hybrid option in its popular Civic small car, the first use of a hybrid system within an existing vehicle line. And consumers will soon be able to purchase an all-new version of the Toyota Prius that boasts more room, greater power, and better gasoline mileage than the original Prius.[76]

Automakers may have the best of intentions with their hybrid programs. But actually getting the vehicles on the road in significant numbers has proven to be more of a challenge. A LEV II/ZEV program would encourage the sale of additional hybrid-electric vehicles. More importantly, by ensuring that all manufacturers will introduce advanced-technology vehicles in their fleets, the ZEV program will shield individual automakers from the risk—taken boldly by Toyota and Honda in the late 1990s—of being "first out of the gate" with a new technology.

A New Leaf?

History is not always an accurate predictor of future events. Automakers like to point to their large and growing investment in the development of fuel-cell vehicles, and to the introduction of specific technologies (such as GM's announcement that it will include fuel-saving "Displacement on Demand" in several models of V8 vehicles) as evidence that they will supply advanced-technology vehicles to consumers, with or without government requirements.[77]

It may be that the success of hybrid-electric vehicles in the marketplace, coupled with increased consumer concern about vehicle fuel economy, is spurring a real change in the automakers' strategy. For example, J.D. Power and Associates' annual initial quality survey recently found excessive fuel consumption to be the second most common driver complaint. This was the highest ranking for fuel consumption in the survey's 17-year history; it had never before rated among the top five concerns.[78]

But, as history shows, it would be a mistake for New Jersey to count on automakers' voluntary commitments to ensure a steady flow of advanced-technology vehicles to the state. With automakers continuing to reserve many of their PZEV vehicles for sale in ZEV-program states, refusing to adopt technologically feasible strategies to improve fuel economy, and experiencing delays in the introduction of more hybrid-electric vehicles, it is clear that only governmental action will get these vehicles on New Jersey's roads in significant numbers.

QUESTION #8
WILL LEV II WORK IN NEW JERSEY WITHOUT COMPLEMENTARY CALIFORNIA CLEAN AIR PROGRAMS?

California and New Jersey share two important things in common: both have a culture built largely around the automobile and both have a history of severe air pollution problems.

In one respect, however, the two states are very different. California has a long history of imposing stringent standards for tailpipe emissions and motor fuels, and for investing significant amounts of money in incentives for alternative-fuel vehicles such as electric cars. It is suggested by some critics of LEV II that New Jersey's reliance on weaker, federal fuel standards and the absence of large financial incentives for the purchase of advanced-technology vehicles mean that the LEV II program would not be successful in the state. These two issues—of fuels and incentives—must be addressed separately.

New Jersey would still gain emissions benefits from LEV II—even with "federal" fuel.

It has long been recognized that there is a significant difference between the emissions performance of vehicles when tested in a laboratory and their performance in the "real world." One reason for this difference is the varying content of fuels used in different parts of the country.

Sulfur in motor fuel has been shown to "poison" a vehicle's catalytic converter, leading to a potentially significant increase in real-world vehicle emissions. A 1998 EPA study found that LEV I and ULEV I certified vehicles using fuel with a sulfur content of 330 parts per million (ppm) released as much as 43 percent more VOCs and 136 percent more NOx than vehicles operating on fuel with 40 ppm sulfur.[79] Those vehicles meeting the most stringent emissions standards tended to be most susceptible to the impacts of sulfur.

The issue is relevant to New Jersey because sulfur levels in fuel nationally average over 300 ppm, and can reach levels as much as 1000 ppm.[80] By contrast, since 1996, California has required the sale of fuel averaging 30 ppm sulfur. Both the federal government and California are taking action to reduce sulfur levels in fuel, with the EPA planning to mimic California's former 30 ppm average, and California planning to reduce sulfur levels further, to 15 ppm average.

Clearly, sulfur content in fuel is a major concern for air quality. The issues surrounding the intersection of fuels and emission controls are very complex and are still not fully understood. But the sulfur issue raises two significant questions about the potential effectiveness of the LEV II program.

1) Would the use of higher-sulfur fuel in New Jersey make it more difficult for automakers to certify their California vehicles to New Jersey LEV II standards?

2) Do differences in fuel sulfur content reduce the projected environmental benefits of LEV II for New Jersey?

Certification

In the May 21, 2002 OLS memo mentioned above, Carrie Anne Calvo-Hahn writes, "California certified low emissions vehicles operating in New Jersey may not achieve the same standards for which they were certified in California when operating on California gasoline, thus making it

difficult to meet the required emission standards."[81]

Variations in fuel between states have historically had nothing to do with their performance in certification testing. The reason: certification testing takes place with a special fuel—called Indolene—that has sulfur content similar to that of California fuel. Automakers use Indolene to demonstrate compliance with federal emission standards and can use it to demonstrate compliance in California. As a result, variations in fuel sulfur levels have no impact on automakers' ability to *certify* their vehicles to the appropriate standards—although it may have an impact on how much pollution those vehicles actually emit in the real world.

