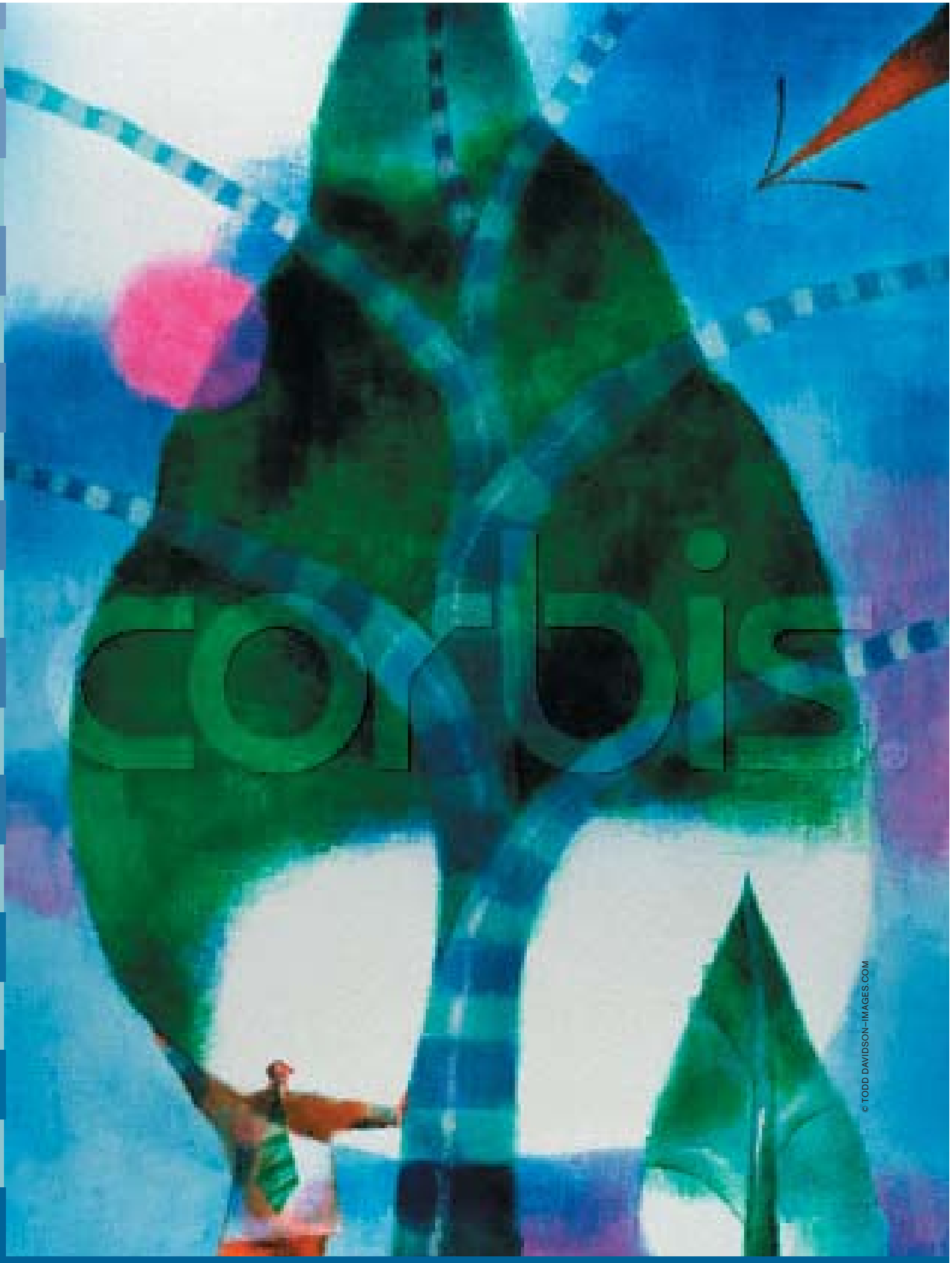
corbis
© TODD DAVIDSON–IMAGES.COM

THE REGIONAL GREENHOUSE GAS INITIATIVE

TAKING ACTION IN MAINE

BY SONDRA BOGDONOFF AND JONATHAN RUBIN

As international and domestic pressure builds on the United States to address climate change, much has been made of regional, state, and citywide plans that have arisen to address global warming. Media coverage of one such plan, the Regional Greenhouse Gas Initiative (RGGI, pronounced "Reggie"), has increased as it moves toward implementation in the eight northeastern and mid-Atlantic states that have signed the original agreement. The first regional mandatory program to address climate change in the United States and encompassing an area that accounts for approximately one-fifth of the total U.S. population, RGGI's efforts will likely have significant impact on other initiatives under way across the Unites States and in other countries.

