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Multi-Pollutant Approaches in Certain OTR States

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List of Acronyms

ALAPCO	Association of Local Air Pollution Control Officials
CAN	Clean Air Now (a coalition of organizations)
CHP	Combined heat and power
CMR	Code of Massachusetts Regulations
DEC	Department of Environmental Conservation
DEP	Department of Environmental Protection
DERC	Discrete Emission Reduction Credit
DES	Department of Environmental Services
DPUC	Department of Public Utility Control
EGRID	Emissions and Generation Resource Integrated Database
EIA	Energy Information Administration
GHG	Greenhouse Gas
HB	House Bill
MACT	Maximum Achievable Control Technology
MAPS	Market Assessment and Portfolio Strategies
MOU	Memorandum of Understanding
NAPAP	National Acidic Precipitation Assessment Program
NBP	NO_x Budget Program
NEG/ECP	New England Governors and Eastern Canadian Premiers
NESCAUM	Northeast States for Coordinated Air Use Management
NYCRR	New York Codes Rules and Regulations
NYSERDA	New York State Energy Research and Development Authority
OTC	Ozone Transport Commission
OTR	Ozone Transport Region
PSEG	Public Service Enterprise Group (a generation owner in New Jersey)
RACT	Reasonably Available Control Technology
RFF	Resources for the Future

SCR	Selective Catalytic Reduction
SIP	State Implementation Plan
SIPRAC	State Implementation Plan Revision Advisory Committee
STAPPA	State and Territorial Air Pollution Program Administrators
US EPA	United States Environmental Protection Agency

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Executive Summary

Several states in the Ozone Transport Region (OTR) have developed environmental statutes, regulations, permits or other programs in the past few years that would reduce emissions of multiple pollutants from power plants. The regulatory approaches, often called "Multi-pollutant" programs, represent a new and innovative approach to the regulation of emissions from power plants. The purpose of this report is to provide a case study of the multi-pollutant approaches developed in Connecticut, Massachusetts, New Hampshire, New Jersey, and New York (which has proposed regulations).

Power plant emissions are currently governed by multiple state and federal regulations under the Clean Air Act. One recent regional initiative affecting power plant emissions in the Ozone Transport Region is the 1998 Ozone Transport Commission NO_x Memorandum of Understanding (OTC MOU). The OTC MOU is an agreement among the OTR states to reduce summertime emissions of NO_x due to their role in the formation of ground level ozone. Despite the success of this program in reducing emissions, several states have decided to take further steps to reduce emissions of NO_x as well as emissions of SO_2. The five states reviewed in this report have developed regulatory programs requiring further reductions in emissions of these two pollutants beyond current levels. Massachusetts and New Hampshire have also developed regulations requiring reductions in emissions of carbon dioxide (CO_2) and mercury; and New Jersey has reached agreement on achieving reductions in CO_2 and mercury from individual power plants.

The states cite several reasons for going beyond the OTC MOU including the following reasons: (1) concern over state and local impacts of emissions (including formation of fine particulates); (2) desire to address annual emissions of NO_x in addition to seasonal emissions; (3) desire to reduce impacts of NO_x beyond ozone formation; (4) the need for additional action to address the impacts of acid rain; (5) desire to reduce known impacts of CO_2 and mercury; (6) opportunity to align environmental policy with electric industry restructuring; and (7) opportunity to foster cost-effective compliance strategies through multi-pollutant regulatory programs.

Many factors shape individual states' approaches. Two factors that are consistent among the states are strong public pressure for the state to take additional action to reduce emissions from power plants, and commitment from the Governor to address environmental impacts in the state. Coordinated Governor policy goals, through the New England Governors and Eastern Canadian Premiers, have also been an important catalyst for individual state actions. In some states, the legislature has played a formative role. In each state site-specific impacts of emissions have been a contentious issue; however, states have adopted a variety of approaches both to defining the geographic area of emissions concern and to establishing compliance options consistent with the state's policy. Finally, electric industry restructuring has shaped state approaches.

In developing the regulatory approach, the five states have made a variety of decisions affecting the ultimate architecture of their multi-pollutant approach. Massachusetts and New Hampshire developed multi-pollutant regulations that are fairly similar in their

applicability to large highly polluting power plants, level of emission standards, output-based approach, and four-pollutant coverage. However, the states took different approaches to compliance with Massachusetts adopting a hybrid of on-site emission reductions and trading, and New Hampshire opting for full trading compliance. In contrast, Connecticut and New York both apply their regulations to a wide range of sources (largely defined as NO_x Budget Program sources), establish emissions standards for SO_2 and NO_x, and set standards on an input basis. Again, the states differ in their compliance options. Connecticut developed a hybrid compliance option with certain provisions for on-site emission reductions (including a fuel sulfur content requirements), and trading provisions that favor in state emission reductions. New York have has proposed a compliance option favoring trading of in-state allowances. New Jersey has negotiated permit conditions for four pollutants with individual power plants. New Jersey used a consent decree and agreement approach with penalties if the targets are not met.

The survey of multi-pollutant programs in Connecticut, Massachusetts, New Hampshire, New Jersey, and New York permits the following conclusions:

- States that have developed multi-pollutant approaches have consistent reasons and goals for these programs. Failure of existing programs to address the full range of emissions impacts on the public health, resources, and economy of individual states is one of the primary catalysts for additional state action.
- The lack of federal action to address multiple pollutant impacts is resulting in a patchwork of state actions, leading to regulatory complexity and inefficiency for regulators and affected sources alike.
- In the absence of a federal policy on climate change, individual states are taking actions that are driven by a perceived imperative to reduce greenhouse gas emissions due to their global impact and the consequences of that global impact on state resources and economy. Governors, legislatures, and state agencies have demonstrated a willingness to tackle greenhouse gases.
- Public health, consumer, and environmental advocates have pushed for state multi-pollutant reductions from power plants and have played a key role in encouraging and supporting state action.
- Governors, both individually and as participants in regional initiatives, have been crucial to the development of multi-pollutant regulatory programs, and to state initiatives to address both CO_2 and mercury.
- Regulatory efforts that focus specifically on power plant emissions permit environmental regulators to align environmental policy goals with economic policy goals. This leads to greater efficiencies in achieving emission reductions.
- Multi-pollutant programs, including more stringent regulatory standards, are consistent with the move to competitive wholesale electricity markets. Further, they do not threaten electric power system reliability in the short-term or the long-term.

- Regulations that rely on output-based approaches are consistent with increased competition in the electric industry and lead to higher emission reductions. Emphasis on encouraging generation efficiency is particularly important from an emissions perspective considering the emissions characteristics of baseload fossil-fueled electric generating units in New England and in other Northeastern electrical control regions.
- Multi-pollutant programs permit greater regulatory efficiencies when they streamline planning, reporting, and compliance obligations. State agencies have determined that multi-pollutant regulatory approaches are cost-effective when compared with single pollutant regulation or with additional regulation in other sectors.
- Federal action is needed in the development of effective multi-pollutant legislation, mercury standards, and approaches to output-based standards for combined heat and power applications.

1. Introduction

This report presents a case study of multi-pollutant approaches to regulating air emissions from large power plants. The report is the second phase of a two-phase project focusing on electricity industry policies on clean power and energy efficiency that Synapse Energy Economics has undertaken for the Ozone Transport Commission (OTC). The first phase of this project was a survey that identifies and summarizes clean power and energy efficiency programs that are currently planned or on going. The survey focused on initiatives within the Ozone Transport Region (OTR) States, but also identified certain promising options from other states. [1] The purpose of the survey was to provide information in a consistent format on each of the programs, and to identify which programs, or which program aspects, are worthy of additional study as OTC continues its clean energy initiative.

In this phase of the project we are doing two studies. The study in this report reviews recent regulatory and legislative activities in Connecticut, Massachusetts, New Hampshire, New Jersey, and New York to reduce emissions of multiple pollutants from electric power plants. Another study, contained in a separate report, is titled *Predicting Avoided Emissions from Energy and Environmental Policies.* That study provides a user-friendly tool for calculating avoided emissions from a variety of energy and environmental policies.

This report is divided into six sections. The second section provides a description of the existing NO_x Budget Program that is currently being implemented in the Ozone Transport Region. The third section addresses why some states have decided to go beyond the NO_x budget to pursue multi-pollutant approaches to air emissions regulations. The fourth section describes the multi-pollutant approaches in Connecticut, Massachusetts, New Hampshire, New Jersey, and New York. The fifth section provides review and analysis of some of the major issues that the states have faced in developing multi-pollutant approaches, and how the states have addressed those issues. Finally, the sixth section contains conclusions.

2. The NO_x Budget Program

The purpose of this section is to provide a status report on the NO_x Budget Program (NBP). The next section discusses why some states have chosen to pursue regulatory initiatives beyond the NBP.

In 1994 the states in the Ozone Transport Region (except Virginia) adopted a Memorandum of Understanding (MOU) to achieve reduction in seasonal NO_x emissions throughout the region. The goal of the program is to reduce NO_x emissions from 1990 baseline emissions (473,011 tons) during the ozone season (May-September) region-wide as part of each state's effort to attain the national ambient air quality standard for ground

[1] The Ozone Transport Region encompasses Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and the Northern Virginia suburbs of Washington, D.C.

level ozone. The MOU established three phases. Phase I required the installation of NO_x Reasonable Available Control Technology (RACT) on affected sources. For Phase II, states committed to developing regulations to achieve region-wide reductions in emissions of NO_x in 1999. Finally, Phase III requires additional region-wide reductions in 2003.[2] The regional cap for 2003 is 143,000 tons of NO_x for the ozone season. On May 1, 1999 OTC-wide trading began under the NO_x Budget Program. The states and the United States Environmental Protection Agency (U.S. EPA) developed a model rule for Phases II and III that identifies specific elements that should be consistent among the states for the successful establishment of an interstate trading program.

After states in the OTR had adopted the NO_x Budget MOU, U.S. EPA promulgated in 1998 a rule to reduce smog in the eastern United States.[3] The rule is known as the NO_x SIP Call. The NO_x SIP Call requires 19 eastern states (excluding Maine, New Hampshire, and Vermont) and the District of Columbia to reduce their summertime NO_x emissions in order to reduce regional ozone levels. EPA's final rule was challenged in court; however, in March 2000 the US Court of Appeals for the District of Columbia Circuit upheld EPA's authority to issue the NO_x SIP Call and to establish state NO_x budgets.[4] Each NOx SIP Call state revised its State Implementation Plan (SIP) to identify how it will comply with these emission reduction requirements. US EPA has not yet determined how to appropriately transition from the OTC NO_x Budget Program with trading to the NO_x SIP Call requirements for May 2004, and it is not clear under what circumstances New Hampshire may participate in trading in 2003.

2.1 State Activities

The state signatories to the MOU enact regulations consistent with the model rule, allocate allowances to sources in state, and verify compliance. The regulations apply to "Budget Sources" defined as a fossil fuel fired boiler or indirect heat exchanger with a maximum rated heat input capacity of 250 MMBtu/Hour or more; and all electric generating devices with a rated output of 15 MW or more. States also allow other sources to participate in the allowance allocation through "opt-in" provisions.

Under the NO_x Budget Program allowance budgets were allocated to the individual states. The states, in turn, allocate some or all of the allowances to affected sources. Some states allocate the allowances available under the NO_x Budget Program in a fashion that rewards efficient generation, energy efficiency, renewable energy, and innovative emissions reduction programs. States have adopted a variety of allocation methods. Connecticut allocates allowances first to new sources, cogeneration sources and industrial sources based on the lower of permitted emission levels, NO_x RACT levels or historical

[2] Additional information on the NBP is available on the OTC website (www.sso.org/otc/) and on the US EPA website (www.epa.gov/airmarkets/otc/index.html).

[3] US EPA 1998.

[4] US Court of Appeals for the District of Columbia Circuit, Michigan v. EPA, No. 98-1497, March 3, 2000.

actual levels.[5] Some states allocate allowances based on electrical output in order to reward generation efficiency. For example, Massachusetts has allocated allowance to generation sources on an output basis.[6] New Hampshire will be moving to output based allocation following 2005.[7] New Jersey also allocates allowances from its incentive reserve on an output basis. A few states provide a set-aside for efficiency and/or renewables (MA, NH, NJ).[8] For example, Massachusetts also has a 5 percent set-aside for new units, and a 5 percent Public Benefit set-aside to be allocated to energy efficiency and renewables. New Hampshire has a 10 percent set aside in Phase II, increasing to 14 percent in Phase III for new units, energy efficiency and renewables, from which it retires 100 allowances each season for environmental benefit. New Jersey has a set-aside for new generation sources and a set-aside for energy efficiency and renewables; the total for both set asides is 9 percent. The New York NO_x budget allocation was determined through a negotiation among affected parties, and includes a fuel-neutral input based allowance allocation.[9] New York uses excess allowances from the new source (5 percent) and energy efficiency and renewable set-asides (3 percent) to account for new generation and reward energy efficiency and renewable generation.

2.2 Results of the OTC NO_x Budget Program

OTC's NO_x Budget Program has produced positive results. US EPA and OTC prepare annual reports evaluating the results of the NO_x Budget Program. In 1999, actual NO_x emissions were 80 percent of 1999 allocations. In 2000, actual NO_x emissions were 89 percent of 2000 allocations. And, in 2001, actual NO_x emissions were approximately 88 percent of 2001 allocations.[10]

In testimony to the Connecticut Department of Environmental Protection (CT DEP), Jason Grumet, from the Northeast States for Coordinated Air Use Management (NESCAUM,) stated that market-based mechanisms such as the NO_x Budget Program have produced (and will produce) substantial emissions reductions. He explained that these emission reductions will lower ambient levels of ozone, fine particulate matter, and acid rain precursors; and that in addition they are likely to lead to reductions in mercury and carbon dioxide emissions from coal-fired power plants.[11]

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[5] Connecticut's NO_x Budget Program is contained in 22a-174-22a (1999-2002) and 22a-174-22b (post 2002).

[6] Massachusetts' NO_x Budget Program is contained in 310 CMR 7.27 and 7.28. Output based allocation is contained in 310 CMR 7.28.

[7] New Hampshire's NO_x Budget Program is contained in NH Code of Administrative Rules, Part Env-A 3200.

[8] New Jersey's NO_x Budget Program is contained in NJ Administrative Code, Title 7, Chapter 27, Subchapter 31.

[9] New York's NO_x Budget Program is contained in 6NYCRR Part 204.

[10] 1999 OTC NOx Budget Program Compliance Report, March 27, 2000; 2000 OTC NOx Budget Program Compliance Report, May 9, 2001; 2001 OTC NOx Budget Program Compliance Report, March 26, 2002.

[11] CT DEP, Hearing Report 2000, at 53.

As discussed in more detail below, output-based approaches for allowance allocation hold particular promise for reductions in emissions of other pollutants. In its explanation supporting output-based allowance allocation, the Massachusetts Department of Environmental Protection (MA DEP) stated that output based allocation of allowance provides several environmental benefits "including significant collateral reductions in emissions of other pollutants."[12] In addition, the MA DEP stated: "The economic signal from an updated, output-based allocation, all else held equal, encourages the operation of generating facilities with lower rates of emissions of several other pollutants with significant public health and environmental benefits."[13]

Thus, individual states have taken steps to ensure that the NBP produces environmental benefits beyond NO_x reductions where possible. Their methods include incorporating energy efficiency and renewables into the program, providing allowances to new sources, and creating incentives for efficient electricity generation. Despite the success of the NBP, as discussed in the next section, several states have determined that additional steps are warranted to further reduce emissions of NO_x and other pollutants.

3. Going Beyond the NO_x Budget Program

This section provides a discussion of some of the reasons that states have decided to undertake additional regulatory activity beyond the NO_x Budget Program despite the success from the program. In many instances, these reasons highlight potential areas where multi-pollutant programs provide benefits beyond the NO_x Budget Program. States have identified a number of reasons for adopting additional pollution control requirements beyond the NO_x Budget Program and other existing regulatory programs. The primary reasons for additional regulatory efforts include reasons pertaining to environmental impacts of emissions as well as to changes in the electric industry. For example, states cite the following reasons: the desire to address subregional emissions impacts; capture the benefits of an annual regulatory scheme; continue to address other impacts of NO_x such as eutrophication, nitrification, and acid deposition as well as ozone and summer deposition; achieve additional emission reductions to protect sensitive areas from acid deposition; address health impacts of emissions; be proactive given the likelihood of federal regulation of fine particulate matter, regional haze, mercury and possibly carbon dioxide (CO_2); and achieve potential efficiency gains from multi-pollutant approaches that include mercury, carbon dioxide, and sulfur dioxide as well as NO_x. These reasons are described in more detail below.

State and local impacts v. regional impacts

The NO_x Budget Program is a regional program. The primary reasons for additional regulatory efforts in individual states also involve regional concerns; however state-by-state multi-pollutant regulations are a "bottom-up" approach to address these concerns across the region.

[12] MA DEP Response to Comments, 310 CMR 7.28 at 3

[13] MA DEP Response to Comments, 310 CMR 7.28 at 4

In addition, multi-pollutant regulations offer an opportunity to reduce state and local emission impacts. For example, the Connecticut DEP cites one of its two principal reasons in support of its regulations that they will "further protect the public health of those living in close proximity to the sources."[14]

Annual v. seasonal impacts

The NO_x Budget Program addresses emissions during the summer ozone season, May through September, when ground level ozone is a problem in this region. However, this focus on summer ozone levels does not address the wide variety of environmental impacts that are associated with emissions of NO_x. A study by Resources for the Future (RFF) determined that an annual emission reduction program would be more cost-effective than an ozone season emission reduction program just on the basis of particulate related health effects.[15] The paper analyzes the benefits and costs of three NO_x reduction scenarios in the electricity sector in the United States. The scenarios are: (1) a summer seasonal cap in the eastern states covered by EPA's NO_x SIP Call; (2) an annual cap in the same SIP Call region; and (3) a national annual cap. The analysis indicates that an annual cap in the SIP Call region offers the greatest benefit-cost ratio, based on particulate related health effects alone. RFF determined that an annual cap would also deliver over a billion dollars more in net benefits than would a seasonal policy. This is because the benefits of an annual policy are more than double those of a seasonal policy, but costs are only slightly greater.

NESCAUM expressed strong support for annual, in addition to seasonal, NO_x emission reduction programs. In comments to the Connecticut DEP, NESCAUM's Executive Director stated:

> Existing regional and national NO_x reduction programs are effectively seeking to address the role of NO_x emissions in the formation of smog and therefore only require compliance during the five summer months. As such, these efforts fail to address the year-round NO_x contribution to fine particle formation, acid deposition[16], water eutrophication, and other environmental impacts. DEP's proposal to extend similar levels of NO_x control beyond the summer months represents a significant and laudable new step.[17]

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[14] CT DEP, Hearing Report, 2000, Section IV

[15] "Cost-effective Reduction of NOx emissions from Electric Generation." David Burtraw et al, Resources for the Future. December 2000.