Even if the variation of fuel sulfur levels did affect the certification or in-use testing performance of motor vehicles, New Jersey would still have the power to compel automakers to make cars that would meet the standards in New Jersey on New Jersey fuel.

The U.S. Second Circuit Court of Appeals addressed this issue in 1996 when deciding a lawsuit filed by the Motor Vehicle Manufacturers Association (MVMA) of the U.S. against the New York State Department of Environmental Conservation. The MVMA argued that New York's implementation of the original LEV standards violated the Clean Air Act's prohibition against standards that have the effect of requiring a "third car" because California's low-sulfur fuels were not available in New York. At the time, the difference in sulfur content between federal and California fuel was far greater than it is today.

The court found that "(M)odifications that might result from the difference in the quality of fuel sold in New York and California do not give rise to a third vehicle violation ... Therefore, the district court properly ruled that alterations stemming from differences in fuels—as opposed to differences in emissions standards—cannot amount to a third vehicle violation."[82]

It should also be kept in mind that automakers will already be manufacturing vehicles to comply with LEV II standards in other northeastern states that do not use California fuel. Any differences in vehicles necessitated by differing fuel mixes will already be dealt with by automakers, regardless of New Jersey's participation in the LEV II program.

Environmental Performance

The relevant question with regard to fuel sulfur is not whether higher sulfur levels in New Jersey gasoline would cause LEV II vehicles here to emit more pollution than their California cousins. Rather, it is whether the LEV II program will bring environmental benefits over the Tier 2 program, even with higher-sulfur fuel.

Studies such as those conducted by NJ DEP and NESCAUM—both of which are based on the EPA's MOBILE6 model—factor in fuel sulfur content in their estimates of emissions benefits from LEV II. While New Jersey would certainly achieve greater environmental benefits with a shift toward lower-sulfur fuel, such a shift is not necessary to receive the projected benefits from the LEV II program.

It is also important to note that California devised its LEV II regulations *before* making the decision to further reduce sulfur levels in gasoline sold in the state. Based on extensive testing of emission-control technologies, CARB concluded that the LEV II standards would be technologically achievable.[83] There is no reason to believe that this has changed.

Fuel sulfur levels are coming down in New Jersey as a result of EPA rules adopted

along with the Tier 2 program. While it is clear that fuel sulfur levels at pre-Tier 2 levels have a damaging impact on emission controls, it is less clear what the difference in performance will be between fuel meeting the 30 ppm average standard in New Jersey and the 15 ppm average standard in California. CARB estimated that implementation of its California Reformuated Gasoline 3 (CalRFG3) fuel standards—which include, but are not limited to, the reduction in sulfur content—would lead to a 2 percent reduction in NOx emissions and a 7 percent reduction in emissions of potency-weighted toxics versus California fuel in use in 1998. There would be virtually no difference in hydrocarbon emissions.[84]

These are significant environmental benefits that New Jersey will not receive—with or without LEV II. Lower fuel sulfur levels are desirable, and state and federal officials should work to achieve them. But the available evidence suggests that the LEV II program will still bring significant environmental results to New Jersey in the years to come, regardless of the type of fuel used.

Economic incentives are desirable—but not necessary—for the success of the LEV II program.

The OLS memo also raises the issue of California's incentives for the purchase of zero-emission vehicles. California provided grants of up to $9,000 toward the purchase of "pure" zero-emission vehicles purchased prior to 2003 and will provide grants of $5,000 in future years.[85]

The elimination of any effective pure zero-emission vehicle requirement until 2012 (See Question #1) makes the issue of financial incentives for the purchase of electric or fuel-cell vehicles moot. Incentives for the purchase of hybrid-electric vehicles would encourage consumers to buy (and automakers to sell) the vehicles. Hybrid-electric vehicles currently qualify for a federal tax deduction of $2,000, although this incentive is currently scheduled to be phased out beginning in 2004 and ended entirely after 2006.[86] President Bush has proposed further incentives for hybrid-electric vehicle purchases and Congress is currently debating them.

In sum, state incentives for the purchase of advanced-technology vehicles would be beneficial, but they are not necessary for the success of the LEV II/ZEV program. New Jersey may wish to consider incentives for the purchase of hybrid-electric or fuel-cell vehicles in the future, but ideally the federal government would take the lead, as it has in the past.