But what is RGGI? What does it mean in the near term for the states that have agreed to

balancing key issues—how to address environmental protection (the reduction of carbon dioxide emissions), while maintaining a healthy economy (not placing too great a hardship on industry) and remaining sensitive to social responsibility (not placing an undue burden on consumers).

Background

In 2001, at the annual Conference of the New England Governors and Eastern Canadian Premiers, the New England states and Atlantic Provinces of Canada agreed to work together on a plan to address global warming.[1] For Maine, this agreement reflected work of the Maine Climate Action Plan, which identified a cap-and-trade program for emissions reductions as one of the state's highest priorities. The 2003 Maine Greenhouse Gas Initiative built further on this commitment.[2]

Over time, the concept of RGGI for the northeastern United States (Canada had joined the Kyoto Protocol) took shape. The goal was to reduce carbon dioxide (CO_2) emissions from power plants in participating states and create the impetus for a national plan while

- allowing flexibility (to encourage innovation in meeting the goals);
- maintaining energy affordability and reliability;
- accommodating the diversity of individual states' policies and programs;
- emphasizing uniformity to facilitate interstate allowance trading;
- being expandable so other states can join; and
- supporting other national, state, or regional emissions trading programs.

In late 2003, an interstate working group (mostly from the New England state environmental agencies) and a 25-member body of stakeholders (including representatives of electricity generators, electric utilities, other businesses, residential consumers, and environmentalists) began to discuss the issues with experts and look at economic models, which led to the development of the RGGI program. In December 2005, the governors of Maine, New Hampshire, Vermont, Connecticut, New Jersey, New York, and Delaware signed a 20-page memorandum of understanding (MOU) adopting a plan for RGGI.[3] The District of Columbia, Massachusetts, Pennsylvania, Rhode Island, the Eastern Canadian Provinces, and New Brunswick were observers in the process. Maryland has since passed legislation to join the program, and Massachusetts Governor Deval Patrick signed the agreement early this year. Rhode Island has not agreed to implement the program in but may do so in the future.

In March 2006, the participating states released a draft model rule outlining regulations for state governments to use in adopting RGGI. Public input was received from more than 100 organizations. After revisions, the model rule was finalized and released in August 2006.

In October 2006, California Governor Arnold Schwarzenegger, at a meeting with Governor Pataki of New York (the convener of the original meeting in 2001), announced that California would join RGGI as well.

RGGI Basics

Essentially, RGGI is an agreement to implement a flexible, market-based program to reduce carbon dioxide (CO_2) emissions—the major cause of global warming—from power plants in the northeastern and mid-Atlantic United States.

The bottom line is that total emissions in the RGGI states may not increase from 2009 to 2014 and thereafter must fall by 2.5 percent per year through 2018, so that by 2019 they must be at least 10 percent below the 2009 level. Modeling forecasts suggest that without RGGI, emissions from power plants in the region would grow by 7 percent from 2009 to 2019. Thus, compared to business-as-usual practice, RGGI is designed to cut emissions by around 17 percent.[4]

The MOU sets the number of allowances budgeted to each state, the timetable for emission reductions, and criteria for acceptable offsets (the box on page 11 outlines the key provisions).

RGGI is a regional plan, but each state must, by the end of 2008, adopt its own regulations or laws for RGGI to come into effect. The model rule, released by the RGGI interstate workgroup, forms the framework of individual state regulatory and/or statutory proposals to adopt and implement the program.[5] Each state will go through its own decisionmaking process, with the legal requirements varying among states.

RGGI's progress is being closely watched. Although a modest first step, RGGI's cap-and-trade program will provide important learning experiences for policymakers in other states, many of which have developed preliminary climate action plans; in Washington, D.C., where Congress is considering the design of a national response; and in many countries around the world, where efforts such as the Kyoto Protocol and the European Union Emission Trading System (EU ETS) are already under way.[6] It also provides a testing ground for development of new technologies and markets.

Considerable experience has accumulated with the design and operation of cap-and-trade systems for more traditional pollutants, including the highly successful U.S. programs to reduce sulfur

dioxide—the main cause of acid rain—and nitrous oxides, which are a major factor in causing ground-level ozone or smog. In addition, EU ETS, implemented in 2005, uses this approach to control greenhouse gases. However, RGGI is breaking new ground in this regard in the United States.[7]

The Focus on Power Plants

Releases of CO_2 account for four-fifths of global warming pollution. The power sector is the largest single source of industrial emissions, accounting for 38 percent of U.S. CO_2 emissions,[8] although in the Northeast they are now second to transportation.