[16] Note that some year-round regulation of NO_x emissions is required under the federal Acid Rain Program to address the NO_x contribution to acid deposition. However, these requirements are currently less stringent, for the most part, than the control requirements being contemplated for ozone mitigation purposes.

[17] Testimony of Jason Grumet, Executive Director, Northeast States for Coordinated Air Use Management Concerning Regulations Proposed by the Connecticut DEP to Implement Connecticut Executive Order No. 19, September 22, 2000.

Additional impacts from NO_x

The NO_x Budget Program was designed primarily to reduce emissions of NO_x, an ozone precursor, due to concerns over high concentrations of ground level ozone. However, NO_x emissions have a number of other impacts, including the acidification and nitrification of watersheds, the eutrophication of coastal waters, and the formation of particulate matter. In explaining their regulatory efforts, the states cite the need to address these additional impacts associated with NO_x.[18]

Need for additional action to address acid rain

The states emphasize that despite significant progress under the provisions of the Clean Air Act towards reducing impacts of acid deposition, the federal provisions in Title IV do not appear to be sufficient to protect sensitive areas from acid rain and other acid deposition.

For example, New York determined that compliance with existing Clean Air Act standards would not be sufficient to address the impacts of acid rain on the Adirondacks. NY Department of Environmental Conservation (DEC) cites the 1998 National Acidic Deposition Assessment Program (NAPAP) report as well as an EPA report from 1995 that both emphasize the need for additional reductions of SO_2 and NO_x emissions in the range of 40-50 percent.[19] The New York DEC cites the "lack of a national program that adequately protects New York State."[20]

Similarly New Hampshire Department of Environmental Services (DES) cites "continuing threats" to the health, environment, and economy of New Hampshire.[21] DES discusses the need to pursue emission reductions beyond the federal requirements and cites a Hubbard Brook Research Foundation report calling for additional reductions of SO_2 of 80 percent.[22]

Massachusetts also cites evidence of the need for emission reductions 40-50 percent below federal requirements to protect sensitive areas based on a report from the General Accounting Office.[23] Massachusetts also notes the goals of the New England Governors and Eastern Canadian Premiers Acid Rain Action Plan, which requires additional action to reduce NO_x emissions (this Plan is described in Section 4.2(2)).[24]

Like the other states, Connecticut states that one of the principal reasons in support of its regulations is that the anticipated emission reductions "will further protect the

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[18] See, e.g. MA DEP *Technical Support Document*, April 2001 at 8-10, 24; NH DES *Clean Power Strategy*, at 25-28; and CT DEP *Hearing Report* Section IV.

[19] NY DES *Consolidated Regulatory Impact Statement*, at 9-10.

[20] Id. at 37.

[21] NH DES, *Clean Power Strategy*, at 2.

[22] Id. at 14-17. Hubbard Brook Study available at www.hubbardbrook.org.

[23] MA DEP, 7.29 *Technical Support Document*, June 2000, at 3.

[24] MA DEP, 7.29 *Technical Support Document*, June 2000, at 9.

environment in Connecticut and throughout New England consistent with the Eastern Canadian Premiers'/New England Governors' Acid Rain Action Plan of 1998."[25]

Anticipated pollutant regulation

Multi-pollutant regulations offer the opportunity to reduce or prevent certain emissions that will be regulated (such as mercury) or to take proactive steps to reduce the impacts of pollutants that are not federally regulated (such as CO_2). A recent report from STAPPA/ALAPCO states:

> Over the next ten years, states and localities in the U.S. will be required to engage in a number of important air quality initiatives. These initiatives, which will compel the identification and implementation of emission control strategies, will not only contribute to the achievement of clean air goals, they will also present tremendous opportunities for reducing [Greenhouse Gases] GHGs. Among the initiatives that will facilitate such opportunities are:
>
> - Development of plans to meet new and revised health-based federal standards for PM and ozone;
> - Preparation of strategies to reduce transported ozone in the eastern U.S.;
> - Identification and implementation of measures to reduce regional haze;
> - Implementation of New Source Review programs for major stationary sources;
> - Implementation of potential new regulatory requirements for hazardous air pollutants, such as mercury; and
> - Compliance with new requirements for restructuring the electricity industry.[26]

Individual states have made similar statements in addressing mercury and greenhouse gases. The New Hampshire DES states: "If unchecked, climate change could have multiple deleterious effects on the health of New Hampshire citizens and their quality of life." The NH DES also explains that "Given the potential scope and irreversibility of ecosystem changes and consequent effects on human health and society, traditional public health values would urge prudent action to prevent such changes."[27] The Massachusetts DEP noted US EPA's efforts to gather data on mercury emissions from coal-fired power plants as well as anticipated climate change due to anthropogenic

[25] CT DEP, *Hearing Report* 2000, Section IV.

[26] STAPPA/ALAPCO*, Reducing Greenhouse Gases and Air Pollution – A Menu of Harmonized Options* Final Report, 1999, at 3.

[27] NH DES, *New Hampshire Clean Power Strategy*, at 84.

greenhouse gas emissions.[28] New Jersey has also decided to address greenhouse gas emissions due to their potential impact on New Jersey's coastline, and the associated infrastructure and revenue losses.

In New England a significant driving force in encouraging states to address both mercury and greenhouse gases has been the Conference of the New England Governors and the Eastern Canadian Premiers (NEG/ECP). The NEG/ECP adopted both a Mercury Action Plan and a Climate Change Action Plan that have formed an important foundation for activities in individual states. These Action Plans are described in Section 4.2(2) Governor Actions, below.

Electric industry restructuring

Over the past decade, there have been significant changes in the electric industry. These changes have occurred at multiple levels, including retail electric service, corporate structure, and wholesale electric supply. For example, in many states electric utilities, which traditionally owned electrical generation, distribution, and transmission, have been broken into separate pieces. In some instances, the electric generation facilities have been sold to independent generators. At the wholesale level, there has been a strong push both at the federal and at the state level, for greater competition among generation sources. This push has lead to changes in the way the bulk power system is operated and planned. In a related area, many states have changed the way they review proposals for new power plants. Several of the states that have embraced electric industry restructuring no longer seek to determine whether there is a need for a new generation source, leaving such determination "to the market." Increased competition, changing planning processes, and the changing dynamics between generation sources, create a new set of economic incentives that could be put to work to achieve environmental policy goals. However, accomplishing this requires that environmental regulators modify the tools they use to achieve environmental policy goals to ensure that they are aligned with changes in the electric industry.

Cost-effective compliance strategies

The multi-pollutant approach can introduce significant administrative efficiency for both the affected facilities and the implementing agency, depending on how it's implemented. The multi-pollutant approach enables the consolidation of compliance planning, measurement, reporting, and verification activities both for the affected facilities and the agency. This approach can also rely on the same electrical output data for all pollutants, which enhances the efficiency and consistency of the program.

In its Clean Power Strategy, the NH DES explains its support of a multi-pollutant regulatory approach:

> By implementing one integrated strategy that comprehensively addresses sulfur dioxide (SO_2), oxides of nitrogen (NO_x), mercury, and carbon dioxide (CO_2),

[28] MA DEP, *Background Document and Technical Support for Public Hearings on Proposed Amendments to 310 CMR 7.00 et. seq.*. June 2000.

> policy makers can provide New Hampshire's electric generators with the certainty and flexibility they need to meet clean air goals in the most cost-effective way. In addition, a comprehensive, integrated approach involving multiple pollutants allows generators to take advantage of the collateral benefits ("co-benefits") created when measures to reduce one pollutant assist in reducing emissions of other pollutants.[29]

Effective emission reductions and cost-effectiveness were also important goals in the development of multi-pollutant regulations in Massachusetts. In explaining its proposal of multi-pollutant regulations MA DEP States:

> This integrated approach will enable facility owners to make emission control decisions wile considering several standards at once, rather than in piecemeal fashion. The multi-pollutant regulatory framework will allow facility owners to make more comprehensive assessments of pollution control strategies and find integrated approaches that can reduce costs relative to sequential investments to meet single-pollutant standards set over several years.[30]

Federal agencies have also determined that regulatory approaches addressing multiple pollutants lead to more efficient compliance decisions. For example, in a 1999 study EPA found that pollution control strategies to reduce emissions of nitrogen oxides, sulfur dioxide, carbon dioxide, and mercury are highly inter-related, and that the costs of control strategies are highly interdependent.[31] The study found that the total costs of a set of actions is less than a piecemeal approach, that plant owners will adopt different control strategies if they are aware of multiple pollutant requirements, and that combined SO_2 and carbon reduction options lead to further air emission reductions.[32] Similarly, in one of several studies on multi-pollutant strategies, the Energy Information Administration (EIA) found that using an integrated approach to NO_x, SO_2, and CO_2, is likely to lead to lower total costs than addressing pollutants one at a time.[33]

Thus, despite the successes of the NO_x Budget Program, individual states cite a number of reasons supporting their development of regulatory approaches that go beyond the NO_x Budget Program. As discussed in the next session, several states in the OTR have pursued regulatory initiatives that address two or more pollutants.

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[29] NH DES, *New Hampshire Clean Power Strategy,* January 2001, at v.

[30] MA DEP 2000, *Background Document and Technical Support Document for Public Hearing on Proposed Amendments to 310 CMR 7.00 et seq.: 310 CMR 7.29 – Emission Standards for Power Plants*, June 2000, at 11.

[31] US EPA, *Analysis of Emissions Reduction Options for the Electric Power Industry,* March 1999.

[32] US EPA, *Briefing Report*, March 1999.

[33] EIA, *Analysis of Strategies for Reducing Multiple Emissions from Power Plants: Sulfur Dioxide, Nitrogen Oxides, and Carbon Dioxide.* December 2000. Note: this cite is not an indication that Synapse endorses all of the methods and findings of this and other similar EIA studies.

4. Multi-pollutant Approaches in Certain OTR States

4.1 Description of Programs

Several states -- CT, MA, and NH -- have implemented approaches dealing with multiple pollutants in the context of addressing older, highly polluting power plants. New York has recently proposed regulations as one component of the states' support of a multi-pollutant strategy. The purpose of this section is to summarize existing approaches to addressing air emissions from high polluting sources. This report focuses on CT, MA, NH and NY as states in the OTR that have taken a comprehensive regulatory approach to seeking additional emission reductions of two or more pollutants from affected sources. A summary table of these states' regulatory approaches is provided in Appendix A. This section also includes a brief summary of a settlement in New Jersey that takes a multi-pollutant approach to emissions reductions from generation facilities owned by one company. This summary is included as another example of a multi-pollutant program. Each description includes a brief summary of the background of the state's approach, the structure of the approach, and the anticipated benefits. Many of the background issues are discussed in greater detail in Section 4.2 "Factors shaping the states' approaches." Many of the anticipated benefits are discussed in more detail in Section 5 "Issues in States' Approaches."

(1) Connecticut (22a-174-19a (SO2), 22a-174-22 (NOx), 22a-174-22a (NOx budget), and 22a-174-22b (NOx budget post 2002).[34]

Background:

In 1999, in response to public pressure the Connecticut Legislature took up air quality legislation designed to reduce emissions of SO_2, and NO_x; however, legislation was not passed. Subsequently, Governor Rowland issued Executive Order No. 19 in May 2000 directing the Connecticut DEP to develop regulations that would achieve reductions in SO_2 emissions 30-50 percent below current commitments and reductions in NO_x emissions 20-30 percent below then current commitments. The CT DEP undertook a regulatory proceeding, including an extensive stakeholder process, to develop regulations in response to the Executive Order.[35] The CT DEP issued final regulations implementing the Governor's Executive Order in December 2000.

[34] This section is based on a review of CT DEP regulations and the hearing report, as well as personal communications with Chris Nelson, CT DEP (March 7 and April 3, 2002).

[35] For more information on the development of the regulations, see CT DEP 2000.

Structure of Regulations:

The final regulations apply to NO_x Budget Program Sources, including all fossil fuel-fired electric generating plants (15 MW and above) and large industrial and commercial boilers (250 MMBtu/hr and above). These are the stationary sources that are already covered by Connecticut's NO_x Budget Program. Connecticut DEP issued separate regulations that cover SO_2 and NO_x. The NO_x regulations require that NO_x budget sources meet a NO_x emissions rate of 0.15lbs/MMBtu of fuel input. The DEP's final SO_2 regulations contain two tiers of requirements. Beginning January 2002 all affected sources must either combust 0.5 percent sulfur fuel, meet a unit-by-unit emission rate of 0.55 lbs SO_2/MMBtu or meet a facility-wide monthly average emission rate of 0.5 lbs SO_2/MMBtu. Beginning January 2003 all power plants subject to the Acid Rain Program must meet one of the following additional requirements: combust 0.3 percent sulfur fuel, meet a unit-by-unit emission SO_2 rate of 0.33 lbs/MMBtu, meet a facility-wide SO_2 emission rate of 0.3 lbs/MMBtu or use emission reduction trading to meet a unit-by-unit emission rate of 0.3 lbs/MMBtu. In May 2002, the Connecticut Legislature passed legislation that will restrict the use of allowance trading for compliance with the second phase of the requirement (see discussion in Section 4.2(3), below).

Anticipated benefits:

Sulfur dioxide: DEP anticipates that the regulations will achieve nearly 19,000 tons of SO_2 reductions beginning with Phase I in 2002, a 50 percent reduction in SO_2 emissions from 1999 baseline levels. An additional 8,900 tons of local reductions may be realized in Phase II, which begins in January 2003.

Nitrogen oxides: DEP also anticipates that the regulations will achieve a 30 percent reduction in NO_x emissions from 1999 baseline levels due to the NO_x Budget Program and the emission reductions required in the non-ozone season.

Additional benefits: DEP expects the regulations to reduce nitrogen loading to Long Island Sound, reduce acidification of lakes and streams, reduce damage to trees at high elevations, reduce the decay of building materials and paints, reduce nitrates in drinking water, and reduce excessive nitrogen loading to aquatic and terrestrial ecosystems.[36]

(2) Massachusetts (310 CMR 7.29)[37]

Background

In September 1998, a coalition of 150 public health, environmental, consumer and community organizations, calling themselves the Clean Air Now (CAN) Coalition, presented a petition to DEP. The petition called for emission reductions from the largest and oldest power plants in Massachusetts. Then-Governor Celucci signed a pledge to

[36] CT DEP, Hearing Report 2000, Section IV.

[37] This section is based on a review of MA DEP regulations and technical support documents, as well as personal communications with Nancy Seidman, MA DEP (April 2, 2002), and William Lamkin, MA DEP (April 5, 2002).

reduce power plant emissions from the "Filthy Five" and directed the MA DEP to take actions to carry out his commitment. The DEP held a series of meetings with stakeholders including representatives from the CAN Coalition, power plant owners, and other state agencies to discuss how the goals of the petition could be addressed. Subsequently, DEP issued proposed regulations in summer 2000, and held public hearings. DEP issued final regulations in April 2001.

Structure of Regulations

The DEP's final regulations require emission reductions from the six largest, most polluting power plants in Massachusetts. They require that the affected facilities meet output based emission standards for SO_2, NO_x, and CO_2. The Department will establish a mercury standard following study and analysis. Sections for CO and PM 2.5 are reserved in the regulations for potential future regulatory activity. The regulations require that power plant owners achieve on-site emission reductions, but also allow power plants owners to use federal allowances to meet a portion of the requirements.

Anticipated Benefits

Sulfur dioxide: The Department expects to achieve an actual reduction in the aggregate average SO_2 emissions rate from all of the affected units of between 50 and 75 percent. All facilities must meet an emission rate of 6.0 lbs/MWh without allowances. In addition all facilities must meet an emission rate of 3.0 lbs/MWh with on-site reductions or using allowances in a 3:1 ratio. However, the Department anticipates that at least three of the facilities will comply with the emission requirement through on-site reductions.

Nitrogen oxides: The Department expects an approximate 50 percent aggregate reduction in NO_x emissions from the affected facilities from the baseline (average of 1997-1999). The regulations require that all facilities meet an emission rate of 1.5 lbs/MWh on an annual basis through real reductions on site. This level represents a reduction of 66 percent from current emission levels allowable under NO_x RACT for units burning coal and would represent a significant non-ozone season emission reduction.

Mercury: The Department anticipates that significant mercury and carbon dioxide reductions will be required over the next ten years and states that the regulations will enable facility owners to incorporate plans to control these emissions at the same time as they control nitrogen oxides and sulfur dioxide. DEP also states that mercury emissions will be reduced simply by implementing an output-based standard that rewards generation efficiency.

Carbon dioxide: The Department's standard of 1,800 lbs/MWh represents a 10 percent reduction from historic baseline (1997-1999). Off-site emissions reductions are allowed for CO_2, subject to DEP approval.

Fine particulates: The DEP anticipates that required NO_x and SO_2 emission reductions will result in reductions in ambient concentrations of fine particulate matter since NO_x and SO_2 are major precursors of fine particulates. The DEP declined to adopt a fine

particulate standard because it determined there was insufficient data on in-stack and ambient concentrations of fine particulate matter.

Generation efficiency: Output based standards reward generation efficiency.

Planning and compliance efficiency: Multi-pollutant regulations enable efficiency in planning compliance strategies and in compliance activities (e.g. reporting and verification).

(3) New Hampshire ("Clean Power Act")[38]

Background:

The origins of this statute are in a public petition presented to the Governor of New Hampshire. A coalition of environmental and public health groups submitted a petition for government action in late 2000. The petition sought emission reductions from the state's oldest and dirtiest coal and oil-fired generation facilities. Governor Shaheen pledged to lead the effort to require power plants to achieve additional emissions reductions. The New Hampshire DES conducted a series of meetings between petitioners, electric companies, and other interested parties. Subsequently, the Department issued its "Clean Power Strategy" in January 2001. The Clean Power Strategy formed the basis for the "Clean Power Act" contained in House Bill 284. The legislation was passed by the New Hampshire Legislature, and signed into law in May 2002.

Structure of Legislation:

House Bill (HB) 284 requires emission reductions from generating units at the three largest, most polluting power plants in New Hampshire. The legislation establishes a cap on the emissions of SO_2, NO_x, and CO_2 from six generating units and provides that the DES shall allocate allowances to the affected units on the basis of electrical output. The legislation provides for the Department to recommend a level for a cap on mercury emissions from coal-fired facilities following study and analysis and the release of US EPA's proposed regulation establishing a Maximum Achievable Control Technology (MACT) standard for mercury emissions from utility boilers. The program provides an incentive to purchase SO_2 allowances within the OTR since it requires the purchase of only 0.8 allowances for each ton of emissions if the allowances are purchased from sources inside the OTR. Allowances from outside the OTR must be purchase in a 1 to 1 ratio.

Anticipated Benefits:

Sulfur dioxide: Through trading, the Department expects to achieve a reduction in the aggregate average SO_2 emissions from all of the affected units of 75 percent below Phase

[38] This section is based on a review of the New Hampshire Clean Power Strategy (January 2001) and H.B. 284, as well as personal communications with Andy Bodnarik NH DES (December 2001- January 2002, April 3, 2002), and Joe Fontaine NH DES (December 2001 – January 2002).