QUESTION #9 WHAT WAS THE IMPACT OF THE ORIGINAL ZERO-EMISSION VEHICLE PROGRAM IN CALIFORNIA? WAS IT A SUCCESS OR A FAILURE?

Whether the original 1990 California ZEV program is termed a "success" or "failure" depends largely on who is answering the question. To automakers—who vehemently opposed the program from the start—the ZEV requirement was a waste of resources and a diversion from their other business interests. To many environmentalists and public health advocates, the original ZEV program proved the technological feasibility of the electric vehicle.

Both supporters and opponents agree on one result of the program: that the ZEV program helped create a surge of research into alternatives to the internal combustion engine that is now bearing fruit in a variety of innovative vehicle designs. While the

history of the battery-electric vehicle may not be as rosy as some of its most passionate supporters might paint it, neither has it been the disaster that automakers have claimed.

The ZEV program has sparked advances in clean car technologies that would not have taken place otherwise.

The ZEV program has fueled investments that have led to dramatic advances in vehicle technologies—advances that are making their mark in the drive toward hybrid-electric and fuel-cell vehicles. Fuel-cell vehicles are essentially electric vehicles without batteries. Any advancement in electric-drive technology in any part of the vehicle other than the battery would have a direct benefit in the pursuit of fuel-cell vehicles. Moreover, advances in batteries driven by the ZEV program have direct applications in hybrid-electric vehicles and in the hybrid systems that will likely be a part of the first generation of fuel-cell vehicles.

The technological progress sparked by the ZEV program is indicated by the number of patents issued for electric vehicle technologies. Prior to California's 1990 adoption of the ZEV program, the number of patents issued for electric vehicle-related technologies was declining by about one patent per year. Immediately following the adoption of the ZEV program, the amount of patent activity skyrocketed; between 1992 and 1998, the number of EV-related patents increased by about 20 patents per year.[87]

Automakers have acknowledged the benefits of ZEV-related research in the development of their current advanced-technology vehicles. Toyota has used technologies developed for the Toyota RAV4-EV in the hybrid-electric Toyota Prius.[88] Honda's corporate Web site states that "Honda engineers are applying what they've learned from developing the EV Plus electric vehicle to the development of fuel-cell technology.... The EV Plus has provided and continues to provide invaluable data on battery technology and construction, service and recharging infrastructure, chassis dynamics and even specialized tire design for generations of Low-Emission Vehicles yet to come."[89] General Motors acknowledges that, "(t)he EV1 was a learning experience for GM. The electric propulsion system forms the basis of GM's advanced technology vehicle programs, from hybrids to fuel cells."[90]

The battery-electric vehicle requirement in the initial ZEV program may not have led to the results the program's originators anticipated. But the "technology forcing" aspect of the program has led to a profusion of advanced technologies that will lead to significant environmental gains for decades to come.

Battery-electric vehicles remain a viable solution for many transportation applications and have been popular with those who have used them.

Lost in the automakers' litany of problems with battery-electric vehicles (low range, high cost, etc.) is the fact that most of those who have used the vehicles actually enjoyed them. Indeed, evidence from California has shown that many more consumers desired to drive electric vehicles, but were turned off by automakers' marketing practices.

A fuller discussion of the California electric vehicle program can be found in NJPIRG Law & Policy Center's 2002 report, "Ready to Roll." Several examples, however, show that the battery-electric vehicle

program has not been the disaster its detractors claim.

- A 2000 survey of electric vehicle drivers by the California Mobile Source Air Pollution Reduction Committee (MSRC) found that 80 percent of those surveyed were more satisfied with their EV than with their current gasoline car and that 77 percent would lease another EV.[91]

- In 2002, Toyota offered its RAV4-EV for retail sale to the public. Published reports stated that Toyota was aiming for between 300 and 360 first-year sales. Between February 2002 and January 2003, Toyota sold 286 of the vehicles in California, with 56 more orders pending fulfillment—for a total of 340 sales—and its model year 2003 RAV4-EVs all sold out.[92] However, in November 2002, the company announced that it would stop taking new orders for the vehicles and, in January 2003, announced that it was discontinuing the program, stating that "sales levels were very low."[93]

- General Motors has refused to extend the leases of California consumers who drive the company's EV1 electric car—despite vehement protests from drivers. "GM wants the program over. They want the cars off the road. They want it out of their hair. They don't want us out there driving these cars, talking about how great they are," said Greg Hanssen, an EV1 lease-holder.[94]

Indeed, for many consumers and many applications, the electric vehicles supplied in California were "great." EVs have low maintenance costs (fewer moving parts), superior acceleration, lower fuel costs, can be recharged at home (eliminating the need to visit filling stations), and most have sufficient range to power drivers through their daily commutes.