Power plants are a relatively straightforward sector to address through state and regional policies for two reasons. First, most state governments have regulatory authority over electricity generation, while the federal government has most of the authority over pollution from cars and other transportation. Second, most electricity is generated at a fairly small number of plants that are easy to identify. In contrast, the other sources of global warming emissions, such as oil and natural gas to heat buildings and run industrial processes, are far smaller, more numerous, and harder to directly regulate.

RGGI's Expected Effects

Available evidence from modeling done by the RGGI states and by independent organizations indicates that RGGI will have little impact on the cost of doing business or on the overall economy in the Northeast. This is because the goals of RGGI are fairly modest and are stretched out over more than a decade, regulated power plants are allowed to use offsets to meet part of their emission reductions, and electricity use is only a small portion of the economy.[9]

The maximum increases in retail electric rates projected by the RGGI models are about 0.5 percent to 0.66 percent per year—a rate of change that would be barely noticeable to consumers. By 2021, residential and commercial rates could rise between 1 percent and 5 percent, with industrial rates rising between 1 percent and 10 percent. The impact of RGGI is small compared to other factors that might affect rates, such as changes in fuel prices (note the 25 percent or greater rate increases during the winter of 2005–2006 as gas and oil prices skyrocketed).

Electricity rate increases could be reduced by instituting efficiencies that shrink demand. Rising demand for electricity drives costly investments in power plants and transmission lines. Improved energy efficiency, such as installing energy-saving light bulbs, home insulation, and automatic temperature controls, can reduce the need for these investments, lower electricity rates by reducing peak demand, and minimize pressure on strained natural gas supplies.

The Nuts and Bolts of RGGI

Traditional environmental regulations require each regulated facility, such as an industrial company or a power plant, to use the "best available technology" to reduce air or water pollution or cut emissions by a certain amount regardless of economics at the plant level.

Under RGGI, CO_2 emissions from the electricity generating sector are capped within each state at approximately 2006 levels. The state then sets compliance requirements for each regulated power plant. The regulated plant is given or buys emission allowances, which it can then save (or "bank"), trade, or sell to meet its compliance level. Some plants will be able to cut emissions more inexpensively than others. Those that can do so will be able to sell their surplus allowances to those whose costs of compliance are higher or whose initial allocation proves insufficient. Trading can take place within a state or across state lines within the RGGI region.

Power companies can also cut their CO_2 emissions by making their operations more efficient; switching from higher-emitting to lower-emitting fuels (such as from coal to natural gas or renewable sources like biomass or wind); shutting down older, less-efficient plants in favor of more modern, lower-emitting plants; encouraging and enabling consumers to use less electricity through demand management programs; or, potentially, using carbon sequestration technologies currently in development to capture CO_2 and store it permanently underground before it enters the atmosphere. Technologies available to reduce electricity demand in residential and commercial and industrial settings are plentiful and varied. They include energy efficient appliances, lighting, and transformers, and efficient opera-

RGGI'S KEY PROVISIONS

The Regional Greenhouse Gas Initiative (RGGI) utilizes a cap-and-trade system: The states have agreed to set limits (caps) on emissions and then auction, sell, or give away tradable allowances, one for each ton of CO_2 allowed by the cap. Other key provisions:

- RGGI applies to all fossil fuel-fired electrical generating plants with a rated capacity equal to or greater than 25 megawatts. The individual states will decide on the CO_2 emission limits for each regulated plant, which will then buy and sell allowances to cover its emission limit.
- Each state is required to sell or auction a minimum of 25 percent of its allowances and use the proceeds for strategic energy or consumer benefit purposes such as energy efficiency, rate-payer rebates, or new clean energy technologies.
- Some portion of the emission reductions can be gained from other sources. RGGI specifies a number of categories of offset allowances, such as planting trees to absorb carbon.
- If allowance prices exceed certain defined limits, RGGI has a "safety-valve" that allows greater use of offset allowances and an extension of the compliance period.

tion of HVAC (heating, ventilation, and cooling) systems.

RGGI's cap-and-trade program is flexible in that it allows regulated power plants several different options for meeting their emissions cap and includes some safety features to limit the price of allowances.