II of Title IV of the Clean Air Act, reducing total SO_2 emissions by 89 percent since 1990.

Nitrogen oxides: The Department expects to achieve a 70 percent further reduction in annual NO_x emissions, above and beyond the 68 percent annual (76 percent seasonal) NO_x reduction that New Hampshire has already achieved, reducing total New Hampshire NO_x emissions from these sources by 90 percent since 1990.

Mercury: The Department will recommend a level for a cap on mercury emissions from coal-fired facilities following emission testing, coal sampling, study and analysis, and the release of US EPA's proposed regulation establishing a MACT standard for mercury emissions from utility boilers.

Carbon dioxide: The Department expects to achieve a 3 percent reduction below 1999 CO_2 emission levels, reducing annual CO_2 emissions from these sources to 1990 levels, consistent with the Climate Change Action Plan adopted by the New England Governors and Eastern Canadian Premiers.

Generation efficiency: Output-based allocations encourage generation efficiency.

Planning and Compliance efficiency: Multi-pollutant statutes can reduce the total costs of compliance with statutes because of the opportunity for integrated decision making on compliance options.

Other benefits: DES determined that the New Hampshire economy would benefit more from this strategy than from any other strategy, including no action to reduce emissions from power plants. Economic benefits include avoided health care costs, support of recreation and natural resource industries, maximizing the auction value of power plants, satisfying legislative requirements for environmental improvement, providing a "first mover" advantage to New Hampshire power plants in regulatory compliance, and creating technological opportunities and job creation.

(4) New York (proposed 6NYRCC Parts 237, 238 and 204)[39]

Background:

In February 2002, the NY Department of Environmental Conservation (DEC) proposed regulations to reduce emissions of acid rain causing pollutants (SO_2 and NO_x) from fossil fuel fired electric generators in New York State. In announcing the release of the draft regulations, Governor Pataki also called for reductions in emissions of mercury and carbon dioxide. The proposed regulations are contained in 6NYRCC Part 237 (NO_x) and Part 238 (SO_2). The proposed regulations were developed with input from a series of stakeholder meetings starting in 1999. The NY DEC met with regulated parties, environmental groups and other affected parties in groups as well as individually. The

[39] This section is based on a review of NY DEC proposed regulations and the Consolidated Regulatory Impact Statement, as well as personal communications with Rob Slewinski, NY DEC (March 2002) and Mike Sheehan, NY DEC (April 1, 2002).

DEC issued draft regulations for pre-proposal review in July 2001 and received few comments, none of which substantially altered the regulations prior to proposal.

Structure of Proposed Approach:

New York is pursuing a multi-pollutant strategy that relies on a combination of regulatory and non-regulatory vehicles. New York DEC has proposed regulations pertaining to SO_2 and NO_x. The proposed regulations are designed to reduce emissions of SO_2 50 percent below what would be allowable under the Clean Air Act regulations. The proposed regulations also extend New York's existing ozone season NO_x regulations to the non-ozone season. For Mercury, New York plans to wait for EPA's issuance of the proposed MACT standard in December 2003. Governor Pataki created a Green House Gas Task Force that is charged with developing a plan with recommended measures in late spring 2002.

Anticipated Benefits:

Sulfur dioxide: The proposed regulations are designed to reduce sulfur dioxide emissions to 50 percent below the levels allowed in Phase 2 of Title IV, the federal acid rain program.

Nitrogen oxides: The proposed regulations annualize the summertime ozone NO_x Budget Trading Program (6 NYCRR Part 204) at the nominal statewide emission rate of 0.15 pounds of NO_x/MMBtu. This is implemented through a cap and trade program with a non-ozone season (October through April) budget of 39,908 tons. DEC anticipates that this will result in an overall mass emission reduction of 70 percent from 1990 levels.

Carbon dioxide and mercury: The New York State Energy Research and Development Authority (NYSERDA) used the Market Assessment and Portfolio Strategies (MAPS) model to analyze the potential impacts of the Acid Deposition Reduction Program on the state's electricity system reliability, air emissions and electricity prices. Through this modeling, NYSERDA projected reductions in emissions of mercury as well as greenhouse gases due to the implementation of compliance strategies to meet the proposed SO_2 and NO_x regulations. The modeling projected ten percent or higher reductions in CO_2 emissions compared to the base case and "significant" reductions in mercury emissions from the base case. In addition, the NY Department of Public Service sent questionnaires to regulated facilities to develop compliance cost data and support modeling efforts.

Other benefits: The NY DEC also anticipates that there would be significant benefits associated with the reduction in premature mortality due to PM2.5 reductions, and that visibility would improve.

(5) New Jersey (Settlement with Public Service Enterprise Group)[40]

Background

In April 2000 the NJ Department of Environmental Protection (NJ DEP) released the New Jersey Sustainability Greenhouse Gas Action Plan. The Plan provides a framework for reducing greenhouse gas emissions in New Jersey to 3.5 percent below their 1990 levels by 2005. In April 2001, Public Service Electric and Gas Company (PSE&G) executed a Covenant of Sustainability/New Jersey Greenhouse Gas Initiative wherein it pledged to support the Plan's goal through energy efficiency and renewable energy programs. Subsequently, in January 2002, Public Service Enterprise Group (PSEG) Fossil LLC, the current owner of the generating units previously owned by PSE&G, signed a multi-pollutant consent decree and agreed to a CO_2 covenant with the New Jersey DEP.[41] The Covenant includes a goal for a CO_2 emission rate. The consent decree includes commitments to achieve reductions in emissions of SO_2, NO_x, and particulates and a goal to reduce mercury emissions at PSEG Fossil's New Jersey coal-fired facilities.

New Jersey DEP has started planning for achieving the carbon reduction goal beyond 2005. New Jersey DEP does not believe the US Climate Change Strategy is sufficient to reduce CO_2, nor that carbon intensity is an appropriate measurement for measuring progress in reducing the threat of climate change. Nevertheless, for purposes of comparison, New Jersey DEP notes that in the past 12 years, NJ has had a 33 percent reduction in carbon intensity. The GHG goal translates into a 35 percent reduction in carbon intensity by 2005 (compared to the US goal of an 18 percent reduction in carbon intensity).[42] New Jersey is adopting a rule to require mandatory reporting of CO_2 for all direct sources that emit greater than 25 tons of nitrogen oxides, and has established a greenhouse gas registry.

Structure of Settlement

The PSEG Fossil CO_2 Covenant includes a goal of reducing the total rate of CO_2 emissions from its NJ fossil fueled electric generating units from the rate of 1706 lb/MWh in 1990 to a rate of 1450 lbs/MWh in 2006. This represents a 15 percent reduction in the emission rate. The commitment will be achieved by the shutdown of inefficient oil units and the construction of efficient combined cycle gas units. If the Company fails to achieve the goal, it must pay to the DEP $1 per pound/MWh it is short of its goal, up to $1.5 million. The fund will be used to fund CO_2 reduction projects

[40] This section based on review of NJ DEP Consent decree with PSEG and associated documents, and input from Mike Wiinka, New Jersey DEP.

[41] United States Court for the District of New Jersey Newark Division, United States State of New Jersey v. PSEG Fossil LLC. *Consent Decree.* 2002. *Covenant Between the New Jersey Department of Environmental Protection and PSEG Fossil LLC,* January 11, 2002.

[42] Office of the President, *US Climate Change Strategy - A New Approach*, February 2002.

within New Jersey.[43] This short-fall fund is on top of the $1.5 million PSEG has already paid to New Jersey DEP upfront to fund innovative landfill gas electricity projects.

In the Consent Decree, PSEG Fossil agreed to specific emission reductions from its coal-fired generating units. For Hudson Unit 2 the company will install a scrubber and baghouse by December 31, 2006 for SO_2 and particulates, and Selective Catalytic Reduction (SCR) by May 1, 2007 for NO_x. For Mercer Units 1 and 2, the company will install scrubbers for SO_2 by December 2010 and December 2012, and SCR by May 1, 2004 and May 1, 2005. PSEG Fossil also agrees to use "best efforts" to achieve 90 percent reductions of mercury emissions with the control devices being installed, and will evaluate continuous monitoring of mercury.[44]

Anticipated Benefits

Sulfur dioxide: DEP expects that the dry scrubbers will reduce SO_2 emissions by over 90 percent from current input-based emission rates to achieve less than 0.150 lb/mmBtu.

Nitrogen oxides: DEP expects that the SCRs will reduce NO_x emissions by over 90 percent from current input-based emission rates to achieve 0.100 or 0.130 lb/mmBtu.

Carbon dioxide: The CO_2 emission goal is to reduce emissions in 2005 by 15 percent from a 2000 baseline.

Mercury: The combination of SCR, scrubber, and baghouse at Hudson Unit 1 is expected to achieve over a 90 percent reduction in heavy metal emissions. If the baghouses are successful, PSEG would undertake mercury control efforts at other coal-fired power plants.

Particulates: Particulate limits are set at, or below, the federal New Source Performance Standard for particulates (0.030 lb/mmBtu for Mercer, and 0.015 lb/mmBtu for Hudson).

Additional benefits: The scrubbers are also expected to reduce hydrochloric acid emissions by at least 90 percent.[45]

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[43] United States Court for the District of New Jersey Newark Division, United States State of New Jersey v. PSEG Fossil LLC. *Consent Decree.* 2002. *Covenant Between the New Jersey Department of Environmental Protection and PSEG Fossil LLC,* January 11, 2002.

[44] New Jersey DEP, *Summary of Key Aspects of Agreement to Control Existing PSEG NJ Coal Units and Covenant to Implement a Goal to Reduce the Rate of Greenhouse Gas Generation in NJ*, 2000.

[45] New Jersey DEP, *Great Things About PSEG Agreement to Control Coal Fired Units*, 2002.

Table 1: Summary of Anticipated Emission Reductions

	Sulfur Dioxide	Nitrogen Oxides	Carbon Dioxide	Mercury
Connecticut	50% reduction from 1999 baseline	30% reduction from 1999 baseline	n/a	N/a
Massachusetts	50-75% reduction from 1997-99 baseline	50% reduction from 1997-99 baseline	10% reduction from 1997-99 baseline	tbd.
New Hampshire	89% reduction from 1990 baseline 75% reduction from Title IV Phase 2	90% reduction from 1990 baseline 70% reduction from 1999 baseline	Return to 1990 baseline 3% reduction from 1999 baseline	tbd.
New Jersey	90% control efficiency	90% control efficiency	15% reduction from 2000 baseline	90% reduction in heavy metal emissions
New York	50% reduction from Title IV Phase 2	70% reduction from 1990 baseline	n/a	n/a

Sources: Projections contained in documents from state environmental regulatory agencies.

4.2 Factors Shaping the Regulations

There are a variety of factors that have shaped multi-pollutant regulatory approaches in individual states. Those factors include public pressure, Governor initiatives, legislative processes, and increased competition in the electric industry. This section describes in broad terms the factors shaping the development of multi-pollutant approaches in Connecticut, Massachusetts, New Hampshire and New York. It identifies many of the factors that affected how each state addressed issues that are discussed in more detail in Section V.

(1) Public Participation, Public Pressure

In each of the states covered in this report, public pressure has played a strong role in urging the state to address air emissions beyond existing federal requirements and state programs. In some states this public pressure has been the catalyst for further state action.

The first of these efforts took place in Massachusetts where 150 organizations formed a coalition in the summer of 1998 seeking emissions reductions from power plants. The coalition included environmental organizations, local citizens groups, public health advocates and others. The coalition generated over 7,000 letters to the Governor urging emission reductions from the oldest and dirtiest power plants in Massachusetts. Subsequently, on September 30, 1998 the CAN Coalition submitted to the Governor a "Petition for New Rulemaking on Air Emissions Standards for Fossil Electric Plants." The CAN Coalition requested an emissions cap equivalent to Best Available Control Technology on electric generation facilities greater than 50 MW, with no trading, no

banking, and no cost caps.[46] Even once the Governor signed a pledge to seek emission reductions from the oldest and dirtiest power plants in Massachusetts, CAN Coalition members continued to be very involved in the regulatory process at every step, including review of proposed compliance plans for the affected sources. In developing proposed and final regulations, Massachusetts also undertook an extensive public process including multiple meetings, and several rounds of oral and written comments. Massachusetts held a series of meetings with affected sources, other state agencies, and CAN Coalition representatives, as well as several public meetings.

A similar effort occurred in Connecticut. A coalition of environmental, citizen and public health groups launched the "Sooty Six Campaign" seeking emission reductions from six large power plants in Connecticut. The Coalition, called "the Connecticut Coalition for Clean Air," includes over 150 organizations.[47] The Coalition pushed hard for restrictions on the use of SO_2 allowance trading as a compliance option, and continue to exert pressure for reductions in mercury emissions from power plants. As in Massachusetts, Connecticut undertook a thorough public process that included multiple meetings, and rounds of oral and written comments. Connecticut established an open subcommittee of the SIP Revision Advisory Committee (SIPRAC), and held several public meetings.

In New Hampshire several environmental advocacy groups worked together to try to restrict the use of emissions trading in achieving compliance. The groups recommended two courses of action: "The single most effective way to cut power plant pollution in New Hampshire and to reduce the health threats stemming from that pollution is to require onsite improvements to the three PSNH power plants."[48] Accordingly, they recommended that state officials require on-site emission reductions rather than allowing allowance trading. In addition, the groups urged the New Hampshire congressional delegation to support legislation that would require the nation's dirtiest power plant to meet modern performance standards. The groups, New Hampshire PIRG, Appalachian Mountain Club, Clean Water Action and the Clean Air Task Force, also proposed alternative legislation.

In New York, environmental groups pressed the Governor to take action to reduce emissions from 21 power plants. Following the Governor's decision to take additional steps to reduce emissions of SO_2 and NO_x, the environmental groups worked with the Governor to achieve emission reductions.[49] The DEC has sought public comment on its proposed regulations.

(2) Governor Actions

In each of the states considered in the report, the Governor has played a key role in the development of additional requirements to reduce emissions from power plants. The

[46] Personal communication with Rob Sargent, MassPIRG, March 6, 2002.

[47] See www.sootysix.org

[48] NH PIRG et al, "PSNH: Generating the Dirtiest Power in New England," November 2001.

[49] Personal communication with Mike Sheehan, NY DEC, April 1, 2002.

Governors have taken on this role both as part of regional policy efforts to address specific environmental concerns, as well as within individual states. In New England the Conference of the New England Governors and the Eastern Canadian Premiers (NEG/ECP) has been a significant driving force behind states' efforts to address both mercury and greenhouse gases. The NEG/ECP adopted a Mercury Action Plan and a Climate Change Action Plan that have provided an important foundation for activities in individual states. Founded in 1973, the NEG/ECP have focused recently on cross-border environmental issues, including acid rain, mercury, and climate change.

In June 1998 the Governors and Premiers adopted both a Mercury Action Plan and an Acid Rain Action Plan. The Mercury Action Plan was adopted in response to a number of policy drivers including mercury's toxicity, the existence of fish consumption advisories in all jurisdictions, the persistence of mercury in the environment, impacts on wildlife, and the existence of controllable local and distant sources.[50] The short-term goals of the Action Plan were 50 percent or greater reduction in mercury emissions by 2003. A further intermediary goal of 75 percent reduction by 2010 was added later. The long-term goal of the Action Plan is "virtual elimination."

Subsequently in August 2001, they adopted a Climate Change Action Plan. The Climate Change Action Plan was adopted in response to a number of policy drivers including advancing climate change, environmental similarity of the regions, prior cooperative experience between the regions and collective regional goals. The short-term goal of the Plan is to reduce greenhouse gas emissions to 1990 levels by 2010. The mid-term goal is to reduce emissions by at least 10 percent below 1990 levels by 2020. And the long-term goal is to reduce emissions by 75 percent to 85 percent from 2001 emission levels.[51]

As described in more detail below, individual Governors have also taken a strong position within their state in support of further efforts to reduce air emissions from the electricity sector.

In Connecticut, Governor Rowland issued Executive Order 19, on May 17, 2000. Executive Order 19 directs the CT DEP to achieve SO_2 reductions 30-50 percent beyond current commitments, and NOx reductions 20-30 percent beyond current commitments. The Order also directs the DEP to use market-based mechanisms, including early reduction credits, and to improve local air quality.

In Massachusetts, Governor Celucci signed a pledge in the Fall of 1998. The Governor directed DEP to write rules to achieve additional reductions of between 50 and 75 percent in smog and acid rain causing pollutants from power plants. The CAN Coalition attributes Governor Celucci's action in large part to the timing of Coalition's petition, which came at a sensitive election time.[52]

In New Hampshire, Governor Shaheen announced in January 2001 that DES had developed a Clean Power Strategy in order to clean up fossil fueled electric generators.

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[50] Presentation of Barbara A. Kwetz, MA DEP, to NEG/ECP February 2002.

[51] Presentation of Kenneth A. Colburn, NH DES, to NEG/ECP February 2002.

[52] Personal communication with Rob Sargent, MassPIRG, March 6, 2002.

The Clean Power Strategy had bipartisan support in the state legislature. Governor Shaheen signed the Clean Power Act, the legislation based on the Clean Power Strategy, into law on May 9, 2002.

In New York, Governor Pataki announced his Multi-Pollutant initiative in October 1999. The Governor directed DEC to issue regulations requiring electric generators in the state to reduce SO_2 emissions 50 percent below "Phase II" of the Federal Clean Air Act. The Governor also directed DEC to implement NO_x emission reductions year-round, rather than just in the summer. The Governor's press release stated that New York's SO_2 emissions would be reduced 130,000 tons annually and NO_x 20,000 tons annually.[53] In his announcement, Governor Pataki called on US EPA to achieve emission reductions from Midwest power plants and urged federal policy makers to work on federal Multi-Pollutant legislation. In addition, on June 10, 2001, Governor Pataki signed an Executive Order requiring state agencies to be more energy efficient and environmentally aware: Executive Order 111 "Green and Clean State Buildings and Vehicles." Among other things, all state agencies are to seek to achieve a reduction in energy consumption from buildings of 35 percent from 1990 levels by 2010; procure energy efficient products; purchase 10 percent of power from renewable sources by 2005 and 20 percent by 2010; and, procure at least 50 percent alternative-fuel vehicles by 2005 and 100 percent by 2010.

(3) Legislative Processes

In two of the states, Connecticut and New Hampshire, proposed plans for achieving further emissions reductions were brought before the state legislature. In these states the legislature has had a strong hand in influencing the final form of the regulations.

In Connecticut the legislature acted directly in response to public pressure, and the first round of legislative activity in 1999-2000 preceded Governor Rowland's Executive Order. The legislature did not pass legislation the first time. The DEP wanted to move quickly to address proactively the concerns reflected in the Governor's Executive Order and the Legislature's efforts. The DEP issued its final regulations seven months after the Governor issued his Executive Order. In response to Governor Rowland's Executive Order, the DEP created a new Section 19a to address SO_2 reduction. The non-ozone season NO_x reduction measures were added to the already existing Section 22. Sections 22a and 22b, the ozone season NBPs, remained unchanged. Because of the short time frame, DEP did not seek to begin from scratch with a single regulation.[54] The agency's administration regulations had to be approved by a regulatory review committee of the General Assembly.

