Global Warming Pollution in New Jersey:

Key Steps to Reduce Emissions from Electricity Generation and Transportation

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Executive Summary

Global warming poses a serious threat to the environment, public health and overall welfare of New Jersey and the rest of the world. In New Jersey, the major sources of carbon dioxide (the leading cause of global warming) are transportation and electric power generation. The state will have to address growing emissions in both of these areas in order to reduce its contribution to global warming.

The transportation sector is responsible for over half of New Jersey's carbon dioxide emissions, and emissions are growing. Transportation in New Jersey produced 62.7 million metric tons of carbon dioxide in 2001 – 54 percent of the state's total.

Unfortunately, consumption of both gasoline and diesel fuel continues to rise. Gasoline consumption in 2004 was 9.2 percent above 2001 levels, and diesel consumption has risen 16.1 percent. Steady growth in vehicle travel and stagnating vehicle fuel economy combine to impede progress in reducing transportation emissions.

Electricity generation is the source of one-sixth of in-state emissions, but its current and potential future impact on global warming is far greater. In 2001, the electric power sector was responsible for 18.9 million metric tons of carbon dioxide in New Jersey – 16 percent of the state's carbon dioxide emissions. These emissions came from the natural gas and coal-fired power plants that serve about 40 percent of the state's electricity demand. However, about 20 percent of the state's electricity is imported from neighboring states, so New Jersey's electricity use actually contributes more carbon dioxide than this figure suggests.

New Jersey also receives about 40 percent of its electricity from four nuclear power plants, which pose significant risks for public health and safety that are increasing as the plants grow older. For example, Oyster Creek, the oldest nuclear power plant in the country, is scheduled to retire in 2009 when its 40-year license expires. Because of the risks of catastrophic accidents and the unsolved problem of nuclear waste, nuclear power should remain off the

table as a solution to global warming pollution. If demand continues to grow, which it has done for the last decade, replacing nuclear power would mean huge increases in emissions if it is done with fossil power.

Real solutions exist for New Jersey to build on the progress the state has already made in curbing global warming emissions. In order to tackle emissions in the transportation sector, the state must implement California's forthcoming standards for tailpipe global warming emissions. In the long-term, the state will also need to develop a coherent strategy to reduce vehicle-miles traveled.

In the electric power sector, New Jersey needs to build on the success of its renewable energy standard and Clean Energy Program, which provides incentives for using renewables and energy-efficient equipment. The state must:

- **Ensure that the Regional Greenhouse Gas Initiative produces real emissions reductions.** New Jersey is working with eight other northeastern states to design a regional cap-and-trade program covering global warming emissions from power plants. The state should ensure that the resulting cap requires reductions of at least 10 percent below current levels by 2010, and 25 percent below current levels by 2020.

- **Complement the carbon cap by increasing energy efficiency and clean energy.** The Board of Public Utilities is currently considering a proposal to increase the amount of electricity sold in the state that must come from clean, renewable sources. Increasing the standard to 20 percent by 2020, from the current level of 4 percent by 2008, will accelerate the state's shift away from dirty and dangerous electricity sources and reduce global warming emissions.

Introduction

Global warming poses a serious threat to the future of New Jersey. By burning fossil fuels, our energy consumption is causing global temperatures to increase. Further warming of the planet is inevitable unless society significantly reduces emissions of gases that trap heat in the earth's atmosphere.

Since the late 19th century, global surface temperatures have increased by 0.7-1.4 °F.[1] Should global warming pollution continue unabated, global temperatures could rise by an additional 2.5-10.4 °F over the period 1990 to 2100.[2] Other projections suggest that temperatures in New Jersey could increase by 2-8 °F by 2100.[3]

Dramatic change in the climate, as predicted by scientists, could trigger severe, adverse effects for New Jersey's public health, agriculture, economy, and even real estate. The U.S. Environmental Protection Agency describes the following possible impacts on New Jersey:[4]

- Warming of 2-3 °F could cause a fivefold increase in heat-related deaths during a typical summer.
- Warming could expand the habitat and populations of disease-carrying insects, like mosquitoes and ticks.
- Increased evaporation resulting from warmer temperatures could decrease waterflow in streams and rivers, from which New Jersey gets half of its potable water.
- Changing climate could threaten coastal wetlands and the forested Pine Barrens, ecosystems that provide critical habitat for rare and unusual species.
- Projections of the impact on New Jersey's agricultural yield are mixed, though they indicate lowered total acres of farmland and production.
- Rising sea level could damage New Jersey's beaches and valuable coastal real estate.

Around the world, global warming will change ecosystems, increase droughts and flooding, allow diseases to spread to new places, disrupt food production, and

potentially undermine political stability by disrupting the livelihoods of millions of people.