Offsets under RGGI

In addition to the different possibilities for meeting the cap listed above, RGGI also allows offsets—alternative means of reducing greenhouse gas emissions (other than cutting CO_2 emissions at power plants themselves). CO_2 is emitted from other sectors of the economy, mainly through the burning of fossil fuels. Also, some pollutants, including methane gas, produce a more powerful global warming effect per pound than does CO_2 (although they tend to be emitted in far smaller quantities). It is from these other sectors of the economy and these other greenhouse gases that offsets are typically drawn. Permitting offset allowances from other sectors to achieve compliance expands the reduction possibilities and provides more flexibility and the likelihood of lower costs. RGGI's MOU specifies that the following types of offsets will be allowed:

- capturing methane gas that would normally be emitted from landfills and agriculture, then burning the methane as an energy source (the burning releases CO_2, but this is much less significant than if the methane were released directly to the atmosphere);
- capturing and recycling sulfur hexafluoride (SF_6) gas, a potent greenhouse gas used in electrical transformers;
- planting trees (which absorb CO_2 and release oxygen);
- improving the efficiency of non–power generation uses of natural gas and heating oil, such as heating buildings and hot water; and
- reducing methane emissions from natural gas transmission and distribution. (Additional offset categories, such as forest management, may be added later.)

Electricity generators would be allowed to cover up to 3.3 percent of their total emissions by buying offset allowances. This is estimated to be approximately 50 percent of the reductions required by RGGI from their business-as-usual emissions.

To be eligible for inclusion in RGGI, offsets would have to meet a strict five-point set of standards: that the offsets are "real, surplus, verifiable, permanent, and enforceable" as stated in the MOU. Offset projects can take place anywhere in the United States as long as the state involved in the project has entered into a memorandum of understanding with the RGGI states that ensures the credibility of the offsets.

RGGI's cap-and-trade program is flexible in that it allows regulated power plants several different options for meeting their emissions cap.

Because the pool of potential emission reductions is not limited to power plant improvements or to RGGI states, offsets can create a large pool of additional emission reductions that can help maintain a well-functioning market. Offsets are a new market that can potentially provide economic opportunities for businesses. For example, a landfill that does not currently capture methane gas could begin to do so and flare it, consuming the methane gas and reducing its impact. The methane reduction, net the additional CO_2 from flaring, would qualify as an offset allowance that could be sold to anyone looking for an offset allowance either to meet their compliance needs or for investment. The same would be true for a cattle feedlot that gathered manure and used an anaerobic digester to prevent methane emissions from going into the air.

RGGI's "Safety Valve"

RGGI's MOU sets two "safety valves" to limit prices for emission allowances. If the average market price for allowances exceeds \$7 per ton of CO_2, regulated power plants could use offset allowances to cover up to 5 percent of their emissions instead of 3.3 percent. If the average market price for allowances exceeds \$10 per ton of CO_2, offset allowances can be used to cover 10 percent of emissions. Regulated power plants would be allowed to extend by up to one year their compliance with the emission levels set by the MOU. The safety valve prices are adjusted upward by the Consumer Price Index plus 2 percent per year, beginning in 2006.

Addressing Leakage

Leakage occurs when electrical generating plants outside RGGI sell power to RGGI states, incurring no costs of compliance. RGGI modeling forecasts that, in the absence of controls on leakage, imported power could expand greatly, negating 40 percent or more of the emission reductions from RGGI. Such a result would effectively prevent RGGI from reaching its goal of cutting emissions 10 percent by 2019. Because CO_2 emissions are a global problem, shifting the location of emissions would undermine the program and provide no benefit to the climate. Thus, addressing leakage issues is an implementation priority.

The straightforward way to prevent leakage would be for all states to function under a common system; that is what advocates of a national policy hope to achieve. Other solutions, such as requiring imported power to meet emissions requirements, introduce certain legal complications. Recognizing the complexity, the MOU says that the states will "pursue technically sound measures to prevent leakage from undermining the integrity of the program." An interstate working group is actively considering options for addressing leakage and will

report in December 2007. One promising option is to reduce the demand for electricity generation. By reducing demand, less electricity will be imported into New England, and, hence, there will be less opportunity to export carbon generation. Leakage is also reduced by the adoption of carbon reduction measures by neighboring states as well as Canada's compliance with Kyoto targets. Nonetheless, leakage remains a serious issue.

Decisions for Maine

RGGI's memorandum of understanding is a set of policies that have already been accepted by the signing states. The state regulations implementing RGGI can be modified, in some limited respects, from the model rule, as long as they remain consistent with the MOU. Maine and other states will develop their own regulations to meet their unique needs.