The legislature addressed emissions issues again in spring of 2001 following the Governor's Executive Order and Final Regulations from the CT DEP. HB6365 would have eliminated the SO_2 trading provisions contained in the DEP's Final Regulations. The legislation was contentious with advocates stating that it would reduce local health

[53] Governor Pataki Press Release, October 14, 1999.

[54] Personal communication with Chris Nelson, CT DEP, March 6, 2002 and April 3, 2002.

impacts, and opponents arguing that it would jeopardize electric system reliability. While the legislation was passed, Governor Rowland vetoed the legislation for a variety of reasons including a provision for suspending the regulations during electric power system emergencies, and his concerns over long-term power system reliability.[55] The legislature considered legislation again in the Spring of 2002 that would restrict allowance trading; and the legislation passed. Governor Rowland the legislation into law in May 2002.

In New Hampshire, legislative action followed Governor Shaheen's directive and the DES' development of a Clean Power Strategy for the state. This legislative process is particularly significant in that it is the first time that a legislature has passed legislation capping CO_2 emissions from power plants. The original bill was introduced in 2001 and retained until 2002. An amended version passed the House on January 2, 2002 and passed the Senate on April 18, 2002. Amendments included incentives for local or nearby reductions and energy efficiency and renewable energy projects. The NH DES believes that the legislation balances environmental goals, economic concerns (electricity rates), and energy (or fuel) diversity.[56]

(4) Electric Restructuring and Competitive Market Issues

Electric industry restructuring has been the backdrop for all of the states' actions and plans to achieve further emission reductions from electric power plants. In fact, in some instances, electric industry restructuring was one of the triggers for further state action to reduce air emissions. All of the states have made specific policy and regulatory decisions in response changes in the electric industry. Below are some examples of the restructuring issues that have driven different states' policy approach.

- New investment decisions: Both New Hampshire and Massachusetts saw an opportunity to incorporate environmental compliance issues into new investment decisions that are triggered by electric industry restructuring. As the electric industry is restructured, and utilities divest fossil generation units, important new investment decisions are being made. This provides an important opportunity for environmental regulations to be incorporated into decision-making. For example, Massachusetts DEP determined that a multi-pollutant regulation would allow facility owners to "make more comprehensive assessments of pollution control strategies and find integrated approaches that can reduce costs relative to sequential investments to meet single-pollutant standards set over several years."[57] Similarly, the New Hampshire DES emphasized that unless issues pertaining to "grandfathering" of power plants were addressed prior to divestiture of the existing facilities, an "environmental subsidy" would be perpetuated.[58]

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[55] Letter of John J. Rowland, Governor of Connecticut, to Hon. Susan Bysiewicz, Secretary of the State, June 22, 2001.

[56] Oral testimony of Kenneth A. Colburn, Air Director NH DES, to NH Senate Environment Committee, April 3, 2002.

[57] MA DEP, *Background Document and Technical Support for Public Hearings on the Proposed Revisions to 310 CMR 7.00 et. seq.*, June 2000, at 11.

[58] NH DES, *New Hampshire Clean Power Strategy,* January 2001, at 68.

- Level playing field: Older generating units that were grandfathered under the Clean Air Act are allowed to emit air pollutants at significantly higher rates than new generation units. This provides a competitive advantage in competitive wholesale markets when the older plants compete against more recent plants whose costs include compliance with more stringent emission standards. The Massachusetts DEP recognized this dynamic stating: "In the new competitive market, all of the electric generation facilities that are affected by 310 CMR 7.28 will compete based on the price per unit of electrical output."[59] To be consistent with the move to competitive markets, both Massachusetts and New Hampshire decided to implement output-based standards. Output-based standards require that affected sources comply on the basis of emissions per unit of electrical output, rather than on the basis of emissions per unit of fuel input. The NH DES stated in support of this decision that in the absence of output based standards "appropriate environmental costs will not be factored into the price of power from these plants."[60] In contrast, the Connecticut DEP was clear that leveling the playing field was not a goal of its regulations, and Connecticut adopted an input-based emission standard.[61]

- Maximizing value of assets: Anticipating the divestiture of utilities' fossil generation, the NH DES stated that new Multi-pollutant emission standards would avoid the potential for "fear-based discounting" by providing regulatory certainty. Since proceeds of the auction would reduce stranded costs, the DES had an incentive to maximize the value of the generation. [62]

- Availability of low sulfur fuel: When CT DEP sought to reduce the allowed sulfur content of fuel used by affected resources, it encountered strong opposition from parties who stated that sufficient low sulfur fuel would not be available. The CT DEP determined that sufficient low sulfur fuel would be available and would not prevent compliance. Nevertheless, the final regulations in CT do include a provision for suspending the regulations in the event of insufficient low sulfur fuel.

These issues highlight the impact of electric industry restructuring on the formation of environmental regulatory policy. A few aspects of electric industry restructuring are particularly worth noting. First, in certain states traditional utilities have either already sold, or may sell, electric generation units to independent power producers that are not part of a vertically integrated utility.[63] As noted by New Hampshire, development of multi-pollutant regulations provides an opportunity to ensure that prospective buyers take into account compliance obligations as sales occur.

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[59] MA DEP, *Background Document and Technical Support for Public Hearings on the Proposed Revisions to the State Implementation Plan for Ozone,* 1999, at 15.

[60] NH DES, *New Hampshire Clean Power Strategy,* January 2001, at 68.

[61] CT DEP, *Hearing Report*, September 2000, Section V.B.

[62] NH DES, *New Hampshire Clean Power Strategy,* January 2001, at 86-87, 103.

[63] A vertically integrated utility owns power plants, distribution lines, and transmission lines.

Second, regardless of what action individual states take with regard to retail competition, there are significant changes in wholesale electricity markets that present both an opportunity and a challenge to state environmental regulators. Throughout the OTR, the electric power system is now run by Independent System Operators (ISOs). Those ISOs dispatch power plants on the basis of suppliers' bids to supply energy at a particular cost per unit of electricity generated. Power plants are no longer dispatched on the basis of actual costs, as they were a decade ago. As a result, electric power plants (and electrical generating units) compete with each other on the basis of cost per unit of electrical output (kilowatthours or megawatthours). A successful generator will minimize its costs per unit of electrical output. This change creates an opportunity to use market forces – the push for generation efficiency – to achieve environmental policy goals – lower emissions for the same service. The challenge is in the transition from input based regulatory approaches, which benefit resources based on their fuel consumption, to output based regulatory approaches, which drive greater generation efficiency and lead to lower emissions.

Finally, it has become clear over the past several years, that the electric industry has not developed as anticipated at the reauthorization of the Clean Air Act in 1977, and that electric industry restructuring has not achieved some of the environmental benefits that restructuring proponents touted.[64] For example, older generating units were exempt from more stringent emissions standards in the late seventies since their expected remaining service life was short. Instead, many of those facilities continue to operate, and are able to emit pollutants at much higher levels than new sources. These inequities create market distortions that hamper the development of efficient markets and result in missed opportunities to achieve environmental policy objectives.[65] As a result, competition in the electric industry has not in itself lead to emission reductions due to the retirement of older, less efficient (and more polluting) generating units.

(5) Concerns Over Health and Environmental Impacts

In each of the states strong concerns have been raised regarding the failure of national regulatory programs to sufficiently protect public health and the environment in the state. Concerns include the impact of emissions on health and the environment at the individual power plant, state or inter-state levels. As discussed in more detail in Section 5.3 Compliance Paths, the states have taken a variety of approaches to addressing concerns over "local" impacts. The term "local impacts" is not a precise term. Some states have sought to reduce "local impacts" at specific power plant sites; some states have sought to reduce "local impacts" at the state level. Following are some examples of concerns raised in different states regarding emissions impacts on public health and the environment at a sub-national level.

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[64] See e.g. Biewald et al., *Grandfathering and Environmental Comparability: An Economic Analysis of Air Emission Regulations and Electricity Market Distortions*, Report to National Association of Regulatory Utility Commissioners, June 11, 1998

[65] Woolf et. al., *Electricity Market Distortions Associated with Inconsistent Air Quality Regulations,* November 18, 1999.

Each of the states has said that existing federal requirements are insufficient to protect the state's health and environmental resources from certain impacts. For example, the driving force behind the Governor Pataki's action was the National Acidic Deposition Assessment Program's Biennial Report to Congress in 1998. That report stated that another 50 percent reduction from Federally allowed SO2 emission levels under Title IV would be necessary to protect sensitive areas such as the Adirondacks. New York's Consolidated Regulatory Impact Statement also cites other studies that demonstrate the need for further actions to reduce acid rain impacts.

Some of the states' actions have been shaped by concerns over emissions impacts on the health of populations neighboring electric power plants. The Harvard School of Public Health issued a report in May 2000 providing an analysis of health impacts of current emissions from two MA power plants.[66] The MA DEP cited this report as one of the reasons for requiring on-site emission reductions from affected sources. While the CT DEP did not rely on the Harvard School of Public Health report, the DEP did require on-site emission reductions from affected sources. The DEP indicated that its issuance of the regulation was a statement that reducing air pollution will benefit public health, but was not an endorsement of any particular health study.[67]

New Hampshire has decided to encourage emission reductions in the OTR, rather than seeking emission reductions at specific power plants. In supporting this approach the DES emphasized that most of the pollution impacting New Hampshire is transported from upwind sources.[68] The final Clean Power Act provides that for compliance an affected source can purchase 0.8 federal SO_2 allowances from OTR states for each ton emitted.[69] In addition, in order to promote local reductions, for each year that combined SO_2 emission rates from affected sources are lower than the annual average of the last three years, the DES will distribute additional allowances to sources.

(6) Alleged New Source Review Violations

As discussed above, in Section 4.1(5), New Jersey has pursued an enforcement action in response to alleged violation of federal and state New Source Review regulations.

4.3 Experience to Date

All of the state initiatives are relatively new, and some are not yet even final; therefore, this section describes certain issues of regulation development and implementation rather than compliance activity.

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[66] Levy, Harvard School of Public Health, *Estimated Public Health Impacts of Criteria Pollutant Air Emissions from Salem Harbor and Brayton Point Power Plants,*. May 2000.

[67] CT DEP, *Hearing Report,* September 2000, Section III.B.

[68] Oral testimony of Kenneth A. Colburn, Air Director, NH DES, to NH Senate Environment Committee, April 3, 2002.

[69] HB-284 FN, Section 125-O:4 Compliance.

(1) MA Emission Control Plans

Pursuant to the Massachusetts regulations facility owners submitted compliance plan applications to the DEP in January 2002. In March 2002, the DEP issued proposals for approval of those applications with certain conditions.[70] The DEP will make its final determination following public hearing and comment on each of the applications. Some of the facility owners are proposing compliance activity that triggers the requirements of 310 CMR 7.02 (Plan Approval and Emission Control Requirements*)*, resulting in a longer compliance period than anticipated in the DEP's multi-pollutant regulations for the affected facility. The proposed extension of the compliance period for certain facilities is a contentious issue.[71]

(2) CT Legislative Actions

In Connecticut, the state legislature has been involved in the development of the DEP's regulatory approach at multiple stages, and continues to be so involved. As discussed above, in the 2001 legislative session the Legislature passed a bill to restrict the use of allowance trading for compliance. Governor Rowland vetoed the legislation. However, that legislation came up again, as expected, for consideration in the 2002 legislative session as HB 5209.[72] The legislation passed and Governor Rowland signed the legislation into law in May 2002. With regard to mercury, as anticipated by the Connecticut Office of Legislative Research, a proposal to limit the amount of mercury in the environment has been reintroduced this session after failing in 2001. That proposal (HB 6687) addresses a wide variety of sources of mercury, and may address one coal-fired power plant in Connecticut.[73]

(3) MA CO_2 Proceeding to Develop Greenhouse Gas Banking and Trading Regulations.

Massachusetts' multi-pollutant regulations provide that compliance with both the cap and rate provision of the CO_2 emission standards may be demonstrated by using offsite reductions or sequestration to offset emissions above the historical actual emissions [Cap] or excess emissions [Rate], provided the Department determines such offsite reductions or sequestration are real, surplus, verifiable, permanent, and enforceable.[74] The regulations commit DEP to promulgating a regulation to allow the certification and trading of greenhouse gas emission reductions. DEP held three meetings between January and April 2002. The greenhouse gas banking and trading regulations will be one

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[70] The DEP's draft approvals for the emission control plan applications are available on line at http://www.state.ma.us/dep/bwp/daqc/daqcpubs.htm under Compliance Plans.

[71] Personal communication with William Lamkin, April 5, 2002.

[72] Connecticut General Assembly, Office of Legislative Research, *OLR Major Issues*, January 18, 2002.

[73] Personal communication with Chris Nelson, April 3, 2002.

[74] Presentation of William Lamkin, MA DEP, to Greenhouse Gas Banking and Trading Regulation Development Meeting, January 30, 2002.

of the actions that Massachusetts takes to fulfill its commitment under the New England Governors/Eastern Canadian Premiers Climate Change Action Plan.

(4) NH Regulation on Voluntary Greenhouse Gas Emission Reduction Registry (Env-A 3800) February 2001.

In 1999 the New Hampshire legislature created a registry for voluntary greenhouse gas emission reductions. In February 2001 it passed regulations to implement the greenhouse gas registry. Those regulations are contained in Env-A 3800. Registered CO_2 reductions could be used, upon DES approval, by power plants to comply with the cap established by HB 284.

(5) NJ Voluntary Greenhouse Gas Registry (NJAC 7:27-30)

In 1999, DEP adopted a voluntary greenhouse gas registry program. The regulation establishes the guidance for development of protocols for indirect and direct sources. The rule allows for aggregation of indirect sources that implement energy efficiency or municipal solid waste recycling. A first notice of a greenhouse gas credit generation has been posted.

5. Issues in Implementing Existing Programs, Lessons for Developing New Programs

The purpose of this section is to identify "lessons learned" from multi-pollutant efforts to date. The section discusses various issues that states have considered and how states have made policy decisions.

5.1 Applicability

The regulatory and legislative activities in the five states considered in this report reflect essentially three different approaches to determining what sources are affected. New Jersey has focused on existing coal-fired electric generation plants that are suspected of violating New Source Review Requirements. Massachusetts and New Hampshire are pursuing emission reduction from the oldest most highly polluting facilities. Connecticut and New York are pursuing a broader group of sources, essentially those 15-25 MW and larger.

New Jersey has chosen the most targeted approach. It is focusing on existing coal-fired electric generation where violation of New Source Review Requirements has been alleged. As described above, state and federal agencies have already reached a settlement with PSEG to reduce emissions of SO_2, NO_x, and particulate matter, and establishing goals for reduction of CO_2 and mercury emissions. In addition, NJ DEP is in the early stages of settlement discussions with Conectiv regarding two other coal-fired electric generation plants.. A third New Jersey generation company, PG&E Generating

Company, has two modern coal-fired power plants with low-NO_x burners, SCR, scrubbers and baghouses.

Massachusetts designed its regulations to reduce emissions from the "largest, oldest, and least efficient power plants in the state that have not yet installed modern pollution control technology."[75] The DEP determined that the affected facilities are by far the most significant sources of emissions from the electricity sector. The affected sources contribute 46 percent of the SO_2 emissions in the state (with other electric generation contributing one percent of the SO_2 emissions in the state). The affected sources contribute eight percent of the NO_x emissions in the state (with other electric generation contributing two percent of the NO_x emissions in the state). The affected facilities contribute 10 percent of the mercury emissions in the state (with other electric generation contributing one percent of the mercury emissions in the state).[76]

New Hampshire's legislation also targets "grandfathered" power plants. In its Clean Power Strategy the NH DES states that the plan is intended to apply to "all existing fossil fuel-burning power plants with nameplate capacity of 25 MW or greater," the same applicability threshold used by EPA's NO_x SIP Call. The Clean Power Strategy does not apply to two new combined cycle natural gas facilities that are under construction in New Hampshire.[77] The Clean Power Act specifically identifies six units at three existing fossil fuel-burning power plants.[78] In its Clean Power Strategy the DES cited the high emission rates and lower generation efficiencies of "grandfathered" power plants as reasons for seeking further emission reduction from those facilities. The DES points out that the combined generating capacity of the existing fossil fuel-fired facilities is only about 70 percent of the combined generating capacity of the new facilities under construction; however, the actual emissions from the "grandfathered" power plants are substantially higher than permitted emissions for the new facilities. Specifically, 1999 SO_2 emission levels are 200 times higher than the permitted levels of the new facilities, 1999 NO_x emission levels are twenty six times higher than the permitted levels of the new facilities, and 1996 mercury emission levels are 328 pounds compared to zero pounds for the new facilities. DES states, "when substantial impact emanates from so few sources, a concerted public policy response with respect to those sources is warranted." The affected sources contribute 81 percent of the SO_2 emissions in the State, 20 percent of the NO_x, 40 percent of the mercury, and 30 percent of the CO_2.[79]

The regulations in Connecticut and New York would apply to a larger group of resources, including electrical generating units 15MW or 25MW and above. This threshold for applicability is consistent with the applicability of the previously existing regulatory

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[75] MA DE, *Background Document and Technical Support for Public Hearings on Proposed Amendments to 310 CMR 7.00 et seq. 310 CMR 7.29 – Emission Standards for Power Plants*. MA DEP. June 2000.

[76] MA DEP, *Statement of Reasons and Response to Comments for 310 CMR 7.00 et seq: 310 CMR 7.29 – Emission Standards for power Plants*. April 2001. Pages 2-3.

[77] NH DES, *New Hampshire Clean Power Strategy,* at 69.

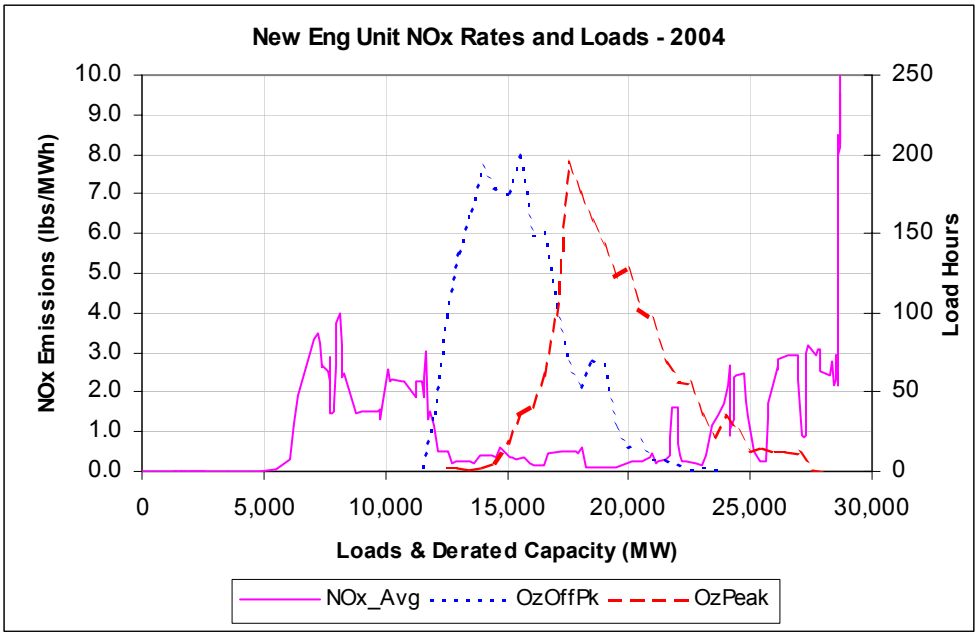
[78] The affected sources are Merrimack Units 1 and 2, Schiller 4,5,6, and Newington Unit 1. H.B. 284, Chapter 125-O:2.

