IMPORTING POLLUTION

COAL'S THREAT TO CLIMATE POLICY IN THE U.S. NORTHEAST

Union of Concerned Scientists
Citizens and Scientists for Environmental Solutions

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DECEMBER 2008

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The Union of Concerned Scientists (UCS) is the leading science-based nonprofit working for a healthy environment and a safer world.

The UCS Clean Energy Program examines the benefits and costs of the country's energy use and promotes energy solutions that are sustainable both environmentally and economically.

More information about the Union of Concerned Scientists and the Clean Energy Program is available on the UCS website (*www.ucsusa.org/clean_energy*).

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Cambridge, MA 02238-9105

Or, email *pubs@ucsusa.org* or call (617) 547-5552.

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ACKNOWLEDGMENTS

This report was made possible in part through the generous support of The Educational Foundation of America, Edwards Mother Earth Foundation, The Energy Foundation, John Merck Fund, The Dirk and Charlene Kabcenell Foundation, The Korein Foundation, Mertz Gilmore Foundation, Oak Foundation, NoraLee and Jon Sedmak, and Wallace Global Fund.

We would like to thank David Farnsworth, Seth Kaplan, and Rob Sargent for their insightful comments on the draft report. Thanks also go to the UCS colleagues who provided helpful input, assistance, and guidance on the report, including Alan Nogee, Steve Clemmer, Barbara Freese, Ned Raynolds, and Kristen Graf, and to Ben Warfield for help in finding the data. And our gratitude also goes to the many policy makers and advocates who worked to shape the all-important first multi-state effort to cap global warming pollution in the United States, the Regional Greenhouse Gas Initiative.

We thank our editor Sandra Hackman for making the report a better read, Penny Michalak for making it more attractive, Heather Tuttle for making it happen more smoothly, and Bryan Wadsworth for guiding the whole process.

The opinions expressed in this report do not necessarily reflect those of the organizations that funded the work or of the reviewers. The opinions and information expressed herein are the sole responsibility of the authors.

EXECUTIVE SUMMARY

Near Fort Martin, WV, just miles from the Pennsylvania and Maryland borders, a new "crop" of an old variety is sprouting. A 695-megawatt coal plant under construction is aimed at meeting the growing demand for power not in West Virginia or Pennsylvania—which already produce much more electricity than they use—but in other Northeast and mid-Atlantic states. In fact, coal already fuels about half of all the electricity used in the United States, and its abundance and historically low price have made that power relatively cheap.

That low price, however, is misleading. Coal-burning power plants create serious adverse impacts, imposing high costs and risks on society. Coal burning is a leading source of mercury contamination and the pollutants that cause smog and acid rain. The process of cooling and scrubbing is water-intensive, accounting for a significant portion of the nation's fresh water use, with attendant damage to aquatic ecosystems. Underground coal mining is dangerous, and both underground and surface mining can cause extensive damage to landscapes, water supplies, and ecosystems.

Yet coal's greatest potential to inflict catastrophic harm lies in the fact that it is the most carbon-intensive fossil fuel, and thus a huge global warming threat. In fact, coal is responsible for one-third of all U.S. carbon dioxide (CO_2) emissions from energy use—about the same amount as that from the country's cars, trucks, buses, trains, and boats combined. Even new coal plants emit more than twice as much CO_2 per unit of electricity as new natural gas plants.

To help address this threat, 10 northeastern and mid-Atlantic states are committed to stabilizing and even cutting global warming emissions beginning in 2009, through the path-breaking Regional Greenhouse Gas Initiative (RGGI). This agreement begins to recognize the cost of climate change by capping CO_2 emissions, and by requiring owners of power plants in the region to buy "allowances" to emit such pollution. In September 2008, participating states auctioned off the first allowances, as a prelude to the launch of the nation's first cap-and-trade system for global warming pollution.

Yet RGGI's very approach threatens to expand reliance on coal-based electricity produced *elsewhere*—thus offsetting its global warming reductions. That is because RGGI puts a price on emissions only from power plants within the region, making electricity from plants outside the region less expensive. That, in turn, could spur

electricity suppliers in RGGI states such as Maryland to import more power from coal-producing states such as West Virginia.

The resulting higher emissions could undo many of the initiative's promised gains:

- Use of the excess capacity of existing coal plants to the west and south of the RGGI region—the equivalent of 15 new coal plants—could produce heat-trapping pollution three and a half times the cuts expected under the initiative. These emissions would equal those from more than 9 million extra cars on the road.
- The six coal plants under or near construction in states near the Northeast could emit global warming pollution equal to 140 percent of RGGI's reductions—the equivalent of emissions from 4 million more cars on the road.
- Several proposed projects would expand the transmission "highway"—the electricity grid that allows power to flow from west to east. That would enable more coal-based electricity to stream from Ohio, Pennsylvania, and West Virginia—states that have not joined RGGI—to Delaware, Maryland, and New Jersey: all states that have agreed to cap their emissions.
- A working group composed of environmental and energy staff from RGGI states projected that rising CO_2 emissions in the Midwest could offset more than one-quarter of the emission cuts spurred by RGGI—even without new transmission lines that would enable more electricity to flow between regions.
- Increases in imports of electricity from coal plants outside the RGGI region that amount to less than 5 percent of today's demand inside the RGGI region would offset all the emission reductions mandated in the year of deepest cuts under the initiative.

RGGI states have agreed to channel revenue from the auction of CO_2 allowances into energy efficiency and renewable energy. That will reduce demand for electricity and imported dirty power. However, those longer-term investments will not offset the immediate threat from greater reliance on coal-based electricity.

Fortunately, RGGI states could tap a range of solutions to plug the leak:

- They could limit the ability of in-state electricity suppliers to contract for power from more polluting plants, whether inside or outside the region.
- They could cap global warming emissions from the entire portfolio of each local electricity supplier.
- Together or individually, RGGI states could require local electricity suppliers to account for global warming emissions from electricity produced outside the region as well as inside it, offsetting the advantage of imported coal power. States could, for example, require local suppliers to offset any increases in emissions linked to higher imports by expanding their investments in energy efficiency, renewable energy, or another public good.
- RGGI states could insist that proposed transmission projects to expand the flow of power from states with abundant coal consider the Northeast's goals for cutting global warming pollution.

Efforts to address global warming emissions in other regions point to the wisdom of such actions. California's nascent efforts to deal with such emissions have prompted the cancellation of at least one out-of-state coal plant project, by creating uncertainty about its economic viability. And regional efforts now in the planning stages—including the Western Climate Initiative and the Midwestern Greenhouse Gas Reduction Accord—are likely to consider the climate impacts of *all* the power used in the region, not just that produced in participating states.

The tremendous challenge of climate change demands swift and deep cuts in global warming pollution. The Northeast must act now to ensure that RGGI does not merely shift the coal industry's expansion plans to areas outside the region—and that the pioneering initiative achieves its full potential.

CHAPTER ONE

INTRODUCTION

The Northeast has long been an environmental leader. With strong energy efficiency standards and renewable energy policies, and a business climate attractive to clean technology companies, most states in the region have managed to keep growth in global warming emissions much lower than growth in the economy and population[1]—and far lower than in the country as a whole.[2]

The region took an early lead in climate policy when 10 states—Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont—agreed to cap carbon dioxide (CO_2) emissions from power plants under the Regional Greenhouse Gas Initiative (see Figure 1). RGGI (pronounced "reggie") is a cap-and-trade system that limits CO_2 emissions from power plants in those states to a total of 188 million tons per year from 2009 to 2015. That cap drops 10 percent by the end of 2018.

Under the agreement, each participating state receives a fixed number of permits to release CO_2 emissions—known as allowances—based on its historical emissions. Each allowance authorizes a power plant to emit one ton of CO_2. Each state will auction all or most of its CO_2 allowances to owners of power plants, and return the proceeds to ratepayers—chiefly as investments in energy efficiency and renewable energy.

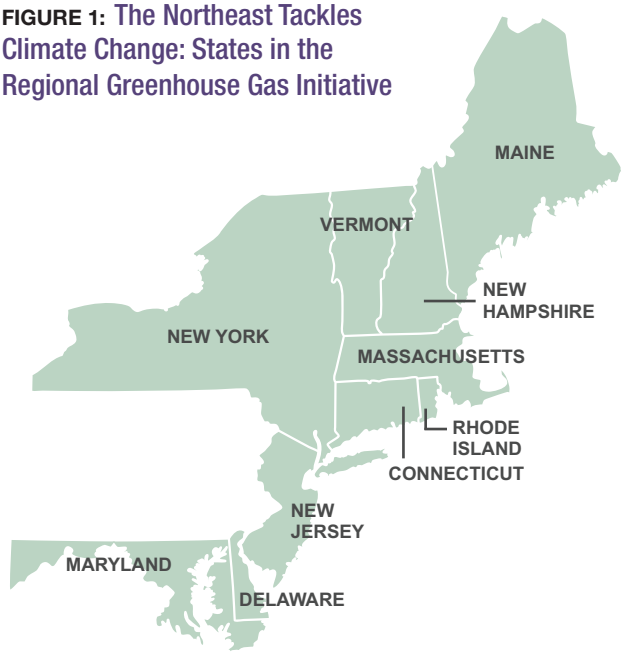
Owners of all power plants in the region larger than 25 megawatts must buy allowances based on those plants' actual emissions, measured over a three-year compliance period. The ensuing buying and selling of these allowances will create a market for global warming emissions. In September 2008, RGGI states conducted the nation's first auction of CO_2 allowances created under a mandatory cap-and trade system.

Cuts in CO_2 emissions under RGGI will be modest: the 10 percent reduction from the 2009 cap level by 2018 is significantly less aggressive than the 15–20 percent reductions from 2000 levels by 2020 called for by leading U.S. scientists and economists.[3] However, the initiative is a milestone in the U.S. response to global warming, and provides an important model for the nation in addressing climate change.

Unfortunately, increased imports of coal-fired electricity into the region threaten to undermine that promise, and the region's environmental leadership. Higher peaks in electricity demand on hot summer days in the Northeast are fueling a push for more power capacity, and owners of coal-fired plants are positioning to meet that demand. Several dozen large coal-fired power plants sit just outside the RGGI region, and electricity producers have proposed at least a dozen more.

In fact, RGGI itself may spur rising imports of electricity from existing or new coal plants because of a flaw in its design. The agreement does not cover global

FIGURE 1: The Northeast Tackles Climate Change: States in the Regional Greenhouse Gas Initiative



RGGI is a pioneering 10-state cap-and-trade system to limit CO_2 emissions from power plants.