Global warming is a worldwide problem that must be addressed by reducing emissions of carbon dioxide and other global warming gases. Delaying action will make it all the harder to stop. Globally, more than 100 nations have entered into an agreement to reduce their greenhouse gas emissions. Because global warming will have tremendous worldwide impacts, major insurance companies, such as Swiss Re, see warming as a threat to their financial future and now urge nations and companies to reduce their global warming emissions.

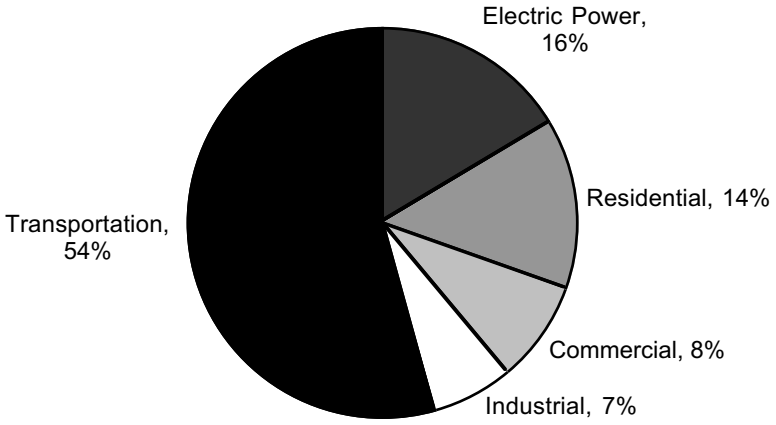
In the United States—the world's leading source of carbon dioxide emissions—the failure of the Bush administration and Congress to implement a national plan to reduce emissions increases the importance of regional and state-level initiatives. The good news is that former Governor McGreevey's decision to classify carbon dioxide as an air pollutant created an opportunity for New Jersey to forge ahead in reducing its contribution to global warming.

New Jersey's Contributions to Global Warming

Carbon dioxide emitted from fossil fuel use is the leading cause of global warming. In 2001, the most recent year for which comprehensive emissions data are available, fossil fuel use in New Jersey resulted in the release of 115.2 million metric tons of carbon dioxide ($MMTCO_2E$, see note on units below). New Jersey's carbon dioxide emissions are significant on a global scale, greater than the combined global warming impact of Peru, Ecuador and Chile and equal to 0.5 percent of total global emissions.[5] In fact, New Jersey's portion of the world's carbon dioxide emissions is about four times its portion of the world's population.[6]

The major sources of emissions in New Jersey are transportation and electricity generation, and New Jersey will need to tackle these two sectors in order to reduce its effect on global warming. (See Figure 1.) Together, they were responsible for approximately 70 percent of the state's carbon dioxide emissions in 2001.

Figure 1. The Transportation and Electric Power Sectors Are Responsible for 70 Percent of New Jersey's In-State Emissions



The transportation sector is responsible for over half of the state's emissions, and gasoline consumption alone is responsible for nearly 30 percent. Unfortunately, fuel consumption continues to grow. If left unchecked, emissions increases in this sector could overwhelm emissions reductions made in other sectors.

The impact of electric power is bigger than in-state emissions suggest, and could increase even further as nuclear power plants are retired. A significant portion of New Jersey's electricity demand is not currently met with in-state electricity generation, and must be imported from neighboring states. Because of the regional nature of the electricity market, several northeastern states are working together to establish a regional carbon dioxide cap-and-trade program for power plants, known as the Regional Greenhouse Gas Initiative.

The residential, commercial and industrial sectors in New Jersey also make significant contributions to global warming pollution. Emissions from each of these sectors come primarily from natural gas use. In the residential sector, which contributes 14 percent of New Jersey's in-state carbon dioxide, natural gas use is responsible for 10 percent of total in-state emissions, and heating oil is responsible for 3.5 percent. Commercial and industrial natural gas use is responsible for 6.5 percent and 4.1 percent of in-state emissions, respectively.