Each state has a budget for the tons of CO_2 that its power plants can emit. By January 2009, the Maine Department of Environmental Protection (DEP) must determine each regulated power plant's emission limit.

RGGI affects only fossil fuel-fired electricity generating units having a rated capacity equal to or greater than 25 megawatts. In Maine, this applies to six electricity generating plants. Smaller generating plants are not regulated, nor are non–CO_2 emitting generation plants that rely on nuclear, hydro, wind, or renewable sources.

Five out of the six regulated power plants in Maine are new natural gas-fired turbines. Two are natural gas-fired combined cycle cogeneration plants and are the lowest emitting plants technologically available. By co-locating with an industrial plant (two paper companies in Maine's case), steam produced as a by-product of the industrial process becomes an additional source of power. Often called combined heat and power, they are among the most efficient generators in the country, so options for reducing CO_2 emissions are limited.

Decisions about how Maine implements RGGI will be made throughout 2007. The public process set up by Maine DEP will inform such key issues as the basis for allocating CO_2 limits; whether allowances are given, sold, or auctioned; and how much revenue should be set aside for public benefit and for what use (the box on this page lists key decisions facing Maine).

Allowances

Under RGGI, allowances—the trading mechanism assigned to emissions for the purposes of a cap-and-trade system—break down with one emission allowance equaling one ton of CO_2 emissions. Maine's total emissions allocation is 5.95 million tons (5.95 million allowances).[10] Each regulated power plant will need a sufficient number of allowances to cover its CO_2 emission limit. The penalty for failing to have sufficient emission allowances at the end of the compliance period will be a deduction of three times the excess emissions from the regulated power plants' future allocation of allowances.

According to the MOU accepted by Maine and the other RGGI states, each state must sell at least 25 percent of its allowances, with the money used for consumer benefit or strategic energy purposes. Buyers will predominantly be the regulated power plants, but anyone can purchase allowances—individuals, environmental groups, or investors within or outside the RGGI area. Each state may allocate the remaining 75 percent of the allowances as it wishes, including giving them to regulated power plants, retaining some for new plants, or selling them and using the revenues to enhance energy efficiency or provide public benefits.

Regulated power plants can buy allowances and sell excess allowances in an open market spanning the RGGI states. The price for an allowance will be set by supply and demand, influenced by what it costs to reduce emissions or purchase offsets. Modeling done as part of the RGGI process, using a wide variety of assumptions, estimated that CO_2 allowances are expected to sell for prices ranging from $1 per ton to more than $10 per ton, depending on modeling assumptions and energy prices.[11] Allowance prices will be influenced by energy costs, technological innovation, electricity demand, and the availability of efficiency improvements in existing generators, among other factors.

Even at the low cost expected for allowances, the RGGI program will create a substantial new market. Maine's allocation of 5.95 million tons and an estimated allowance price of $5 per ton would yield a total value of Maine's allocation at about $30 million per year.

DECISIONS MAINE MUST MAKE

The following decisions about how Maine will implement the Regional Greenhouse Gas Initiative (RGGI) will be made over the course of 2007 and will be informed by the public process set up by Maine's Department of Environmental Protection (DEP).

Allowances
- Who gets allowances to emit CO_2 and how much will they cost?
- Will emission allowances be sold, auctioned, or given away?
- If allowances are given away, what are the criteria?
- How will allowances be put aside for new entrants?

Public benefit from revenues
- What percentage of revenues should be dedicated to public sector benefits and how should they be used?

The process
- What is the role of Maine's legislature and DEP?
- How can interested parties get involved?

Given the value of this market, it is not surprising that one of the most difficult issues is determining a fair and equitable way to determine allowance allocations.

The argument for giving allowances to regulated plants is that it eases the transition to a new regulatory regime with new pollution control liabilities. How plants choose to utilize these allowances, such as using all of them to cover their existing emissions or, instead, to reduce emissions through efficiency techniques and then sell the excess allowances, is left up to competitive pressures and individual firm decisionmaking. This is the method used in the EU ETS. Giving allowances to regulated power plants in Maine and other RGGI states may also help keep the RGGI state power plants competitive with non-RGGI power plants that sell and buy electricity to and from the RGGI region.

At the same time, there are justifications for auctioning more than 25 percent of the state's allowances. The revenues from

allowance sales can be used to fund energy efficiency programs, provide for consumer rebates, support development of renewable energy projects, or otherwise lower the costs to consumers from rate hikes associated with increased costs of electricity generation due to the new regulations.