Obtaining those vehicles, however, was a nightmare for many consumers. Automakers freqently "screened" would-be purchasers of EVs, leased EVs on restrictive terms, limited the availability of EVs to only a handful of dealerships, and placed customers on months-long "waiting lists" for vehicles. Given these practices, it is little wonder that consumer "demand" for EVs—as measured in actual sales or leases—was underwhelming.

Another factor may have been at play as well. A 1995 confidential request for proposals from the American Automobile Manufacturers Association (AAMA) noted that most Californians "believe zero-emission vehicles (ZEVs) or electric vehicles are a 'workable and practical' means of reducing air pollution," a shift from earlier polling results. The memo went on to note that "The AAMA is conducting a search for a qualified contractor to manage a statewide grassroots and educational campaign in California to create a climate in which the state's mandate requiring automakers to produce a fixed percentage of electric vehicles beginning in 1998 can be repealed."[95]

The consistent attempt to undersell the technological potential of electric vehicles—and thereby undermine the rationale for the ZEV program—continues today in references to the "golf carts" that GM and other manufacturers placed in California in an attempt to bank credits under the ZEV program. While automakers are correct that such vehicles "do not represent advanced technology," they frequently fail to note that much better electric-vehicle technology does exist.[96] Thirteen years ago, GM chair-

man Roger Smith, in announcing a prototype GM electric vehicle, told reporters that the GM Impact was "no golf cart."[97] It wasn't. And the few thousand people who have been able to drive actual, full-function battery-electric vehicles in California know the potential benefits of the technology.

Far from being a failure, the original ZEV program helped spark a technological revolution—a revolution whose beneficial impacts will be felt in New Jersey and elsewhere for years to come. Moreover, it proved that battery-electric vehicles could serve the needs of many, if not most, commuters — despite automakers' lack of enthusiasm over the technology. The adoption of the LEV II/ZEV program in New Jersey would continue to provide an incentive for automakers to create innovative vehicles that meet the day-to-day needs of commuters while protecting the state's environment.

QUESTION #10 WHAT WOULD BE THE ECONOMIC IMPACT OF ADOPTING LEV II?

With New Jersey's economy in trouble, some are concerned about the potential economic impact of adopting LEV II. Several of the economic issues surrounding LEV II (such as increased administrative costs for state government and higher vehicle costs) have already been addressed earlier in this report. It is fair to ask, however, just what the LEV II program will cost New Jersey, and what the potential benefits of the program might be.

The adoption of LEV II in New Jersey could create a long-term economic benefit for the state, while having minimal short-term impacts.

The primary entry on the cost side of the ledger is the physical cost of upgrading vehicles to meet the tougher standards. As noted above, the LEV II standards, in and of themselves, are expected to have a negligible impact on vehicle costs. The ZEV program—with its near-term requirements for the sale of hybrid-electric and clean conventional vehicles—will, however, impose some technological costs.

Assuming that the ZEV program will require the sale of approximately 18,000 hybrids and 147,000 conventional PZEVs in New Jersey in 2007 (a figure consistent with CARB's projection of vehicle sales in California), it would cost automakers approximately an additional $42 million to manufacture the vehicles, based on CARB's cost estimates. This figure would likely rise to as much as $73 million by 2011, as sales requirements rise.

To put this in perspective, the $42 million outlay in 2007 represents about 0.2% of the $24 billion in total sales by New Jersey new car dealers in 2002.[98] Spreading this cost across all new light-duty vehicles sold in New Jersey, the ZEV program would increase costs by an average of about $64 per car. At this level of impact, New Jersey would likely not see a significant drop in vehicle purchases—the key potential economic result of tighter emission standards.

The state would, however, see significant economic benefits on a variety of fronts:

- **Fuel savings—**As noted above, further drops in the cost of hybrid-electric vehicles—even amid an atmosphere of moderate fuel

prices—lead to the possibility that consumers could see a net benefit from the purchase of hybrids within the next decade, with or without tax incentives. Ironically, should this take place, it will be auto dealers and manufacturers—the most vehement opponents of the ZEV program—who would benefit, as consumers spend less on fuel and more on vehicles that provide better fuel economy.

- **Health care costs—**New Jersey's continuing problems with ozone smog and air toxics represent a burden on the state's health care system. In 1998, for example, asthma affected approximately 426,000 people in New Jersey, at an estimated total cost of $324 million.[99] In 2002, the National Institutes of Health estimated that cancer cost the American economy in excess of $170 billion.[100] Reducing emissions that trigger asthma attacks and increase cancer incidence will inevitably lead to fewer sick days and reduced health care costs for New Jersey businesses and the state government.