[79] NH DES, *New Hampshire Clean Power Strategy,* January 2001, at pages 4-7.

program. Connecticut DEP states that its air pollution program is based on achieving emissions reductions from a wide range of source categories.[80] However, in NY unlike the ozone season program, Part 237 applies to sources 25MW and above.[81] While the Department did consider including all electricity generators 15MW and above, its proposed regulations for both SO_2 and NO_x apply just to units 25MW and above since smaller units "have a small impact on overall acid deposition precursor emissions."[82]

In considering applicability of multi-pollutant approaches in the electricity sector, it is informative to consider how electric power plants are operated as part of a regional electricity system.[83] To illustrate this concept we have considered the New England electric power system. In general, the lowest cost power plants are operated (or "dispatched") first, with more expensive power plants being brought on-line as demand for electricity increases.[84] Figure 1, below, shows the NO_x emission rates of power plants that are dispatched at different load levels.

Figure 1: Loads and NO_x Emissions in New England



[80] CT DEP, *Hearing Report,* Section V.B.

[81] Personal communication with Mike Sheehan, NY DEC, April 3, 2002.

[82] NY DEC, *Consolidated Regulatory Impact Statement*, February 14, 2002, at 36.

[83] This section of the report on generating unit dispatch and emission characteristics is based on the work of Dr. David E. White, Synapse Energy Economics, Inc.

[84] While power plants in New England, New York, and the PJM Interconnection are dispatched largely based on the price at which generators are willing to supply power (i.e. based on the "supply bids"), dispatch is also affected by transmission system constraints and other characteristics of the bulk power sytem in a particular region.

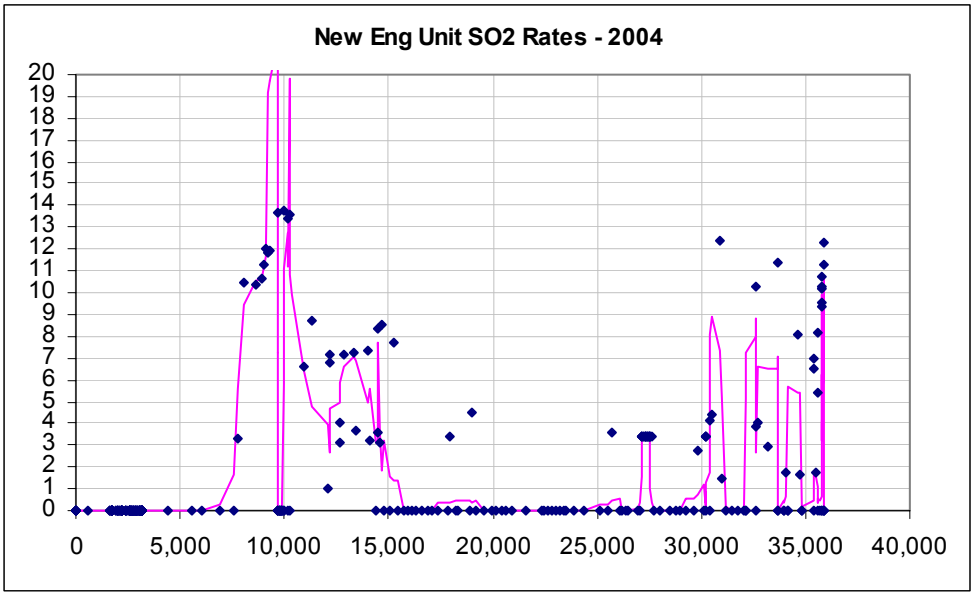
As shown in this figure, the emission rates for one pollutant across time periods are largely a function of where the loads for the periods fall relative to different types of generator in the region. To help in visualizing this, Figure 1 shows the loads of the ozone season day and night periods in 2004 superimposed upon the region's "NO_x supply curve." Along the horizontal axis of Figure 1 the generating units are lined up in order of increasing operating costs. This is the New England supply curve. The solid line in Figure 1 shows a plot of the NO_x emission rates of each generating unit. This line can be viewed as the New England "NO_x supply curve." This curve was generated based on power system dispatch modeling using the PROSYM model.

The dotted line is a histogram showing the distribution of nighttime loads. The dashed red line is a histogram of daytime loads. The higher the histogram curve is above a load point (i.e., generating unit), the more hours that unit was on the margin during the period – and the NO_x rate of that unit gets weighted more heavily in developing the marginal emission rate for the period.

First, look at the shape of the NO_x supply curve. Roughly the first 6,000 MW in the New England system is hydro and nuclear baseload capacity. From 6,000 to about 13,500 MW the region's fossil-fueled baseload and load following plants dominate. The area between about 13,500 and 23,000 MW is dominated by CCCTs with very low NO_x rates, with a few oil- and gas- steam units interspersed. (Note that there are more CCCTs in this chart than currently exist in New England.) Above about 23,000 MW lie higher cost oil- and gas- steam units and the region's peaking turbines with extremely high NO_x rates. The NO_x emission rates along the New York and PJM supply curves follow a very similar shape, except that most NO_x rates are higher in New York than in New England, and they are highest in PJM. Also, PJM has a much larger region of baseload fossil units with high NO_x rates.

Similar curves can be developed for other pollutants. For example, Figure 2 shows SO_2 emission rates of generating units along the dispatch curve.

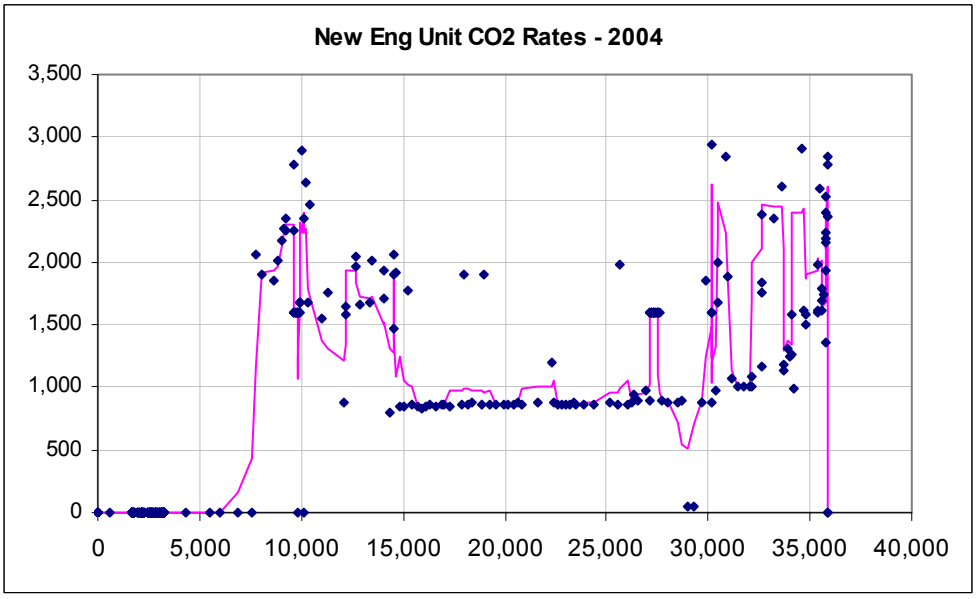
Figure 2: SO_2 Emission Rates in New England



X-axis units: MW. Y-axis units: lb/MWh.

Similarly, Figure 3 shows the CO_2 emission rates of generating units along the dispatch curve.

Figure 3: CO_2 Emission Rates in New England



X-axis units: MW. Y-axis units: lb/MWh.

These charts highlight the emissions characteristics of fossil-fueled baseload electrical generating units that are used to serve load in the 7,000 to 15,000 MW range. The NO_x,

SO_2, and CO_2 emission rates in this range of the dispatch curve are all considerably higher on a pounds per MWh basis than the emission rates for these pollutants at higher load levels. They illustrate the importance for reducing emissions of multiple pollutants from the electric power industry of achieving emission reductions from the baseload fossil-fueled electrical generating units.

5.2 Structure of Multi-pollutant Program

As discussed above, four states (CT, MA, NH and NY) have developed or are developing multi-pollutant regulations, and New Jersey has developed a multi-pollutant program through an enforcement action. The regulatory structure that different states have chosen appears closely tied to the states' decision on applicability. Massachusetts and New Hampshire, which are targeting "grandfathered" power plants, both chose to pursue a single regulation for achieving emission reductions from the affected facilities.

The Massachusetts DEP explained its decision to develop a single regulation as follows:

> This integrated approach will enable facility owners to make emission control decisions while considering several standards at once, rather than in piecemeal fashion. The multi-pollutant regulatory framework will allow facility owners to make more comprehensive assessments of pollution control strategies and find integrated approaches that can reduce costs relative to sequential investments to meet single-pollutant standards set over several years."[85]

Similarly, the New Hampshire DES stated that an integrated approach allows facility owners "to make emission control decisions – and investments – on the basis of a comprehensive assessment, rather than in a piecemeal pollutant-by-pollutant fashion.[86] NH DES also emphasized that "[t]he opportunity to achieve multiple benefits (also known as 'co-benefits') through 'two-for-one' or 'three-for-one' reductions contrasts markedly with traditional, expensive pollutant-by-pollutant regulatory approaches."[87]

Connecticut decided to modify existing regulations rather than starting with completely new regulations. Connecticut DEP decided to work off of existing regulations, applying its new regulations to the same sources as covered under the NO_x Budget Program.[88] The DEP intends to revamp its NO_x program. Since elements of the program are contained in a variety of regulations, there will be a concerted effort to combine these elements into one program for efficiency and simplicity. Also, the state intends to include a set-aside for qualifying efficiency and renewable projects. The effort is expected to be completed by May 1, 2003.[89] New York created two new regulations, utilizing the framework developed under the ozone season NO_x Budget program, Part 204. Both Connecticut and

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[85] MA DEP, *Background Document and Technical Support for Public Hearings on Proposed Amendments to 310 CMR 7.00 et seq.: 310 CMR 7.29 – Emission Standards for Power Plants*. June 2000. at 11.

[86] NH DES, *New Hampshire Clean Power Strategy,* January 2001, at 68-69.

[87] NH DES, *New Hampshire Clean Power Strategy,* January 2001, at 6.

[88] Personal communication with Chris Nelson, CT DEP, April 3, 2002.

[89] Personal communication with Chris Nelson, CT DEP, April 19, 2002

New York have separate filing and compliance requirements for the separate portions of the regulations. For example, New York is proposing that an affected source's report on SO_2 compliance be due March 1, while the report on NO_x compliance would be due June 1 of each year. In addition, the SO_2 permit application would be due in January 2004 whereas the NO_x permit application would be due in October 2003.[90]

Development of a new rule provides a certain regulatory flexibility that permits agencies to capture regulatory efficiencies. For example, the consolidation of compliance demonstration and reporting requirements, and reliance on the same data for compliance activities regarding multiple pollutants can simplify and streamline regulatory processes for both the regulatory agency and the affected entity.

New Jersey has not undertaken a regulatory approach. Instead New Jersey has pursued enforcement actions in response to alleged violations of Prevention of Significant Deterioration rules. Federal and state agencies alleged that PSEG modified its coal-fired plants in Hudson and Mercer counties and constructed its gas-fired Bergen plant without first obtaining permits required under the New Source Review program of the Clean Air Act and the New Jersey Air Pollution Control Act. Subsequently, the U.S. Justice Department, U.S. Environmental Protection Agency, state officials, and PSEG Fossil undertook settlement discussions to resolve the issue. NJ DEP is currently in the early stages of settlement discussions with Conectiv, the owner of two other coal-fired electric generation plants in New Jersey. PGE Generating Company owns two new coal-fired plants that installed Best Available Control Technology ("BACT"). As a result of its enforcement actions, NJ DEP does not anticipate needing a multi-pollutant regulation to ensure that coal-fired generating stations meet BACT for NO_x, SO_2, and particulates.[91] New Jersey is considering rules for mercury and participation with other states in a regional CO_2 reduction program.

5.3 Input v. Output Based Approaches

MA and NH have adopted or proposed output based regulations, CT regulations incorporate a combination of output and input based methods, and NY has proposed input based regulations. This section will discuss the factors governing these choices and the lessons that can be gleaned from these states.

Connecticut's regulations SO_2 and NO_x regulations are primarily input based regulations, although its NO_x Budget Program uses output based methods for baseload power generating units beginning in 2003. New York's proposed regulations are also input based. Both states decided to pursue an input based approach because of the difficulty of adopting an output-based approach for electric generating sources with steam output and for non-electric generating sources. Connecticut's regulation applies to the large population of sources covered in the OTC NOx Budget Program. The lack of a comprehensive EPA method for converting heat and steam output to a generation

[90] NY DEC, *Consolidated Regulatory Impact Statement,* at 38-39.

[91] Personal communication with Bill O'Sullivan, NJ DEP, June 21, 2002.

equivalent hampered the Connecticut DEP from adopting an output-based approach. Using output-based methods would have made developing regulations that apply to all NBP sources too complex.[92]

In rejecting output-based standards that would apply similarly to old and new sources, CT DEP stated explicitly that it did not intend to level the playing field between sources. However, DEP noted that the regulations contained market based incentives, including provisions for DERCS, the use of allowances from regional programs, and incentives to reduce emissions by increasing the cost of emissions in Connecticut that would favor those who produce power most efficiently and at least cost.[93] Connecticut does take an output-based approach in its new New Source Review regulation, 22a-174-3a, effective March 15, 2002. [94] That regulation specifically provides for BACT to be determined on an output basis. This will provide incentives for combined heat and power (CHP) and for more thermally efficient generation.

Similar to Connecticut, in New York a large proportion of the facilities that are affected under Parts 237 and 204 have steam hosts. In its consolidated regulatory impact statement New York DEC explains that it chose not to do an output-based allocation because of "the lack of available generation data as well as deficiencies in the standardization of generation data."[95] New York also rejected the option of using an auction to allocate allowances due to its concerns over whether it has the authority to conduct an auction, disposition of auction revenue, and potential perceptions of the auction as a state revenue program. In addition, the DEC noted the precedent from other allowance trading programs for allocating to sources based on historic operation.[96]

Massachusetts first implemented an output based regulatory approach in its regulations implementing Phase 2 of the NO_x Budget MOU and the US EPA SIP Call. In supporting its approach then, DEP stated that output based regulation supported three policy goals:

- To establish environmental regulations that reward clean, efficient electrical generation, and encourage pollution prevention in the electric generation sector;
- To establish environmental performance measures that encourage fair competition in the new market for electricity, where generating units will be competing on the basis of price per unit of net electrical output;
- To be consistent with other emission-related regulatory policies in Massachusetts' electric industry restructuring legislation, including Generation Performance Standards and Information Disclosure. These

[92] Personal communication with Chris Nelson, CT DEP, March 6, 2002, April 19, 2002.

[93] CT DEP, *Hearing Report,* Section V.B.3 & 4.

[94] The regulation is available at http://dep.state.ct.us/air2/siprac/2002/sip02.htm, in the February handouts.

[95] NY DEC, *Consolidated Regulatory Impact Statement - 6 NYCRR Part 237, Acid Deposition Reduction NOx Budget Trading Program, 6 NYCRR Part 238, Acid Deposition Reduction SO2 Budget Trading Program.* At 32-33

[96] NY DEC, *Consolidated Regulatory Impact Statement*, at 33.

> policies place requirements on generation and retail sale portfolios, and rely upon output-based indices of environmental performance.[97]

MA DEP also stated that the output-based approach is consistent with a national trend toward output-based standards.

In developing its output-based NO_x Budget allocation, the Massachusetts DEP identified one option for output-based allocation to generating units with useful steam output. To implement its output based approach, DEP requested from all affected units data on heat input, electrical output, heat rate and heat input for useful steam output for the 1995-1997 ozone seasons.[98] Subsequently, the DEP allocated allowances using a three step process: (1) determine average heat input dedicated to useful steam output using the two highest values for steam input for the period 1994-1998; (2) multiply that average by an assumed boiler efficiency of 80 percent; and (3) multiply resulting MMBtu output value by an output-based standard of 0.44lbs/MMBtu, which DEP states is equivalent to the electrical output standard of 1.5lb/MWh. The steam allocation is added to the electrical output allocation for units with both steam and electrical output.[99]

The NH DES explained that one of the principles underlying the proposed Clean Power Act is "Environmental Effectiveness." The NH DES recommends emission caps based on electricity output, rather than fuel input, "in order to encourage greater efficiency and more pollution prevention."[100] The agency explains further: "the public's interest in competitive parity among electric generators coincides with the public's interest in better health, an improved natural environment, a more robust economy, enhanced quality of life, and setting an example for upwind jurisdictions. Both interests require that all large, electrical generating facilities in New Hampshire – old and new- receive equitable environmental treatment."[101] In the future, the NH DES plans to follow EPA guidance on developing output-based regulations.[102]

There is a trend at both the state level and at the national level towards regulating electrical generation on the basis of emissions per unit of useful output rather than based on fuel input. Such approaches reward generation efficiency and are consistent with competitive electricity markets where generation sources compete on the basis of useful output. The regulatory programs presented in this report demonstrate a variety of approaches and stages in the development of output-based emission standards. The methods reflected in these approaches provide a basis upon which other states can build in developing output-based regulatory programs.

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[97] MA DEP, *Background Document and Technical Support for Public Hearings on the Proposed Revisions to the State Implementation Plan for Ozone. 1999. Page 15.*

[98] MA DEP, *Background Document and Technical Support for Public Hearings on the Proposed Revisions to the State Implementation Plan for Ozone.* 1999, at 18.

[99] MA DEP, *Background Document and Technical Support for Public Hearings on the Proposed Revisions to the State Implementation Plan for Ozone.* 1999, at 24.

[100] NH DES, *New Hampshire Clean Power Strategy,* January 2001, at vi.

[101] NH DES, *New Hampshire Clean Power Strategy,* January 2001, at 6.