BOX 1:

CLIMATE CHANGE IN THE NORTHEAST

Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions—a 2007 report based on a collaboration between the Union of Concerned Scientists (UCS) and more than 50 independent scientists and economists—outlined the expected impact of global warming on human health, the economy, and natural resources in the region, and thus the importance of reducing CO_2 emissions.[4]

Without urgent action today, the study found, the Northeast could face many more days with extreme heat and poor air quality, and the loss of the cod population in the historically important fishing ground of Georges Bank. An expected sea-level rise of 10 inches to two feet by the end of the century—along with more frequent and severe storm surges—would harm coastal communities, infrastructure, industry, and ecosystems. Significant loss of suitable habitat, including that for spruce/fir forests, could dramatically affect the fauna that inhabit forests, rivers, and streams.

However, the report also highlighted the abundant technologies and policies available to curb global warming pollution and the most dangerous consequences of climate change. These solutions would stimulate the region's economy, create jobs, save consumers money, and increase energy security.

warming emissions from electric power imported from plants outside the region. As owners of plants within RGGI states add the cost of allowances to emit CO_2 to the price of the power they produce, that cost difference will spur owners outside the region to ramp up the use of existing coal plants and build new ones (see Appendix A).

Today limits in the capacity of the grid used to transport electricity from one region to another hamper the ability of producers to move power from west to east. However, planned efforts to expand this capacity would remove that barrier, allowing states with large, low-priced coal resources that are outside RGGI, such as West Virginia, to send power to nearby states that are party to the agreement, such as Maryland. If such "leakage" occurs, the agreement could reduce CO_2 emissions much less than intended.

Individual states and the region as a whole must take critical steps to ensure that the very cap-and-trade system designed to limit global warming pollution does not end up undercutting itself.

Fortunately, northeastern states can directly control their own destiny to a large extent. RGGI itself will expand investments in energy efficiency and power based on renewable sources, which will curb the need for more electricity based on coal while also promoting economic development within the region. However, such investments alone will not be enough to forestall the expansion of coal-based electricity. Individual states and the region as a whole must take other critical steps to ensure that the very cap-and-trade system designed to limit global warming pollution does not end up undercutting itself.

This report tells the story of the links between coal-fueled power and climate policy in the Northeast. It examines the role of coal-fired electricity in the region, and explores what drives or limits the use of existing coal plants and the construction of new ones. The report also suggests options to ensure the success of the Northeast's important efforts to address global warming pollution and foster a national effort to tackle climate change.

CHAPTER TWO

THE CONTEXT FOR COAL

Understanding the outlook for coal in the Northeast depends on knowing why coal matters, particularly given climate change, and the variety of influences that will help determine whether its use will rise or fall.

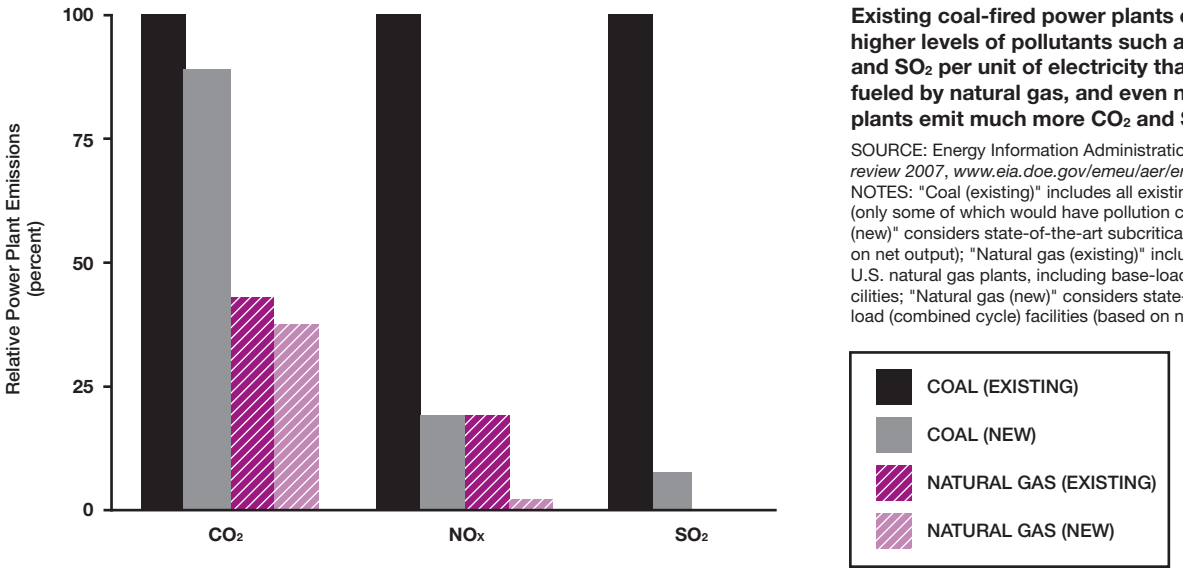
Why Coal Matters

Coal fuels half of our nation's electricity supply. Unfortunately, its environmental impacts are substantial and alarming—and much worse than those of natural gas, the second most commonly used fossil fuel for electricity.[5] Coal burning is the second-largest source of nitrogen oxides (NO_x), for example, which create smog, and the largest source of sulfur dioxide (SO_2), which causes acid rain.[6] Coal burning is also the largest source of fine soot particles, contributing to thousands of premature deaths annually from heart and lung disease, as well as the largest source of human-generated mercury.[7]

The process of cooling and scrubbing coal plants is very water-intensive, accounting for a significant portion of the nation's fresh water use,[8] with attendant damage to aquatic ecosystems.[9] Coal mining and combustion also create waste that presents potentially serious environmental threats, such as fly ash, bottom ash, boiler slag, and sludge from air pollution controls, from which toxic substances may leak out and contaminate water supplies. Underground coal mining is dangerous, and both underground and surface mining are highly damaging to landscapes, water supplies, and ecosystems.[10]

Yet coal's greatest potential to inflict catastrophic harm lies in the fact that it is the most carbon-intensive fossil fuel, and thus a huge global warming threat. Coal is responsible for one-third of all U.S. CO_2 emissions from energy use—about as much as the emissions from the country's cars, trucks, buses, trains, and boats combined.[11] Even new coal plants emit more than twice as much CO_2 per unit of electricity as new natural gas plants (see Figure 2).[12] A recent analysis from the Union of Concerned Scientists (UCS) reveals the serious consequences of such emissions for the Northeast (see Box 1).

FIGURE 2: Pollution Contest

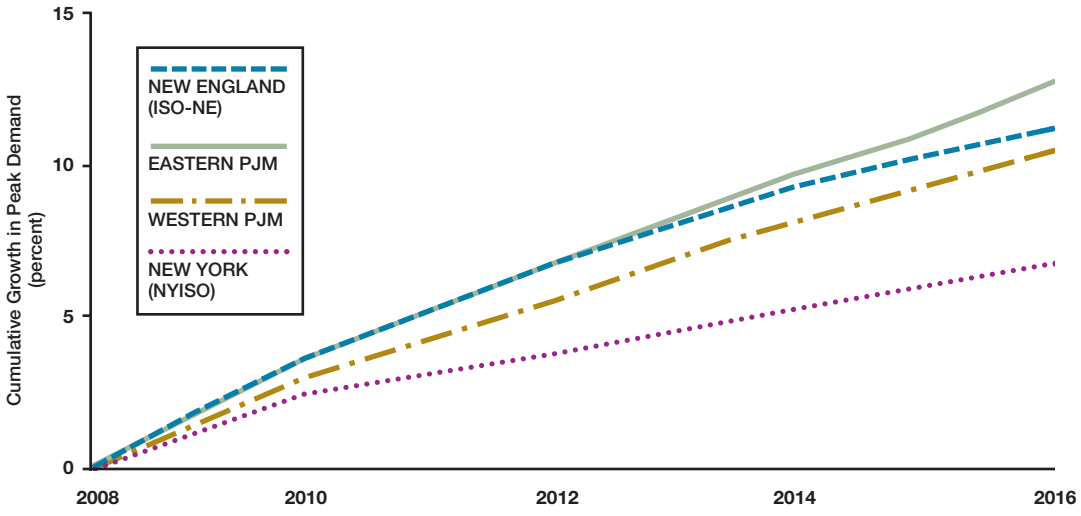


Existing coal-fired power plants emit much higher levels of pollutants such as CO_2, NO_x, and SO_2 per unit of electricity than plants fueled by natural gas, and even new coal plants emit much more CO_2 and SO_2.

SOURCE: Energy Information Administration, *Annual energy review 2007*, *www.eia.doe.gov/emeu/aer/envir.html.*
NOTES: "Coal (existing)" includes all existing U.S. coal plants (only some of which would have pollution controls); "Coal (new)" considers state-of-the-art subcritical facilities (based on net output); "Natural gas (existing)" includes all existing U.S. natural gas plants, including base-load and peaking facilities; "Natural gas (new)" considers state-of-the-art base-load (combined cycle) facilities (based on net output).

The environmental threats of coal include serious damage to landscapes, water supplies, and ecosystems. One of the more egregious practices is mountaintop removal mining (such as this operation near Marthatown, WV), which permanently destroys mountains and valleys, threatening the region's biodiversity and way of life.

FIGURE 3: Dangerous Climbs



Without sufficient attention to energy efficiency and good management, rising peak demand for electricity in summer in the Northeast may help drive greater use of coal-fired power plants. The numbers represent projected annual growth in peak demand over the next 10 years in PJM, ISO-NE, and NYISO—the "regional transmission organizations" that manage the Northeast's electricity grid.

SOURCES: PJM, PJM 2008 load forecast report, January 2008, online at *www.pjm.com/planning/res-adequacy/downloads/2008-load-report-data.xls;* ISO-NE, Forecast data 2007, worksheet 2, online at *www.iso-ne.com/trans/celt/fsct_detail/2007;* NYISO, 2007 New York Control Area peak load forecast, online at *www.nyiso.com/public/webdocs/products/icap/general_info/nyca_2007_icap_final.pdf.*

Factors Driving Greater Use of Coal

Whether coal-fired electricity expands to serve the Northeast despite such negative effects depends on some factors within the region's control and some beyond it—some pushing the use of coal power forward and some holding it back. Influences driving expanded use of coal include:

Lower fuel costs

The low cost of coal is a major driver of its widespread use in generating electricity. Coal plants cost more to build than natural gas plants, but coal itself is relatively cheap. Spot market prices for coal—those paid for immediate delivery—rose from $40 per ton in January 2007 to $140 per ton in August 2008.[13] However, that price remains lower than the price of oil and natural gas, and power producers purchase most coal under less costly long-term contracts.