- **Global warming—**New Jersey has much to lose from global warming, particularly the potential impact on the state's tourism and recreation economy of sea level rise along the Jersey Shore. The EPA has cited sea level rise as the primary cause of shore erosion. Along the Jersey Shore, the sea level is rising at a rate of approximately one inch every six years. Shore protection and sand replenishment currently costs the state about $15 million per year.[101]

  Both NESCAUM and the MASSPIRG Education Fund have documented the carbon dioxide emission reduction benefits of the LEV II/ZEV program in the transportation sector—which produces 35% of New Jersey's greenhouse gas emissions.[102] The 2-5% reductions in carbon dioxide emissions projected by those studies for the LEV II/ZEV program would not be sufficient to solve New Jersey's greenhouse gas emission problems, but they would make an important contribution.[103]

- **Energy security—**New Jersey's economy is heavily dependent on the availability of inexpensive fossil fuels. A dramatic increase in the price of fossil fuels or a severe disruption in supply would have a disastrous impact on the state's economy. Such disruptions are even more likely to occur in the future, as readily accessible sources of oil are exhausted and supplies become stretched. The U.S. Energy Information Administration (EIA) projects that, at current rates of growth in oil consumption, oil production worldwide will peak in about 2037, leading to shortages and dramatically higher prices.[104] Other analysts have criticized the EIA's assumptions as far too optimistic and suggest that peak oil production could come as soon as the end of the next decade—or about the time many of today's new cars, trucks and SUVs reach the end of their useful lives.

  Many advanced-technology vehicles—particularly hybrids,

battery-electric vehicles and fuel-cell vehicles—have the potential to dramatically reduce the consumption of petroleum in the transportation sector. Stimulating the supply of these vehicles will enhance the state's long-term economic security by cushioning New Jersey against the damaging impacts of fossil fuel price and supply instability.

New Jersey's current economic doldrums are unlikely to extend beyond the 2006 implementation date for LEV II. Even if they did, however, the vehicles sold in 2006 will still be on the road for 10 to 15 years. The decisions New Jersey makes today with regard to LEV II/ZEV will have an impact for years to come. By helping to protect public health, reduce the long-term threat of global warming, and conserve precious fossil fuels, the LEV II/ZEV program can contribute to the attainment of a sustainable economic future for New Jersey.

Notes

1. New Jersey Department of Environmental Protection, *Historical Data: Ground-Level Ozone, 8-Hour Exceedences*, downloaded from www.state.nj.us/dep/airmon/oz8tbl.htm, 16 May 2003.

2. Emily Figdor, U.S. PIRG Education Fund, *Dangers of Diesel*, October 2002.

3. Sibyl R. Golden, Inform, Inc., *Green Transportation for New Jersey: The Promise of Clean Fuels*, 2000.

4. See note 2.

5. Jack Doyle, *Taken For a Ride*, Four Windows Eight Walls, 86.

6. Ibid., 89.

7. Ibid., 92.

8. Michael P. Walsh, *California's Low Emissions Vehicle Program Compared to U.S. EPA's Tier 2 Program*, 20 January 2000, 35. Because compliance under the LEV II program is tied to NMOG emissions and Tier 2 compliance is tied to NOx, actual emission levels of NOx under LEV II and NMOG under Tier 2 may vary. Under Tier 2, NMOG emissions are capped at 0.09 grams per mile—the highest level possible under any bin. It is likely that actual NMOG emissions will be somewhat lower than 0.09 g/mi as manufacturers certify vehicles to cleaner bins. Under LEV II, the highest permissible NOx emission standard is 0.07 g/mi—the same as the federal standard. However, LEV II NOx emission levels are guaranteed to be lower due to the requirement that many vehicles be certified to the super-low emission vehicle (SULEV) and zero-emission vehicle (ZEV) bins under the ZEV program.

9. California Environmental Protection Agency, Air Resources Board, *ARB Modifies Zero Emission Vehicle Regulation* (press release), 24 April 2003.

10. State of California, Air Resources Board, *Resolution 03-4*, adopted 24 April 2003.

11. In this case, "zero" evaporative emissions refers to emissions from fuel. Hydrocarbon evaporative emissions also come from other sources, including paint, adhesives, air conditioning refrigerants, vinyl, tires, etc. Source: California Air Resources Board, *California Evaporative Emission Test Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles*, I.E.1(2), adopted 5 August 1999.

12. California Environmental Protection Agency, Air Resources Board, *Staff's Suggested Modifications to the Proposed Regulation Order: Proposed 2003 Amendments to the California Zero Emission Vehicle Regulation*, 5 March 2003.