[102] EPA guidance available at www.epa.gov/airmarkt/fednox/dec99/dguidance.html

5.4 Compliance Paths

Within each of the states pursuing a regulatory multi-pollutant approach, there has been a vigorous debate over local air quality issues, compliance paths, and cost of compliance. Each state has taken a slightly different approach. The states' choice of compliance paths is shaped in large part by their definition of, and approach to, "local impacts." The states have taken a variety of approaches to addressing concerns over "local" impacts. The term "local impacts" is not a precise term. Some states have sought to reduce "local impacts" at specific power plant sites, requiring on site reductions, and including mechanisms that discourage trading. Other states have sought to reduce "local impacts" at the state level by favoring the use of allowances from a certain geographic region, but not requiring on-site emission reductions. This section highlights the extensive and comprehensive discourse in regulatory discussions in Connecticut, Massachusetts, New Hampshire, and New York concerning compliance paths.

Connecticut initially adopted a hybrid approach in its emission reduction requirements, requiring that a certain level of standards be achieved on site, and allowing trading to achieve more stringent emission levels.[103] While the DEP did not make specific findings regarding local health impacts, it determined that it "should not fail to proceed in the absence of scientific uncertainty" and that requirements for on-site emission reductions would further protect the health of those living in close proximity to the emission sources.[104] Provisions to achieve local (on-site) and regional SO_2 emission reductions include: a low sulfur fuel requirement; use of discrete emission reduction credits (DERCs) at a one to one ratio and Federal Acid Rain Program allowances at a four to one ratio; and surrender of SO_2 allowances from the Federal Acid Rain Program for every ton emitted in Connecticut. For non-ozone season NO_x reductions, CT is contemplating moving to a system administered by EPA (such as New York is pursuing) rather than its current approach of its own in-state trading program.[105] Connecticut has placed limits on fuel sulfur content for a number of years. Initially, the state's limit was set at 0.5 percent sulfur; although it was subsequently changed to a 1.0 percent sulfur limit, some sources have had a lower sulfur fuel limit as part of their permit already.[106]

In May 2002, the Connecticut General Assembly again passed legislation that would restrict the use of allowance trading for compliance. Proponents of the legislation anticipate this restriction will ensure additional emission reduction at power plant sites. However, the CT DEP is opposed to this restriction as unnecessary and unlikely to achieve the intended local benefits. In its Hearing Report, the CT DEP states that efforts to restrict allowance trading overlook important components of the regulations designed to achieve on-site emission reductions and emission reductions that will benefit Connecticut. For example, the DEP emphasizes the following provisions of the regulations: (1) use of allowances is restricted to those originating in Connecticut, New

[103] The DEP's discussion of this hybrid approach can be found in the *Hearing Report* in Section VI.J.

[104] CT DEP, *Hearing Report,* Section IV.

[105] Personal communication with Chris Nelson, CT DEP, April 3, 2002.

[106] Personal communication with Chris Nelson, CT DEP, April 3, 2002.

York, New Jersey, Massachusetts, or Rhode Island; (2) affected sources must retire two allowances for every ton of emissions in Connecticut; and (3) in addition to allowances that must be retired, allowances must be purchased in a four-to-one ratio, creating a market-based incentive to reduce SO_2 emissions in Connecticut.[107] The restriction on using allowances for compliance removes the incentive for large power plants to overcomply (and thereby achieve on-site reductions).[108]

Massachusetts requires on-site reductions by requiring that each affected facility meet certain emission standards. The DEP regulations allow compliance using SO_2 allowances from the Federal Acid Rain Program in a three to one ratio once the first phase standard is met. Proposed regulations had included a provision for averaging between facilities owned by the same owner; however that provision was eliminated in the final regulation because of opposition to the provision from local groups in Fall River, MA near the Brayton Point Station owned by USGen New England. Those groups feared that the provision would result in clean up at US GEN New England's Salem Harbor in Salem, MA rather than at the Brayton Point Station in Fall River, MA.[109]

New York has taken a different approach to achieving emission reductions in state. The proposed regulations in New York would create New York state allowances, which would be used for the majority of compliance. However, the proposed regulations would allow up to five percent of the amount of the budget to come from upwind states to ensure a robust allowance pool and avoid potential exercise of market power in a New York-only pool. Upwind allowance would have to be purchased in a three to one ratio, and federal SO_2 allowances must be surrendered. The Department considered, but rejected, the use of federal SO_2 allowances stating that such use would have very limited effect on sulfate depositions in New York State. Similarly, the Department rejected the use of NO_x allowances because it would not assure that emission reductions occurred in the State.[110] Finally, New York declined to impose fuel sulfur requirements because it determined that such an approach is too inflexible and limits compliance options.[111]

The New Hampshire Clean Power Act takes a much less restrictive approach to compliance that is more consistent with considering "local" impacts on a state or regional basis rather than on a power plant specific basis. The legislation creates a positive incentive to use allowances that will benefit the state of New Hampshire. The legislation requires that affected sources purchase only 0.8 SO_2 allowances from the Federal Acid Rain Program per ton emitted for allowances purchased from OTR states.[112] Allowances from non-OTR states must be purchased in a one to one ratio. New Hampshire explains its decision to allow full trading for compliance in the DES' Clean Power Strategy citing

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[107] CT DEP, *Hearing Report*, Section VI.J.

[108] Personal communication with Chris James, CT DEP, May 2, 2002.

[109] MA DEP, *Statement of Reasons and Response to Comments for 310 CMR 7.00 et seq.: 310 CMR 7.29 – Emission Standards for Power Plants, Appendix A*, April 2001, at 16-17.

[110] NY DEC, Consolidated Regulatory Impact Statement, at 33-35.

[111] NY DEC, Consolidated Regulatory Impact Statement, at 30.

[112] HB 284 at 5.

numerous benefits of trading.[113] DES determined that transport contributes more to health risk than local emissions.[114]

In determining compliance options, individual states must be clear about their environmental policy goals. Some states have determined that emission reductions at in-state sources present a public health benefit in the vicinity of the source. Other states, such as New Hampshire have determined that due to pollutant transport, the state's policy should encourage emission reductions in upwind areas but that reductions at in-state sources are not necessary.

5.5 Reliability issues

In both Connecticut and Massachusetts there was some strong opposition to proposed regulations on the basis that the regulations would force plants to retire and reduce the reliability of the regional power system. Reliability concerns have also been an issue in New Hampshire and New York. This section summarizes the electric power system reliability concerns raised in different states.

In Connecticut, the CT Department of Public Utility Control (DPUC) submitted comments stating that the regulations reasonably balanced environmental goals with the need to maintain adequate generation resources.[115] The reliability concerns became more significant in Connecticut when the legislature considered a bill that prohibited the use of allowances to achieve compliance with air emissions limits. The bill passed by a narrow margin following significant pressure on legislators from both opponents and proponents of the restrictions. However, Governor Rowland vetoed the legislation citing his concerns over the bill's potential impact on long-term electric power system reliability.

In Massachusetts, the Massachusetts DEP disagreed with filed comments that its regulations would threaten electric system reliability. While DEP acknowledged that compliance with the regulation would result in additional operating costs, it emphasized that these costs were a cost of doing business and did not penalize older facilities since "new facilities entering the energy market in New England are required to make significant investment in pollution prevention/pollution control."[116] Nevertheless, when the regulations were in the final approval stages, opponents of the regulations mounted significant opposition to them on the grounds of protecting electric system reliability.

The regional operator of the bulk power system, ISO New England became heavily involved in raising concerns about electric system reliability by submitting written comments to state agencies in Massachusetts and Connecticut, and meeting directly with Governor Rowland of Connecticut.[117] ISO New England supported its comments with an

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[113] NH DES, *Clean Power Strategy*, at 71ff.

[114] NH DES, *Clean Power Strategy*, at 76.

[115] CT DEP, *Hearing Report*, September 21, 2000, Section V.B.2.

[116] MA DEP*, Statement of Reasons and Response to Comments for 310 CMR 7.00 et seq.: 310 CMR 7.29 – Emission Standards for Power Plants, Appendix A*, April 2001, at 19.

[117] ISO New England includes a chronology of its activities on its website: www.iso-ne.com

analysis that assumed that all large power plants subject to the new regulations in Connecticut or Massachusetts would cease operations in the near term. This analysis represented an extreme and unlikely scenario.[118] However, due to a general reluctance among policy makers to take any steps that might impair electric system reliability, ISO New England was not pushed to develop a more realistic scenario. ISO New England applauded Governor Rowland's veto as a responsible decision based on reliability concerns.[119]

The New Hampshire DES recommended the use of market-based measures for compliance in order to reduce the risk of plant closings and the potential for impairment of electric system reliability.[120] The proposed regulations in New York include a unit specific exemption for reliability concerns under which a unit will not be subject to the excess emission reduction provisions if the Department of Public Service certifies that compliance will "imperil" the reliability of the New York state electric power system and the source has not sold its allocated allowances.[121]

While electric power system reliability is clearly a public policy concern, both in the short term and in the long term, these concerns should not be used to block innovative environmental regulatory policy. Because of the importance of the electric power system to all citizens and to a state's economic health, any concerns over system reliability have the potential to freeze efforts to improve air quality even if there is no analysis to substantiate the concerns.. In this atmosphere, environmental regulatory efforts can be thwarted even when electric power system reliability has not been demonstrated to be at risk. Environmental regulators should not hesitate to ensure that reliability concerns be based on thorough analysis of likely regulatory and compliance scenarios rather than on vague and exaggerated compliance scenarios. State regulatory agencies should push entities raising reliability concerns to demonstrate specific reliability threats based on thorough an realistic analysis. In fact, reliability concerns present a good opportunity for close coordination between the economic and environmental policy arenas. Through such coordination, economic and environmental policy regulators can ensure the achievement of both power system reliability goals and environmental policy goals.

5.6 Fuel Diversity

The issue of fuel diversity is closely tied to the issue of power system reliability in policy formation. In general, reliance on a diversity of fuel sources contributes to a more reliable power system. The states covered in this survey all specifically addressed the

[118] See e.g., Biewald et. al., *Room to Breathe: Why the Massachusetts Department of Environmental Protection's Proposed Air Regulations Are Compatible With Electric System Reliability,* March 22, 2001. Also, Schlissel et. al., *Clean Air and Reliable Power: Connecticut HB 6365 Will Not Jeopardize Electric System Reliability,* May 24, 2001.

[119] ISO New England press release, June 22, 2001.

[120] NH DES, *New Hampshire Clean Power Strategy,* at 73.

[121] NY DEC, *Comprehensive Regulatory Impact Statement*, February 2002, at 24.

issue of fuel diversity in the formation of their regulatory approach, but did not adopt a consistent approach.

In its regulatory review CT DEP determined that fuel diversity was not threatened because the regulations provided a variety of compliance options, including the installation of air pollution control equipment.[122] Similarly, MA DEP determined that it regulations would not reduce fuel diversity. DEP's analysis indicated that compliance with the regulations was economically and technically feasible for generation sources burning coal, oil, or natural gas. DEP emphasized that the current trend towards new gas-fired electrical generation is occurring independently of the regulations.[123] In fact, Massachusetts noted that the owner of the Salem Power Station planned to increase its use of coal-fired generation in Salem.

In contrast, in New York the DEC specifically rejected a fuel-neutral SO_2 allowance allocation because it feared such an allocation would provide an unfair advantage to natural gas over coal. This advantage would occur because of the large difference in the uncontrolled SO_2 emission rates for different types of fossil fuels.

New Hampshire anticipates that the cap and trade program contained in the Clean Power Act will ensure sufficient fuel diversity, as facilities can choose a variety of compliance options.[124]

Thus all states have sought to preserve fuel diversity. However, they have come to different conclusions regarding what regulatory approach can achieve that goal. New Hampshire indicates that full trading for compliance will preserve fuel diversity. In contrast Connecticut and Massachusetts, have determined that affected sources can comply with a hybrid regulatory approach that requires on-site emission reductions as well as compliance using trading. New York declined a fuel-neutral regulatory approach for SO_2, whereas other states have determined that a fuel neutral approach is not inconsistent with maintaining fuel diversity.

5.7 Carbon Dioxide

The NEG/ECP adoption of a Climate Change Action Plan provides an important backdrop for actions of individual states in New England to reduce greenhouse gas emissions associated with electricity generation. The Action Plan includes near term and long-term goals. The short-term goal is the reduction of greenhouse gas emissions to 1990 levels by 2010. The mid-term goal is to reduce emissions by at least ten percent below 1990 levels by 2020. Finally, the long-term goal is to reduce emissions "sufficiently to eliminate any dangerous threat to the climate." NEG/ECP anticipates that the long-term goal will require emission reductions 75-85 percent below current levels.[125]

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[122] CT DEP, *Hearing Report*, Section VI.F.3.

[123] MA DEP*, Statement of Reasons and Response to Comments for 310 CMR 7.00 et seq.: 310 CMR 7.29 – Emission Standards for Power Plants, Appendix A*, April 2001, at 19-21.

[124] NH DEP, *New Hampshire Clean Power Strategy*, at 72.

[125] Presentation of Kenneth A. Colburn, NH DES, to NEG/ECP February 2002.

The Plan includes the following specific action categories:(1) establish a standardized regional greenhouse gas emissions inventory; (2) establish a plan for reducing greenhouse gas emissions and conserving energy; (3) promote public awareness; (4) governments lead by example, reducing public sector greenhouse gas emissions by 25 percent by 2012; (5) reduce electricity sector CO_2 emissions per megawatthour produced by 20 percent by 2025; (6) increase total energy saved by 20 percent by 2025; (7) reduce and/or adapt to negative impacts of climate change; (8) reduce growth in transportation sector greenhouse gas emissions; and (9) create a regional greenhouse gas emissions registry and explore regional trading.[126]

Massachusetts, New Hampshire, and New Jersey decided to seek CO_2 emissions reductions from affected power plants.[127] Massachusetts's determination to regulate was based on its conclusion that excessive CO_2 emissions from the affected facilities are contributing to a "condition of air pollution." As a result, MA DEP determined that it had the authority to regulate those emissions despite arguments that it was exceeding its regulatory authority. Massachusetts cites numerous impacts of CO_2 and climate change in support of its conclusion. Since CO_2 is a global pollutant rather than a regional pollutant, Massachusetts declined to set ambient air quality standards and imposed instead caps on emissions from specific sources. However, the DEP stated that emissions offsets would be a viable compliance option since "any reduction of CO_2 anywhere, from any source, will slow the buildup of greenhouse gases in the atmosphere as a whole."[128]

New Hampshire's decision to regulate CO_2 stems from its concern over specific impacts to New Hampshire from global warming. For example, the DES anticipates that New Hampshire could be much more affected by sea level rise and severe coastal storms than other areas of the globe. Similarly, the Department anticipates that New Hampshire's habitat could be strongly affected, harming economically crucial native species, and that recreational industries could suffer.[129]

Similarly, New Jersey has 127 miles of coastline that it has determined will be impacted by sea level rise associated with climate change. This area includes billions of dollars in infrastructure development, and generates billions of dollars in revenue annually. New Jersey has decided that the coastline is a priceless natural resource that requires protection.[130]

In each of these instances, individual states have decided to address this pollutant even in the absence of specific federal action. The three states have determined that CO_2 emissions have a negative impact on the state. While recognizing that CO_2 has global rather than local impacts, the states have determined that state action is appropriate.

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[126] Id.

[128] MA DEP, *Statement of Reasons and Response to Comments, 310 CMR 7.29,* April 2001, at 10-14.

[129] NH DES, *Clean Power Strategy,* at 40-46.

[130] NJ DEP, *Sustainability – Greenhouse Gas Action Plan*, December 1999.

5.8 Mercury

The NEG/ECP adoption of a Mercury Action Plan provides an important backdrop for actions of individual states in New England to reduce mercury emissions associated with electricity generation. The Action Plan includes the following specific action categories: (1) establishment of a regional mercury task force; (2) emission reductions; (3) pollution prevention; (4) outreach and education; (5) research, analysis, and strategic monitoring; and (6) stockpile management. To date many states have been aggressive in pursuing emission reductions from municipal and medical waste incinerators; action on emission reduction from utilities is just getting underway region-wide.[131] In a Status Report on the implementation of the Mercury Action Plan, the Mercury Task Force estimated that regional mercury emissions would be reduced between 50 percent and 55 percent by 2003, exceeding the interim reduction goal.[132]

In a larger regional effort, the North American Agreement on Environmental Cooperation between the governments of Canada, Mexico and the United States has developed a North American Regional Action Plan on Mercury. The second phase of that Plan, issued in March 2000, includes a specific action item related to the electric power generating sector. Action item 1b stresses multi-pollutant regulatory approaches, stating that the three national governments will investigate options for reducing mercury emissions from the power sector consistent with a 50 percent reduction target, "and including an evaluation of multi-pollutant approaches [...]."[133]

States in New England and in other OTR states have undertaken numerous activities to reduce or eliminate mercury including from municipal waste incinerators, medical waste incinerators, thermometers, dental uses, and other sources. States have used a variety of approaches including public education and outreach, regulatory initiatives, collection programs and others. Several states, including Connecticut, Massachusetts, New Hampshire, New Jersey, have adopted an Action Plan, developed a Mercury Reduction Strategy, and/or created a Mercury Task Force. One summary of individual state actions throughout the United States is contained in a report issued by the Clean Air Network and the Environmental Council of Sates in January 2001. The report, entitled "Mercury in the Environment – States Respond to the Challenge. A Compendium of State Mercury Activities" provides a state-by-state listing of mercury efforts including regulatory and non-regulatory efforts, public outreach activities, research and monitoring efforts, state resources, task forces and current statistics.[134]

Since this report focuses on multi-pollutant regulatory approaches in the electricity sector, the report looks at individual state actions to address mercury emissions

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[131] Presentation of Barbara A. Kwetz, MA DEP, to NEG/ECP February 2002.

[132] NEG/ECP Committee on the Environment, "Implementation of the Conference of New England Governors and Eastern Canadian Premiers Mercury Action Plan," August 27, 2001, at 3.

[133] North American Implementation Task Force on Mercury, "North American Regional Action Plan on Mercury, Phase II," 16 March, 2000, at 9.

[134] Another source of information is a database of mercury reduction programs developed by the Northeast Waste Management Officials' Association. See the NEWMOA website at www.newmoa.org.

associated with electric power plants.[135] But, before turning to the discussion of individual state actions, it is important to note the on-going federal effort to regulate emissions of mercury and other toxics from coal- and oil-fired power plants. In December 2000, US EPA determined that it would regulate emissions of mercury and other air toxics from coal- and oil-fired electricity generating units. This announcement came after several years of gathering and analyzing data on emissions of mercury and other toxics from electric power plants. The agency is seeking public input in developing the proposed regulations (this process is frequently called the "mercury MACT" process). EPA will propose regulations by December 15, 2003, and issue final regulations by December 15, 2004.