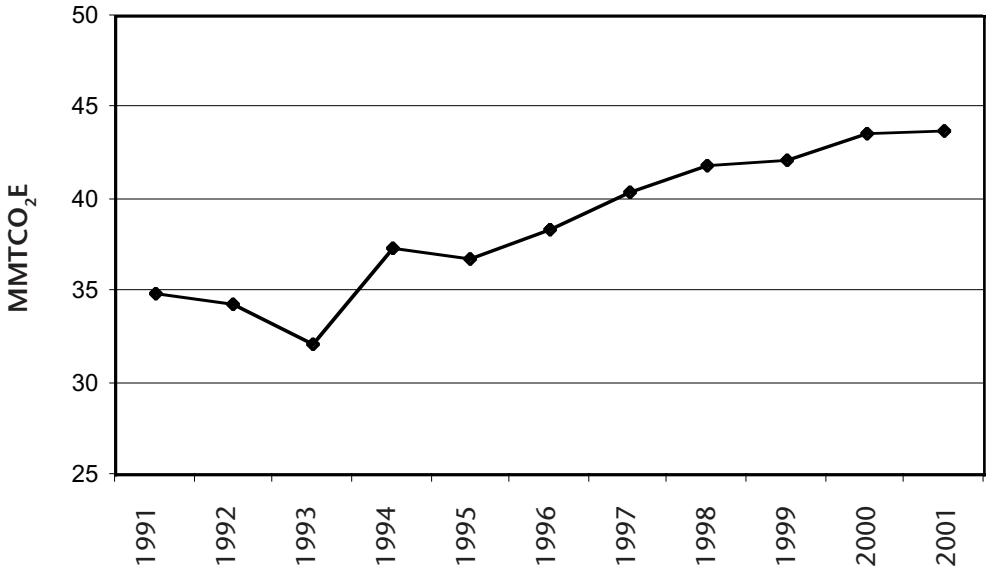
Transportation Emissions

Any plan to reduce New Jersey's overall emissions must address fuel consumption in the transportation sector. The transportation sector emitted 62.7 $MMTCO_2E$ of carbon dioxide in 2001 – 54.4 percent of New Jersey's total in-state emissions.

Motor vehicle fuels were responsible for the bulk of these emissions. Transportation gasoline and diesel together accounted for 38 percent of the state's total emissions in 2001, and emissions resulting from consumption of these fuels were 25 percent higher than in 1991. (See Figure 2.)

Average daily consumption of both of these fuels has continued to rise since 2001,

Figure 2. Transportation Gasoline and Diesel Emissions Rose 25 Percent from 1991 to 2001



Note on Units

There are several ways to communicate quantities of global warming emissions. In this report, we communicate emissions in terms of "carbon dioxide equivalent" – in other words, the amount of carbon dioxide that would be required to create a similar global warming effect. This makes it possible to compare different quantities of various global warming gases – such as carbon dioxide, methane, soot, etc. – based on their impact on the climate. Specifically, we use million metric tons of carbon dioxide equivalent ($MMTCO_2E$). Other studies frequently communicate emissions in terms of "carbon equivalent." To translate from carbon dioxide equivalent to carbon equivalent, one can simply multiply by 0.273.

indicating that emissions have continued to increase from the 2001 level. In 2004, gasoline consumption was 9.2 percent higher than in 2001.[7] Diesel consumption during these 12 months was 16.1 percent higher than in 2001.[8] The degree of this increase in diesel consumption is likely due to a temporary spike: consumption in fall 2003 and winter 2004 rose drastically. In the long term though, consumption levels for both fuels are on the rise. (See Figures 3 and 4.)

The increase in transportation fuel use is largely due to the increase in vehicle-miles traveled (VMT), coupled with continued stagnation in vehicle fuel economy. More miles are being driven each year – and not just because of population growth. Total highway VMT in New Jersey increased by 8.2 percent from 1998 to 2003, and VMT per capita rose 3.8 percent.[9] If unchecked, this trend could outweigh the benefits of per-mile emissions reductions