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BOX 2:

DIRTY COAL

Many coal-fired power plants just outside the Northeast predate the 1990 Clean Air Act, and have operated for decades without effective emission controls. The Cardinal plant in Brilliant, OH, for example, which began operation in 1967, emits NO_x at more than twice the rate of the average coal plant in New York and New England.[16]

The U.S. Environmental Protection Agency, several northeastern states, and national environmental groups have repeatedly cited and sued five of the companies that operate these plants for expanding their capacity without installing pollution controls required by the Clean Air Act. Three of those companies—VEPCO (owned by Dominion), Ohio Edison (part of FirstEnergy), and American Electric Power—have settled these lawsuits, and are now spending billions of dollars installing equipment to reduce sulfur dioxide, nitrogen oxide, and particulate emissions.[17] However, Duke Energy and Allegheny Power have not settled. And none of the controls being installed by the first three companies will reduce their CO_2 emissions.

Rising demand

Although overall demand for electricity in the Northeast has remained relatively flat, demand during periods of highest use ("peak" demand) grew an average of 3.0 percent per year from 2001 to 2006.[14] Regional transmission organizations (RTOs)—which manage electricity flows over larger areas than those typically covered by independent utilities—expect that growth to continue (see Figure 3). PJM, an RTO that includes all or portions of 13 states, forecasts that summer peak demand will rise 1.5 percent per year in its eastern region, which includes RGGI states Delaware, Maryland, and New Jersey, and 1.2 percent in its western region.[15] ISO-NE, the RTO that serves New England states, predicts annual growth of 1.7 percent in summer peak load between 2007 and 2016.[18] NYISO, which serves New York State, expects growth of around 1.0 percent.[19] Coal plants may be well positioned to serve that increased demand.

More run time for cheaper plants

In the 1990s, the lower emissions profile of natural gas and its then-low price spurred the construction of several thousand megawatts of natural gas plants in the Northeast. However, the price of natural gas has nearly quadrupled since 1990,[20] and owners now run these

plants much less often than they expected. Many coal units that predate the Clean Air Act, in contrast, run almost continuously.

Across the United States, power producers usually operate the plants that produce electricity most cheaply (although they may occasionally run more costly plants to ensure a reliable power supply). That means that cleaner but more expensive natural gas units operate less often, as they are throttled up and down depending on peak demand.

In the Northeast and Mid-Atlantic, plant owners submit a bid price for supplying electricity to the transmission grid. All plants running in a given hour receive the price bid by the owner of the most expensive plant needed at that time. Given the large number of natural gas plants in the Northeast and their relatively high fuel costs, natural gas sets the hourly price of electricity the vast majority of the time in New England, and often in other northeastern states. That means owners of low-cost coal units are often paid as if they were burning more expensive natural gas—allowing them to reap high profit margins (see Box 3).

Monopolies versus the free(r) market

Power companies in the Northeast operate in markets that have been "restructured," or largely deregulated. Under that approach, electricity generation, transmission, and distribution are seen as separate activities—and usually controlled by different companies. That approach gives owners of power plants in coal-heavy states bordering the Northeast—many of which have not restructured their electricity markets—certain advantages:

Power companies in the Northeast's "restructured" markets are at a disadvantage compared with owners of power plants in coal-heavy states that have not restructured their electricity markets.

Access to money. Electricity generators in states with restructured markets compete to sell electricity. In states with regulated monopolies, in contrast, public utility commissions set electricity rates based on the cost of power plants, plus an agreed-upon rate of return for their owners. Because financial rating agencies tend to view the traditional rate-setting process as lower risk, power producers in non-restructured states have easier access to financing, and a lower cost of capital.[23] That makes plants outside the Northeast less expensive to build and own, increasing the incentives for electric companies within the region to import power—often based on burning coal.

Local recovery of regional costs. Regulators in traditionally regulated states with many coal plants often approve upgrades to power plants and transmission lines even without clear local need for more power. Because captive ratepayers in these states pay for such upgrades, plant owners can sell their extra electricity cheaply in

BOX 3:

COAL RAKES IT IN

In 2007, the average market-clearing price for PJM—that is, the average price received by all plant owners supplying electricity at a given time—was $61.66 per megawatt-hour.[21] The profit margin for the owner of the plant (which is usually fired by natural gas) setting that price would be limited to the profit in the $61.66 bid.

However, the owner of a coal unit bidding into the market at $40 per megawatt-hour would reap an enviable profit margin of $21.66—on top of whatever profit the $40 bid included beyond fuel and other costs. That means a 600-megawatt coal plant operating 85 percent of the time—the annual average—would make more than $97 million in extra profit. Because of such advantages, one utility estimated, the Merrimack coal plant in Bow, NH, earned a 67 percent rate of return in 2005.[22]

other markets. What's more, although recent pollution control settlements are forcing owners of some older plants to upgrade them, local ratepayers will again cover much of the cost of the new controls—sustaining the cost advantage of those plants.[24]

Archaic modeling

A small but growing number of states now require electric utilities and public utility commissions to consider the costs and risks of rising fuel prices and current or future controls on CO_2 and other emissions when deciding whether to build new power plants. However, a large majority of states do not require utilities and commissions to account for such costs and risks.[25] That approach makes coal look less costly than it may prove to be—and potentially cheaper than other options—spurring the construction of new coal plants (see Box 4).

For example, the risks of meeting demand by encouraging energy efficiency are minimal compared with those of building new coal plants. That's because efficiency is not subject to fluctuations in the price of fuel, and because it has fewer environmental impacts. Efficiency measures also have much lower operating and maintenance costs, and can reduce the need to upgrade the power lines used to transmit electricity. However, many economic models of the cost of new power sources use the same criteria to evaluate both energy efficiency and new plants.

BOX 4:

COAL DOESN'T ADD UP

In November 2007, the Southern Environmental Law Center gave testimony in Virginia that Dominion Virginia Power had not considered the costs of greenhouse gas regulation in the economic analysis of its proposed 585-megawatt Wise County coal plant. The testimony projected that such regulation would cost Dominion and Virginia ratepayers an additional $44 million to $169 million each year. The testimony also noted that Dominion had ignored the option of pursuing energy efficiency measures rather than coal-fired generation—which, the center noted, were two to five times more cost-effective.[27]

Factors Driving Coal Away

In contrast to the factors driving greater use of coal, some influences actively discourage its expansion:

Escalating costs

The costs of building coal plants are much higher than those of building other fossil fuel plants, and account for a larger component of the cost of a coal plant's electricity over its lifetime. Construction costs for coal plants have increased an average of almost 80 percent since 2000, owing to a 400 percent rise in the price of components such as nickel, copper, and tungsten, and rising cement prices and labor costs.[26] A weak U.S. dollar, global competition for resources, and higher energy costs may keep such prices high, undercutting demand for new coal plants.[28]

Transmission constraints

Transmission bottlenecks, particularly in the New York City and Washington, DC, areas, limit the flow of electricity from states with large amounts of low-priced coal-fired power, such as Pennsylvania and West Virginia, into Northeast states (see more on this below). This drives demand to more expensive (and cleaner) plants in the Northeast.

Tighter emission standards

Northeastern states are investigating the control measures they will need to comply with ozone standards of the U.S. Environmental Protection Agency (EPA).[29] Along the way, states have determined that those standards will not protect public health in the I-95 corridor stretching from Connecticut to Washington, DC. Beyond requiring local power plants to adopt more stringent controls, these states may petition the EPA—as

BOX 5:

LOCAL PAIN, LITTLE GAIN

Power producers in RGGI states will include the cost of permits to emit CO_2 in their hourly bids to electricity markets, raising the price of power. While small, this price difference will spur plant owners outside RGGI to produce more electricity to sell to RGGI states.

However, power producers in Pennsylvania, and probably Virginia and West Virginia, will also include the CO_2 charge in the prices they bid into the PJM market. That means consumers in the non-RGGI portion of PJM may pay higher costs for their electricity, just like their counterparts in RGGI, but will not receive the benefits—including investments in energy efficiency and renewable energy.

Instead, although the price difference attributable to RGGI will likely be small, producers in western PJM will reap hundreds of millions of dollars annually in extra profit. Public service commissions and consumer advocates in those states could consider seeking to recapture those excess profits and return them to consumers. Without such a move, local ratepayers will not benefit from the higher prices they pay because of RGGI.

they successfully did under the Clean Air Act in 1998—to force states that are the source of air pollution affecting the Northeast to add their own controls. Because coal plants create large amounts of ozone, such policies are likely to affect them.

New climate policies

In the absence of federal policy tackling climate change, some states and regions, such as the Northeast, have begun creating or have completed plans to reduce greenhouse gas emissions from power plants or their whole economies. Federal policy is likely to follow early in the new administration. Studies of a national CO_2 cap-and-trade bill considered by Congress in mid-2008 showed that most emission cuts would likely come from the electricity sector.[30] Because coal plants are such a substantial and easily targeted source of greenhouse gases, these policies will significantly affect the future of coal.

Despite these influences offsetting pressure to expand coal-based power, excess capacity in existing plants—and new plants now being planned—threaten to tilt the balance toward greater reliance on coal, and more carbon emissions.

CHAPTER THREE

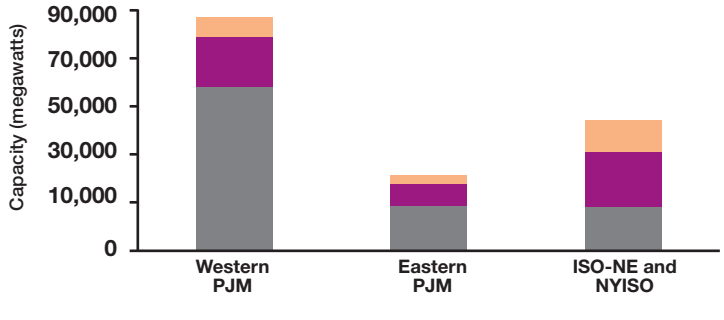
THE THREAT OF MORE COAL-BASED POWER

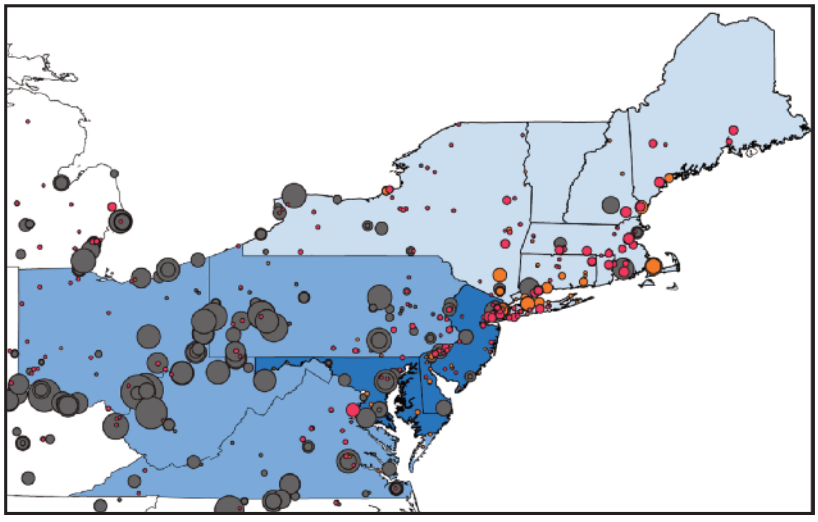
The Northeast could rely on a variety of technologies and fuels—and efforts to enhance energy efficiency—to meet rising demand for power. However, coal from outside the RGGI region is well positioned to expand its role because of excess capacity in existing coal-fueled power plants, and because of new plants already in the pipeline. The resulting rise in CO_2 emissions would greatly undercut the region's efforts to combat global warming.