In explaining its decision to regulate mercury, the MA DEP identified mercury as a persistent, bioaccumulative toxic metal and noted that air emissions play a significant role in the transport and dispersion of mercury.[136] The DEP stated that a 1996 inventory of Massachusetts facilities suggested that coal and oil-fired generation were the source of approximately 30 percent of the in state mercury emissions at that time. The Department decided to determine the appropriate mercury standard through a feasibility study and stack testing and fuel sampling requirements. However, the Department believed that affected facilities could plan to control emissions at the same time as they plan to control nitrogen oxides and sulfur dioxide based on their knowledge that significant mercury reductions would be required over the next ten years.

In addition to the NEG/ECP Mercury Action Plan, one of the drivers behind New Hampshire's decision to regulate mercury emissions from power plants was the desire to set an example of environmental leadership for other jurisdictions to follow.[137] Other drivers were a report by the National Wildlife Federation indicating that mercury concentration in rain water in New England is substantially higher than the level EPA considers safe for people, aquatic life and wildlife in surface waters, expected future regulations on mercury, and potential co-benefit reductions in other pollutants. A multi-stakeholder group evaluated the feasibility of achieving a 75 percent reduction in mercury emissions from coal-burning power plants by 2005.

There is some evidence that standards such as established by Massachusetts and New Hampshire are attainable and will serve as technology drivers. NESCAUM issued a report in 2000 concluding that there is a strong link between technological innovation and the existence, timing, and stringency of regulatory drivers. NESCAUM also concluded that the present status of mercury controls does not preclude near-term regulation.[138]

The New Jersey Mercury Task Force issued a report in December 2001 containing recommendations for reducing mercury emissions in New Jersey. The report

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[135] States outside the OTR are also pursuing mercury emission reductions from power plants. Such states include Illinois, Michigan, North Carolina, and Wisconsin. Source: Felice Stadler, National Wildlife Federation. April 2002.

[136] MA DEP, *Technical Support Document,* April 2001, at 14-17, 24.

[137] NH DES, *New Hampshire Clean Power Strategy*, at 32-5.

[138] NESCAUM, *Environmental Regulation and Technology Innovation: Controlling Mercury Emissions from Coal-Fired Boilers*, September 2000.

recommends reducing mercury emissions from the production of electricity by promoting energy efficiency, promoting electric power from certified green sources including renewables and sources with low or zero mercury emissions, and requiring mercury emissions to be disclosed to consumers. The report also recommends specifically that New Jersey should reduce mercury emissions from coal combustion by (1) urging EPA to develop and implement output-based mercury emission limits, (2) adopting state standards if EPA has not promulgated and implemented mercury emission limits by December 2003, and (3) working with interstate organizations to pursue federal multi-pollutant legislation that addresses mercury, as well as other pollutants.[139] The DEP is currently participating in the EPA MACT process, and will consider the need for a rulemaking on mercury emissions associated with coal combustion based on the results of the EPA process.

5.9 Cost and Market Impacts of Allocation Methods

This section contains two types of analysis. First, there is a theoretical calculation of market impact of NO_x allowance allocation to two hypothetical 100 MW electrical generating units. This theoretical calculation is presented to provide a simple comparison of the impact of input-based and output-based NO_x allowance allocation on hypothetical generating units. Following the theoretical example, there is a preliminary analysis based upon actual data from 1998 for power plants 15MW and larger in the OTR. This analysis based on actual data provides a first level assessment of potential market impacts of input and output-based NO_x allowance allocation.

Theoretical Analysis

Tables 2-4 present a theoretical analysis of the relative costs and market impacts of input and output-based NO_x allowance allocations for two hypothetical 100 MW power plants. Plant 1 is an older coal facility and Plant 2 is a new gas facility. Table 2 shows the characteristics of the hypothetical units used in the analysis. The heat rate and emissions characteristics of the coal facility are based on the average characteristics of coal facilities in the OTR upon which the allocation method has the highest impact.[140] For simplicity, the calculation assumes that each unit runs at full capacity for an entire year (100 percent Capacity Factor). While this assumption does not represent actual operation for any unit, it provides a consistent point of comparison in this theoretical analysis. The annual emissions are calculated based on the total annual generation of a 100MW power plant at 100 percent capacity factor, and the emission rates assumed for the hypothetical units.

[139] New Jersey Mercury Task Force, *Report to the Department of Environmental Protection*, December 2001, at 10.

[140] These characteristics were determined using 1998 data from US EPA's Emissions and Generation Resource Integrated Database (EGRID) for actual generating facilities in the OTR.

Table 2: Characteristics of plants used in theoretical analysis

	Plant 1 Older Coal-fired Plant	Plant 2 New Gas-fired Plant
Capacity	100 MW	100 MW
Heat rate	12,000 Btu/kWh	7,000 Btu/kWh
Annual Generation	876,000 MWh	876,000 MWh
Output-based NO_x Emission Rate	5.00 lb/MWh	0.06 lb/MWh
Input-based NO_x Emission Rate	0.50 lb/mmBtu	0.01 lb/mmBtu
Annual NO_x Emissions	2,190 tons	26 tons

Assumes 100 percent capacity factor.

Table 3 shows how many NO_x allowances each hypothetical power plant would receive under an output-based allowance allocation and calculates the market impact of that allowance allocation at different allowance costs. In this example, generating units are allocated allowances at the rate of 1.5 lb NO_x per megawatthour of electrical output. This is the rate that Massachusetts and New Hampshire used in their multi-pollutant regulations. Both units, since they are of the same size and are assumed to generate the same amount of electricity in a year, receive the same allocation. The Net Allowances row shows the difference between the hypothetical unit's actual emissions and the allocated allowances. The (Cost)Profit row shows how much the unit owner would pay or receive in the allowance market, at different allowance prices, based on its Net Allowances. The cost or profit of the allowance allocation is calculated for allowance costs of $500/ton, $1000/ton, and $1,500/ton. The Impact on Generation Costs row shows the impact of the cost or profit on a kilowatthour basis using the total annual generation and the total cost or profit for different allowance costs. Finally, the Difference in Generation Cost row shows the net difference between the impact on generation cost for Plant 1 (coal facility) and for Plant 2 (gas facility). This value shows the total impact of the allocation method on the generation cost spread between the two units. This difference is a relevant point of comparison since, in competitive electric markets, generating units compete on the basis of costs per unit of electrical output (or generation).

Table 3: Output-based Allocation and Theoretical Market Impacts

	Plant 1 Older Coal-fired Plant	Plant 2 New Gas-fired Plant
Annual NO_x Emissions	2190 tons	26 tons
Allowance Allocation (1.5lb/mWh)	657	657
Net Allowances	-1,530	631
Allowances @$500/ton		
(Cost)Profit	($767,000)	$315,000
Impact on Generation Cost	($0.875/MWh)	$0.36/MWh
Difference in Generation Cost between Plant 1 and Plant 2	$1.24/MWh	
Allowances @$1,000/ton		
(Cost)Profit	($1,530,000)	$631,000
Impact on Generation Cost	($1.75/MWh)	$0.72/MWh
Difference in Generation Cost between Plant 1 and Plant 2	$2.47/MWh	
Allowances @$1,500/ton		
(Cost)Profit	($2,300,000)	$946,000
Impact on Generation Cost	($2.63/MWh)	$1.08/MWh
Difference in Generation Cost between Plant 1 and Plant 2	$3.71/MWh	

Notes: Net Allowances= Annual Emissions – Allowance Allocation
*(Cost)Profit= Net Allowances * Allowance Cost*
Impact on Generation Cost= (Cost)Profit/Annual Generation from Table 2.

Table 4 shows what each hypothetical power plant would receive under an input-based allowance allocation, and calculates the market impact of that allowance allocation at different allowance costs. In this example, generating units are allocated allowances at the rate of 0.15lb NO_x per MMBtu of fuel input. This is the rate that Connecticut DEP and NY DEC used in developing input-based NO_x regulations. Under this allocation, because the units have different heat rates, the units receive different allocations. As in Table 3, the Net Allowances shows the difference between the hypothetical unit's actual emissions and the allocated allowances. Similarly, the (Cost)Profit row shows how much the unit owner would pay or receive in the allowance market, at different allowance prices, based on its Net Allowances. The cost or profit of the allowance allocation is calculated for allowance costs of $500/ton, $1000/ton, and $1,500/ton. Finally the table shows the impact of the cost or profit on a kilowatthour basis using the total annual generation and the total cost or profit for different allowance costs.

Table 4: Input-based Allocation and Theoretical Market Impacts

	Plant 1 Older Coal-fired Plant	Plant 2 New Gas-fired Plant
Annual NO_x Emissions	2190 tons	26 tons
Allowance Allocation (0.15lb/mmBtu)	788	460
Net Allowances	-1,402	434
Allowances @$500/ton		
(Cost)Profit	($700,800)	$217,000
Impact on Generation Cost	($0.80/MWh)	$0.25/MWh
Difference in Generation Cost between Plant 1 and Plant 2	$1.05/MWh	
Allowances @$1,000/ton		
(Cost)Profit	($1,401,000)	$434,000
Impact on Generation Cost	($1.60/MWh)	$0.50/MWh
Difference in Generation Cost between Plant 1 and Plant 2	$2.10/MWh	
Allowances @$1,500/ton		
(Cost)Profit	($2,102,000)	$650,000
Impact on Generation Cost	($2.40/MWh)	$0.74/MWh
Difference in Generation Cost between Plant 1 and Plant 2	$3.14/MWh	

Table 5 shows the impact of the input-based allocation compared to the output-based allocation by looking at the net difference between the "impact on generation costs" under the output-based allocation (Table 3) and under the input-based allocation (Table 4).

Table 5: Net Theoretical Market Impact of Input v. Output-Based Allocation on an Older Coal Unit and a New Gas Unit.

	Allowance Cost		
	$500/ton	**$1,000/ton**	**$1,500/ton**
Market Impact	$0.19/MWh	$0.38/MWh	0.56/MWh

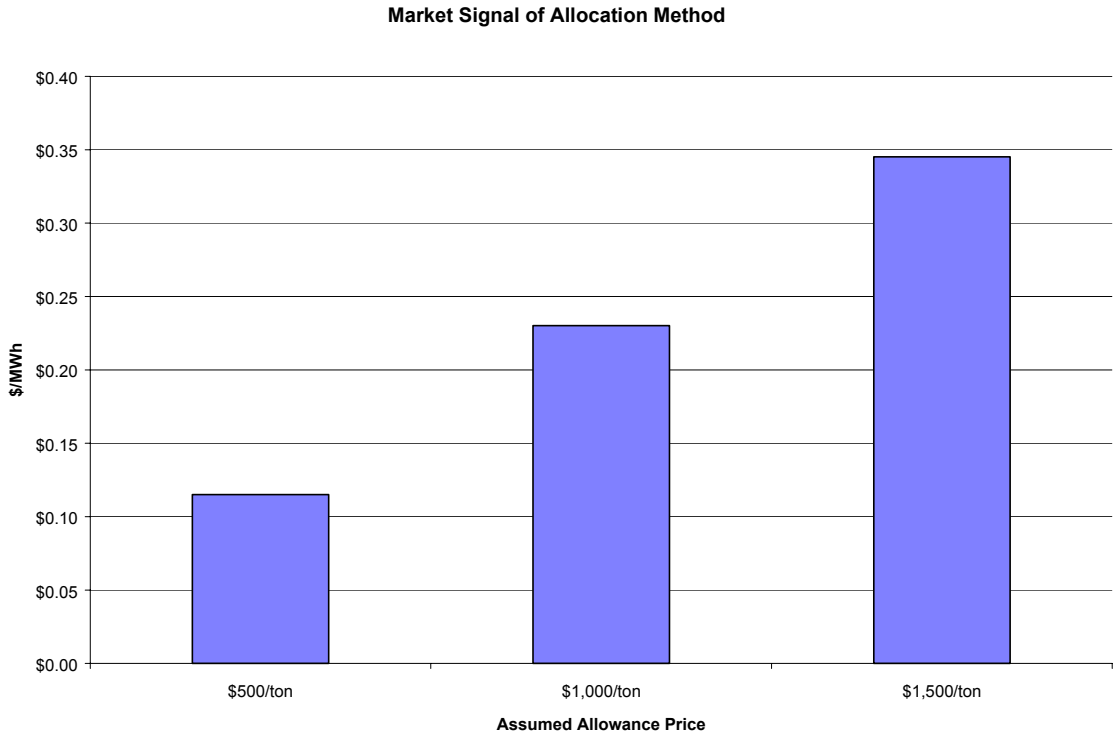
Analysis of 1998 Data

Analysis of actual power plant data in U.S. EPA's EGRID from 1998 produces results that are consistent with this theoretical analysis.[141] For example, Figure 4 shows the total average market impact ($/MWh) between an input-based and an output-based allocation under different allowance costs. This chart reflects calculations based on actual 1998 data for power plants in the OTR 15 MW and larger. The actual data includes generation,

[141] 1998 is the most recent data included in EGRID as of May 2002. EPA anticipates the next update of EGRID in summer 2002.

heat input, and emissions. The output-based allocation is based on 1.5lb NO_x/MWh, consistent with the output emission rate used in Massachusetts and New Hampshire. The input-based allocation is based on 0.15lb NO_x/MWh, the rate that Connecticut and New York used in input-based NO_x standards. This chart shows that if allowance costs were $500/ton the allocation method would have an average impact of about $0.12/MWh on affected sources. This is consistent with the results in Table 5. While this result shows a lower impact than the theoretical analysis because the results are based on averages of all generation facilities larger than 15MW in the OTR. The theoretical analysis, which presents a more stark contrast between an older coal-fired unit and a new gas-fired unit, reflects more divergent results.

Figure 4: Comparison of Market Signal of Input-based v. Output-based Allocation



Output-based NO_x allowance allocation does not just favor sources with lower rates of NO_x emissions per unit of electrical output. Additional analysis of the 1998 data in the EGRID database reveals the average emission characteristics of generating units that generally benefit from an input-based allocation compared to the average emission characteristics of generating units that generally benefit under an output-based allocation. Figure 5 shows that generation sources that have lower NO_x emission rates per unit of electrical output, also generally emit other pollutants at a lower rate per unit of electrical output. Since these results are based on actual 1998 data, they do not reflect any new highly efficient, low emission generating units that would be in more stark contrast to the existing units. It is important to note that there is not a strict correlation between fuel type and impact of the allowance allocation method.

Figure 5: Comparison of Average Emission Characteristics of Generating Units that Benefit From Input-based Allocation v. Those That Benefit from Output-based Allocation.

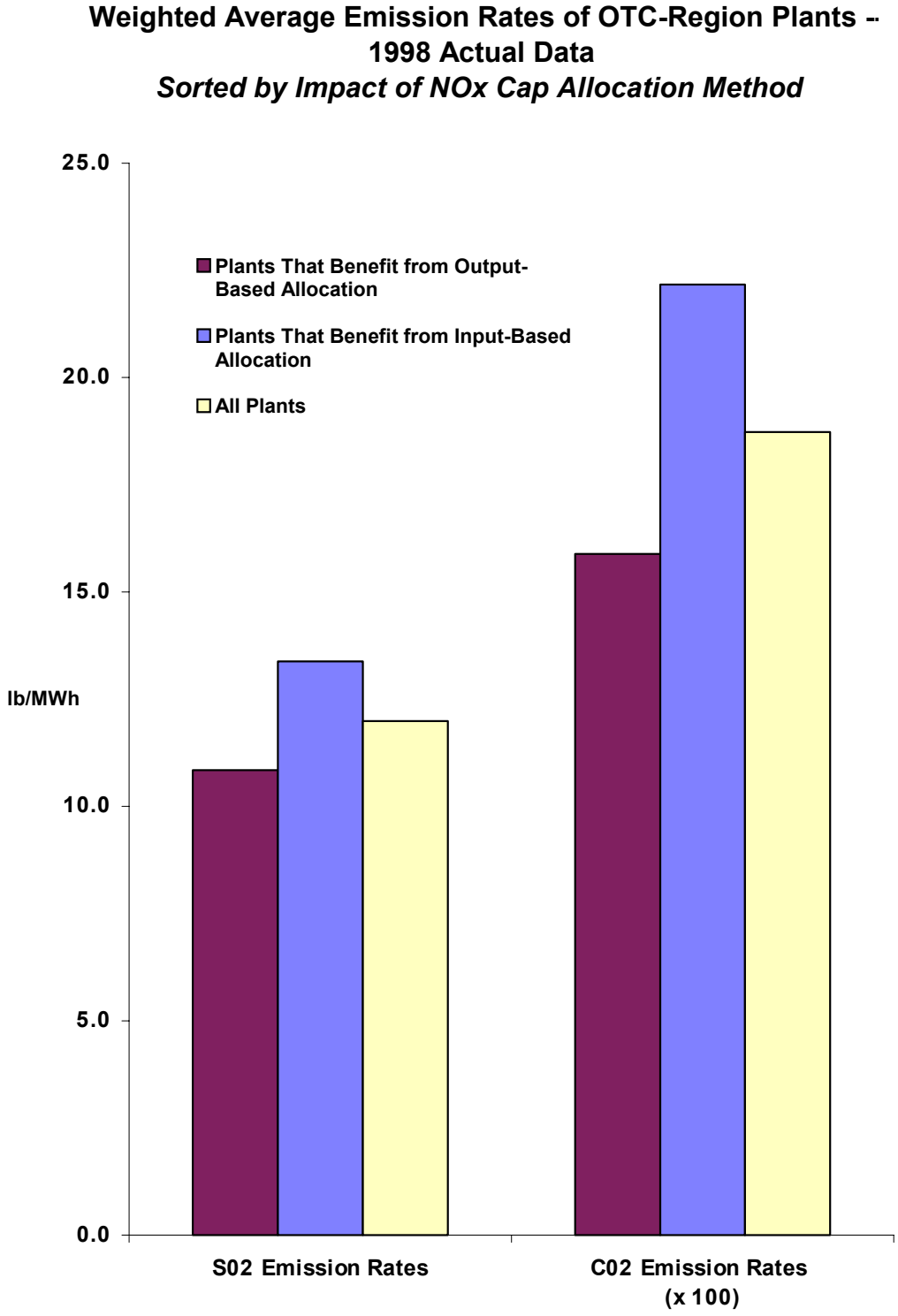
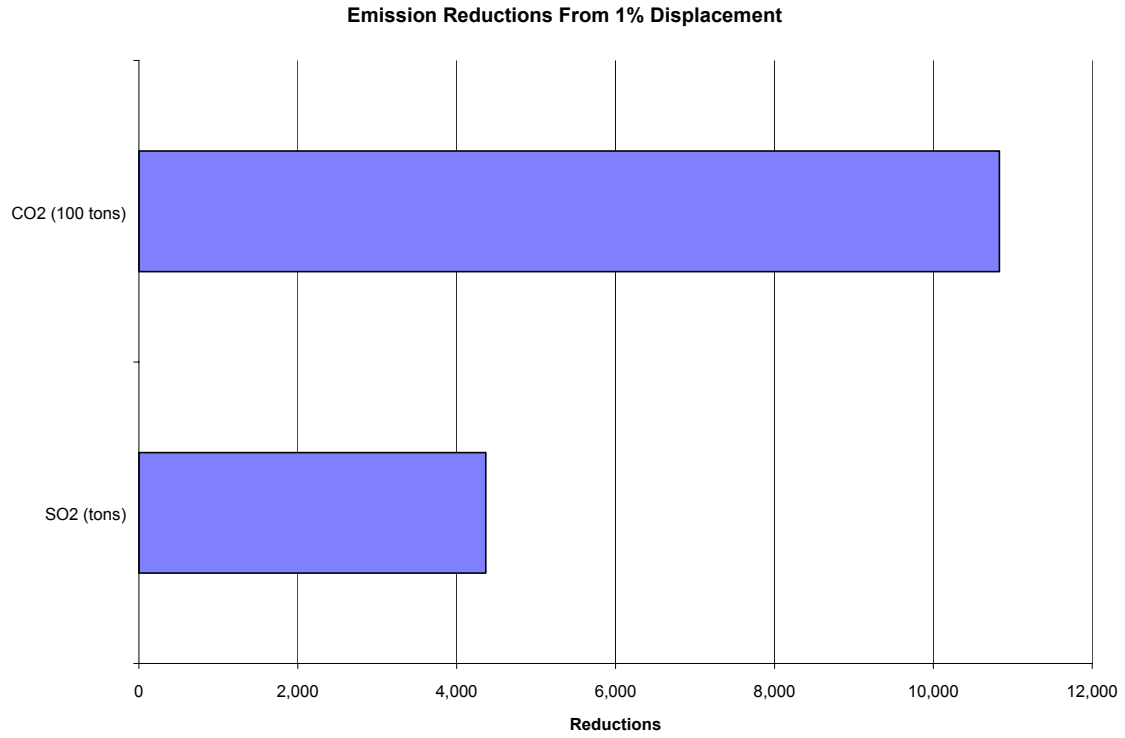


Figure 5 illustrates the "co-benefits" that derive from regulatory approaches that favor higher generation efficiency.