Figure 3. Gasoline Consumption Has Generally Risen Since 2001

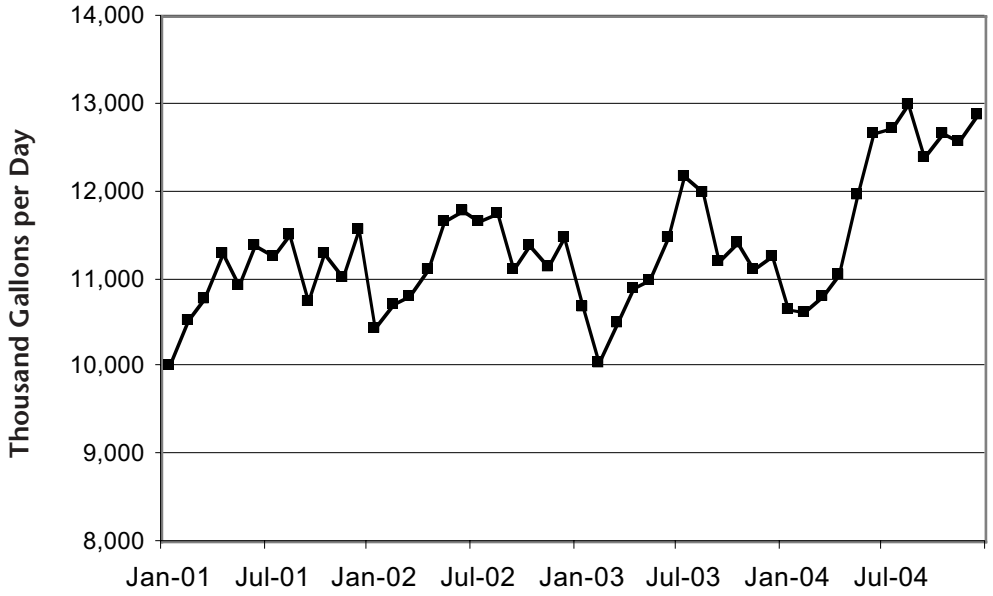


Figure 4. Diesel Consumption Has Generally Risen Since 2001

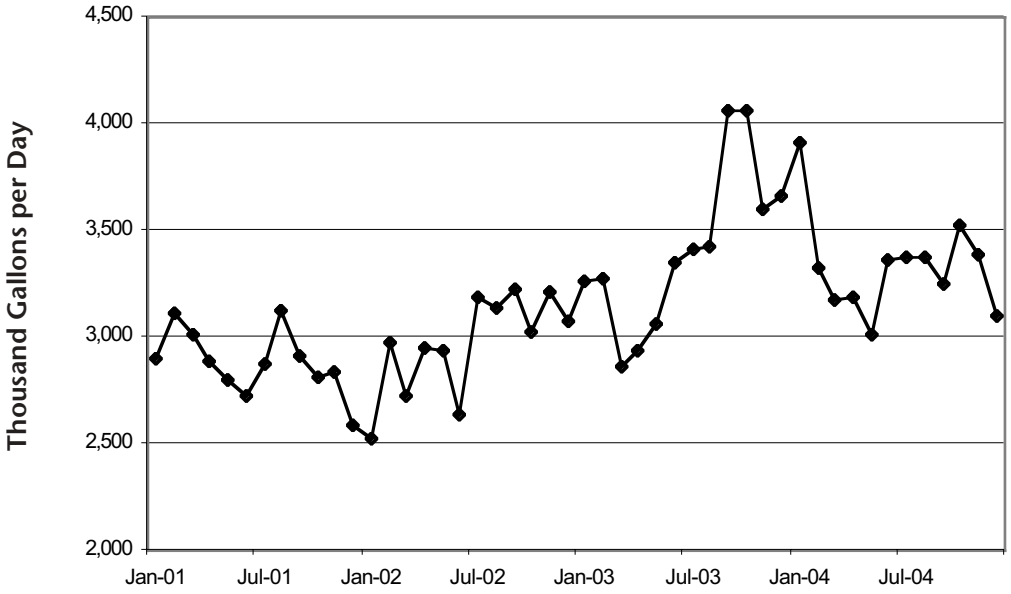
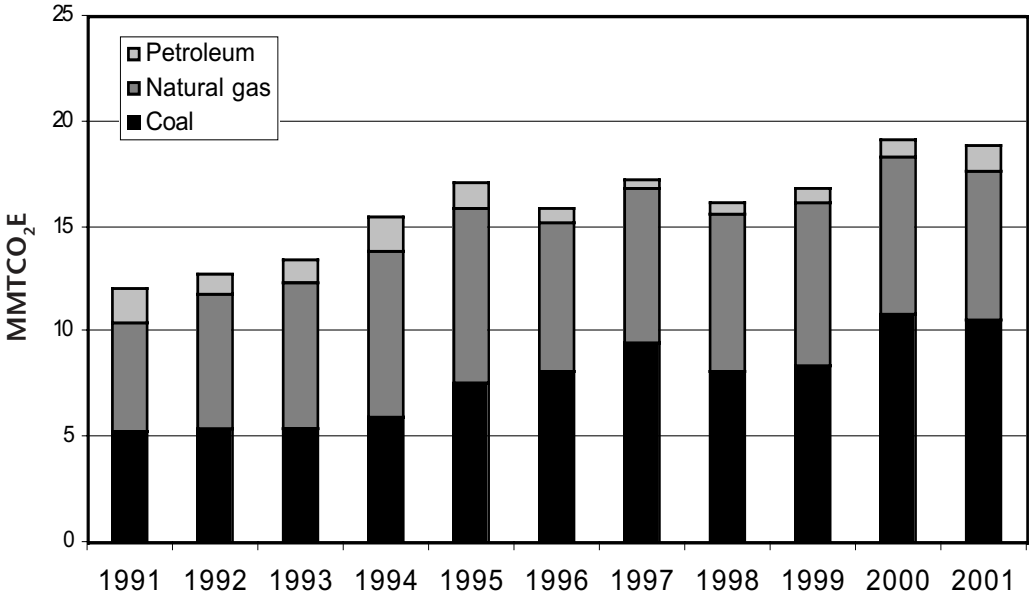


Figure 5. In-State Electric Power Emissions Rose from 1991 to 2001



resulting from cleaner cars, as well as emissions reductions made in other sectors.