13. New Jersey Chamber of Commerce, *Trenton Watch*, 14 and 21 March 2003.

14. Automakers choosing this option must supply 10 times the number of battery-electric vehicles as they would fuel-cell vehicles, due to the cost differential between the two technologies. Source: State of California, Air Resources Board, *Resolution 03-4*, Adopted 24 April 2003, Attachment D.

15. See note 10.

16. California Environmental Protection Agency, Air Resources Board, *Staff Report: Initial Statement of Reasons: Proposed Amendments to California Exhaust and Evaporative Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles "LEV II,"* 18 September 1998.

17. Massachusetts Department of Environmental Protection, *Background Document and Technical Support for Public Hearing on the Proposed Amendments to the State Implementation Plan for Ozone; and Public Hearing and Findings under the Massachusetts Low Emission Vehicle Statute*, October 1999.

18. See note 16.

19. California Air Resources Board, *2003 Model Year Guide to Passenger Cars*, updated 5 February 2003.

20. Joe Tomita, vice president, Toyota North America, testimony before the California Air Resources Board, 27 March 2003.

21. *Ron Cogan's Green Car Journal*, "Ford's Focus: Bringing Thousands of PZEVs to Worldwide Markets," March 2003.

22. The exceptions appear to be the natural gas-powered Honda Civic GX, available nationwide, and the Ford Focus PZEV, which is standard in New York, Massachusetts and California and may be optional elsewhere. Ford intends to begin selling the Focus PZEV nationwide in the near future.

23. California Environmental Protection Agency, Air Resources Board, *Staff Report: Initial Statement of Reasons: 2003 Proposed Amendments to the California Zero Emission Vehicle Program Regulations*, 10 January 2003.

24. Ibid.

25. See note 21.

26. *Contra Costa Times*, "Hybrid Car Sales, Demand Picking Up," 4 January 2003, downloaded from www.evworld.com/databases/shownews.cfm?pageid=news040103-04, 21 February 2003.

27. John Gartner, "Electric Vehicles Try to Turn Corner," *Wired News*, 14 December 2001; Toyota, *Hybrid Vehicle Lineup*, downloaded from http://toyota.irweb.jp/IRweb/corp_info/hybrid_tech_2001/5.html, 19 February 2002; Toyota, *Toyota Worldwide Hybrid Sales Top 100,000 Mark* (press release), 22 April 2002.

28. J.D. Power and Associates, *J.D. Power and Associates Reports: Interest in Hybrid Technology is High, Especially Among Women* (press release), 6 March 2002.

29. Toyota, *The All-New 2004 Prius*, downloaded from www.toyota.com, 21 April 2003.

30. See note 23.

31. Ibid.

32. Jim Appleton, testimony before the New Jersey Assembly Environment and Solid Waste Committee, 3 March 2003.

33. Estimates based on CARB projections of ZEV program vehicle sales under March 2003 proposed amendments to the ZEV program, adjusted based on the relative size of the New Jersey new vehicle market. These figures should be considered preliminary estimates.

34. See note 23.

35. Jim Appleton, director, New Jersey Coalition of Automobile Retailers, quoted in Alexander Lane, "'Clean Car' Rules on Road to NJ," *Star-Ledger*, 4 March 2003.

36. Alexander Lane, "'California Car' Bill Begins to Rev in Jersey," *Star-Ledger*, 7 May 2003.

37. See note 17.

38. Northeast States for Coordinated Air Use Management, *Emissions Benefits of Adopting the LEV II Program in the Northeast* (draft report), May 2003. The NESCAUM analysis differed from EPA's modeling approach in assuming some evaporative emissions benefit from the "zero" evaporative emission requirement for ZEV program-certified vehicles. See note 39.

39. Testimony of Sam Wolfe, NJ Department of Environmental Protection, before the New Jersey Assembly Environment and Solid Waste Committee, 3 March 2003.

40. The uncertainty in the VOC emission figures stems from changes made in the U.S. EPA's guidance for modeling the LEV II program using the MOBILE6 model. One set of EPA guidance suggests that all vehicles covered under the ZEV program would release no evaporative VOC emissions. Revised EPA guidance acknowledges that even vehicles certified to "zero" evaporative emission standards would release some evaporative VOCs. However, EPA concludes, on this basis, that ZEV-compliant vehicles would emit the *same* amount of evaporative VOCs as other LEV II vehicles, despite the tighter evaporative emission requirements they face. This conclusion serves to underestimate the VOC reduction benefits of LEV II. As a result, the true VOC reductions that could be expected from LEV II are likely somewhere in between the two figures cited by NJ DEP.