Existing Plants: Too Much Growing Room

Excess capacity in existing coal plants in and near the Northeast is a significant and ready source of power (and global warming pollution—see Figure 4). Coal plants serving the Northeast tend to get heavy use, because they typically have lower operating costs than other fossil-fueled power plants. Even so, coal units in states both inside and outside RGGI often operate at less than full capacity (typically 85 percent) because of periods of limited demand, as well as limits in the capacity of the transmission grid.[31]

The "capacity factor" of coal plants across the country—the ratio of the energy a plant produces in a given time period (typically one year) to the theoretical amount it could have produced running 100 percent of the time at full power—averages about 73 percent. The capacity factor of the least-used plants is below 50 percent (see Figure 5, p. 13).





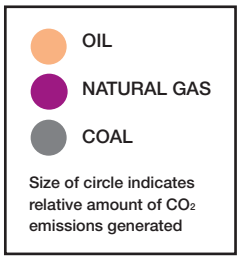


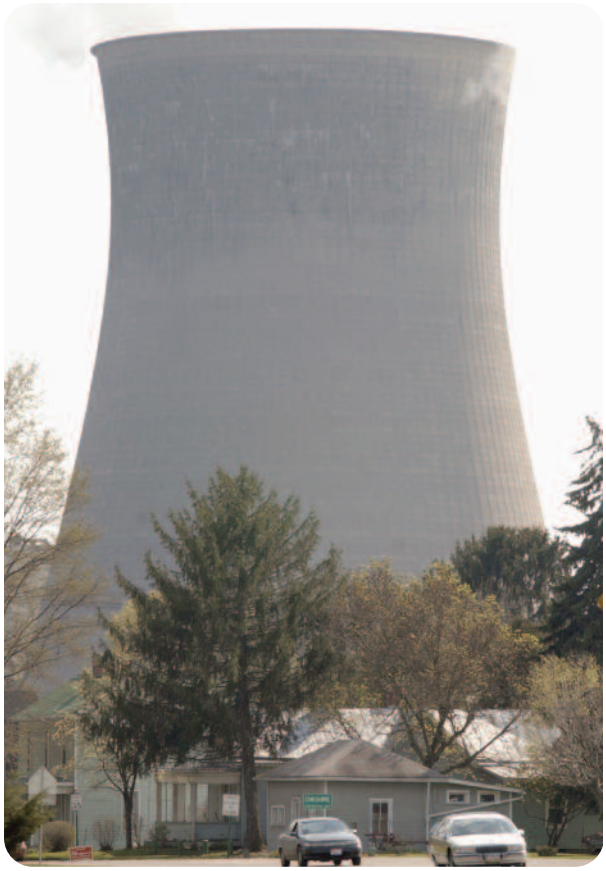
FIGURE 4: Where We Stand: Fossil-Fueled Power Plants in the Northeast

States in western PJM–which sit near RGGI states served by eastern PJM, ISO-NE, and NYISO–have significant capacity to burn fossil fuels to create electricity (top). An analysis of annual CO_2 emissions in the region shows the effect of heavy reliance on coal-fired power plants in western PJM states (bottom).

SOURCES: EPA, Clean air markets: Data and maps—2006 hourly emissions prepackaged data sets; eGRID2006 version 2.1 generator file (2004 data).

The considerable potential for expanding output from many coal plants in or near the Northeast has serious implications for the region's global warming emissions. Existing coal plants in the western region of PJM alone could generate some 66 billion more kilowatt-hours of electricity in a year than they produced in 2006—nearly an 18 percent increase. That is the equivalent of some 15 new coal plants, and enough electricity to power 11 million households. That new output would add 64 million tons of CO_2 emissions annually—more than a third of the CO_2 emissions from power plants in all RGGI states in 2006, and the equivalent of some 9 million more cars on the road (see Figure 6).[32] For more details, see Appendix B.

In western Pennsylvania, for example, one of three coal-fired units at the 2,460-megawatt Bruce Mansfield plant operated only 70 percent of the time in 2006. If that unit had run at 85 percent capacity, it would have generated another 1.2 billion kilowatt-hours of electricity. And if one of the two units at the 2,600-megawatt General James M. Gavin coal plant in southeast Ohio had run at 85 percent instead of its 2006 level of 64 percent, it would have produced up to 2.6 billion more kilowatt-hours of electricity. In so doing, those two plants alone would have emitted an additional 3.5 million tons of CO_2.[33]



Many coal-fired power plants to the west and south of the RGGI region have excess capacity, including the 2,600-megawatt General James M. Gavin plant in southeast Ohio (pictured here), which can contribute to additional global warming pollution in the Northeast.

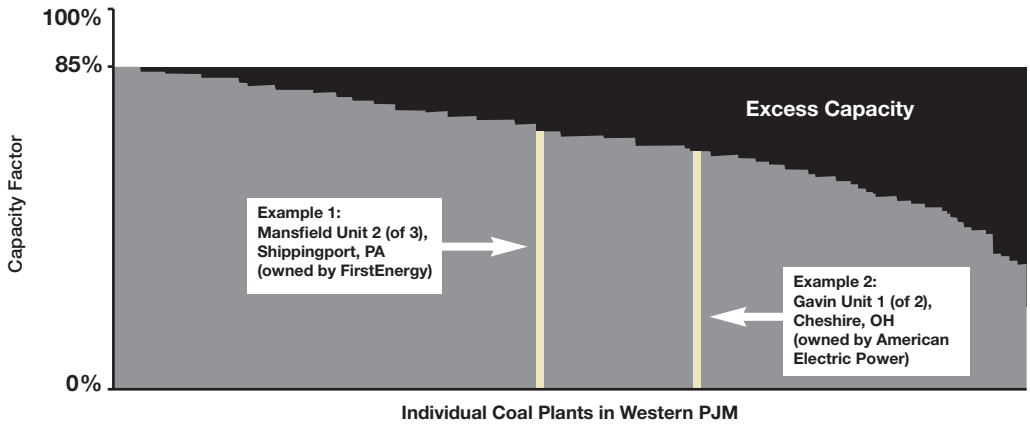
New Plants: Sunk Costs, Sunk Planet

Besides expanding the use of existing capacity, power producers respond to growing consumer demand by building new plants. For example, capacity in the three RTOs serving RGGI states—PJM, ISO-NE, and NYISO—grew from 106,800 megawatts in 2000 to 206,700 megawatts by 2006—an average of almost 12 percent per year.

Today the RTOs have power plants totaling 150,000 megawatts under construction or study. While a variety of factors determine where owners build new coal-fired plants—including population density, fuel availability, labor costs, and access to markets—states with less restrictive environmental policies attract more than their share (see Figure 7, p. 14).

And indeed, plant owners are concentrating the coal portion of that proposed capacity in western PJM states, including Ohio, Pennsylvania, and West Virginia, even though predicted growth in demand is higher in eastern PJM. For example, 97 percent of coal plants already being built in PJM states are in the western region. And 61 percent of 65,000 megawatts of new capacity now being studied—21 percent of which would come in the form of coal-fired units—is also in the western region.[34] This region includes states that are outside RGGI, and thus not subject to its limits on global warming emissions. That figure includes at least a dozen coal plants with capacity

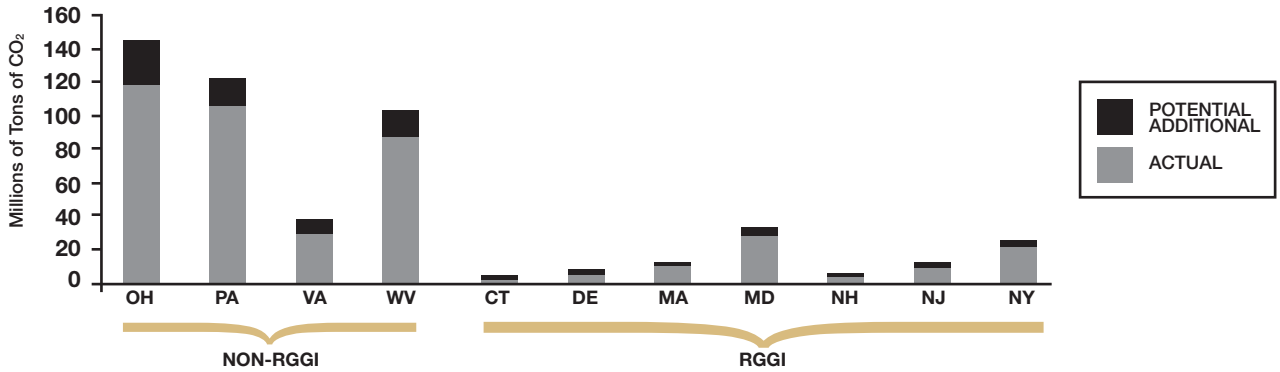
FIGURE 5: Growing Room: Capacity Factors of Coal Plants Just outside RGGI States



While coal plants can usually produce electricity 85 percent of the time, many operate at well below that level. That means they have excess capacity under certain conditions. The figure shows the capacity factors–the amount of time a plant is actually used–for more than 100 coal plants in some of the states of western PJM (Ohio, Pennsylvania, Virginia, and West Virginia). Those states are not members of RGGI, and thus are not subject to caps on global warming pollution.

SOURCES: EPA, Clean air markets: Data and maps—2006 hourly emissions prepackaged data sets; eGRID2006 version 2.1 generator file (2004 data).
NOTE: The figure includes plants larger than 100 megawatts with capacity factors under 85 percent and greater than 20 percent.

FIGURE 6: Coal Clouds: Actual and Potential CO_2 Emissions



Existing coal-fired power plants have significant potential to produce more global warming emissions because of their unused capacity–if they can get that electricity to market.