Electric Power Emissions

Electric power generators in New Jersey emitted 18.9 $MMTCO_2E$ of carbon dioxide in 2001, accounting for 16 percent of total in-state emissions. This is the result of meeting increasing electricity demand with dirty forms of generation. (See Figure 5.) Therefore, reducing the electric power sector's impact on global warming can take the route of reducing emissions from current power plants, reducing demand, or shifting to cleaner electricity sources. A comprehensive and economical solution will require all three.

A majority of the state's emissions come from a small handful of coal and natural gas facilities.[10] (See Table 1.) However, this does not tell the full story of the impact that electricity use in New Jersey has on global warming and the environment. In fact, less than half of New Jersey's electricity is generated in-state from fossil fuels.

In 2002, total in-state generation was large enough to meet only 82.7 percent of demand; over the last decade, in-state generation has ranged from 56.4 percent of demand (in 1996) to 83.0 percent of demand (in 2000).[11] The rest has been imported from outside the state, mostly from a similarly dirty generation mix that relies primarily on nuclear power, natural gas, and coal.[12] (See Figure 6.)

Nuclear power, although it produces far less carbon dioxide than fossil fuel generation, should remain "off the table" as a solution to global warming pollution. The environmental and public health risks inherent in nuclear power are too great for it to be considered an acceptable alternative to fossil fuel generation. The state should advocate for, and begin to plan for, the orderly retirement of New Jersey's nuclear reactors. (See box, p. 15.)

Nationwide, there has been a trend toward natural gas generation, but it is not a safe bet for future generation, even though it is much less carbon-intensive than petroleum or coal. Although natural gas was relatively cheap throughout the 1990s, prices have fluctuated wildly in recent years.[15] (See Figure 7.) The price is likely to keep rising and could experience even greater fluctuations if, as the U.S. Energy

Table 1. Top 10 CO_2 Emitting Power Plants in New Jersey, 2003[13]

Facility Name	Emissions ($MMTCO_2E$)	Primary Fuel
Hudson Generating Station	2.87	Coal
Mercer Generating Station	2.38	Coal
B L England	1.53	Coal
Bergen	1.48	Natural Gas
Deepwater	1.29	Coal
Linden Cogeneration Facility	0.62	Natural Gas
AES Red Oak	0.31	Natural Gas
Sewaren Generating Station	0.24	Natural Gas
Bayonne Plant Holding, LLC	0.21	Natural Gas
Gilbert Generating Station	0.18	Natural Gas/Oil
TOTAL	**11.10**	

Information Administration projects, natural gas demand rises by another 54 percent from 2001 to 2025.[16]

On the demand side, electricity consumption has steadily risen in New Jersey: from 1993 to 2003, demand increased by 15 percent.[18] (See Figure 8.) This has been driven especially by increases in the residential and commercial sectors as New Jersey's population continues to grow. Solutions like the recently passed energy efficiency standards help address this growing demand, but much more can be done.

Ultimately, New Jersey must plan for and encourage a long-term shift to zero-carbon renewable energy, like wind and solar power. Future uncertainty in natural gas supplies and the retirement of New Jersey's nuclear plants will make it imperative that the state develop its renewable resources, as well as reduce – or at least slow the growth in – electricity demand.

Figure 6. The Electricity Generated In-State Comes from Dirty Sources[14]

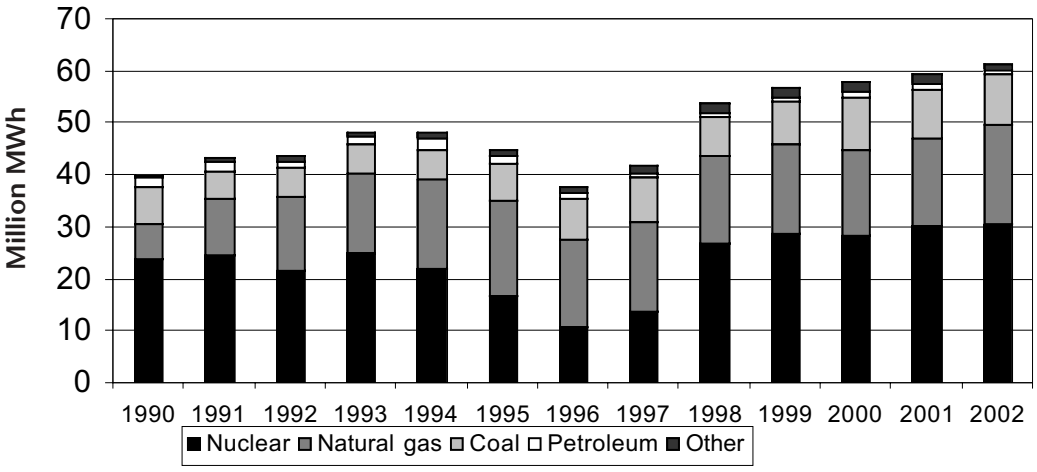


Figure 7. Average Annual Wellhead Price of Natural Gas Has Risen Dramatically in Recent Years[17]

