MORE HEAT THAN LIGHT

Global Warming Pollution From The Northeast's Dirtiest Power Producers

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Executive Summary

Nine Northeast states from Delaware to Maine are currently working to develop a regional cap-and-trade system to limit global warming pollution from power plants. The program, known as the Regional Greenhouse Gas Initiative (RGGI), represents one of the first significant efforts to address global warming in the U.S.

Most global warming pollution from electricity generation in the Northeast comes from a handful of power plants, owned by a small number of companies. Cleaning up these plants would significantly reduce the Northeast's contribution to global warming.

A handful of power plants produce most of the global warming pollution from electricity generation in the Northeast.

- Out of 188 facilities that generate electricity in the Northeast, the top 10 plants produced one-third of all carbon dioxide pollution in the year 2004. (See Table ES-1.)
- These 10 plants emitted nearly twice as much carbon dioxide per unit of power generated (1,570 lbs/MWh) as the regional average (850 lbs/MWh).
- Over 80 percent of all emissions from electricity generation came from just 50 plants, which produced only 45 percent of the region's electricity. (See Figure ES-1.)

A small number of companies own the most polluting power plants.

- The top 10 companies were responsible for more than 60 percent of all global warming pollution from Northeast power plants in 2004 (out of 72 total companies owning power plants). Each produced more than 3.5 million metric tons of carbon dioxide.
- Many of these companies operated carbon-inefficient power plant fleets, generating large amounts of carbon dioxide per unit of energy by using inefficient technology and dirty fuels. Among the top 10 companies, NRG Energy ranked as the most carbon-intensive electricity generator, producing nearly a ton of carbon dioxide per megawatt-hour. (See Table ES-2.) NRG plants emitted 9 percent of electric-sector carbon dioxide pollution in the Northeast while generating only 4 percent of the region's electricity.
- The most polluting companies depend heavily on coal and oil for fuel. Over 50 percent of the global warming pollution from the top 10

Table ES-1: The Top 10 Carbon Dioxide-Emitting Power Plants

Plant Name	State	Owner	Carbon Dioxide Emissions (Million Metric Tons)	Carbon Dioxide Emissions (Percent of Total Northeast Electric Sector Emissions)	Pounds of CO_2 / MWh
Brayton Point	MA	Dominion*	5.7	4.8%	1,757
Northport	NY	KeySpan Energy	5.2	4.5%	1,727
Canal	MA	Mirant	4.2	3.5%	1,680
AES Somerset	NY	AES Corporation	4.1	3.5%	1,608
Mystic	MA	Exelon† (Boston Generating LLC)	3.9	3.3%	950
Ravenswood	NY	KeySpan Energy	3.7	3.2%	1,711
Dunkirk	NY	NRG Energy	3.2	2.8%	1,988
Roseton	NY	Dynegy Northeast	3.0	2.6%	1,774
C.R. Huntley	NY	NRG Energy	3.0	2.5%	2,100
Linden Cogen Plant	NJ	Newmarket Energy / MMC Energy (Cogen Technologies)	2.8	2.4%	1,180

*In 2005, Dominion purchased Brayton Point from USGen New England.
†During the year 2004, Exelon transferred ownership of Boston Generating to a group of investors.

companies came from coal and 30 percent came from residual fuel oil.

The worst carbon dioxide emitters are also the largest sources of soot and smog pollution.

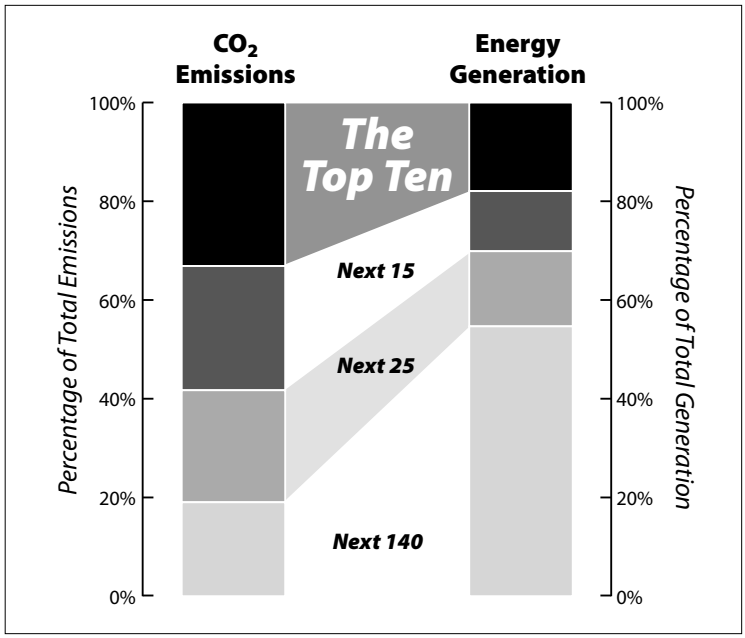
- In 2004, the top 50 plants (accounting for 80 percent of power-sector global warming pollution) also emitted:
  - o 90 percent of the region's power-sector emissions of sulfur dioxide, which causes acid rain and soot pollution; and
  - o 81 percent of the region's power-sector emissions of nitrogen oxides, which contribute to smog.
- Reducing carbon dioxide pollution from these plants will make it easier for generators to meet increasingly stringent soot and smog pollution limits, yielding public health benefits.

An effective power-sector carbon cap must aim to clean up the largest sources of global warming pollution.

In order to be most effective, the carbon dioxide cap that emerges from the RGGI process should create incentives to clean up the dirtiest power plants identified here. Actions at relatively few plants will make a big impact and enable the region to achieve a meaningful and effective near-term target for reducing carbon dioxide pollution. The following principles should apply to the RGGI model rule:

- The cap should reduce global warming pollution to 25 percent below current levels by 2020, growing tighter over time.
- Reductions must be achieved first and foremost from a mandatory cap on carbon dioxide emitted from fossil-fueled power plants. Emission reductions from outside the regional electricity sector should not be used to achieve compliance with the initial cap.
- The rules should not create a financial windfall for owners of dirty power plants. States should not give emission allowances (that is, permits that allow a facility to emit carbon dioxide) to electricity generators for free. Allowances should be allocated for the benefit of consumers and the public, by providing funding for energy efficiency, renewable energy and consumer rebates.

Figure ES-1: Carbon Dioxide Emissions of the Most Polluting Power Plants Compared to Regional Electricity Generation (Percentage of Total)



A strong, well-designed regional carbon cap could provide further momentum in the region's efforts to achieve a cleaner, more reliable electric system by making greater use of renewable energy and energy efficiency. A 2004 study by Synapse Energy Economics found that such an approach—if adopted nationally—would reduce carbon dioxide pollution significantly while generating $36 billion annually in savings by 2025.

Table ES-2: The Top 10 Polluting Companies in 2004 (Companies Producing More Than 3.5 Million Metric Tons of CO_2, Ranked by Worst Carbon Efficiency)

Company	Carbon Efficiency (lbs CO_2/MWh)	CO2 Emissions (Million Metric Tons)	CO_2 Emissions (Percent of Regional Electric-Sector Total)
NRG Energy	1,948	11	9.4%
Dynegy Northeast	1,760	4.8	4.1%
Mirant Corporation	1,734	6.8	5.8%
KeySpan Energy	1,697	13	10.1%
Dominion*	1,689	8.0	6.8%
Public Service Co. of NH	1,667	3.9	3.3%
Pepco Holdings	1,590	3.8	3.3%
PSEG Fossil	1,566	10	8.8%
AES Corporation	1,430	9.4	8.1%
Exelon Holdings† (Including Boston Generating LLC)	942	4.6	3.9%

*In 2005, Dominion purchased Brayton Point, Salem Harbor, and Manchester Street Station from USGen New England.
†During the year 2004, Exelon transferred ownership of Boston Generating to a group of investors.

Introduction

The Brayton Point power plant towers over Mt. Hope Bay in Somerset, turning coal and oil into electricity. For more than four decades, Brayton Point's smokestacks have belched out a toxic mixture of air pollution, contributing to New England's frequently unhealthy air quality.

Public health advocates have been campaigning for years to get the plant cleaned up. Exempt from Clean Air Act requirements faced by plants built after 1977, Brayton Point was until recently allowed to emit five times the level of pollution allowed for newer facilities.[1] The economic advantage afforded by this loophole in the law was too great for the plant owners to resist.[2] Instead, public health paid the price: researchers at Harvard estimated that the plant caused 100 premature deaths annually, tripling mortality risk for people living with 30 miles of the plant.[3]

Brayton Point

However, Brayton Point's impact is not limited to health-damaging pollution. The plant also emits vast quantities of carbon dioxide pollution, the leading cause of global warming.

Global warming threatens to significantly increase the average temperature in the Northeast and around the world, causing dramatic changes in our economy and quality of life. In the next century, the impacts of global warming in the Northeast could include coastal flooding, shifts in populations of fish and plants, loss of hardwood trees responsible for fall foliage displays, longer and more severe smog seasons, increased spread of exotic pests, more severe storms, increased precipitation and intermittent drought.

A handful of dirty and inefficient giants across the Northeast—like the Brayton Point plant—release millions of tons of invisible global warming pollution into the atmosphere each year.

With leadership from Washington D.C. almost entirely absent, the governors of nine Northeast states (Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont) have initiated a process that offers a good chance to reduce the region's impact on global warming by cleaning up old power plants. The process, known as the Regional Greenhouse Gas Initiative (RGGI), would cap regional carbon dioxide pollution from electricity generation and set up a trading mechanism to achieve the required emissions reductions in an economically efficient way. (See "Cap and Trade, A Primer" on page 4.)