SOURCES: EPA, Clean air markets: Data and maps—2006 hourly emissions prepackaged data sets; eGRID2006 version 2.1 generator file (2004 data).

totaling almost 7,000 megawatts, of which six plants (3,700 megawatts) are under or near construction.[35]

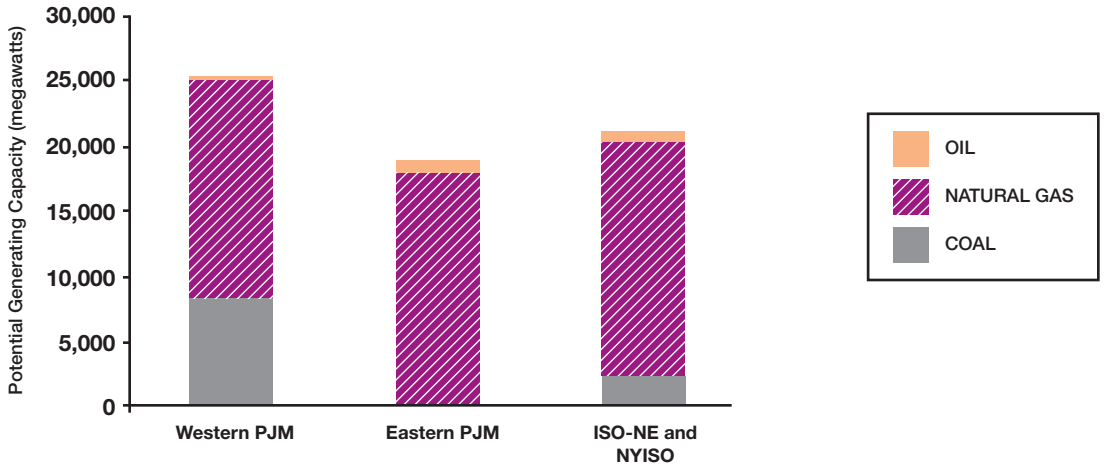
In sharp contrast, coal plants in eastern PJM—that is, Delaware, Maryland, and New Jersey, which are part of RGGI—account for less than 1 percent of the new capacity under construction or under study.[36] This trend is also clear in the other RTOs serving states that are part of RGGI, in New England and New York. Coal accounts for only 5 percent of new capacity under construction or study by ISO-NE and NYISO, while natural gas accounts for 41 percent.

Developers looking to build power plants within PJM have historically completed only 35 percent of proposed new capacity.[37] However, the western part of the RTO is clearly developing a significant number of new coal-fired power plants.

This represents a huge commitment to the wrong climate path. Once a new coal plant is built, its owner needs to use it more fully than other power plants, given that its construction takes years and is so costly. And given that coal plants last 50 years or more, even those based on the most efficient coal technologies now available could lock the region for the long term into heat-trapping emissions that undermine its goals.

Even though predicted growth in demand is higher in eastern PJM, 97 percent of coal plants already being built in PJM states are in the western region. Power plants under development in western PJM include at least a dozen coal plants with capacity totaling almost 7,000 megawatts, of which six plants (3,700 megawatts) are under or near construction.

FIGURE 7: Dark Horizons: Potential Fossil Fuel Expansion



The three regional transmission organizations that serve the Northeast have significant amounts of fossil-fueled generation under construction or under study. Coal plants are weighted heavily toward western PJM–that is, states that sit just outside RGGI. (The figure omits power plants that do not burn fossil fuels.)

SOURCES: PJM, Generation queues: Active, *www.pjm.com/planning/project-queues/queue-gen-active.jsp;* NYISO, Interconnection queue, *www.nyiso.com/public/services/planning/interconnection_studies_process.jsp;* and ISO-NE, Interconnection request queue, Active: Administered TX system, and Active: Affected system, *www.iso-ne.com/genrtion_resrcs/nwgen_inter/status/index.html.*

CHAPTER FOUR

THE IMPACT OF TRANSMISSION BOTTLENECKS

Transmission bottlenecks now prevent a significant amount of electricity from flowing west to east, to serve the Northeast. Those constraints reduce the availability of energy in certain areas at peak times, and raise its cost. However, if advocates of new transmission projects get their way, expanded capacity of the electricity grid will allow greater use of existing coal plants, and spur construction of new ones now on the drawing board.

Coal-Based Power Flows: West to East

Information on the amount of electricity each state imports and exports strongly suggests that much power now flows eastward—especially to the RGGI states of Delaware, Maryland, and New Jersey (see Figure 8). In fact, five of the 10 RGGI states are net importers of electricity, and none are large exporters compared with West Virginia and Pennsylvania. Indeed, those two states alone export more than enough electricity to fulfill the needs of the RGGI states that import electricity. And because coal fuels almost 100 percent of the electricity produced in West Virginia, and about 56 percent of that produced in Pennsylvania, a significant amount of the electricity that RGGI states use comes from coal.[38]

Despite these flows, congestion costs in parts of the region imply that transmission constraints are limiting the amount of electricity that states in eastern PJM import. With no such constraints, the average cost of additional electricity—known as the "location marginal price," or LMP—would be nearly the same everywhere, except for the small cost of electricity that is lost as it moves through the grid. Instead, areas with greater transmission constraints face higher LMPs.

In 2006, half of the congestion costs within PJM stemmed from four of the five most costly interfaces, which act as critical pathways for electricity produced in the western PJM region to high-load centers in eastern PJM. These constraints also imply that customers in eastern regions are exposed to more volatile short-term prices because of high congestion costs.[39]

Greater transmission capacity would make prices throughout PJM more even. However, such capacity could also allow more imports of coal-based electricity into eastern PJM.

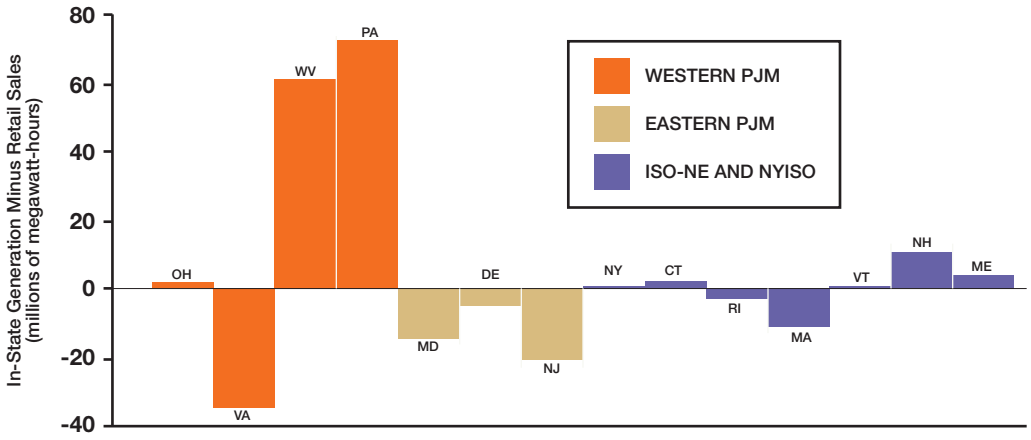


FIGURE 8:
Electricity Coming and Going

The difference between the amount of electricity Northeast states produce and the amount they sell in-state shows that the coal-heavy states of Pennsylvania and West Virginia export large amounts of power. (States with a net amount of electricity above zero export power, while those below zero import it.)

SOURCE: EIA, 2006 state electricity profiles, Table A1, Selected electric industry summary statistics by state, 2006.

Leakage Highways: New Transmission Coming Soon?

While transmission bottlenecks have constrained electricity service in the Northeast—and prevented the expansion of coal-based power—more grid capacity may be on the way. At least eight planned transmission lines would connect the Northeast to power plants farther west.[40] By mid-2007, PJM had approved $5.3 billion in upgrades to transmission lines to improve the reliability of the grid. In fact, projects worth at least $4.4 billion are specifically designed to reduce west-east congestion.

For example, PJM cited the need for a new transmission line, known as TrAIL (for Trans-Allegheny Interstate Line—see Figure 9), to run

> *…from western Pennsylvania to feed the Northern Virginia area–Washington, D.C.–Baltimore–Maryland area and other load centers. This area of PJM continues to experience significant economic growth, growth that requires access to additional sources of electricity and the transmission infrastructure to provide it.*[41]

Ohio, Pennsylvania, Virginia, and West Virginia are home to many PJM coal-fired units with excess capacity. Because the electricity grid draws power from the cheapest plants first, and because owners of many existing coal

While transmission bottlenecks have constrained electricity service in the Northeast—and prevented the expansion of coal-based power—more grid capacity may be on the way. At least eight planned transmission lines would connect the Northeast to power plants farther west.

plants have paid off their investments, more transmission capacity will boost the amount of both electricity and emissions from these units, especially given rising demand in RGGI states.

The federal government is now supporting new transmission lines even more strongly, and even preempting state authority on the siting of those lines. In late 2007, the U.S. Department of Energy designated two "national interest electric transmission corridors" to ease growing congestion. Within those corridors, the Federal Energy Regulatory Commission can override states' decisions and permit new transmission projects, if those projects would "significantly reduce congestion into or within the congestion area."