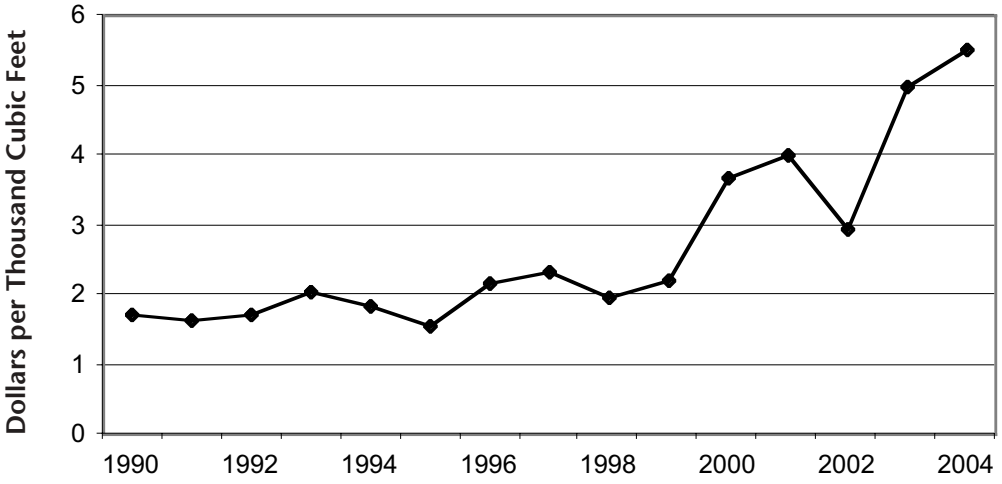
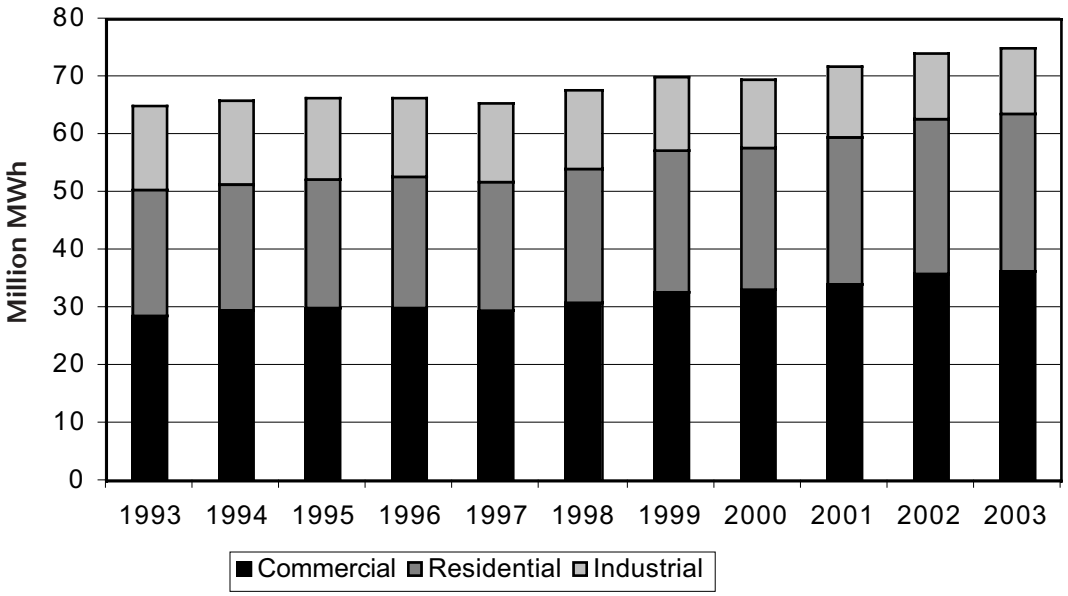


Figure 8. Electricity Demand Rose by 15 Percent from 1993 to 2003[19]



The Dangers of Nuclear Power

Oyster Creek, the oldest nuclear plant in the country, is located in the fastest growing region in New Jersey. Ignoring public health and safety, as well as public opinion, Exelon Corporation is applying to the Nuclear Regulatory Commission for a 20-year extension on Oyster Creek's original 40-year license, which expires in 2009. For environmental and public health reasons, neither the relicensing of existing nuclear reactors nor the construction of new nuclear facilities should be considered as a means to reduce global warming emissions.