Negotiators originally set a goal of agreeing on a model rule by April 2005.[4] However, that date has passed, and negotiators have not yet set specific numerical goals for the reduction of carbon dioxide pollution.[5]

The RGGI framework offers an opportunity to set a meaningful and effective near-term target for reducing carbon dioxide pollution from electricity generation, creating momentum toward the deeper cuts that will be necessary in the long term.

Power companies have a variety of choices to deliver energy. Energy efficiency opportunities are enormous and economically effective; renewable energy sources also hold promise to reduce global warming and health-damaging pollution. A well-designed carbon cap will steer power companies toward these options, without creating huge financial windfalls for the largest polluters.

Cap-and-Trade: A Primer

Traditionally, environmental goals have been achieved through direct performance requirements. Regulators established limits on emissions or required facilities to adopt certain technologies to reduce pollution. These rules were then enforced through civil or in some cases criminal penalties.

Beginning in the 1970s, economists and government officials began to experiment with market-based approaches to environmental protection. These market-based approaches made the right to emit pollution a tradable commodity, allowing facilities to generate credits for emission reductions that go above and beyond legal requirements. These credits could then be sold to companies that wished to build new facilities, increase their emissions, or reduce the expense of complying with environmental safeguards.

Cap-and-trade programs are among the market-based approaches with the greatest track record of success in reducing emissions. In a cap-and-trade system, government first establishes an overall limit on pollutant emissions within an economic sector (the "cap"). This total amount of pollution is then converted into "allowances" to emit a given quantity of the pollutant, which regulated facilities must hold in order to emit pollution. Facilities that reduce their emissions can hold fewer allowances, enabling them to sell their excess allowances to other facilities that may be having a harder time achieving emission reductions. Such trading allows the economic sector covered by the cap-and-trade program to achieve the desired emission reductions at lower aggregate cost. Additionally, regulators can reduce the amount of pollution over time by tightening the cap.

In order for the cap to be effective in producing benefits for the environment and public health, the cap must first be set at an achievable but ambitious level that forces the development and deployment of new technologies. In the case of a carbon cap, the cap must be set low enough to promote curtailment, efficiency improvements, and fuel switching at the most polluting power plants. Tightening the cap over time can continue momentum toward the desired region-wide shifts in the electricity system. If the cap is set at a weak level, it will fail to drive significant technology changes.

To ensure the fairness of the program, emissions allowances (or the right to emit pollution) should not be given for free to facilities purely on the basis of their past emissions. Emissions allowances in a cap-and-trade program have monetary value. Giving them away for free would effectively create billions of dollars in "windfall" profit for the worst polluters. A "polluter pays" mechanism would be more appropriate. For example, emissions allowances could be auctioned to facilities with a need to emit pollution. An auction would have additional benefits as well, acting as a source of funding that could be used to benefit consumers and the environment. The funding could be directed toward energy efficiency programs, which would help meet the emissions cap at a lower cost; toward consumer rebates to offset the cost of the program; or to renewable energy programs that would accelerate the transition of the electric system toward less carbon-intensive fuels.

Finally, to maximize the benefit of a cap-and-trade program, the scope of the program needs to be clearly defined. Some cap-and-trade programs allow offsets, or pollution-reducing actions from outside the industry to which the cap applies. However, it is difficult or impossible to guarantee that offsets deliver equivalent emissions reductions. Offsets also have the potential to eliminate the ancillary benefits of direct and local actions. For example, allowing an offset for an energy efficiency program in India would not create jobs and economic growth in the Northeast, or help to reduce health-damaging pollution from local power plants. Offsets should not be considered at all until a cap-and-trade program has matured and been proven effective. If offsets are eventually considered, they should meet conservative and rigorous criteria to ensure that they enhance the benefit of the cap-and-trade program.[6]

The Most Polluting Power Plants

A Handful Of Power Plants Produce Most of the Global Warming Pollution from Electricity Generation in the Northeast

As a result of differences in performance and fuel, the largest, least carbon-efficient and most oil- and coal-dependent plants are the dominant source of global warming pollution from electricity generation in the Northeast.

Every year, the electricity generation industry in the Northeast emits over 120 million metric tons of carbon dioxide, the leading cause of global warming. However, these emissions are not divided equally among all 188 electricity-producing facilities.[7] Nor do emissions correspond with how much electricity each facility generates.

The reason? Power plants differ in the efficiency at which they use fuel, and in the carbon content of the fuel itself. Zero-carbon technologies such as solar or wind power generate electricity with no pollution except during facility manufacturing and installation. Newer fossil-fired power plants are able to produce the same amount of energy as an old plant, but use half the fuel. (See Table 1.) In addition, fuels like natural gas naturally contain more energy than other fossil fuels per pound of carbon dioxide produced. Natural gas contains 50 percent more energy per pound of carbon dioxide than residual fuel oil and 75 percent more than bituminous coal.[8] Modern combined-cycle turbine designs that use natural gas emit carbon dioxide at a rate three times lower than the oldest coal plants.

Nuclear power and hydropower emit relatively low amounts of carbon dioxide pollution—only during uranium mining, facility construction, and as plants decay after a valley is flooded. However, neither technology should be considered a viable means to reduce carbon dioxide emissions at this time. Nuclear power poses serious economic, safety, international security, environmental and public health problems (See "The Problems with Nuclear Power" on page 7), while large dams seriously damage the ecosystems they occupy.

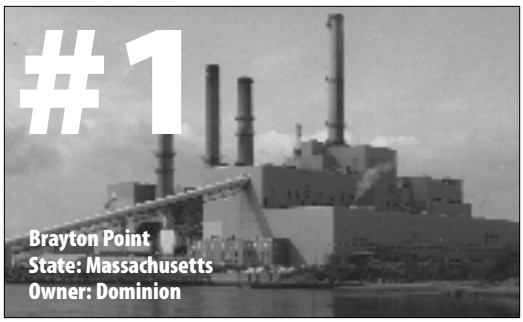
The Most Polluting Northeastern Power Plants in 2004

The most polluting power plants have a disproportionately large impact in terms of global warming pollution. In 2004, over 80 percent of all carbon dioxide pollution from electricity generation in the Northeast came from just 50 power plants. These plants, disproportionately dependent on coal and oil for fuel, produced only 45 percent of the region's electricity.

The Brayton Point plant in Massachusetts, now owned by Dominion, ranked as the top emitter of carbon dioxide in the Northeast in 2004.[20] The plant emitted 4.8 percent of the region's carbon dioxide from electricity generation, yet produced only 2.3 percent of the region's electricity. The vast

Table 1: Comparison of Carbon Dioxide Emissions from Various Types of Power Plants[9]

Technology	Overall Plant Fuel to Electricity Conversion Efficiency (%)	Fuel Characteristics		Emission Rate (lbs CO_2/MWh)
		Carbon Content (% by weight)	Heat Content (BTU/lb of fuel)	
Eastern Coal-Fired Power Plant	33	80	14,030	2,162
Distillate Oil-Fired Utility Boiler	33	87	19,380	1,702
Gas-Fired Utility Boiler	33	69	23,814	1,144
Gas-Fired, Combined-Cycle Gas Turbine Controlled with Best Available Control Technology	58	69	23,814	680
Wind Energy	NA	0	NA	0
Solar Power	NA	0	NA	0
Energy Efficiency	NA	0	NA	0



*In 2005, Dominion purchased Brayton Point from USGen New England.

#2

KEYSPAN

No photo available

Northport
State: New York
Owner: KeySpan Energy

During the year 2004, Exelon transferred ownership of Boston Generating to a group of investors.

#6

KEYSPAN

No photo available

Ravenswood
State: New York
Owner: KeySpan Energy

#8

DYNEGY

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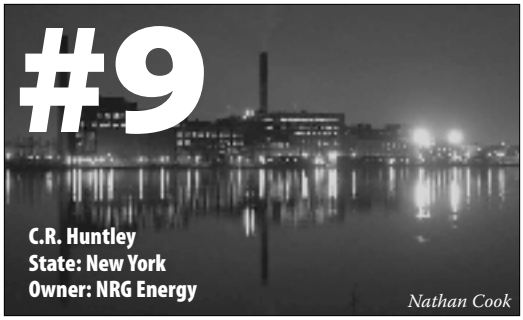
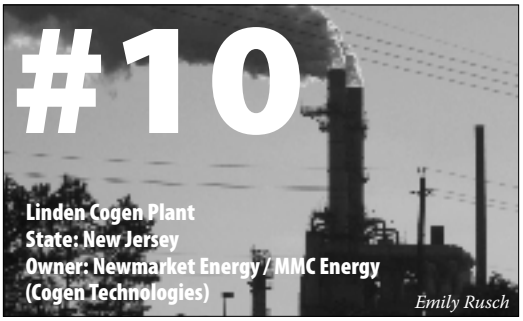
Roseton
State: New York
Owner: Dynegy Northeast





The Problems with Nuclear Power

Nuclear power is able to generate electricity with relatively few carbon dioxide emissions. However, the problems with nuclear power, explored below, make it an inappropriate solution to global warming. Policies aimed at reducing carbon dioxide pollution should not directly or inadvertently support the already heavily subsidized nuclear industry.