The Mid-Atlantic Area National Corridor includes parts of Ohio, West Virginia, Pennsylvania, and Virginia—all potential sources of coal-related power—plus parts of New York and Maryland and all of New Jersey and Delaware: four RGGI states (see Figure 10).[42] The creation of this corridor will boost federal support for new

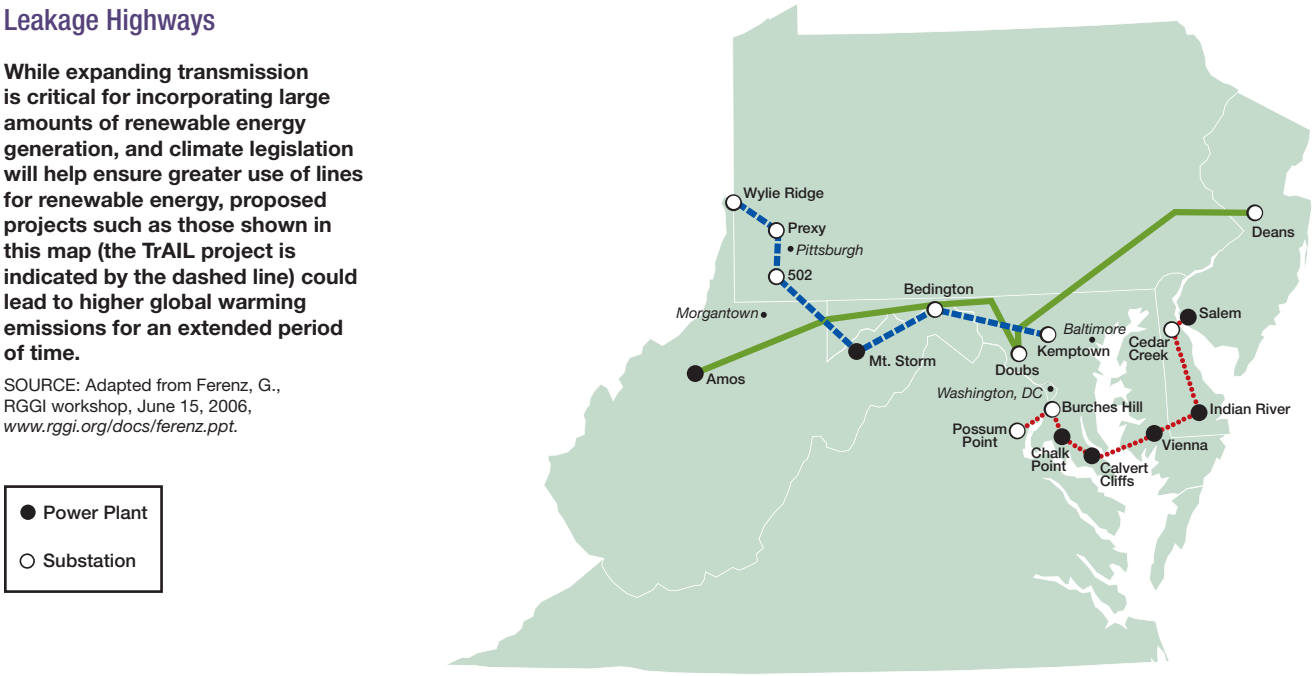
Proposed transmission projects would allow larger amounts of coal-fired electricity to flow in the near term into the RGGI region, particularly Delaware, Maryland, and New Jersey.

FIGURE 9:

Leakage Highways

While expanding transmission is critical for incorporating large amounts of renewable energy generation, and climate legislation will help ensure greater use of lines for renewable energy, proposed projects such as those shown in this map (the TrAIL project is indicated by the dashed line) could lead to higher global warming emissions for an extended period of time.

SOURCE: Adapted from Ferenz, G., RGGI workshop, June 15, 2006, *www.rggi.org/docs/ferenz.ppt.*



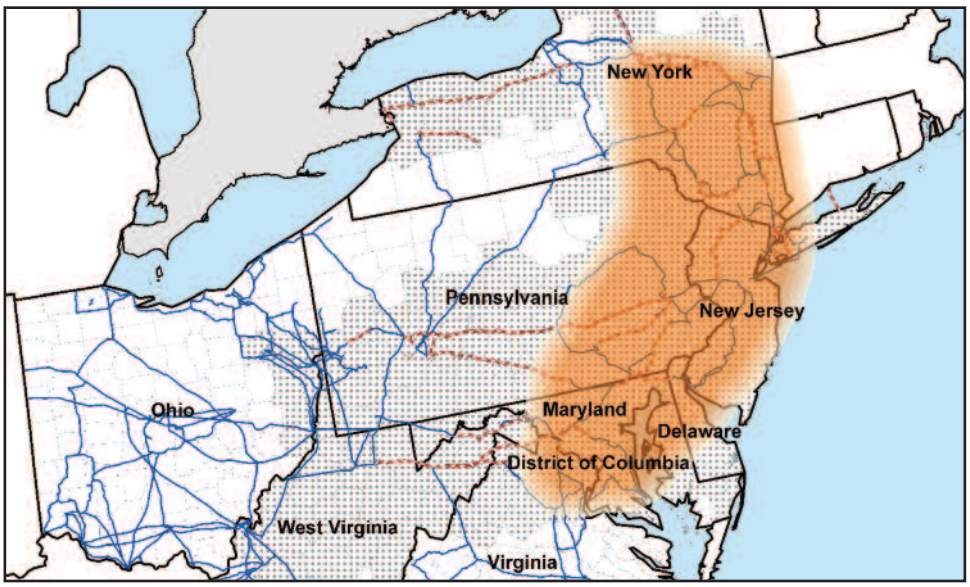


FIGURE 10:

Expanding Federal Authority

The U.S. Department of Energy's 2007 designation of a "national interest electric transmission corridor" in the Northeast allows proponents of new transmission projects to seek federal overrides of state and local permitting.

SOURCE: Department of Energy, 2007, DOE designates Southwest area and Mid-Atlantic area National Interest Electric Transmission Corridors, *www.energy.gov/news/5538.htm.*

transmission projects that affected residents and industries, such as owners of existing power plants inside RGGI, might otherwise successfully oppose.

Expanded capacity to transmit electricity would likely mean an even greater near-term flow of coal-fired electricity from western PJM to eastern PJM and other RGGI states. Lower congestion costs would make coal-fueled power plants in the west even more competitive, while power producers in eastern PJM states continued to face higher fuel costs because of their greater dependence on natural gas. This trend could spur even more proposals for new coal plants and new transmission capacity, as electricity production moved away from higher-priced states. The result would be greater amounts of heat-trapping emissions.

Expanding transmission is also critical for incorporating the large amounts of renewable energy generation that will be needed to meet climate goals. Over the long run, federal cap-and-trade legislation will likely ensure that the generation feeding into the grid produces a net reduction in global warming emissions. But there is significant potential for an extended problem in the meantime depending on how long it takes for climate legislation to be enacted and on the structure of that legislation. Lax near-term targets, "safety valves" that allow utilities to avoid meeting the targets, or extensive allowance for using carbon offsets—such as planting trees—to meet the targets could lead to higher global warming emissions for an extended period of time.

CHAPTER FIVE

AT A CROSSROADS: COAL AND CLIMATE POLICY

Climate policies have important implications for the use of coal. If wielded wisely, they will reduce global warming pollution, as electricity providers and customers respond to emission caps and rising costs by moving to low- or no-carbon options such as energy efficiency and renewable energy—and away from dirty coal. Used poorly or implemented incompletely, however, they may lead to rising emissions in one region or sector, offsetting reductions elsewhere.

In the absence of federal leadership, states across the country have developed comprehensive short-, medium-, and long-term action plans to reduce greenhouse gas emissions. California and the RGGI states were the first to focus on CO_2 from the utility sector, and others have followed, drawing on their experience in regulating power plant emissions such as NO_x and SO_2 over the past 20 years. RGGI's cap-and-trade structure is based on the EPA's NO_x budget program, a cap-and-trade system that has significantly and cost-effectively reduced power plant emissions since 1998.

Several states have now capped heat-trapping emissions from all sectors. For example, an executive order in February 2007 by New Jersey Governor Jon Corzine—codified by legislation in July 2007—requires the state to reduce greenhouse gas emissions by 80 percent from 2006 levels by 2050.[43] Connecticut's Global Warming Solutions Act, passed in May 2008, similarly requires 80 percent across-the-board cuts from 2001 levels by 2050.[44] The Massachusetts Global Warming Solutions Act of July 2008 sends an even stronger near-term signal, requiring cuts of 10 to 25 percent below 1990 levels by 2020, and 80 percent cuts by 2050.[45] Washington State has also legislated a cap on heat-trapping emissions. These initiatives have strong implications for the future of coal.

California's recent climate change initiatives show the potential for comprehensive policies to frustrate coal's advance. The state's landmark 2006 Global Warming Solutions Act requires electricity providers to include an implicit cost for carbon emissions, including those "imported" from other states. And in early 2007, the state announced plans to require long-term contracts for electricity retailed in the state—whether produced in-state or imported—to meet stringent environmental requirements, including limits on global warming pollution.[46]

California has no large coal plants of its own, but imported coal-based electricity accounts for almost 30 percent of the state's greenhouse gas emissions from the utility sector.[47] The costs of meeting California's requirements may make many of these coal plants uneconomical—and thus prevent emissions leakage.

In fact, California's efforts have already had an impact on projects such as a 950-megawatt upgrade to Intermountain Power's coal plant in western Utah. The developer, PacifiCorp, abandoned plans for the plant in December 2007 because of concerns about the "timeframe and the uncertainty around coal, based on climate change issues." The decision came after the six California cities that buy 75 percent of the power from the plant refused to support the expansion.[48] Though without so explicit a connection, developers also shelved plans to build other coal plants, including the 1,450-megawatt Granite Fox facility in Nevada and the 850-megawatt Hunter 4 plants in Utah.[49]

Even Midwest states—which Northeast states have long criticized for tall smokestacks that spread pollution downwind—are considering regional legislation to ensure that companies are responsible for emissions from all electricity they sell, including imported power.

The Carbon Math

While a number of Northeast states are addressing carbon emissions head-on, states bordering RGGI to the west and south still have no regulatory constraints on carbon emissions, and coal continues to dominate electricity generation in those regions. Indeed, a working

BOX 6:

SHORTSIGHTED LONGVIEW

Just two dozen miles outside the RGGI region, not far from the Maryland border, a new coal plant in West Virginia could punch a big hole in the cuts in CO_2 emissions the initiative is designed to spur. The 695-megawatt Longview Power Plant, under construction in Fort Martin and scheduled for completion in 2010, could emit 4 million to 5 million tons of CO_2 each year—almost a quarter of RGGI's reductions in its year of deepest cuts.[50] The project's proponents say it will sell its electricity into PJM, "the largest and most liquid competitive wholesale electricity market in the United States."[51]

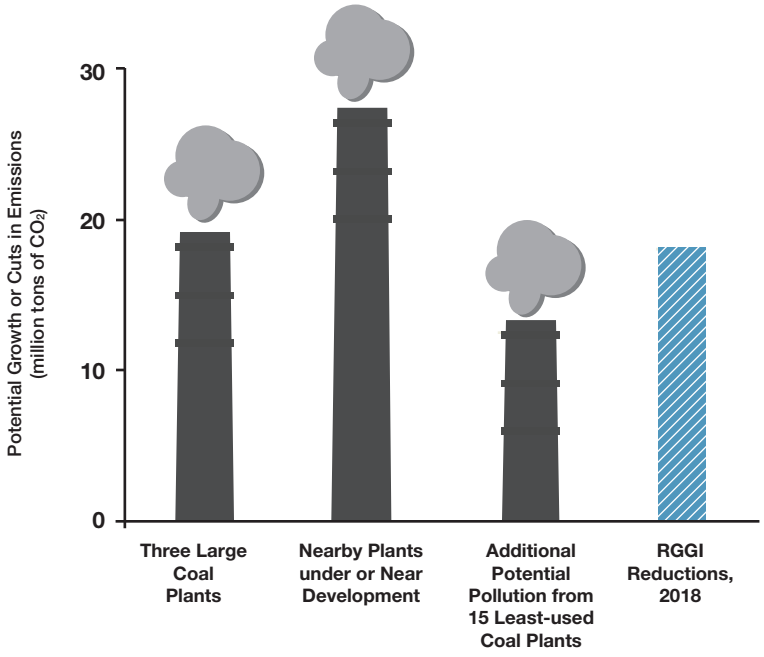
group composed of environmental and energy staff from RGGI states projected that rising CO_2 emissions in the Midwest would offset 27 percent of the cumulative emission cuts spurred by RGGI through 2015—even without new transmission lines that would enable more electricity to flow between regions.[52]

In fact, a single year's CO_2 emissions from just three new large coal plants would cancel out reductions mandated by RGGI during the year of deepest cuts.[53] And the six plants already under or near development in nearby states could emit 140 percent of those reductions (see Figure 11).