The risk of accidents is greatly increased as plants get older, and the possibility of a terror attack makes these risks even more unacceptable. In 2001, the Union of Concerned Scientists identified eight instances in just the previous 17 months in which nuclear reactors were forced to shut down due to age-related equipment failures.[20] Also, a 2003 report by the Government Accountability Office found significant weaknesses in the Nuclear Regulatory Commission's oversight of security at commercial nuclear reactors.[21]

Furthermore, nuclear power production results in the creation of tons of spent fuel, which must be held safely for tens of thousands of years without contaminating the environment or the public. Nearly all U.S. nuclear reactors store waste on site in water-filled pools at densities approaching those in reactor cores. The cost of the disaster that would occur should coolant from the spent-fuel pools be lost has been estimated at as much as 54,000-143,000 extra deaths from cancer and evacuation costs of more than $100 billion.[22] Centralized waste repositories, on the other hand, would require the transport of high-level nuclear waste across highways and rail lines within proximity of populated areas.

State and Regional Opportunities to Reduce Global Warming Emissions

In September 2004, then-Governor McGreevey announced that the state of New Jersey would define carbon dioxide as an air pollutant, formally recognizing the harmful impacts of global warming pollution.[23] This added carbon dioxide to the list of air pollutants that the Department of Environmental Protection is able to regulate, and opened the door for policies to tackle pollution from all sectors across the state.

State officials must turn primarily to the transportation and electric power sectors in these efforts. The transportation sector is responsible for over half of the state's carbon dioxide emissions, and so presents a necessary hurdle for reducing the state's contribution to global warming. New Jersey also has huge opportunities right now to implement policies to reduce emissions from the electric sector, the second largest source of emissions, which will put our state on a cleaner, less polluting energy path.

Transportation

New Jersey has already taken steps that will help put cleaner cars on the road, but also needs to tackle the growth of vehicle-miles traveled.

In January 2004, the New Jersey Legislature passed the Clean Cars Act, requiring the sale of advanced technology vehicles such as hybrids starting in 2009. The law will bring cleaner vehicles to New Jersey – reducing soot, smog and other toxic pollutants while also reducing global warming emissions from cars – once the Department of Environmental Protection finalizes regulations for implementing it. The state should include California's forthcoming global warming tailpipe standards in the clean cars program. California's Air Resources Board estimates that these standards could cost-effectively reduce average global warming pollution by 34 percent from new cars and by 25 percent from new light-trucks by 2016.[24]

However, emissions reductions resulting from cleaner cars could be swamped if the state does not slow the growth of vehicle-miles traveled. Public policy needs to provide transportation options other than driving and incentives to choose those options. This means increased access to mass transit and the design of communities that let people live near shops and jobs.

Electric Power Sector

So far, New Jersey has taken many short-term steps to increase energy efficiency and clean, renewable energy. Now is the time to implement a long-term plan to reduce carbon dioxide emissions from power plants and shift to cleaner, more efficient energy use. New Jersey has a political opportunity this year to reduce our carbon dioxide emissions from the electric power sector as momentum grows for regional and in-state solutions.

Regional Greenhouse Gas Initiative

The first step in a serious effort to reduce New Jersey's power plant pollution is to set a limit on the amount of carbon dioxide that power plants are allowed to emit. New Jersey is taking part in the Regional Greenhouse Gas Initiative (RGGI), a process to design a multi-state cap-and-trade program covering global warming emissions from power plants. The model rule is scheduled to be designed this year, at which point the nine northeastern states involved would have to ratify it before it would take effect.

The RGGI process is important for two reasons. First, it can be used to drive significant reductions in emissions from power plants in the region. Second, RGGI can provide valuable lessons and could ultimately be expanded to include additional sectors of the economy or even additional states.

The most important decisions RGGI participants will make are over the level of the carbon cap and the integrity of the program. The power-sector carbon cap adopted under RGGI should require emission reductions of at least 10 percent below current levels by 2010 and 25 percent below current levels by 2020. Such goals are clearly achievable with a sound clean energy strategy that includes efforts to promote energy efficiency and the use of renewable sources of energy.

To be effective, however, the carbon cap-and-trade must also have integrity. RGGI participants should, at least in the early stages of the program, resist efforts to allow "offsets" (in which emission reductions outside the region or in other economic sectors are allowed to substitute for in-region power sector reductions) to count toward compliance with the carbon cap.[25]

In the event that the RGGI model rule does not produce significant reductions in emissions, New Jersey also has the option of enacting caps on carbon dioxide emissions from in-state generation.