- **Cost —** Nuclear power has proven to be expensive due to the high cost of building, maintaining and decommissioning nuclear reactors. But looking only at market costs obscures the more than $100 billion spent by U.S. taxpayers for research and development, protection against liability from accidents, and other subsidies for nuclear power.[10] Without these ongoing subsidies, the nuclear industry would likely not exist. Nuclear power is one of the major reasons why electricity rates in the Northeast have historically been among the highest in the nation.[11]

- **Accident risk —** In the short history of nuclear power, the industry has experienced at least two major accidents—at Three Mile Island and Chernobyl—that endangered the health of millions of people.[12] While the United States has thus far been spared an accident of the scale of Chernobyl, there have been numerous "near-misses." For example, in 2002, inspectors discovered a football-sized cavity in the reactor vessel head of the Davis-Besse nuclear reactor in Ohio. The damage was overlooked in previous inspections and went unnoticed for six years, despite similar damage occurring at other nuclear plants. According to a study performed by the Oak Ridge National Laboratory, the reactor vessel could have breached in as little as two months, potentially causing a core meltdown worse than Three Mile Island.[13]

- **Terrorism and sabotage —** In 2005, the National Academy of Sciences found that a terrorist attack aimed at the spent fuel storage pools at a boiling water reactor could cause a large radiation release, perhaps worse than Chernobyl.[14] The security record of nuclear power plants is far from reassuring. In tests at 11 nuclear reactors in 2000 and 2001, mock intruders were capable of disabling enough equipment to cause reactor damage at six plants.[15] A 2003 General Accounting Office report found significant weaknesses in the Nuclear Regulatory Commission's oversight of security at commercial nuclear reactors.[16]

- **Nuclear waste —** Nuclear waste remains a serious problem without a safe solution. Nuclear power creates tons of spent fuel, which must be stored either on-site or in a centralized repository. Both options pose safety problems. Centralized waste repositories require the transport of high-level nuclear waste across highways and rail lines within proximity of populated areas. Once the waste arrives, it must be held safely for tens of thousands of years without contaminating the environment or the public. On-site storage poses its own problems. Nearly all U.S. nuclear reactors store waste on site in water-filled pools at densities approaching those in reactor cores. Should coolant from the spent-fuel pools be lost, the fuel could ignite, spreading radioactive material across a large area. The cost of such a disaster, were it to occur, has been estimated at 54,000-143,000 deaths from cancer and evacuation costs of more than $100 billion.[17]

- **Aging —** Continued operation of nuclear reactors beyond their initial projected 40-year lifespan could lead to unforeseen safety problems.[18] 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.[19]

For the last several decades, the Northeast has relied upon nuclear power for a significant share of its electricity. However the operating licenses of most nuclear reactors are scheduled to expire in the next 20 years. For environmental and public health reasons, neither the relicensing of existing nuclear reactors beyond their original 40-year lifespans nor the construction of new nuclear facilities should be considered as a means to reduce global warming pollution.

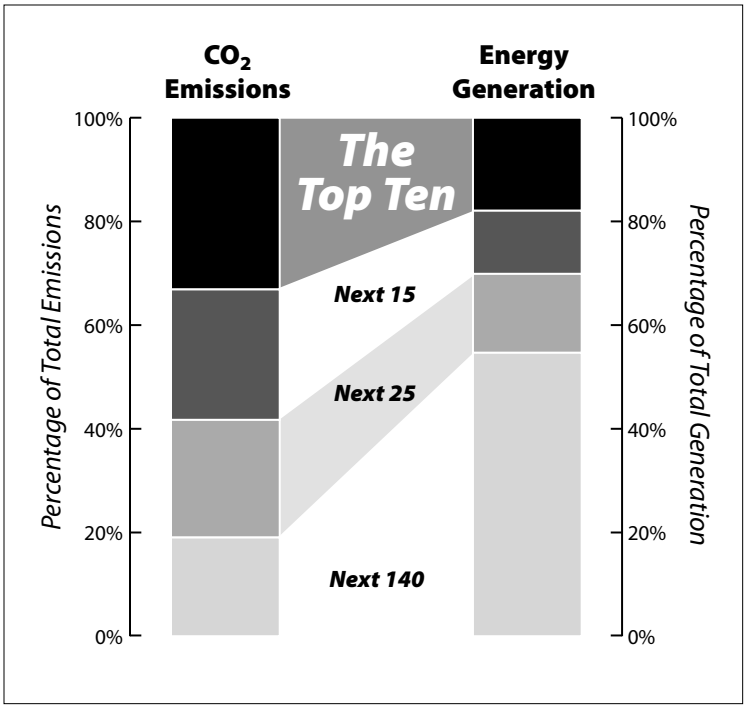
majority of Brayton Point's carbon dioxide pollution (98 percent) came from coal combustion.

There are a variety of possible options to reduce emissions at Brayton Point. (See "Carbon Dioxide Reduction Strategies" on page 9.) The plant already has the technical capacity to burn natural gas in one of its units and there is a natural gas pipeline already leading to the facility site. The plant could also improve the efficiency at which it uses fuel, or limit its operating time.

Figure 1 shows that, despite the fact that their energy output is roughly similar, the top 10 plants produce more carbon dioxide than the next 15 plants; and those produce more carbon dioxide than the next 25 plants.

The top 10 plants alone produced one third of all carbon dioxide pollution (nearly twice as much as the bottom 140 plants, while generating only one-third as much electricity). Table 2 lists the top 10 facilities. (For a list of the top 50 plants, see Table A1 on page 20.)

Figure 1: The Top Carbon Dioxide-Emitting Power Plants Compared to the Fraction of Regional Electricity They Generate



Facilities are sorted by global warming pollution rank in 2004.

The Most Polluting Plants Tend to be Carbon-Inefficient

The top 10 polluting power plants in the Northeast tend to use carbon-inefficient technology to generate electricity. In 2004, these plants produced more carbon dioxide per unit of energy than the average power plant in the Northeast.

Brayton Point, among the least efficient plants, generated 1,760 pounds of carbon dioxide for every megawatt-hour (MWh) of energy generated. Overall, the top 10 plants produced nearly twice as much carbon dioxide per unit of power generated (1,570 lbs/MWh) as the regional average (850 lbs/MWh).

Mystic Generating Station is notably different than the other top 10 plants. In 2003, Mystic's owners repowered the facility to burn natural gas.

Table 2: The Top 10 Carbon Dioxide-Emitting Power Plants

Plant Name	State	Carbon Dioxide Emissions (Million Metric Tons)	Carbon Dioxide Emissions (Percent of Regional Total)	Generation (Percent of Regional Total)	Pounds of CO_2 / MWh
Brayton Point	MA	5.7	4.8%	2.3%	1,757
Northport	NY	5.2	4.5%	2.2%	1,727
Canal	MA	4.2	3.5%	1.8%	1,680
AES Somerset	NY	4.1	3.5%	1.9%	1,608
Mystic	MA	3.9	3.3%	3.0%	950
Ravenswood	NY	3.7	3.2%	1.6%	1,711
Dunkirk	NY	3.2	2.8%	1.2%	1,988
Roseton	NY	3.0	2.6%	1.2%	1,774
C.R. Huntley	NY	3.0	2.5%	1.0%	2,100
Linden Cogen Plant	NJ	2.8	2.4%	1.7%	1,180

Loading coal at Dunkirk. (Photo by NREL)

The owners took action in response to air pollution regulations—including carbon dioxide rules—applying to the "Filthy Five," announced by former Massachusetts Governor Jane Swift in 2001. The company decided that fixing the old units at the plant was too expensive and that installing more modern equipment made more economic sense.[21] As a result, in 2004 Mystic achieved a carbon dioxide generation rate of 950 pounds per MWh, the most carbon-efficient performance among the top 10 polluting plants.

However, 17 percent of Mystic's emissions in 2004 came from the use of fuel oil, and Mystic's carbon efficiency was still higher than the regional average. The Mystic plant could achieve a higher energy output with less carbon dioxide emissions by minimizing the use of fuel oil. The most modern combined cycle natural gas turbines can generate electricity at a rate of 680 pounds of CO2 per MWh. (See Table 1.)

Carbon Dioxide Reduction Strategies

Owners of power plants have a variety of strategies at their disposal to reduce carbon dioxide pollution. In order to meet regional goals for reducing global warming pollution, plant owners will need a mixture of these strategies, balancing the need for energy with the dangers of over-dependence on natural gas or any other single limited-quantity fuel.

- **Improving Fuel Efficiency**. Power plants can reduce their emissions with on-site efficiency improvements without fully overhauling the plants. The most common way to improve the efficiency of a coal plant is to lower the heat rate. Improved maintenance and minor upgrades can lower heat rates by 5% from traditional operating levels, resulting in a 5% reduction in carbon emissions.[22]

- **Curtailing Operations**. Power plant owners could choose to operate their facilities less to reduce emissions. Owners could agree to operate their plants for only a portion of the year, or fully decommission the plant. The resulting reduction in CO_2 emissions could be used to generate emissions reduction credits that could be sold to other facilities.

- **Switching to a Fuel with Lower Carbon Content.** Coal-fired power plants can reduce their global warming pollution by switching to a fuel that delivers more heat per pound of carbon, such as natural gas. Co-firing with biomass fuels like switchgrass can also reduce net emissions significantly. Repowering using a different fuel can also deliver significant improvements in efficiency. Modern combined-cycle turbine designs that use natural gas can deliver carbon dioxide emissions rates three times lower than the oldest coal plants.

- **Out-of-Sector Offsets**. Theoretically, power plant owners could pay for pollution reductions outside of the electricity sector and produce an equivalent benefit as cleaning up the plant itself. However, there is no guarantee that offsets would deliver equivalent emissions reductions—some measures might happen on their own anyway. Offsets also could move the additional benefits of emission reduction, such as economic growth, to another part of the country or the world.[23]

The Dirtiest Power Companies

A Small Number of Companies Own The Most Polluting Power Plants

Several large companies own a significant amount of generating capacity in the Northeast. Some of these companies own fleets of power plants that rank among the most carbon-intensive facilities in the region. As a result, the activities of just a few companies create most of the region's carbon dioxide pollution from electricity generation. In particular, companies with a large dependence on fossil fuels like oil and coal have a disproportionate impact.

The Most Polluting Companies in 2004 Tended To Operate Carbon-Intensive Coal- or Oil-Fired Plants

In the Northeast, 72 companies own and operate power plants. Among these entities, the top 10 polluting companies produced more than 60 percent of all global warming pollution from electricity generation in the Northeast in 2004. Each company individually released more than 3.5 million metric tons of carbon dioxide, for a total of over 70 million metric tons. Table 3 lists the top 10 polluting companies ranked by worst carbon efficiency.