The operation of competitive markets, in conjunction with output-based regulatory approaches, can achieve this type of "co-benefits." For example, as discussed above, output-based allowance allocation will have different impacts on the competitive position of sources depending on the sources' emissions per unit of electrical output. In some instances, the market impact may lead to cleaner sources displacing sources with higher emissions per unit of electrical output. Figure 6 depicts the average emission benefits of a one percent displacement of the most highly polluting generation (on a pounds/MWh basis) by less polluting generation (on a pounds/MWh basis) due to an output-based NO_x allocation. Again, these results are based on actual emissions, and generation data for power plants in the OTR in 1998.

Figure 6: Emission Reductions from One percent Displacement Due to Output-based NO_x Allocation.



There are a few factors that temper the results of this analysis and that point to the need for further refinement of the analysis:

- The results of this analysis are somewhat tempered by the fact that it is based on actual 1998 data. It does not include any comparison between existing and newly permitted sources. A comparison between existing and newly permitted sources would reveal even greater differences in the emissions profiles and hence the market impacts of allocation methods.

- The graphs represent weighted averages reflecting all generation above 15MW capacity in the OTR. Further analysis could look at the different market impacts between those resources that benefit the most from an input based allocation compared to those that benefit most from an output-based allocation. Such analysis could define a more representative sample of generation sources that might displace/or be displaced. For example, a comparison using 1998 data on the fifty sources that benefit most from output-based allocation and the fifty sources that benefit most from input-based allocation would reveal a stronger cost differential attributable to the allocation method. Such a comparison would also demonstrate a larger emission reduction benefit for NO_x, SO_2, and CO_2 associated with a one percent displacement.

- The calculations far do not account in any way for useful steam output. It appears that the data available in the EGRID database may allow for some refinement in this area; however such an analysis was not possible within this project.

Nevertheless, this analysis permits several conclusions:

- The method of allocation has real market impacts on generation sources. Both input-based and output-based allocations create winners and losers in a competitive market. No allowance allocation method is neutral. States should consider the consistency of the allocation method with other policy goals.

- The multi-pollutant emission profile of sources that benefit from an output-based allocation is cleaner than the multi-pollutant emission profile of sources that benefit from an input-based allocation.

- Based on the market impacts of allocation methods, allocation methods will affect the competitiveness of energy efficiency and renewable generation sources in electricity markets. If less efficient sources must factor allowance costs (or other compliance costs) into their price per unit of electrical output, energy efficiency and renewable generation sources will become more competitive.

- Output-based allocation of NO_x allowances can have a substantial benefit in reduction of emissions of other pollutants (e.g. SO_2, CO_2 and mercury) since such allocation rewards sources that produce lower emissions per unit of electrical power generated (see Figure 2). Figure 1, 2, and 3 together indicate that allocation of NO_x allowances, and the associated market impacts, could lead to displacement of resources and thus to reductions in emissions of other pollutants.

5.10 Cost Estimates

The MA DEP determined that the multi-pollutant regulations were the most cost-effective means of achieving emission reductions. The agency based its conclusion on a comparison of control costs in the electric generation sector and other sectors. Massachusetts also highlighted other steps it had taken to minimize the costs of achieving emission reductions through its regulation. For example, the DEP will rely on existing monitoring requirements (with the exception of mercury), annualized costs of multi-pollutant strategies are lower than single pollutant regulatory programs, and affected sources have a variety of compliance options.[142] DEP stated that final compliance costs for the regulation would be much lower than some commenters' estimate of $2.40/month for each electricity customer.[143]

New Hampshire DES also discussed estimates of the cost of complying with the Clean Power Strategy. The agency estimated that the actual compliance costs would be even lower than the range of $7/year to $35/year per household presented in its analysis.[144] New Hampshire anticipated that costs of compliance would be even lower if older power plants operated less frequently due to increased generation from newer, more efficient gas-fired combined-cycle power plants. Finally, New Hampshire emphasizes that the use of full trading as a compliance option contributes to the cost-effectiveness of the regulation.

5.11 Interaction With Existing Regulations

The multi-pollutant regulations adopted in Massachusetts contemplated a specific timetable for compliance activities. However, in developing compliance plans, some of the affected facilities determined that a later compliance date would be applicable because compliance activities would trigger the provisions of existing MA DEP regulations pertaining to the construction, substantial reconstruction, or alteration of a generating unit at an affected facility.[145] For some affected sources, this option has resulted in a two-year delay in the compliance schedule for NO_x, SO_2, and CO_2.[146]

5.12 Preparation and Sources of Data

Several states emphasized that in order to have a strong foundation, regulatory approaches must be based on solid data and thorough preparation. For example, in Massachusetts the availability of consistent and detailed data on historic operation of affected sources was critical to the DEP's ability to develop output-based standards. The

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[142] MA DEP, *Technical Support Document,* April 2001, at 19-22.

[143] MA DEP, *Technical Support Document,* April 2001, Appendix A, at 18.

[144] NH DES, *New Hampshire Clean Power Strategy*, at 101.

[145] Regulations are contained in 310 CMR 7.02.

[146] See e.g. MA DEP Emission Control Plan Draft Approval for Brayton Point Station, Table 6, March 2002.

DEP relied heavily on publicly available data from federal agencies. Proposals in the past few years by the Energy Information Administration to restrict the availability of information on electrical generation sources would have significantly hampered regulatory efforts in Massachusetts.[147] In New Hampshire also, preparation and homework were deemed critical to the success of New Hampshire's Clean Power Strategy and to the ability of the DES to bring a successful proposal before the legislature.[148]

Nevertheless, in certain circumstances, preparation alone will not determine the success of an agency's proposal. For example, in Connecticut, the DEP's thorough preparation and background work did not prevail in a highly politicized process. Despite the DEP's active involvement at the legislature, and its analysis of anticipated local benefits from a hybrid approach designed to require on-site emission reductions and to use market-based compliance approaches, the legislature acted to restrict compliance options.[149] Similarly, in New Hampshire, confusion in the political process lead to the rejection of the DES proposal for a specific cap on mercury emissions.[150]

6. Conclusions

This report provides a summary and case study of several approaches that individual states in the OTR have developed to reduce emissions of multiple pollutants from electric power generation. With other states contemplating multi-pollutant approaches, and with efforts at the Federal level to develop multi-pollutant legislation, these states offer some early experience and lessons in the development of multi-pollutant regulatory approaches.

- There is strong consistency in the goals and underlying reasons for state multi-pollutant regulations. Failure to achieve the objectives of the federal Acid Rain Program has been one of the primary catalysts for states' efforts to promulgate new regulations. In addition, states have consistently expressed the need to address impacts of nitrogen oxides on an annual basis rather than just on a seasonal basis, and to address the full range of emissions impacts. In summary, individual states have taken steps to further reduce emissions of certain pollutants based on their conclusion that federal regulations do not sufficiently protect the states' resources and public health. The states anticipate public health, environmental, and economic benefits from their regulatory actions.
- The lack of federal action to address continuing acid rain issues, as well as other pollutant impacts is resulting in a patchwork of state approaches. In the absence of a comprehensive and sufficient federal program, individual states will take

[147] Personal communication with William Lamkin, MA DEP, April 5, 2002. See, e.g. letter from Lauren A. Lis, Commissioner DEP and David L. O'Connor, Commission DOER to John G. Colligan, EIA Re: confidential treatment of information reported to the EIA on electric power surveys. May 11, 2001.

[148] Personal communication with Andy Bodnarik, NH DES, April 3, 2002.

[149] Personal communication with Chris Nelson, CT DEP, March 7, 2002.

[150] Personal communication with Andy Bodnarik, NH DES, April 3, 2002.

actions that they determine are necessary to protect state resources and health. The diversity of state approaches will lead to complexities and inefficiencies for owners of affected sources in different states, as well as for state agencies. In addition, the diversity of state approaches could lead to complications in determining compliance with multiple state requirements as individual states develop state-specific allowances, record keeping, and compliance procedures.

- In the absence of a federal policy of reducing emissions of pollutants with a global impact, individual states are taking specific steps that they have determined are consistent with their state mandate. State policies are being developed through actions of Governors, state agency, state legislatures, and individual company actions. Some states have identified specific threats to state resources that are posed by greenhouse gases. While they recognize that individual state actions will not have a proportionate benefit to the state, due to the global impact of GHG, they are nonetheless determined to do their part, and set an example in policy development.

- Involvement by public health, consumer, and environmental advocates in the regulatory development process has provided a strong basis of support for state efforts to pursue multi-pollutant regulations. To date, this targeted public participation appears more effective than consumer choice in electricity markets in achieving emissions reductions in the electricity sector. While public health, consumer, and environmental advocates have pushed some states to put in place even more stringent emissions standards or compliance options, they have provided a necessary element of support to initial state efforts to address greenhouse gas emissions in the absence of federal action.

- The state Governor has played a strong leadership role in each of the states adopting a multi-pollutant approaches to date in the OTR. In addition, regional coordination among Governors has been essential in establishing a policy framework, and broad goals, that underlie individual state action.

- Despite consistency in the overall goals, different state approaches are shaped by circumstances in each state and by the universe of affected resources they include. Regulatory efforts focused specifically on electrical generation sources seem to provide greater flexibility to the state regulatory agency in the design of multi-pollutant regulations. This may be in large part due to the fact that such a targeted approach enables the regulatory agency to incorporate regulatory elements that are specific to a particular emissions sector, using incentives that are specific to that subset of stationary sources as a tool to achieve environmental policy objectives. Aligning environmental regulatory approaches with economic incentives for generation efficiency can be an effective way of using electric industry restructuring in the pursuit of environmental improvement.

- Multi-pollutant approaches, including more stringent regulatory standards, have not threatened electric system reliability. Concerns to date over electric system reliability have not been based on thorough analysis of likely scenarios. Furthermore, environmental regulations are generally developed with sufficient

lead time so that (1) short-term reliability is not threatened, (2) market entry and compliance planning activities ensure that long-term reliability is stable.

- Output based regulations -- including allowance allocation and emissions standards -- align environmental policy objectives with competitive pressures in the electric industry. The emphasis on emissions per unit of electrical output is consistent with competition at the wholesale level on the basis of electric output. Such an approach encourages generation efficiency, thereby producing collateral benefits by favoring sources whose emissions per unit of output are low. There is a general trend to output based approaches with states moving at different rates toward output-based regulations. Emphasis on encouraging generation efficiency is particularly important from an emissions perspective considering the emissions characteristics of baseload fossil-fueled electric generating units in New England and in other Northeastern electrical control regions.
- Multi-pollutant regulatory approaches that consolidate regulatory requirements and compliance activities and demonstration are likely to produce efficiencies for affected sources as well as for agencies.
- State estimates of the cost of multi-pollutant regulations indicate that these approaches are cost-effective both within the electricity sector and in comparison to achieving emission reductions in other sectors.
- There is a strong need for federal action on several fronts. Some states are waiting for federal multi-pollutant legislation; however they will take action in the absence of federal legislation. Similarly, states are poised to establish mercury standards in the absence of a federal determination. Finally, U.S. EPA could assist state efforts to move to output-based regulatory approaches by recommending specific approaches to use output-based standards for combined heat and power applications.

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Appendix A

Table A-1: Summary of Multi-Pollutant regulatory approaches in CT, MA, NH and NY

	Connecticut	Massachusetts	New Hampshire	New York
Regulation	22a-174-19a (SO2), 22a-174-22 (NOx), 22a-174-22a and 22b (NOx)	310 CMR 7.29	Clean Power Act. HB 284 – FN	6NYCRR Part 204 (NO_x ozone season). 6NYCRR Part 237 (NO_x non-ozone season). 6NYCRR Part 238 (SO_2).
Date	December 2000	April 2001	May 2002	Pending. Regulations proposed February 2002.
Status	Adopted regulation, Hg legislation under consideration	Adopted regulation	Signed into law.	Hearings and Comment Period on proposal on-going. Comment period ends 5/28/02.
Applicability	SO_2: Phase I applies to all NBP sources. Phase II applies to Acid Rain Program sources. NO_x: applies to NBP sources.	Facility that emitted greater than 500 tons of SO_2 and NOx during 1997, 1998, or 1999 and includes an electric generating unit that: is subject to 40 CFR Part 72 (Title IV); serves generator with nameplate capacity of 100MW or more; was originally permitted prior to 8-7-77, and has not since undergone New Source Review.	HB 284 lists affected sources as Merrimack 1&2; Schiller 4,5,6; and Newington 1.	Part 204: units that serve electrical generator of 15 MW or more and sells electricity. Industrial Boilers 250 mmBtu and larger and Cement Kilns 250 mmBtu and larger Part 237: units that serve electrical generator of 25 MW or more and sells electricity. Part 238: SO_2 budget units (Title IV).

	Connecticut	Massachusetts	New Hampshire	New York
Nitrogen oxides	By October 2003 NO_x Budget Program sources: tonnage cap based on 0.15 lb/MMBtu x actual Heat Input. Sources can trade if they are above this cap. October 1 –April 30.	By October 2004: 1.5 lb/MWh rolling twelve month average. By October 2006: 3.0 lb/MWh monthly cap.	By December 2006: Cap of 3,644 tons (based on 1999 MWh x 1.5 lb/MWh)	Part 204 effective 5/1/03 for ozone season only. Budgets are: Electric Generators 30,405, Cement Kilns 8,085, Industrial Boilers 2,860. Total 41,350 Part 237 for non-ozone season. Budget is 39,908 Fuel neutral input based allowance allocation.
Sulfur Dioxide	January 2002: Combust 0.5% sulfur fuel, or meet unit-by-unit *quarterly* emission rate of 0.55 lbs SO_2/MMBtu, or meet facility-wide quarterly emission rate of 0.5 lbs SO_2/MMBtu. January 2003: Title IV sources shall combust 0.3% sulfur fuel, or meet unit-by-unit *quarterly* average emission rate of 0.33 lbs SO_2/MMBtu, or meet facility-wide quarterly average emission rate of 0.3 lbs SO_2/MMBtu, or use emission reduction trading to achieve average emission rate of 0.3 lbs SO_2/MMBtu or less for each calendar quarter	By October 2004: 6.0 lb/MWh twelve month rolling average. By October 2006: 3.0 lb/MWh rolling twelve month average. 6.0 lb/MWh monthly cap.	By December 2006: Cap of 7,289 tons (based on 1999 MWh x 3.0 lb/MWh)	Permit applications January 1, 2004 Phase I: 2005-2007. 197,046 tons for each control period. Phase II: 2008 and beyond. 131,364 tons for each control period. Fuel-specific input-based allowance allocation.

	Connecticut	Massachusetts	New Hampshire	New York
	provided that each affected unit burns 0.5% or lower sulfur fuel or actual quarterly average emission rate does not exceed 0.55 lbs SO_2/MMBtu.			
Carbon Dioxide	None.	1800 lbs/MWh annual average for each facility. On-going public proceeding to develop greenhouse gas banking and trading regulations. Tonnage cap on specific facilities at historic actual emissions 1997-99 (see TSD/RTC 4-01)	By December 2006: Cap of 5,425,866 tons (1990 emissions) until December 2010. Lower cap for following years to be recommended by DEP by March 2004..	No regulations. Governor has created a Greenhouse Gas Task Force. DEC anticipates 10% reduction of CO_2 emissions from base case due to control of SO_2 and NO_x
Mercury	Legislation may be taken up in 2002 session.	Require monitoring and fuel sampling. Feasibility evaluation by December 2002, emission standards for Mercury within 6 months of feasibility evaluation. Compliance by October 2006.	DES makes recommendation to legislature by March 2004. Recommendation to be based on results of testing (due July 1, 2003), and will have to take into account EPA Hg MACT (release proposal December 2003).	No regulations. Awaiting Federal action. DEC anticipates significant mercury emission reductions from control of SO_2 and NO_x.
Averaging	Allow averaging among units on premises, but require lower emission rate.	Allow averaging among units at affected facility.	Allow averaging within facilities and between facilities of same owner.	
Trading	Trading allowed. Require retirement of allowances for emissions in CT (1:1 ratio) (for 2002 SO_2 requirements). Affected sources may use trading for 2003 SO_2	Trading allowed to meet SO_2 requirements for October 2006. Require 3:1 ratio.	Full trading compliance allowed.	Trading of New York Acid Deposition Reductions (ADRs). 5% of budget from upwind states in 3:1 ratio. No inter-seasonal trading for

	Connecticut	Massachusetts	New Hampshire	New York
	requirements – must retire DERCs in 1:1 ratio, or SO_2 Allowances in 4:1 ratio. Retire NO_x DERCs or allowances in 1:1 ratio.			NO_x.
Extensions	For Title IV sources up to 6/1/03 for SO_2 requirements.			
Fuel emergency	Requirements can be suspended for units using low-sulfur fuel during fuel emergency.	Not applicable	Not applicable	Not applicable.
Compliance	Owners of affected units must submit compliance reports at end of each compliance period	Owners of affected units must submit compliance plan in January 2002.	Owners of affected units must submit compliance plan by July 2003.	Owners of affected units must submit compliance reports at end of each compliance period