41. Alliance of Automobile Manufacturers, *Statement of the Alliance of Automobile Manufacturers Before the New Jersey Assembly Environment Committee Regarding A409/A2439*, 30 September 2002.

42. See note 8.

43. For example, the Web site of the New Jersey Business and Industry Association described the situation this way, "(D)ata presented by the NJ Office of Legislative Services (OLS), the NJ Institute of Technology and the US Environmental Protection Agency (EPA) indicate that California standards have not produced a significant environmental benefit." New Jersey Business and Industry Association, *Issues Affecting Your Business: Top Issues in New Jersey*, downloaded from www.njbia.org, 7 May 2003.

44. James F. Fitzgerald and Richard S. Magee, *New Jersey Institute of Technology, Adoption of the California Low Emission Vehicle: An Analysis of the Environmental Impact and Cost*, December 1993.

45. U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Ozone Transport Recommendation to Require California LEV Progra*m, 7 December 1994.

46. *Federal Register*, 60 FR 6027, 1 February 1995.

47. Peter Iwanowicz, American Lung Association of New York State, personal communication, 30 May 2003.

48. U.S. Environmental Protection Agency, *Regulatory Announcement: Final Rule for the National Low Emission Vehicle Program*, December 1997.

49. New Jersey Department of Environmental Protection, *Commissioner Shinn Endorses Emissions Reduction Plan*, 24 April 1998.

50. Carrie Anne Calvo-Hahn, New Jersey Office of Legislative Services, *Memorandum to Honorable Upendra Chivukula regarding Low Emission Vehicles*, 21 May 2001.

51. 13 CCR 1961(a)(14)(A)

52. Karl J. Simon, U.S. Environmental Protection Agency, Office of Air and Radiation, *Letter to Chuck Mueller, Texas Natural Resource Conservation Commission*, 16 December 1999.

53. Christine Todd Whitman, U.S. Environmental Protection Agency Administrator, *Letter to the Honorable Thomas H. Kean, Jr.*, 14 August 2002.

54. U.S. Environmental Protection Agency, *California State Motor Vehicle Pollution Control Standards; Waiver of Federal Preemption: Notice of Decision*, published in Federal Register, Vol.68, No.77, 22 April 2003, 19811-19813.

55. *Federal Register*, 67 FR 72576-72579.

56. See note 47.

57. The Clean Air Act's requirement that states give automakers two years of lead time only specifically applies to states adopting California standards. Section 177 of the Clean Air Act establishes no similar timeline for states wishing to adopt federal standards.

58. Scott Mackey, Martin, Bontempo, Matacera, Bartlett, Inc., *Letter to the Honorable Reed Gusciora*, 30 September 2002.

59. Sam Wolfe, NJ Department of Environmental Protection, Testimony Before the Assembly Environment and Solid Waste Committee, 3 March 2003.

60. New Jersey Office of Legislative Services, *Legislative Fiscal Estimate: Assembly Committee Substitute for Assembly, Nos. 3393 and 2439*, 2003.

61. Connecticut General Assembly, *Substitute for Raised S.B. 1006: Fiscal Note*, 2003 Legislative Session, downloaded from www.cga.st.ct.us, 8 May 2003.

62. Ward's Communications, *Ward's Automotive Yearbook 2002*, 244-245.

63. U.S. Environmental Protection Agency, *Light-Duty Automotive Technology and Fuel Economy Trends: 1975 Through 2001*, September 2001.

64. Fuel Cells 2000, *Fuel Cell Directory*, downloaded from www.fuelcells.org/fcdevel.htm, 13 May 2003.

65. Millennium Cell, *Company Overview*, downloaded from www.millenniumcell.com/news/overview.html, 13 May 2003.

66. Nancy Homeister, Ford Motor Company, Testimony Before the Assembly Environment and Solid Waste Committee, 3 March 2003.

67. U.S. Environmental Protection Agency, *Light-Duty Automotive Technology and Fuel Economy Trends: 1975 Through 2003*, April 2003. The federal law that established CAFE standards also established the means for testing of vehicles to determine compliance with the standards. It has long been recognized that these testing methods overstate the "real world" fuel economy of vehicles and EPA has begun to include adjusted figures in its reporting of fuel economy trends. The latest EPA report also includes estimated data for the 2003 model year. These data show a slight increase in the projected fuel economy of the entire fleet between 2002 and 2003.

68. Ibid.

69. Transportation Research Board, National Research Council, *Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards*, 2002, 66-67.

70. John DeCicco, Feng An, Marc Ross, American Council for an Energy-Efficient Economy, *Technical Options for Improving the Fuel Economy of U.S. Cars and Light Trucks by 2010-2015*, July 2001.