Carbon efficiency is a measure of how clean a plant is in terms of global warming pollution. The greater the carbon dioxide pollution created per unit of energy generated, the more poorly a plant is performing.

Among the top 10 companies, NRG Energy ranked as the most carbon-intensive electricity generator, producing nearly a ton of carbon dioxide per megawatt-hour. (See Table 3.) NRG plants emitted 9 percent of electric-sector carbon dioxide pollution in the Northeast while generating only 4 percent of the region's electricity. Most of these emissions came from NRG's Huntley and Dunkirk plants in New York. These facilities produced 2,100 and 1,988 pounds of CO2 per MWh generated, respectively—among the least efficient facilities in the Northeast.

The most polluting companies depend heavily on coal and oil for fuel. Over 50 percent of the global warming pollution from the top 10 companies came from coal and 30 percent came from residual fuel oil.

The most coal-dependent companies were Dominion (the new owner of Brayton Point and Salem Harbor) (92 percent of emissions from coal), NRG Energy (82 percent of emissions from coal),

Table 3: The Top 10 Polluting Companies in 2004 (Companies Producing More Than 3.5 Million Metric Tons of CO2, Ranked by Worst Carbon Efficiency)

Company	Carbon Efficiency (lbs CO_2/MWh)	CO_2 Emissions (Million Metric Tons)	CO_2 Emissions (Percent of Regional Total)	Generation (Percent of Regional Total)
NRG Energy	1,948	11	9.4%	4.1%
Dynegy Northeast	1,760	4.8	4.1%	2.0%
Mirant Corporation	1,734	6.8	5.8%	2.9%
KeySpan Energy	1,697	13	10.1%	5.1%
Dominion*	1,689	8.0	6.8%	3.4%
Public Service Co. of NH	1,667	3.9	3.3%	1.7%
Pepco Holdings	1,590	3.8	3.3%	1.7%
PSEG Fossil	1,566	10	8.8%	4.7%
AES Corporation	1,430	9.4	8.1%	4.8%
Exelon Holdings† (Including Boston Generating LLC)	942	4.6	3.9%	3.0%

*In 2005, Dominion purchased Brayton Point, Salem Harbor and Manchester Street Station from USGen New England.
†During the year 2004, Exelon transferred ownership of Boston Generating to a group of investors.

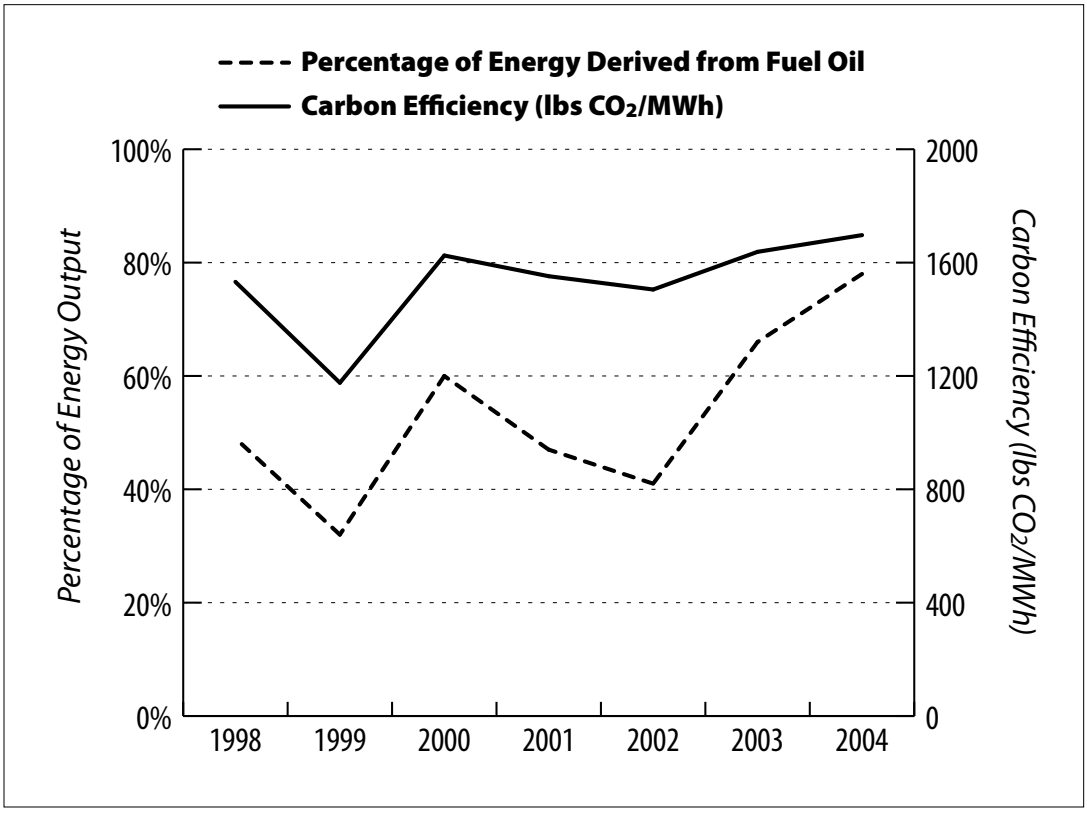
AES Corporation (82 percent of emissions from coal), Pepco Holdings and PSEG Fossil (two-thirds of emissions from coal each).

Dynegy operates the second-least efficient fleet of facilities among the top polluters. It depends on residual fuel oil for just under two-thirds of its generation and coal for the remainder. Mirant, the third-ranking company, operates a fleet of power plants that derive three-quarters of their electricity from residual fuel oil and 20 percent from coal.

KeySpan is also heavily dependent on fuel oil, despite operating the region's largest natural gas supply business. Over 80 percent of the emissions from KeySpan plants came from the combustion of fuel oil, with the remainder from natural gas. In 2004, KeySpan used roughly 20 percent of all the fuel oil burned for electricity generation in the Northeast. Presumably because of the financial advantage of using fuel oil instead of natural gas, KeySpan has used increasing amounts of fuel oil over the last decade. As a result, KeySpan plants have performed with worse carbon efficiency over the last six years. (See Figure 2.)

Also notable among the least efficient companies is Danielson Holdings Corporation, the owner of American Ref-Fuel Co. and Covanta, operators of trash incinerators. Plastics and other non-biogenic trash burned in these incinerators cause a significant amount of carbon dioxide pollution. Danielson Holdings incinerators on average emit over 2,200 lbs of carbon dioxide per megawatt-hour of energy generated. Danielson Holdings ranks 15th among the largest emitters of carbon dioxide, emitting 2.3 percent of regional carbon dioxide pollution while generating less than 1 percent of regional electricity.

Figure 2: KeySpan Has Used an Increasing Amount of Fuel Oil, Leading to Worse Carbon Efficiency



Soot and Smog Pollution

The Largest Emitters of Global Warming Pollution Also Release Significant Amounts of Health-Damaging Pollution

The facilities with the largest carbon dioxide emissions are also the largest sources of soot and smog pollution. In addition to aggravating global warming, these plants contribute to poor air quality and harm public health. (See "The Health Impacts of Soot and Smog" on Page 13 and "Mercury and Dioxin: Two Other Dangerous Byproducts of Energy Production" on Page 14.)

In 2004, the top 50 plants (accounting for 80 percent of power-sector global warming pollution) also emitted:

- 90 percent of the region's power-sector emissions of soot-forming sulfur dioxide; and
- 81 percent of the region's power-sector emissions of smog-forming nitrogen oxides.

The top 10 dirtiest plants, listed in Table 4 and Table 5, overlap significantly with the worst emitters of carbon dioxide pollution. For example, Brayton Point emitted over 6 percent of all sulfur dioxide and nitrogen oxide pollution caused by electricity generation in the Northeast in 2004.

Power plants release health-damaging pollution.

Efforts aimed at reducing carbon dioxide emissions from the largest polluters will make it easier for generators to meet increasingly stringent soot and smog pollution limits. Given the serious impacts of power plant pollution, this benefit could improve the health of millions of people living in the region.

Table 4: Largest Sulfur Dioxide (SO_2) Polluters in 2004

Facility Name	State	Owner	SO_2 Emissions (Tons)	Percent of Regional Total	Emissions Rate (lbs/MWh)
C.R. Huntley Station	NY	NRG Energy	31,534	6.9%	20.1
Dunkirk Station	NY	NRG Energy	30,624	6.7%	17.1
Merrimack	NH	Public Service Co. of NH	29,736	6.5%	19.0
Brayton Point	MA	Dominion[24]	29,250	6.4%	8.2
Canal Station	MA	Mirant Corporation	28,181	6.2%	10.3
Northport Station	NY	KeySpan Energy	28,099	6.2%	8.4
Rochester 7	NY	Rochester Gas & Electric Corp. / Energy East	26,905	5.9%	34.8
Indian River	DE	NRG Energy	24,202	5.3%	15.0
Roseton Station	NY	Dynegy	23,161	5.1%	12.3
Hudson Station	NJ	PSEG Fossil	21,512	4.7%	14.0

The Health Impacts of Soot and Smog

Coal- and oil-fired power plants emit sulfur dioxide, which forms fine soot particles in the atmosphere. When inhaled, these particles become lodged deep in the lungs where they cause a variety of health problems, including asthma, bronchitis, lung cancer and heart attacks.[26] Soot pollution from power plants is responsible for significant harm to public health in the Northeast. According to a study by Abt Associates, a frequent consultant to the U.S. EPA, soot in New York shortens the lives of over 1,200 people every year.[27] People who live in cities with high levels of soot pollution face a health risk similar to that of living with a smoker.[28]

Fossil-fueled power plants also emit nitrogen oxides, one of the primary ingredients in smog. Smog makes lung tissues more sensitive to allergens and less able to ward off infections.[29] It scars airway tissues.[30] Children exposed to smog develop lungs with less flexibility and capacity than normal. During high smog days, otherwise healthy people who exercise can't breathe normally.[31] Over time, smog exposure can lead to asthma, bronchitis, emphysema and other respiratory problems.[32] Most of the Northeast does not meet federal health standards for smog.