Some evidence from the EU ETS and studies of the proposed RGGI system and a national carbon trading system suggests that when allowances are given away, the result is higher generator profits and possibly less incentive to reduce emissions.[12]

These same studies find that charging generators for their allowances will not cause the prices to rise compared to giving the allowances away. They note that in deregulated electricity markets, such as those in the Northeast, electricity prices are based not on the average cost of producing power but on the incremental cost of additional power needed to meet demand at any given time. While the average cost may rise if generators must buy their allowances, the last dispatched price is based on the cost of available power to meet additional demand, not average price. This is true whether the electricity is generated within the Northeast or imported from states or countries neighboring the RGGI region.

In the past, regulators have used either the level of average historical emission rates as the basis for allocations ("grandfathering") or allocation emission rates implied by the best available technology ("benchmarking"). Another method, output-based allocations, awards allowances in proportion to the amount of electricity generated (updated each year to reflect changes in generation at that facility).

Grandfathering on the basis of historic emissions rates tends to reward the most polluting plants and discriminates against firms that have already taken action to reduce emissions. Benchmarking tends to favor the plants that have effectively reduced their ratio of carbon emissions per unit output. Output-based allocations tend to level the playing field and allow for new entrants to gain market share. As noted previously, some of Maine's operating facilities are older, less efficient plants, but others are quite efficient already.

Another key implementation question will be how to structure allocations to accommodate new market entrants. If all fossil fuel–powered electric generation has to function under a cap, some provision must be established to create room under the cap for new generators. Under the U.S. Acid Rain Trading Program, for example, the Environmental Protection Agency holds aside a small percentage of each year's total allowance pool and puts it in a bank that can then be tapped to accommodate new entries to the electric generating market. Because the allowances were culled from the total pool, the new emissions represented by the new generation do not exceed the yearly emissions budget.

There are justifications for auctioning more than 25 percent of Maine's allowances.

Public Benefits from Revenues

According to the MOU, at least 25 percent of a state's allowances are to be dedicated to strategic energy or consumer benefit purposes, such as rate-payer rebates, energy efficiency, and new clean energy technologies. Maine will have to decide if it wants to keep or raise that percentage. It is also up to each individual state to decide on the process and procedure for determining the specific use of those revenues for the public benefit.

Some to-be-defined portion of the revenues generated from the sale of allowances could be allocated to directly offset impacts from the RGGI program on electricity bills, a strategy that could be effective in helping low-income households. At the same time, electricity rates send signals to consumers (lower rates tend to increase usage), so care must be taken not to undermine the conservation incentives that are a crucial aspect of the program. One way to do this is to target the rebates only at the households most vulnerable to

rate hikes. Another is to provide a fixed rebate per household (rather than a rebate linked to consumption level that would rise as users consume more energy) so that the consumer can pocket any savings achieved from reduced consumption.

Allowance revenues can also be dedicated toward energy efficiency programs. By increasing spending on energy efficiency with proceeds from allowance sales or other funds, RGGI could assist electricity customers in cutting their monthly bills by lowering electricity consumption without lowering services (for example, installing temperature controls and energy-saving light bulbs). Modeling performed as part of RGGI's development examined the impacts from doubling current spending on efficiency programs in the nine original RGGI states. The analysis found that if such doubling was continued for 15 years, the average household would see its electric bill fall by about $100 a year, or roughly 12 percent. Business customers would gain a similar savings.[13]

The amount of funding available for efficiency and rebates would depend on what percentage of the allowances regulated power plants must buy and the allowance market price. It is unlikely that the necessary funding to double efficiency spending could be obtained if regulated power plants pay for only 25 percent of their emissions allowances.

Most of the Northeast states already have state-mandated programs that help pay for energy efficiency measures, although in some states the funding is quite limited. Historical evidence shows that over time these programs save consumers more on their electric bills than they cost. For New England, the evidence suggests that efficiency programs could save electricity for about one-third the cost of generating the same amount of power. In coming years, more than enough cost-effective efficiency potential is available to completely cancel out projected increases in electricity demand.[14]

Funding clean energy technologies would stimulate or reward investment in the research and development of new innovative carbon emissions abatement technologies and promote renewable or non-carbon emitting energy advances such as wind, solar, and geothermal power generation.

The Process

In some of the RGGI states, the state environmental agencies already have authority under existing laws to require that power plants reduce their carbon dioxide emissions.

However, because of RGGI's potential

impact, the agencies in these states may seek legislative approval even though they do not believe that it is a legal necessity.