71. Based on California Environmental Protection Agency, Air Resources Board, *2003 Model Year Guide to Passenger Cars and 2003 Model Year Guide to Trucks, Vans and Sport Utility Vehicles*, downloaded from www.arb.ca.gov, 20 March 2003. Availability based on information from automakers' Web sites, surveyed in March 2003.

72. U.S. Department of Energy, Energy Information Administration, *Alternatives to Traditional Transportation Fuels 2000*, September 2002.

73. Jamie Butters and Jocelyn Parker, "Environmental Groups Frustrated by American Auto Industry," *Detroit Free Press*, 23 April 2003.

74. *EV World*, "Durango Hybrid SUV Cancelled," 31 May 2002.

75. *Detroit News*, "Ford Drops Fuel Goal," 18 April 2002.

76. See note 29.

77. General Motors, *GM "Displacement on Demand" Technology to Provide Fuel Economy Benefits in V8 Engines* (press release), 21 May 2001.

78. Danny Hakim, "Whether a Hummer or a Hybrid, the Big Complaint Is Fuel Use," *New York Times*, 7 May 2003.

79. U.S. Environmental Protection Agency, *EPA Staff Paper on Gasoline Sulfur Issues*, 1 May 1998.

80. Ibid.

81. See note 50.

82. United States Court of Appeals for the Second Circuit, *Motor Vehicle Manufacturers Association of the United States, Inc. et al vs. New York State Department of Environmental Conservation, et al.* Docket No. 94-9114.

83. See note 16.

84. California Environmental Protection Agency, Air Resources Board, *Proposed California Phase 3 Reformulated Gasoline Regulations: Staff Report: Initial Statement of Reasons*, 22 October 1999.

85. See note 50.

86. U.S. Department of Energy, National Renewable Energy Laboratory, *Tax Deduction: Hybrid Electric Vehicles* (fact sheet), January 2003.

87. A.F. Burke, K.S. Kurani, E.J. Kenney, *Study of the Secondary Benefits of the ZEV Mandate*, prepared for the California Air Resources Board, August 2000.

88. Toyota, *Toyota RAV4-EV Leads the Charge to the Future* (press release), 15 September 2001.

89. Honda, *From EV Plus to Fuel Cells*, downloaded from www.hondacorporate.com/environ_tech/index.html?subsection=evplus, 14 May 2003.

90. General Motors, *EV1 Lessons Learned*, downloaded from gm.com/company/gmability/adv_tech/300_hybrids/hyb_ev1.html, 15 May 2003.

91. California Environmental Protection Agency, Air Resources Board, *Staff Report: 2000 Zero-Emission Vehicle Biennial Review*, 7 August 2000, 75-78.

92. *Hartford Courant*, "Auto Notes," 18 January 2003.

93. Toyota, *RAV4-EV Frequently Asked Questions*, downloaded from www.toyota.com/html/shop/vehicles/ravev/rav4ev_0_home/, 21 February 2003.

94. Katherine Mieszkowski, "Steal this Car!," *Salon.com*, 4 September 2002.

95. See note 5, 321.

96. *Implementation Issues Due to the California LEV II Program*, submitted as testimony by Robert Babik, General Motors, to the New Jersey Assembly Environment and Solid Waste Committee, 30 September 2002.

97. See note 5, 274.

98. Dealership sales figures from National Auto Dealers Association, *NADA Data: Total Dealership Sales Dollars*, downloaded from www.nada.com, 14 May 2003.

99. Asthma and Allergy Foundation of America, *The Costs of Asthma in the United States*, downloaded from www.aafa.org/states/index.cfm, 15 May 2003.

100. American Cancer Society, *Costs of Cancer,* downloaded from www.cancer.org/docroot/MIT/content/MIT_3_2X_Costs_of_Cancer.asp, 15 May 2003.

101. U.S. Environmental Protection Agency, *Saving New Jersey's Vanishing Shores*, July 1999.

102. New Jersey Department of Environmental Protection, *New Jersey Sustainability Greenhouse Gas Action Plan, Fact Sheet #5: Sea Level Rise*, December 1999.

103. Estimates from Northeast States for Coordinated Air Use Management, *Emissions Benefits of Adopting the LEV II Program in the*

Northeast (draft report), May 2003; MASSPIRG Education Fund, *Cars and Global Warming*, April 2003.

104. U.S. Energy Information Administration, *Long Term World Oil Supply (A Resource Base/ Production Path Analysis)*, downloaded from www.eia.doe.gov/pub/oil_gas/petroleum/ presentations/2000/long_term_supply/ tsld001.htm, 20 March 2003.