Progress in Reducing Soot and Smog Pollution Has Not Extended to Carbon Dioxide Pollution

Regulators have made progress in reducing soot- and smog-forming emissions from power plants over the last decade. However, carbon dioxide pollution has been unaffected by these efforts. (See Figure 3.)

Enforcement of federal clean air laws (sometimes prompted by state lawsuits) in combination with effective state-level policies continue to reduce soot- and smog-forming pollution from power plants. Progress on mercury emissions should be forthcoming in several states as well. Massachusetts, Connecticut and New Jersey have passed laws to reduce mercury emissions from in-state power plants.

These pollutants are similar to carbon dioxide in that a handful of plants create a majority of emissions.[40] Regulations addressing these pollutants have demonstrated that large benefits can result from actions at a small number of facilities. As this report demonstrates, the same will be true for carbon dioxide.

Figure 3: Soot Pollution in the Northeast has Declined in the Last Decade, While Carbon Dioxide Pollution Has Not[41]

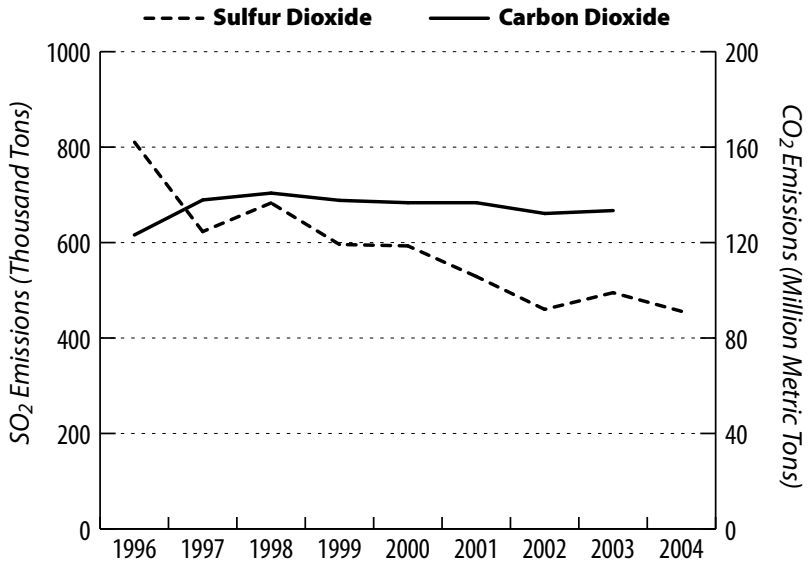


Table 5: Largest Emitters of Nitrogen Oxides (NOx) in 2004

Facility Name	State	Owner	NO_x Emissions (Tons)	Percent of Regional Total	Emissions Rate (lbs/MWh)
Brayton Point	MA	Dominion[25]	9,568	7.5%	2.7
Hudson Station	NJ	PSEG Fossil	8,239	6.4%	5.4
Northport Station	NY	KeySpan Energy	6,291	4.9%	1.9
Indian River	DE	NRG Energy	6,155	4.8%	3.8
Mercer Station	NJ	PSEG Fossil	6,026	4.7%	4.8
C.R. Huntley Station	NY	NRG Energy	5,763	4.5%	3.7
Roseton Station	NY	Dynegy	5,115	4.0%	2.7
Canal Station	MA	Mirant	4,859	3.8%	1.8
Ravenswood	NY	KeySpan Energy	4,385	3.4%	1.8
Dunkirk Station	NY	NRG Energy	4,213	3.3%	2.4

Mercury and Dioxin: Two Other Dangerous Byproducts of Energy Production

Burning coal and trash in power plants creates more than just soot and smog pollution. Coal contains mercury, a neurotoxin that especially threatens children's development. Burning trash can release dioxin, one of the most potent carcinogens known.

Mercury is a neurotoxin that is particularly damaging to the developing brain. In early 2004, EPA scientists estimated that one in six women of childbearing age in the U.S. has levels of mercury in her blood that are sufficiently high to put one in six babies born each year at risk of learning disabilities, developmental delays and problems with fine motor coordination, among other problems.[33]

Mercury emissions from coal-fired power plants and waste incinerators are making the fish in our lakes, rivers and streams unsafe to eat. Mercury in the air contaminates rivers and lakes, where bacteria convert it to a highly toxic form that bioaccumulates in fish. In 2000, coal-fired power plants in the Northeast emitted over 3,600 pounds of mercury.[34] Six of the Northeast states have warned people against eating fish from all of their inland freshwater lakes and/or rivers for at least one species of fish.[35]

Dioxin is one of the most toxic substances ever created. Any exposure to dioxin—even a dose as low as one thousandth of one millionth of a gram—increases the risk of cancer.[36] Dioxin can cause a variety of other health problems, including reproductive and developmental disorders, heart disease and diabetes, and weakened immune systems, learning disabilities and IQ deficits.[37]

Dioxin comes from burning plastic containing chlorine, like PVC.[38] Released from incinerator smokestacks, dioxin contaminates the food chain. People are exposed through fatty foods like meat, eggs, and dairy products. Current average levels of dioxin in humans are at or near the levels that have been demonstrated to cause problems in animals. Because of how dioxin accumulates through the food chain, breast-feeding infants may receive a dose 35 to 65 times higher than "safe" levels. The EPA estimates that the cancer risk from dioxin in levels already present in the general public is approximately 1-per-1,000, far higher than EPA's acceptable risk level of one in one million.[39]

Reducing carbon dioxide pollution from coal- and trash-fired power plants will help to reduce toxic mercury and dioxin emissions as well.

Policy Recommendations

In order to be most effective, the carbon dioxide cap that emerges from the Regional Greenhouse Gas Initiative (RGGI) should clean up the dirtiest power plants in the Northeast. Actions at relatively few plants will make a big impact and enable the region to achieve a meaningful and effective near-term target for reducing carbon dioxide pollution, while building momentum for the deeper cuts that will be necessary in the future.

Global warming threatens to have a serious impact on our way of life and our economy. Ultimately, scientists estimate that eliminating any dangerous threat to the climate will require cutting pollution to 75 to 85 percent below present-day levels.[42] Achieving such significant cuts in emissions will require a coordinated approach involving cooperation across state and national borders.

The Regional Greenhouse Gas Initiative is the first program of its kind directed at global warming emissions in the United States. As such, it will likely set a precedent for future efforts in other regions or at the federal level. As a result, there is a great deal riding on the Northeast states' "getting it right" as they move forward in the RGGI process.

The following principles should apply to the design of the RGGI model rule:

1) The cap should reduce emissions to 25 percent below current levels by 2020, tightening over time. The cap should apply to electricity imports as well as to power generated within the Northeast.

2) Each state should implement the program expeditiously after the release of the model rule. Each state should set up a process for enforcing in-state reductions that is transparent and verifiable to the public.

3) The rules to implement the cap-and-trade program should not create new subsidies for nuclear power nor rely upon nuclear power as an emission-reduction strategy. Safer and more cost-effective options can achieve the emissions targets—while creating jobs and saving consumers money.

Efficiency and renewables deliver energy without global warming pollution.

4) Reductions must be achieved first and foremost from a mandatory cap on carbon dioxide emitted from fossil-fueled power plants. Offsets should not be eligible for compliance with the initial RGGI cap.

5) Subsequently, offsets should not be considered unless:

   a. The regional cap is substantially reduced beyond the level stated above.

   b. There are stringent and explicit limits on the amount of emission reductions that can be achieved through offsets;

   c. Only offsets from within the region are allowed; and

   d. Any offset meets the highest standard of environmental integrity in achieving real, verifiable, enforceable and permanent reductions in greenhouse gas emissions, while providing real additional environmental benefits to the region.

6) The rules should not create a financial windfall for owners of dirty power plants. States should not give emission allowances (that is, permits

that allow a facility to emit carbon dioxide) to electricity generators for free. Allowances should be allocated for the benefit of consumers and the public, by providing funding for energy efficiency, renewable energy, and consumer rebates. This makes the program work better by establishing a polluter-pays system, rather than allowing the generators to receive windfall profits based on past emission levels.

7) States should implement complementary policies to encourage energy efficiency and renewable energy through incentives and other measures. Such policies should also remove barriers to investments in energy efficiency by utilities and drive investment in efficiency by electricity and gas consumers.

A strong, well designed regional carbon cap could provide further momentum in the region's efforts to achieve a cleaner, more reliable electric system by making greater use of renewable energy and energy efficiency. Such a strategy could provide significant economic benefits for the region, as described below in "The Economic Benefits of a Regional Carbon Cap and Clean Energy Strategy."

The Economic Benefits of a Regional Carbon Cap and Clean Energy Strategy

A power-sector carbon cap is typically considered to be a potential economic burden on electric generators and, by extension, electricity consumers. But there is growing evidence that the doomsday economic scenarios often predicted for a carbon cap are exaggerated—particularly if a carbon cap is complemented with other policies to reduce electricity demand and to satisfy more of that demand with local or renewable generation.