In Maine, the legislature must pass new legislation directing Maine DEP to develop rules and regulations for implementing RGGI, including establishing allocation limits, selling or auctioning allowances, and collecting and dispersing funds. Certain regulations must be reviewed after adoption by the Maine DEP. Because these are major and substantive actions, the rules will go back to the legislature before they become law.

Beginning in October 2006 and continuing through December 2006, Maine DEP held a series of regional roundtable discussions to provide information and solicit comments on how to tailor the model rule to meet Maine's needs and circumstances.

Maine DEP submitted a bill to the legislature on **[TK]** January 2007 to authorize the implementation of the rule. The legislation will be referred to the appropriate committee, which will hold one or more public hearing, followed by one or more working sessions to finalize the proposed legislation. After committee, the proposed legislation would come before Maine's full house and senate, then the governor for approval. This process should be completed before the session ends in June. The bill would take effect 90 days later and includes provisions for Maine DEP to undertake rulemaking for implementation.

Looking Beyond Maine

The federal government has a number of policy measures, financial incentives, and voluntary programs aimed at slowing the growth of greenhouse gas emissions and reducing greenhouse gas intensity of the U.S. economy. Federal programs, including Climate VISION and Energy STAR, work with industry to reduce emissions voluntarily. These programs and other research and clean energy technology development projects are coordinated by the Federal Climate Change Technology Program.

In addition, the Federal Climate Change Initiative has as its goal to cut the greenhouse gas intensity of the economy by 18 percent over a period of 10 years, from 2002 to 2012. Greenhouse gas intensity measures the ratio of CO_2 equivalent emissions to economic output. The goal is to reduce the amount of CO_2 equivalent emissions per dollar of gross domestic product. Reducing the CO_2 intensity of the U.S. economy and furthering research on low carbon technologies are important steps to reducing national greenhouse gas emissions, but these federal programs do not directly cap or reduce the level of U.S. greenhouse gas emissions.

Frustration at the lack of a mandatory federal cap on U.S. greenhouse gas emissions has led municipalities and states to

undertake a broad range of activities to cap and reduce greenhouse gas on their own. In June 2005, the U.S. Conference of Mayors unanimously endorsed the U.S. Mayors Climate Protection Agreement,

which urges U.S. cities to follow the principles of the Kyoto Protocol (despite the fact that the United States has not ratified the protocol). The mayors' agreement has now been signed by 307 mayors representing more than 50 million Americans. In 1997, Oregon became the first state to regulate greenhouse gas emissions by requiring new power plants to counter their global warming impact by offsetting approximately 17 percent of their CO_2 emissions, attaining high efficiency standards in generation, or purchasing offsets.

In 2005, California adopted emission reduction targets that reduce California greenhouse gas emissions to 2000 levels by 2010, 1990 levels by 2020, and 80 percent below 1990 levels by 2050. This is assisted by a low carbon fuel standard, announced this January, which requires fuel providers to ensure that the mix of fuels they sell for passenger vehicles produces 10 percent fewer greenhouse gas emissions by 2020. In addition, California and Oregon are also developing a "load-side cap-and-trade" approach, which focuses on those who purchase electricity rather than those who generate it. Like RGGI, this load-side cap-and-trade program focuses on the power system, but unlike RGGI, it counts and caps the carbon associated with power purchases, regardless of where the power originates. The details on the California-Oregon cap-and-trade program have yet to be finalized. Other states, including Arizona and New Mexico, are also in the process of adopting programs to reduce greenhouse gas emissions.

Conclusion

Regional state and local actions are a collective first step toward addressing climate change in the United States. They provide a valuable laboratory for learning about how to make programs work effectively. The lessons from RGGI and other state and local actions can help pave the way to a mandatory program of greenhouse gas reduction for the nation. As Maine and the other RGGI states move forward, their success will require continued leadership, thoughtful discussion, and creative solutions. As a result, we will learn how to stimulate new technologies, reward conservation, and balance public good with market forces.

Sondra Bogdonoff is the director of development and planning at the Muskie School of Public Service at the University of Southern Maine in Portland. Her research focuses on decisionmaking processes, in particular consensus building in the environmental regulation process. She may be contacted at bogdonof@usm.maine.edu. Jonathan Rubin is an associate professor at the Margaret Chase Smith Policy Center and the Department of Resource Economics and Policy at the University of Maine. Rubin's research focuses on using economic mechanisms (tradable credits, taxes, and regulation design) and information programs to assist with the attainment of environmental goals. Rubin is the secretary and treasurer of the Committee on Transportation Energy, US Transportation Research Board, National Research Council. He can be contacted at jonathan.rubin@umit.maine.edu.