Furthermore, if existing plants in PJM simply expanded their output by tapping 30 percent of their excess capacity, the annual rise in CO_2 emissions would completely offset the cuts that RGGI mandates. And rising utility prices resulting from RGGI could spur power plant owners to do just that. The average capacity factor of the 15 power plants (of more than 25 megawatts) with the lowest capacity factors in western PJM states is 50 percent—well below their potential of 85 percent. If owners expanded the output of these 15 plants to 85 percent, annual CO_2 emissions would rise by 13.3 million tons—offsetting most of the 19 million tons that RGGI is expected to save in its final year. And because states just outside PJM offer still more potential for expanded coal generation, even these figures understate the threat.

FIGURE 11: Coal vs. Climate

A single year's CO_2 emissions from three large new coal plants, from plants now under or near development in nearby states, or from full use of the 15 nearby coal plants with the lowest capacity factors would cancel out most or all of the cuts in global warming pollution expected from RGGI.



CHAPTER SIX

BLOCKING POLLUTION IMPORTS

While RGGI could contribute to the expansion of coal-fired electricity elsewhere, there are several options for reducing this risk.

Relieving Negative Pressure: Coal versus Efficiency and Renewables

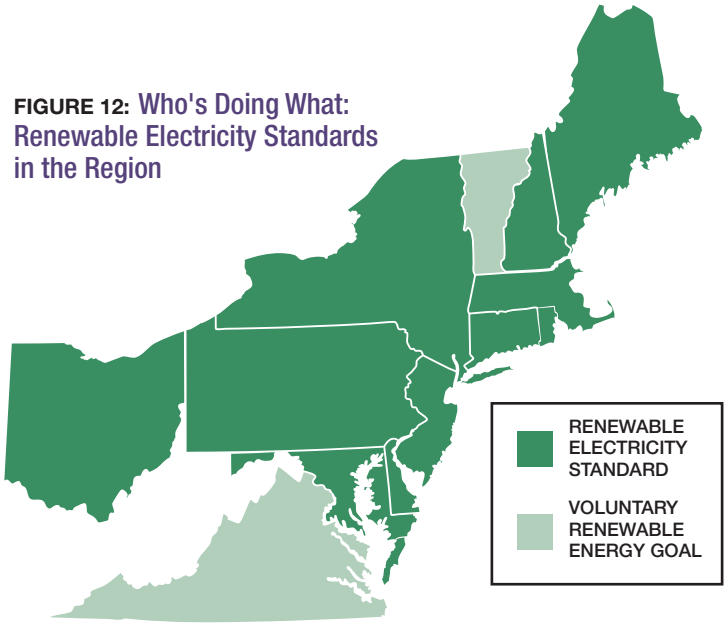
One option is to curb rising demand for electricity. Many northeastern states have done so by supporting both energy efficiency and renewable energy. Connecticut, Maine, Massachusetts, and Rhode Island, for example, require utilities to develop plans to capture all cost-effective opportunities to boost energy efficiency. Vermont has a dedicated non-profit organization funded by ratepayers statewide focusing specifically on energy efficiency. New York is working to cut electricity consumption in the state 15 percent below predicted levels by 2015. Maryland's developing plan to significantly reduce greenhouse gas emissions may also require electricity providers to promote energy efficiency more vigorously among their customers. New Jersey's new

While RGGI could contribute to the expansion of coal-fired electricity elsewhere, there are several options for reducing this risk.

"Energy Master Plan" aims to more than offset projected growth in demand through 2020 with energy efficiency.

Under RGGI, in fact, states will use the proceeds from the auction of CO_2 emission allowances to reinvest in energy efficiency and renewable energy. And RGGI models show that if the region doubles funding for energy efficiency over 2006 levels, net imports of electricity could drop 21 percent by 2015 and 28 percent by 2024.[54]

FIGURE 12: Who's Doing What: Renewable Electricity Standards in the Region



Many Northeast states have developed policies to encourage energy efficiency and renewable energy, for example, by requiring utilities to gradually expand their use of renewables. Those approaches will help the region meet electricity demand while reducing its climate impact.

Many Northeast states have also already embraced renewable energy, another powerful option for curbing incentives for coal-based power. Washington, DC, and 28 states—including virtually all those in the Northeast—now require utilities to gradually expand the proportion of power they sell from renewable resources such as wind, solar, biomass, and geothermal (see Figure 12). Full compliance would spur the installation of more than 61,000 megawatts of new renewable energy by 2020. And CO_2 emissions would drop by more than 145 million metric tons annually—the equivalent of taking at least 23.6 million cars off the road, or planting nearly 7 billion trees.[55]

Other regions are also developing frameworks similar to RGGI but even broader in scope, which could also reverse incentives for electricity producers to expand and export coal-based power. For example, seven states and

four Canadian provinces are forming the Western Climate Initiative, while six Midwest states and one province are developing the Midwestern Greenhouse Gas Reduction Accord. Each effort is likely to include the climate impacts of imported power as well. If those efforts come to fruition, a significant portion of the U.S. electricity sector—and the country's overall global warming emissions—will be subject to mandatory cuts.

As promising as these developments are, however, they will not be enough to stop the near-term expansion of coal, or eliminate the incentive RGGI creates to import more coal-based electricity to the region.

Hitting Coal Head-On

The states involved in RGGI—particularly those in the PJM region—can choose among several active steps to ensure that this groundbreaking initiative does not spur the expansion of coal-based power:

Demand high performance and low emissions

Individual RGGI states could cap the amount of CO_2 emissions linked to every kilowatt-hour of electricity sold. Such an approach could target different levels of electricity supply.

For example, states could target utilities by prohibiting them from contracting with owners of individual power plants with emissions higher than a set standard. California's public utilities commission prevents electricity distributors from signing contracts of five years or more with owners of plants with carbon emission rates above 1,100 pounds per megawatt-hour—low enough to cut out owners of coal plants that do not capture and store at least some of their emissions.[56] The many northeastern states that prohibit utilities from signing long-term contracts could apply such a standard to short-term contracts.

Individual RGGI states could cap the amount of CO_2 emissions linked to every kilowatt-hour of electricity sold, targeting different levels of electricity supply.

Another approach is to cap global warming emission rates from a utility's entire supply portfolio. Connecticut and Massachusetts passed such legislation in 1998 but

have not implemented it, because of concerns that the price of electricity would rise if other states did not adopt a similar standard.[57]

Such standards would encourage electricity distributors to opt for the most efficient power source. However, those approaches focus on CO_2 emissions per unit of electricity rather than capping overall levels of such pollution—the key to addressing climate change.

Cap carbon at the retail level, too

RGGI requires power *producers* in each state to buy an allowance for each ton of carbon they emit. A complementary approach would require *distributors* to account for emissions from all the power they sell—whether produced in state or out of state—perhaps by requiring them to obtain RGGI allowances.[58] Of course, electricity produced in state would already have allowances.[59]

RGGI states might have to coordinate such an approach and approve it individually, just as they did when designing and adopting RGGI itself. They would also have to navigate around prohibitions on regulating out-of-state producers by focusing on in-state electricity supply. As an alternative, a single state could require local distribution companies to offset any increases in emissions linked to higher imports by expanding their investments in energy efficiency, renewable energy, or other public good.[60]

The scale of the climate challenge, the ready source of CO_2 emissions from existing coal plants and expanded transmission lines, and the long-term investment in the wrong direction that new coal units represent demand a more comprehensive approach.

The original RGGI memorandum of understanding required the initiative's working group to consider several options for reducing leakage.[61] The group concluded that capping carbon at the retail level "would be effective in addressing the majority of any potential emissions leakage." However, the group noted that such a policy would "likely be accompanied by numerous challenges," and opted to simply monitor leakage and support New Jersey's efforts to implement solutions at the state level (see Box 7).[64]

Watch the electricity highways

States and the region could also address leakage by taking advantage of opportunities to carefully scrutinize proposals to expand the capacity of the electricity grid, to ensure that such projects support the region's climate

BOX 7:

TACKLING LEAKAGE: WHERE THINGS STAND

While the RGGI states together have not yet addressed leakage directly, they can now more easily track the amount of electricity they import and export. That's because recent modifications in their monitoring systems will allow each RTO (PJM, ISO-NE, and NYISO) to easily distinguish between electricity from capped sources (those within RGGI, and producing more than 25 megawatts) and non-capped sources. Although such measures will not explicitly curb imports of coal-based electricity, they will help policy makers understand whether imports do increase under RGGI—and with them the carbon emissions that the region is responsible for.

Select states within RGGI are addressing the problem more actively. New Jersey's global warming legislation requires the state's Public Utilities Board to adopt a mechanism "to mitigate leakage applicable to all electric power suppliers and basic generation service providers that provide electricity to customers within the State."[62] And Maine's Public Utilities Commission has convened a process to evaluate the effects of imported electricity.[63]

goals. For example, the same Energy Policy Act of 2005 that allows federal policy makers to approve new capacity in "national interest electric transmission corridors" allows three or more contiguous states to sign a compact authorizing them to "review, certify, and permit siting of transmission facilities," even within those corridors.[65] RGGI states could also rely on reviews required by state environmental laws or the National Environmental Policy Act of 1969 to help ensure transmission projects help curb CO_2 emissions, for example, by expanding access to electricity from renewable energy.

The Bottom Line

The systems for tracking leakage that states and RGGI are now developing are important. Yet the scale of the climate challenge, the ready source of CO_2 emissions from existing coal plants and expanded transmission lines, and the long-term investment in the wrong direction that new coal units represent demand a more comprehensive approach. By implementing any or all of these strategies, RGGI states would signal their determination to prevent an expansion of coal-fired electricity to serve their region.