- A 2001 study by Resources for the Future estimated that a $25 per ton tax on carbon dioxide emissions from electricity generation (which, like a carbon cap without offsets, could not be escaped by utilities) would generate approximately $12-$14 per ton of ancillary economic benefits through reduced public health expenditures and reduced need for utilities to invest in emission control equipment. The ancillary benefits are estimated to be about equal to the anticipated marginal cost of reducing carbon dioxide emissions.[43]

- A 1999 study by the Tellus Institute estimated that a series of policies to reduce carbon dioxide emissions (including measures in the electric sector) could enable the United States to reduce emissions by 14 percent below 1990 levels by 2010, while creating nearly a million net new jobs, and achieving an overall net economic benefit.[44]

- A variety of studies have pointed to the job creation benefits of renewable energy—which could play a significant role in reducing power-sector emissions. A 2001 study by the Renewable Energy Policy Project estimated that wind and solar power offer 40 percent more jobs per dollar spent than coal.[45] Because the Northeast produces relatively little of the fossil fuel it consumes for electricity generation, the region would likely benefit strongly from this job-creation phenomenon.

- Shifting to a less carbon intensive electric system could also reduce (rather than increase) costs for electricity consumers, particularly if paired with policies that encourage energy efficiency. A 2004 study by Synapse Energy Economics estimated that such a balanced energy strategy would reduce electric system costs by $36 billion annually by 2025—not including environmental or other co-benefits of the policies, and all while reducing dependence on nuclear energy by half.[46]

In addition to the quantifiable benefits of a combined carbon cap/clean energy strategy for the Northeast, such a policy direction would tend to insulate the region's economy from fossil fuel price volatility, encourage the location of renewable energy and energy efficiency companies within the region, and establish the region as an exporter of technology and expertise to other regions and the world. However, in order to provide these benefits, a carbon cap must be set at an achievable but ambitious level that forces the development and deployment of new technologies. The cap must be set low enough to drive substantive changes in electric generating and consumption patterns in the region.

Methodology

In this report we examine emissions of carbon dioxide—the leading global warming pollutant—from all utility and non-utility power plants within the nine-state Northeast region in 2004. We derive emissions data from fuel consumption figures reported to the U.S. Department of Energy and estimates of the carbon content of each fuel source.

Carbon Dioxide Emissions

In order to develop the carbon dioxide emissions data for each power plant in this report, we performed the following steps:

1) We obtained fuel consumption and electricity generation data for power plants operating in the nine Northeast states participating in the Regional Greenhouse Gas Initiative (RGGI) (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Delaware) from the U.S. Department of Energy's Energy Information Administration (EIA). We obtained 2004 data from the Form EIA-906 and EIA-920 database.[47]

2) Using fuel consumption specifically for electricity generation (as opposed to heat production), we translated fuel amounts by mass or volume into carbon dioxide emission amounts using a set of coefficients developed by the EIA for the Voluntary Reporting of Greenhouse Gases Program, with appropriate unit conversions.[48] For all biogenic biomass fuels, including wood waste, we assigned an emissions value of zero as suggested by the EIA. For municipal solid waste, we used the EIA derived value of 919 pounds of carbon dioxide per short ton of waste burned, reflecting the non-biogenic portion of municipal solid waste.

3) Using Lexis-Nexis, SEC filings and web searches, we identified the parent holding companies that owned all or a majority of each facility.

The end result was a database containing information on each power plant, including ownership, generation, carbon dioxide emissions, and fuel consumption for 2004. Sorting and summation of this database yielded all of the results related to carbon dioxide emissions rankings and fuel consumption patterns reported here.

Smog and Soot Pollution Data

Individual power plant emissions of sulfur dioxide and nitrogen oxides were obtained from the EPA Clean Air Markets Acid Rain database.[49] Data relevant to the nine-state RGGI region was isolated and emissions from each plant tabulated by year. In addition, the data were linked by plant ID number to the carbon dioxide emissions database for further analysis. Because not all facilities that generate electricity in the region participate in the EPA Clean Air Markets program, the EPA database is less comprehensive in terms of carbon dioxide emissions than the fuel consumption data from the EIA. Statistics on the largest polluters and trends in the emission of sulfur dioxide and nitrogen oxides stem from sorting and summation of this database.

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[53] Recently sold to a coalition of investors including Goldman Sachs.

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[55] Ibid.

[56] Now owned by a group of investors.

[57] See Note 20.

[58] See Note 51.

[59] The assets of this company were recently transferred to a group of investors including Goldman Sachs.

[60] See Note 56.

[61] Recently sold to Dynegy.

[62] See Note 20.

[63] See Note 51.

[64] See Note 20.

[65] See Note 53.

[66] Ibid.

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[69] AES transferred this plant to Dutch-based creditor ABN AMRO Bank N.V. in September 2004.

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Appendix: Detailed Tables

Table A1: The Top 50 Polluting Power Plants, Ranked by Carbon Dioxide Emissions in 2004

Rank	Plant Name	Owner	State	CO_2 Emissions (Metric Tons)	Percent of Regional Total CO_2 Emissions	Generation (MWh)	Carbon Efficiency (lbs CO_2 / MWh)
1	Brayton Point	Dominion[50]	MA	5,685,746	4.8%	7,135,263	1,757
2	Northport	KeySpan Energy	NY	5,237,676	4.5%	6,684,594	1,727
3	Canal	Mirant	MA	4,153,534	3.5%	5,449,628	1,680
4	AES Somerset LLC	AES Corporation	NY	4,115,023	3.5%	5,642,606	1,608
5	Mystic Generating Station	Exelon (Boston Generating LLC)[51]	MA	3,883,899	3.3%	9,014,336	950
6	Ravenswood	KeySpan Energy	NY	3,718,212	3.2%	4,790,744	1,711
7	Dunkirk Generating Station	NRG Energy	NY	3,227,040	2.8%	3,577,856	1,988
8	Roseton Generating Station	Dynegy Northeast Generating	NY	3,034,291	2.6%	3,771,000	1,774
9	CR Huntley Generating Station	NRG Energy	NY	2,991,975	2.5%	3,140,723	2,100
10	Linden Cogen Plant	Goldman Sachs (Cogen Technologies)	NJ	2,817,272	2.4%	5,262,331	1,180
11	Indian River	NRG Energy	DE	2,810,268	2.4%	3,227,891	1,919
12	Astoria Generating Station	Reliant Energy	NY	2,557,789	2.2%	3,633,684	1,552
13	PSEG Hudson Generating Station	PSEG Fossil LLC	NJ	2,554,037	2.2%	3,071,765	1,833
14	Bridgeport Station	PSEG Fossil LLC	CT	2,493,214	2.1%	2,727,698	2,015
15	Merrimack	Public Service Co. of NH	NH	2,359,656	2.0%	3,127,790	1,663
16	Bergen	PSEG Fossil LLC	NJ	1,994,863	1.7%	4,472,027	983
17	Salem Harbor	Dominion[52]	MA	1,958,892	1.7%	2,118,786	2,038
18	PSEG Mercer Generating Station	PSEG Fossil LLC	NJ	1,900,685	1.6%	2,486,960	1,685
19	Danskammer Generating Station	Dynegy Northeast Generating	NY	1,722,013	1.5%	2,185,177	1,737
20	Chambers Cogeneration LP	ArcLight and Delta Power	NJ	1,632,050	1.4%	1,743,363	2,064
21	AES Cayuga	AES Corporation	NY	1,587,697	1.4%	2,039,485	1,716
22	Edge Moor	Pepco Holdings, Inc. (Conectiv)	DE	1,537,749	1.3%	1,811,537	1,871
23	Newington	Public Service Co. of NH	NH	1,534,430	1.3%	1,757,252	1,925
24	Kodak Park Site	Eastman Kodak Company	NY	1,439,513	1.2%	759,022	4,181
25	Port Jefferson	KeySpan Energy	NY	1,433,892	1.2%	1,845,189	1,713

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Table A1 *(continued)*: The Top 50 Polluting Power Plants, Ranked by Carbon Dioxide Emissions in 2004

Rank	Plant Name	Owner	State	CO_2 Emissions (Metric Tons)	Percent of Regional Total CO_2 Emissions	Generation (MWh)	Carbon Efficiency (lbs CO_2 / MWh)
26	Lovett	Mirant	NY	1,427,286	1.2%	1,639,356	1,919
27	Charles Poletti	Power Authority of State of NY	NY	1,397,302	1.2%	2,084,054	1,478
28	Westbrook Energy Center	Calpine	ME	1,312,372	1.1%	3,430,642	843
29	AES Thames	AES Corporation	CT	1,297,098	1.1%	1,586,021	1,803
30	Rochester 7	Energy East (Rochester Gas & Electric Corp)	NY	1,285,054	1.1%	1,545,236	1,833
31	Logan Generating Plant	National Energy Gas and Transmission[53]	NJ	1,246,221	1.1%	1,530,348	1,795
32	Selkirk Cogen Partners LP	National Energy Gas and Transmission[54]	NY	1,244,820	1.1%	2,546,947	1,077
33	Bridgeport Energy Project	Duke Energy	CT	1,225,208	1.0%	3,180,200	849
34	BL England	Pepco Holdings, Inc. (Atlantic City Electric Co.)	NJ	1,129,328	1.0%	1,310,122	1,900
35	Delaware City Plant	The Premcor Refining Group, Inc	DE	1,092,539	0.9%	623,450	3,863
36	Brooklyn Navy Yard Cogeneration	Brooklyn Navy Yard Cogen LP	NY	1,079,234	0.9%	1,964,322	1,211
37	AES Granite Ridge[69]	AES Corporation	NH	1,077,308	0.9%	2,750,187	864
38	Bellingham Cogeneration Facility	FPL Energy	MA	1,072,663	0.9%	2,427,219	974
39	Newington Power Facility	Con Edison Energy	NH	1,030,677	0.9%	2,541,900	894
40	Maine Independence Station	Duke Energy	ME	991,170	0.8%	2,740,089	797
41	Athens Generating LP	National Energy Gas and Transmission[55]	NY	890,572	0.8%	2,198,536	893
42	Lake Road Generating Plant	CitiGroup	CT	883,824	0.8%	2,203,616	884
43	Saranac Facility	TransAlta	NY	880,684	0.8%	1,877,211	1,034
44	Bowline Point	Mirant	NY	879,231	0.7%	1,041,053	1,862
45	EF Barrett	KeySpan Energy	NY	866,566	0.7%	1,334,275	1,432
46	Bucksport Mill	International Paper Company	ME	854,435	0.7%	1,923,366	979
47	Milford Power Project	El Paso[56]	CT	816,370	0.7%	2,119,423	849
48	Hay Road	Pepco Holdings (Conectiv)	DE	748,859	0.6%	1,698,651	972
49	AES Greenridge LLC	AES Greenridge	NY	734,275	0.6%	877,712	1,844
50	Sithe Independence Station	Sithe Energies	NY	711,802	0.6%	1,686,366	931