This article is an edited version of "A Primer for Maine: Regional Greenhouse Gas Initiative," which was designed to provide Maine citizens with a basic understanding of the Regional Greenhouse Gas Initiative and the key decisions Maine must make in its implementation. It is a collaborative effort between the Edmund S. Muskie School of Public Service at the University of Southern Maine and the Margaret Chase Smith Policy Center at the University of Maine, funded through a grant from Environmental Defense with in-kind contributions from the University of Maine System. A draft of the article was read and commented on by faculty at campuses across Maine, members of the Maine utility companies, the Maine Department of Environmental Protection, and environmental groups in Maine. The authors also used information from the RGGI Web site (www.rggi.org) and drew substantially on the work by Marc Breslow, *The Northeast's Global Warming Plan: A Primer* (Boston: Center for Public Interest Research, 2006). Without their valuable insights and expertise, this article would not have been possible.

NOTES

1. See New England Governors/Eastern Canadian Premiers, *Climate Change Action Plan 2001* (Halifax, NS, and Boston, MA: The Committee on the Environment and the Northeast International Committee on Energy of the Conference of New England Governors and Eastern Canadian Premiers, 2001), http://www.negc.org/documents/NEG-ECP%20CCAP.PDF.

2. See RAAB Associates Ltd., *Maine Greenhouse Gas Initiative*, http://maineghg.raabassociates.org/index.asp (accessed 16 January 2007).

3. Regional Greenhouse Gas Initiative (RGGI), *Memorandum of Understanding*, 20 December 2005, http://www.rggi.org/docs/mou_final_12_20_05.pdf (accessed 16 January 2007).

4. RGGI Staff Working Group, "Reductions Needed/Offsets Allowed" spreadsheet accompanying RGGI, *Analysis Supporting Offsets Limit Recommendation*, http://www.rggi.org/docs/offsets_limit_5_1_06.pdf (accessed 16 January 2007).

5. RGGI, *Regional Greenhouse Gas Initiative Model Rule 8/15/2006*, http://www.rggi.org/docs/model_rule_8_15_06.pdf (accessed 16 January 2007).

6. For more on the EU Emission Trading System, see J. A. Kruger and W. A. Pizer, "Greenhouse Gas Trading in Europe: The New Grand Policy Experiment," *Environment* 46, no. 8 (October 2004): 8–23.

7. U.S. Environmental Protection Agency (EPA), *Clean Air Markets*, http://www.epa.gov/airmarkets/ (accessed 1 October 2006).

8. EPA, *Inventory of U.S. Greenhouse Gases and Sinks: 1990–2004*, http://www.epa.gov/climatechange/emissions/downloads06/06_Complete_Report.pdf (accessed 16 January 2007), page 3-14.

9. L. Petraglia and D. Breger, 2005. "REMI Impacts for RGGI Policies Based on the Standard Reference and Hi-Emission Reference," presentation to RGGI stakeholders by the Economic Development Research Group, Boston, 17 November 2005.

10. RGGI, note 3 above, page 3.

11. ICF Consulting, "RGGI Electricity Sector Modeling Results: Updated Reference, RGGI Package and Sensitivities," presentation to RGGI stakeholders by ICF Consulting, 21 September 2005.

12. D. Burtraw, K. Palmer, and D. Kahn, "Allocation of CO_2 Emissions Allowances in the Regional Greenhouse Gas Cap-and-Trade Program," Resources for the Future (RFF) Discussion Paper (Washington, DC: RFF, 2005); J. Sijm, K. Neuhoff, and Y. Chen, "CO_2 Cost Pass through and Windfall Profits in the Power Sector," Working Paper, Electricity Policy Research Group (Cambridge, UK: University of Cambridge, 2006); and P. Cramton and S. Kerr, "Tradeable Carbon Permit Auctions: How and Why to Auction Not Grandfather," *Energy Policy* 30, no. 4 (2002): 333–45.

13. B. Prindle, "Energy Efficiency's Role in Limiting RGGI Leakage," presentation at the RGGI Workshop on Electric Imports and "Emission Leakage," South Royalton, VT, 15 June 2006.

14. Optimal Energy, *Economically Achievable Energy Efficiency Potential in New England* (Lexington, MA: Northeast Energy Efficiency Partnerships, 2005); and National Association of State PIRGs, *Stopping Global Warming Efficiently* (Washington, DC: U.S. PIRG, 2005).