Complements to RGGI: Renewable Energy and Energy Efficiency

A limit on carbon dioxide from power plants is cost effective and easier to reach when complemented with policies that promote energy efficiency and clean, renewable energy development. In fact, a study by Synapse Energy Economics found that a nationwide program to aggressively pursue energy efficiency and clean energy would save $35.8 billion a year by 2025, while resulting in 47 percent less annual carbon dioxide than a business-as-usual approach.[26]

Energy efficiency is the cheapest way to reduce global warming pollution from power plants, because it reduces the need to generate and deliver electricity in the first place. In January 2005, the New Jersey Legislature passed a law to set new minimum energy efficiency standards for eight common appliances sold in the state, but we have barely begun to tap our potential for energy efficiency.

New Jersey should continue to adopt minimum energy efficiency standards for new appliances, and update its building codes so that new buildings in the state are achieving maximum levels of efficiency. This will reduce carbon dioxide pollution by reducing electricity demand, and will also cut emissions from the residential and

commercial sectors by reducing energy lost in heating and cooling homes and businesses.

Energy efficiency must be accompanied by increased clean energy development. Currently, New Jersey receives less than 1 percent of its energy from clean, renewable sources, though that percentage will increase to 4 percent by 2008 due to a provision adopted when the state deregulated its electric power industry in 1999. The state should keep moving in this direction by requiring that a larger percentage of the state's electricity come from wind, solar and other renewables. Recently, the Center for Energy, Economic, and Environmental Policy at Rutgers University showed that requiring clean energy to make up 20 percent of New Jersey's energy mix would have benefits including reducing global warming pollution, decreasing other air and water pollution from power plants, and creating jobs in the state; any detrimental impact on economic growth would be negligible.[27]

In 2003, the Governor's Renewable Energy Task Force recognized the long-term benefits of clean energy requirements, and recommended that the BPU adopt a 20 percent clean energy requirement by 2020. The BPU should adopt a 20 percent by 2020 policy without delay, a requirement that will help to lock in carbon dioxide pollution reductions for years to come.

Methodology

This report relies primarily on information supplied by the U.S. Energy Information Administration (EIA). This analysis also focused exclusively on carbon dioxide emissions from energy use, and does not include emissions of other global warming gases.

Based on data on energy consumption obtained from the EIA at www.eia.doe.gov/emeu/states/sep_fuel/notes/_fuelnotes_multistate.html, we are able to calculate comprehensive carbon dioxide emissions through 2001. The comma-delimited files provide consumption data by fuel category for all years 1960 through 2001. The data is broken down by state, economic sector, and specific fuel.

To calculate carbon dioxide emissions, energy use for each fuel in each sector (in BTU) was multiplied by carbon coefficients used in EIA, *Emissions of Greenhouse Gases in the United States 2002*. Several additional assumptions were made:

- Carbon dioxide emissions due to electricity imported into New Jersey were not included in emission estimates.
- Combustion of wood was excluded from the analysis, per EIA, *Documentation for Emissions of Greenhouse Gases in the United States 2002*, 241. The exclusion is justified by EIA on the basis that wood and other biofuels obtain carbon through atmospheric uptake and that their combustion does not cause a net increase or decrease in the overall carbon "budget."
- Electricity generated from nuclear and hydroelectric sources was assumed to have a carbon coefficient of zero.
- Carbon emissions from the non-combustion use of fossil fuels in the industrial and transportation sectors were derived from estimates of the non-fuel portion of fossil energy use and the carbon storage factors for non-fuel use presented in U.S. EPA, *Comparison of EPA State Inventory Summaries and State-Authored Inventories*, downloaded from yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/JSIN5DTQKG/$File/pdfBcomparison1.pdf, 31 July 2003. To preserve the simplicity of analysis and to attain consistency with future-year estimates, industrial consumption of asphalt and road oil, kerosene, lubricants and other

petroleum, and transportation consumption of aviation gasoline and lubricants were classified as "other petroleum" and assigned a carbon coefficient of 20 MMTCE per quad BTU for that portion that is consumed as fuel.

In recent years, EIA has revised its methods for estimating energy consumption to reflect changes in the structure of the electric industry and to improve overall data quality. EIA's revised estimates for state-level energy consumption were first issued in the 2001 version of the State Energy Data reports. Where applicable, this report uses these revised figures.

The percentages of various energy uses' contributions to 2001 emissions are based on calculations made from EIA data.

In order to see how transportation emissions have changed since 2001, we look at more recent fuel consumption data from EIA, *Transportation Fuels: Prime Supplier Sales in New Jersey*, downloaded from www.eia.doe.gov/emeu/states/oilsales_trans/oilsales_trans_nj.html, 28 March 2005.

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26. Bruce Biewald, et al, Synapse Energy Economics, *A Responsible Electricity Future: An Efficient, Cleaner and Balanced Scenario for the US Electricity System*, 11 June 2004.

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