Table A2: CO2 Emissions by Power Company in 2004, Ranked by Worst Carbon Efficiency

Rank	Corporation	CO_2 Emissions (Metric Tons)	Percent of Regional Total	Generation (MWh)	Percent of Regional Total	Carbon Efficiency (lbs CO_2/MWh)
1	Eastman Kodak Company	1,439,513	1.4%	759,022	0.2%	4,181
2	Starrett City Inc.	132,929	0.1%	72,764	0.0%	4,027
3	The Premcor Refining Group, Inc	1,092,539	0.9%	623,450	0.2%	3,863
4	Energy Investors Funds Group	453,242	0.4%	419,554	0.1%	2,382
5	Danielson Holding Company (MSW Energy, American Ref-Fuel Co. and Covanta)	2,634,178	2.3%	2,584,621	0.9%	2,247
6	ArcLight and Delta Power	1,632,050	1.4%	1,743,363	0.6%	2,064
7	NRG Energy	10,983,641	9.4%	12,429,990	4.1%	1,948
8	Wheelabrator	970,216	0.8%	1,105,951	0.4%	1,934
9	Energy East (Rochester Gas and Electric)	1,285,054	1.2%	1,545,236	0.5%	1,833
10	Dynegy Northeast Generating	4,756,304	4.1%	5,956,177	2.0%	1,760
11	Mirant Corporation	6,818,644	5.8%	8,668,689	2.9%	1,734
12	Massachusetts Institute of Technology	120,408	0.1%	153,548	0.1%	1,729
13	Finch Pruyn & Company Inc.	168,633	0.1%	217,852	0.1%	1,707
14	KeySpan Energy	11,853,049	10.1%	15,398,232	5.1%	1,697
15	Dominion (US Gen)	7,951,286	6.8%	10,377,996	3.4%	1,689
16	Public Service Co. of NH	3,894,086	3.3%	5,150,764	1.7%	1,667
17	Advanced Energy Systems	210,377	0.2%	284,485	0.1%	1,630
18	Pepco Holdings, Inc.	3,822,157	3.3%	5,300,500	1.7%	1,590
19	Reliant	3,155,420	2.7%	4,388,218	1.4%	1,585
20	PSEG Fossil	10,515,526	9.0%	14,285,285	4.7%	1,566
21	AES Corporation	9,445,728	8.1%	14,558,990	4.8%	1,430
22	Massachusetts Municipal Wholesale Electric Co.	167,779	0.1%	269,224	0.1%	1,374
23	Project Orange Association	95,842	0.1%	165,005	0.1%	1,281
24	Brooklyn Navy Yard Cogen LP	1,079,234	0.9%	1,964,322	0.6%	1,211
25	National Energy Gas and Transmission	3,381,613	2.9%	6,275,832	2.1%	1,188

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Table A2 *(continued)*: CO2 Emissions by Power Company in 2004, Ranked by Worst Carbon Efficiency

Rank	Corporation	CO_2 Emissions (Metric Tons)	Percent of Regional Total	Generation (MWh)	Percent of Regional Total	Carbon Efficiency (lbs CO_2/MWh)
26	Goldman Sachs (Cogen Technologies)	2,817,272	2.4%	5,262,331	1.7%	1,180
27	SD Warren Co.	221,788	0.2%	416,164	0.1%	1,175
28	Con Edison	1,910,680	1.6%	3,883,347	1.3%	1,085
29	Masspower	605,996	0.5%	1,240,552	0.4%	1,077
30	North Jersey Energy Assoc. LP	202,434	0.2%	415,450	0.1%	1,074
31	TransCanada Co. (Ocean State Power Co.)	626,037	0.5%	1,323,532	0.4%	1,043
32	Lockport Energy Associates LP	375,158	0.3%	795,266	0.3%	1,040
33	Saranac Energy Co., Inc.	880,684	0.8%	1,877,211	0.6%	1,034
34	Madison Paper Industries	64,944	0.1%	147,649	0.0%	970
35	Exelon Holdings (Including Boston Generating LLC)	4,625,233	3.9%	10,820,330	3.6%	942
36	Sithe Energies	711,802	0.6%	1,686,366	0.6%	931
37	Berkshire Power Company LLC	496,909	0.4%	1,232,319	0.4%	889
38	CitiGroup	883,824	0.8%	2,203,616	0.7%	884
39	El Paso	916,471	0.8%	2,308,087	0.8%	875
40	International Paper Co.	1,071,214	0.9%	2,710,543	0.9%	871
41	International Power	905,170	0.8%	2,306,065	0.8%	865
42	Calpine	2,913,337	2.5%	7,520,652	2.5%	854
43	Millennium Power Partners LP	408,387	0.3%	1,057,690	0.3%	851
44	Duke Energy	2,216,378	1.9%	5,920,289	2.0%	825
45	Katahdin Paper Inc.	46,731	0.0%	165,127	0.1%	624
46	Mead Paper	211,113	0.2%	1,023,647	0.3%	455
47	FPL Energy	2,014,827	1.7%	14,552,295	4.8%	305
48	SAPPI	91,291	0.1%	771,710	0.3%	261
49	Boralex	52,673	0.1%	749,630	0.2%	155
50	Power Authority of State of NY	1,397,302	1.2%	22,035,744	7.3%	140

Table A3: CO2 Emissions by Power Company in 2004, Ranked by Tonnage

Rank	Corporation	CO_2 Emissions (Metric Tons)	Percent of Regional Total	Generation (MWh)	Percent of Regional Total	Carbon Efficiency (lbs CO_2/MWh)
1	KeySpan Energy	11,853,049	10.1%	15,398,232	5.1%	1,697
2	NRG Energy	10,983,641	9.4%	12,429,990	4.1%	1,948
3	PSEG Fossil	10,515,526	9.0%	14,285,285	4.7%	1,566
4	AES Corporation	9,445,728	8.1%	14,558,990	4.8%	1,430
5	Dominion (US Gen)[57]	7,951,286	6.8%	10,377,996	3.4%	1,689
6	Mirant Corporation	6,818,644	5.8%	8,668,689	2.9%	1,734
7	Dynegy Northeast Generating	4,756,304	4.1%	5,956,177	2.0%	1,760
8	Exelon Holdings (Including Boston Generating LLC)[58]	4,625,233	3.9%	10,820,330	3.6%	942
9	Public Service Co. of NH	3,894,086	3.3%	5,150,764	1.7%	1,667
10	Pepco Holdings, Inc.	3,822,157	3.3%	5,300,500	1.7%	1,590
11	National Energy Gas and Transmission[59]	3,381,613	2.9%	6,275,832	2.1%	1,188
12	Reliant	3,155,420	2.7%	4,388,218	1.4%	1,585
13	Calpine	2,913,337	2.5%	7,520,652	2.5%	854
14	Goldman Sachs (Cogen Technologies)	2,817,272	2.4%	5,262,331	1.7%	1,180
15	Danielson Holding Company (MSW Energy, American Ref-Fuel Co. and Covanta)	2,634,178	2.3%	2,584,621	0.9%	2,247
16	Duke Energy	2,216,378	1.9%	5,920,289	2.0%	825
17	FPL Energy	2,014,827	1.7%	14,552,295	4.8%	305
18	Con Edison	1,910,680	1.6%	3,883,347	1.3%	1,085
19	ArcLight and Delta Power	1,632,050	1.4%	1,743,363	0.6%	2,064
20	Eastman Kodak Company	1,439,513	1.4%	759,022	0.2%	4,181
21	Power Authority of State of NY	1,397,302	1.2%	22,035,744	7.3%	140
22	Energy East (Rochester Gas and Electric)	1,285,054	1.2%	1,545,236	0.5%	1,833
23	The Premcor Refining Group, Inc	1,092,539	0.9%	623,450	0.2%	3,863
24	Brooklyn Navy Yard Cogen LP	1,079,234	0.9%	1,964,322	0.6%	1,211
25	International Paper Co.	1,071,214	0.9%	2,710,543	0.9%	871

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Table A3 *(continued)*: CO2 Emissions by Power Company in 2004, Ranked by Tonnage