CHAPTER SEVEN

CONCLUSION

Even as the Northeast blazes a trail for other regions and the federal government in fighting global warming, its pioneering efforts could unwittingly contribute to the growth of coal elsewhere. By adding to the price difference between electricity produced within the region and outside it, RGGI could drive some demand to uncapped sources, particularly nearby coal plants. While the cost of RGGI allowances will be just one factor in the purchasing decisions of local utilities, even a small amount of leakage—a small shift to out-of-region coal plants as a result of the emissions cap—would offset expected cuts in CO_2 emissions.

Greater use of existing coal plants alone could overwhelm the impact of the region's effort to mitigate climate change, while coal plants under development could lock the region onto a dangerous path for decades. Planned new transmission lines into the region, if not properly sited and used, would help make both types of expanded coal-based electricity possible.

However, the region does not have to fuel coal's expansion as it addresses its own carbon pollution problem. Investments in energy efficiency and renewable power would reduce demand for more electricity while protecting the environment and spurring the local economy. Caps on global warming pollution in other regions or a national effort would level the playing field by ensuring that utilities across the country reduce their emissions.

Still, the urgency of the climate challenge and the risks of relying solely on such approaches demand that the RGGI states take more immediate steps to prevent greater use of coal. State-level caps on CO_2 emission rates from all electricity sold in-state can prevent local consumers from inadvertently supporting coal plants in nearby regions. Or RGGI states could adopt an add-on that extends its rules to all electricity—including that imported from outside the region. Strong state or regional review could help prioritize transmission projects that are consistent with the region's climate goals rather than those that simply serve as highways for more coal-based power.

RGGI is a critical early effort to address climate change. The region must take urgent steps to keep coal plants at bay and ensure that the pioneering agreement achieves its full potential.

APPENDIX A

CARBON PRICING AND COAL PLANT DISPATCH

Regional transmission organizations rely heavily on fuel costs when deciding which power plants to tap—that is, dispatch—first. Within PJM, producers are already less likely to sell power from coal plants within RGGI than from coal plants elsewhere, because the former's average fuel costs are higher (see Figure 13a).

Congestion also makes power produced within RGGI states more expensive—another reason that coal plants in those states tend to be dispatched later. However, congestion does require the use of some plants within RGGI, to ensure that consumers have enough power.

Economic modeling suggests that the emission allowances required by RGGI will cost three to five dollars per ton of carbon, adding about four to seven dollars per megawatt-hour of electricity.[66] That small increase in the cost of fuel will further increase the advantage of plants outside RGGI that do not have to factor in the cost of carbon (see Figures 13b and 13c). If more of those uncapped plants are dispatched first, that, in turn, will mean more CO_2 emissions.

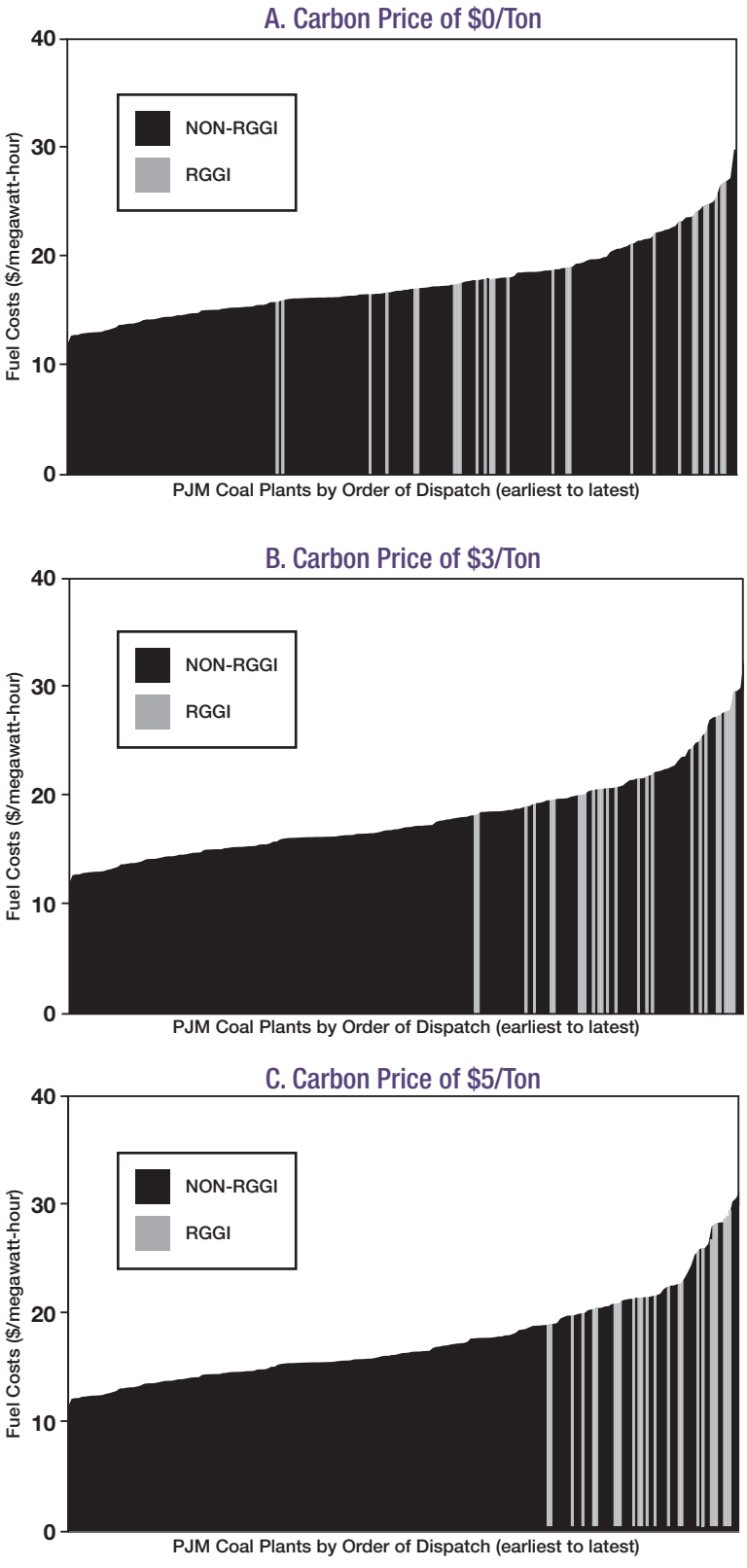


FIGURE 13: Coal-Fired Power Plants within PJM by Fuel Costs

Carbon pricing affects the dispatch order of coal-fired power plants, as shown in these figures. At a carbon allowance price of $0/ton (top), the RGGI plants in PJM are interspersed with the non-RGGI plants; with carbon prices of $3/ton (middle) and $5/ton (bottom), RGGI plants would generally be dispatched later than non-RGGI plants.

SOURCES: EPA, Clean air markets: Data and maps—2006 hourly emissions prepackaged data sets; eGRID2006 version 2.1 generator file (2004 data); EIA, Electric power sector average cost of coal for 2006, *Electric Power Monthly*, April 2007.
NOTE: Analysis uses estimated fuel costs from the Energy Information Administration's statewide 2006 average annual cost of coal per million BTUs for the electric power sector. Because the EIA withholds this information for the state of Delaware, the analysis used the cost of coal in Maryland for Delaware's six coal-fired units.

APPENDIX B

COAL PLANTS WITH THE GREATEST POTENTIAL FOR ADDITIONAL POLLUTION

Many coal plants in western PJM have significant excess capacity to produce additional electricity, with corresponding increases in carbon pollution. This chart shows the 15 plants with the highest additional pollution potential in the states closest to the RGGI region, based on capacity factors below 85 percent.

Coal Plant/Unit	City	State	Owner(s)	Year Operational	Additional Pollution Potential (million tons of CO_2)
Gen. J.M. Gavin Unit No. 1	Cheshire	OH	American Electric Power	1974	2,420,000
Mountaineer Unit No. 1	New Haven	WV	American Electric Power	1980	2,410,000
Mitchell Unit No. 2	Moundsville	WV	American Electric Power	1971	1,990,000
Mitchell Unit No. 1	Moundsville	WV	American Electric Power	1971	1,970,000
Conesville Station Unit No. 4	Coshocton	OH	Duke Energy/American Electric Power	1959	1,860,000
Hatfield's Ferry Unit No. 3	Masontown	PA	Allegheny Energy	1969	1,500,000
Cheswick Unit No. 1	Cheswick	PA	Reliant Energy	1970	1,460,000
Brunner Island Unit No. 3	York Haven	PA	PPL	1967	1,290,000
Avon Lake Unit No. 12	Avon Lake	OH	Reliant Energy	1968	1,280,000
Philip Sporn Unit No. 51	New Haven	WV	American Electric Power	1950	1,190,000
Homer City Station Unit No. 3	Center Township	PA	Edison International	1969	1,140,000
J.M. Stuart Unit No. 1	Aberdeen	OH	American Electric Power	1969	1,090,000
John E. Amos Unit No. 3	Winfield	WV	American Electric Power	1971	1,060,000
Bruce Mansfield Unit No. 2	Shippingport	PA	FirstEnergy Corp.	1976	1,050,000
J.M. Stuart Unit No. 4	Aberdeen	OH	American Electric Power	1969	1,020,000

Source: EPA. Clean air market: Data and maps—2006 hourly emissions prepackaged data sets. And: eGRID. eGRID2006 version 2.1 generator file (2004 data).

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IMPORTING POLLUTION

COAL'S THREAT TO CLIMATE POLICY IN THE U.S. NORTHEAST

The launch of the Regional Greenhouse Gas Initiative (RGGI)—which would cap carbon dioxide emissions from power plants in 10 Northeast states—marks an important milestone in the country's response to climate change. Yet that pioneering effort could unwittingly contribute to greater use of coal elsewhere. Even a small shift to out-of-region coal plants in response to the cap would offset expected cuts in carbon emissions. Greater use of existing coal plants alone could overwhelm the Northeast's efforts, while coal plants under development could lock the region onto a dangerous path for decades. Planned new transmission lines could help make this expanded use of coal-fired electricity possible.

In this report, the Union of Concerned Scientists examines the links between coal-fueled power and climate policy in the Northeast. It examines the role of such electricity in the region, and explores what drives and limits the use of existing coal plants and the construction of new ones. The report also suggests options to ensure the success of the Northeast's nascent efforts to address global warming pollution and foster a national effort to tackle climate change.

Investments in energy efficiency and renewable power would reduce demand for more electricity, including coal-based power. The urgency of the climate challenge demands that RGGI states take more immediate steps to prevent greater use of coal, however. They can broaden the cap on carbon emissions, and also prioritize transmission projects that advance the region's climate goals, rather than those that simply serve as highways for more coal-based power.

RGGI is a critical early effort to address climate change. The region must take urgent steps to keep coal plants at bay and ensure that the pioneering agreement achieves its full potential.

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