Rank	Corporation	CO_2 Emissions (Metric Tons)	Percent of Regional Total	Generation (MWh)	Percent of Regional Total	Carbon Efficiency (lbs CO_2/MWh)
26	Wheelabrator	970,216	0.8%	1,105,951	0.4%	1,934
27	El Paso[60]	916,471	0.8%	2,308,087	0.8%	875
28	International Power	905,170	0.8%	2,306,065	0.8%	865
29	CitiGroup	883,824	0.8%	2,203,616	0.7%	884
30	Saranac Energy Co., Inc.	880,684	0.8%	1,877,211	0.6%	1,034
31	Sithe Energies[61]	711,802	0.6%	1,686,366	0.6%	931
32	TransCanada Co. (Ocean State Power Co.)	626,037	0.5%	1,323,532	0.4%	1,043
33	Masspower	605,996	0.5%	1,240,552	0.4%	1,077
34	Berkshire Power Company LLC	496,909	0.4%	1,232,319	0.4%	889
35	Energy Investors Funds Group	453,242	0.4%	419,554	0.1%	2,382
36	Millennium Power Partners LP	408,387	0.3%	1,057,690	0.3%	851
37	Lockport Energy Associates LP	375,158	0.3%	795,266	0.3%	1,040
38	SD Warren Co.	221,788	0.2%	416,164	0.1%	1,175
39	Mead Paper	211,113	0.2%	1,023,647	0.3%	455
40	Advanced Energy Systems	210,377	0.2%	284,485	0.1%	1,630
41	North Jersey Energy Assoc. LP	202,434	0.2%	415,450	0.1%	1,074
42	Finch Pruyn & Company Inc.	168,633	0.1%	217,852	0.1%	1,707
43	Massachusetts Municipal Wholesale Electric Co.	167,779	0.1%	269,224	0.1%	1,374
44	Starrett City Inc.	132,929	0.1%	72,764	0.0%	4,027
45	Massachusetts Institute of Technology	120,408	0.1%	153,548	0.1%	1,729
46	Project Orange Association	95,842	0.1%	165,005	0.1%	1,281
47	SAPPI	91,291	0.1%	771,710	0.3%	261
48	Madison Paper Industries	64,944	0.1%	147,649	0.0%	970
49	Boralex	52,673	0.1%	749,630	0.2%	155
50	Katahdin Paper Inc.	46,731	0.0%	165,127	0.1%	624

Table A4: Detailed Emissions Data for the Top 50 Polluting Power Plants in 2004

Rank	Plant Name	Owner	State	CO_2 Emissions (Metric Tons)	Percent of Regional Total CO_2 Emissions	SO_2 Emissions (Tons)	Percent of Regional Total SO_2 Emissions	NO_x Emissions (Tons)	Percent of Regional Total NO_x Emissions
1	Brayton Point	Dominion[62]	MA	5,685,746	4.8%	29,250	6.9%	9,568	8.1%
2	Northport	KeySpan Energy	NY	5,237,676	4.5%	28,099	6.7%	6,291	5.3%
3	Canal	Mirant	MA	4,153,534	3.5%	28,181	6.7%	4,859	4.1%
4	AES Somerset LLC	AES Corporation	NY	4,115,023	3.5%	4,744	1.1%	3,513	3.0%
5	Mystic Generating Station	Exelon (Boston Generating LLC)[63]	MA	3,883,899	3.3%	5,059	1.2%	894	0.8%
6	Ravenswood	KeySpan Energy	NY	3,718,212	3.2%	6,574	1.6%	4,385	3.7%
7	Dunkirk Generating Station	NRG Energy	NY	3,227,040	2.8%	30,624	7.3%	4,213	3.5%
8	Roseton Generating Station	Dynegy Northeast Generating	NY	3,034,291	2.6%	23,161	5.5%	5,115	4.3%
9	CR Huntley Generating Station	NRG Energy	NY	2,991,975	2.5%	31,534	7.5%	5,763	4.9%
10	Linden Cogen Plant	Goldman Sachs (Cogen Technologies)	NJ	2,817,272	2.4%	7	0.0%	33	0.0%
11	Indian River	NRG Energy	DE	2,810,268	2.4%	24,202	5.7%	6,155	5.2%
12	Astoria Generating Station	Reliant Energy	NY	2,557,789	2.2%	2,833	0.7%	3,518	3.0%
13	PSEG Hudson Generating Station	PSEG Fossil LLC	NJ	2,554,037	2.2%	21,512	5.1%	8,239	6.9%
14	Bridgeport Station	PSEG Fossil LLC	CT	2,493,214	2.1%	2,867	0.7%	2,253	1.9%
15	Merrimack	Public Service Co. of NH	NH	2,359,656	2.0%	29,736	7.1%	4,153	3.5%
16	Bergen	PSEG Fossil LLC	NJ	1,994,863	1.7%	30	0.0%	403	0.3%
17	Salem Harbor	Dominion[64]	MA	1,958,892	1.7%	8,208	1.9%	2,701	2.3%
18	PSEG Mercer Generating Station	PSEG Fossil LLC	NJ	1,900,685	1.6%	11,509	2.7%	6,026	5.1%
19	Danskammer Generating Station	Dynegy Northeast Generating	NY	1,722,013	1.5%	10,027	2.4%	2,618	2.2%
20	Chambers Cogeneration LP	ArcLight and Delta Power	NJ	1,632,050	1.4%	0	0.0%	0	0.0%
21	AES Cayuga	AES Corporation	NY	1,587,697	1.4%	3,044	0.7%	2,837	2.4%
22	Edge Moor	Pepco Holdings, Inc. (Conectiv)	DE	1,537,749	1.3%	9,784	2.3%	3,132	2.6%
23	Newington	Public Service Co. of NH	NH	1,534,430	1.3%	16,783	4.0%	2,700	2.3%
24	Kodak Park Site	Eastman Kodak Company	NY	1,439,513	1.2%	0	0.0%	0	0.0%
25	Port Jefferson	KeySpan Energy	NY	1,433,892	1.2%	9,030	2.1%	1,677	1.4%

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Table A4 *(continued)*: Detailed Emissions Data for the Top 50 Polluting Power Plants in 2004

Rank	Plant Name	Owner	State	CO_2 Emissions (Metric Tons)	Percent of Regional Total CO_2 Emissions	SO_2 Emissions (Tons)	Percent of Regional Total SO_2 Emissions	NO_x Emissions (Tons)	Percent of Regional Total NO_x Emissions
26	Lovett	Mirant	NY	1,427,286	1.2%	9,282	2.2%	3,829	3.2%
27	Charles Poletti	Power Authority of State of NY	NY	1,397,302	1.2%	1,275	0.3%	1,761	1.5%
28	Westbrook Energy Center	Calpine	ME	1,312,372	1.1%	7	0.0%	99	0.1%
29	AES Thames	AES Corporation	CT	1,297,098	1.1%	0	0.0%	0	0.0%
30	Rochester 7	Energy East (Rochester Gas & Electric Corp)	NY	1,285,054	1.1%	26,905	6.4%	2,829	2.4%
31	Logan Generating Plant	National Energy Gas and Transmission[65]	NJ	1,246,221	1.1%	0	0.0%	0	0.0%
32	Selkirk Cogen Partners LP	National Energy Gas and Transmission[66]	NY	1,244,820	1.1%	0	0.0%	0	0.0%
33	Bridgeport Energy Project	Duke Energy	CT	1,225,208	1.0%	7	0.0%	191	0.2%
34	BL England	Pepco Holdings, Inc. (Atlantic City Electric Co.)	NJ	1,129,328	1.0%	13,533	3.2%	4,163	3.5%
35	Delaware City Plant	The Premcor Refining Group, Inc	DE	1,092,539	0.9%	0	0.0%	231	0.2%
36	Brooklyn Navy Yard Cogeneration	Brooklyn Navy Yard Cogen LP	NY	1,079,234	0.9%	24	0.0%	80	0.1%
37	AES Granite Ridge[70]	AES Corporation	NH	1,077,308	0.9%	6	0.0%	96	0.1%
38	Bellingham Cogeneration Facility	FPL Energy	MA	1,072,663	0.9%	0	0.0%	0	0.0%
39	Newington Power Facility	Con Edison Energy	NH	1,030,677	0.9%	13	0.0%	76	0.1%
40	Maine Independence Station	Duke Energy	ME	991,170	0.8%	6	0.0%	132	0.1%
41	Athens Generating LP	National Energy Gas and Transmission[67]	NY	890,572	0.8%	6	0.0%	136	0.1%
42	Lake Road Generating Plant	CitiGroup	CT	883,824	0.8%	5	0.0%	73	0.1%
43	Saranac Facility	TransAlta	NY	880,684	0.8%	0	0.0%	0	0.0%
44	Bowline Point	Mirant	NY	879,231	0.7%	2,210	0.5%	1,622	1.4%
45	EF Barrett	KeySpan Energy	NY	866,566	0.7%	386	0.1%	896	0.8%
46	Bucksport Mill	International Paper Company	ME	854,435	0.7%	0	0.0%	0	0.0%
47	Milford Power Project	El Paso[68]	CT	816,370	0.7%	7	0.0%	98	0.1%
48	Hay Road	Pepco Holdings (Conectiv)	DE	748,859	0.6%	6	0.0%	132	0.1%
49	AES Greenidge LLC	AES Greenridge	NY	734,275	0.6%	4	0.0%	111	0.1%
50	Sithe Independence Station	Sithe Energies	NY	711,802	0.6%	7	0.0%	99	0.1%

The Top 10 Carbon Dioxide-Emitting Power Plants

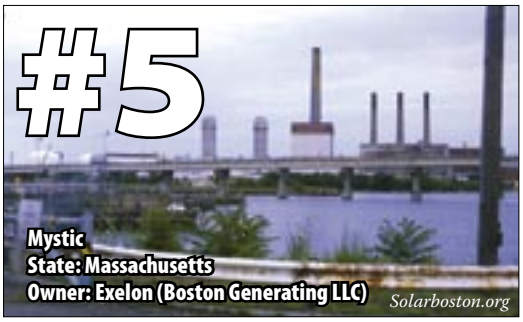
*In 2005, Dominion purchased Brayton Point from USGen New England.

#2

KEYSPAN

No photo available

Northport
State: New York
Owner: KeySpan Energy



During the year 2004, Exelon transferred ownership of Boston Generating to a group of investors.

#6

KEYSPAN

No photo available

Ravenswood
State: New York
Owner: KeySpan Energy

#8

DYNEGY

No photo available

Roseton
State: New York
Owner: Dynegy Northeast