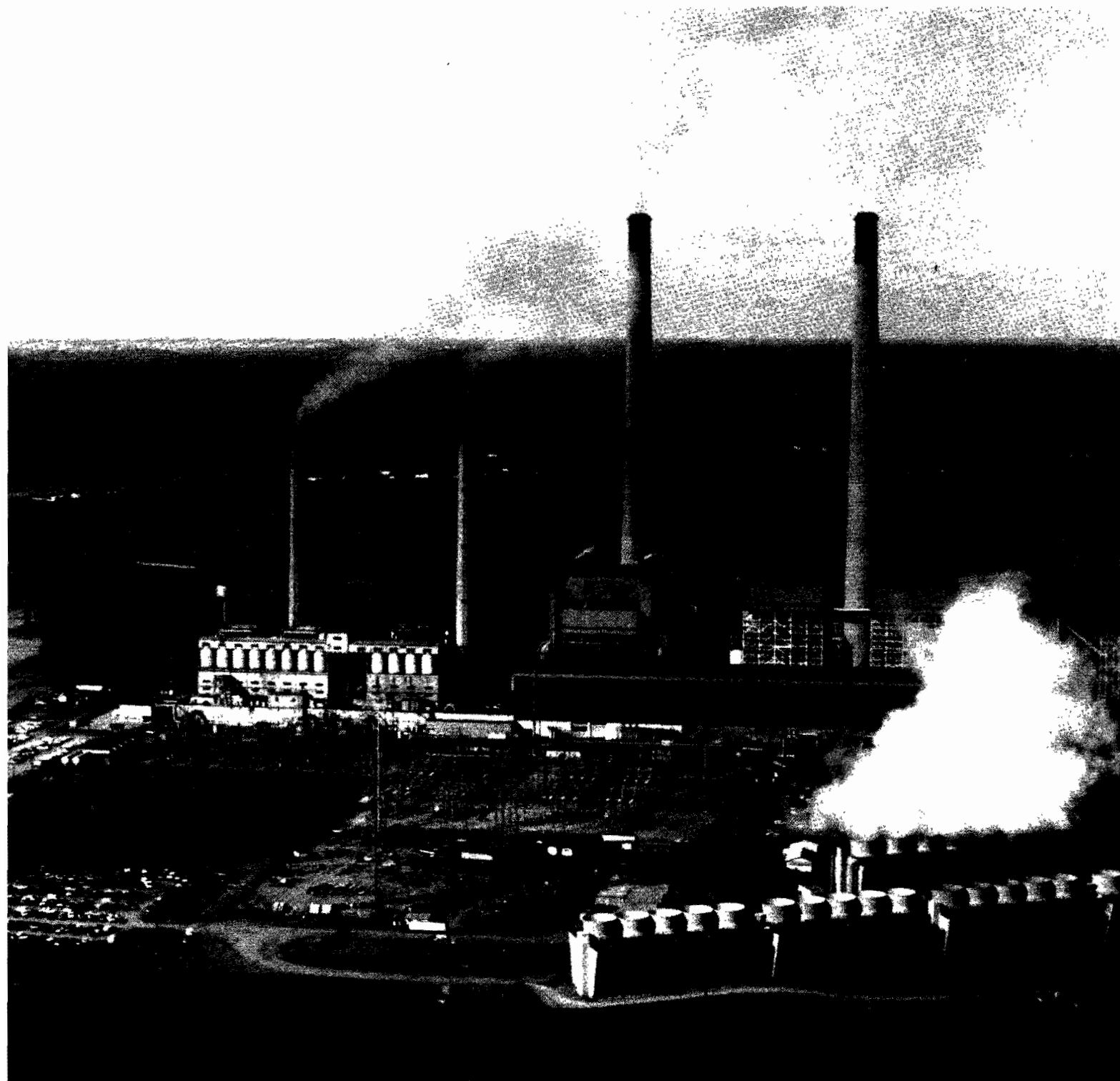




# State Acid Rain Program

## Final Report

## Appendices



# **State Acid Rain Program**

## **Final Report**

### **Appendices**

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# **State Acid Rain Projects**

## **Brief Summaries**

### **Appendix A**

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**March 1989**

State: Alabama

Study: Sulfur Dioxide and Nitrogen Oxides Emissions from Industrial and Utility Sources in Alabama from 1980 to 1985

Key Word: Emissions Inventory

Purpose:

The purpose of the Alabama study was to develop an emissions inventory of stationary sources of sulfur dioxide and nitrogen oxides for the years 1980 through 1985. The inventory excludes boilers of less than 50 MMBtu/hour heat input capacity and industrial processes that emit less than 100 tons per year of sulfur dioxide or nitrogen oxides.

Results:

TOTAL SULFUR DIOXIDE AND NITROGEN OXIDES EMISSIONS  
(TONS PER YEAR)

<u>Year</u>	<u>Sulfur Dioxide</u>	<u>Nitrogen Oxides</u>
1980	665,678	235,475
1981	676,489	230,020
1982	507,983	188,999
1983	569,115	201,485
1984	564,544	215,212
1985	653,158	247,459

SULFUR DIOXIDE EMISSIONS BY INDUSTRY  
(1985)

<u>Industry</u>	<u>Tons/Year</u>	<u>% of Total</u>
Utilities	531,324	81.35%
Pulp/Paper	48,614	7.44%
Petro/Gas	47,529	7.28%
Chemical	11,208	1.72%
Bas Metals	8,534	1.31%
Fin Metal	374	.06%
Textiles	1,177	.18%
Minerals	4,164	.64%
Tire Manufacturers	199	.03%
Other	35	.01%

NITROGEN OXIDES EMISSIONS BY INDUSTRY  
(1985)

<u>Industry</u>	<u>Tons/Year</u>	<u>% of Total</u>
Utilities	201,408	81.39%
Pulp/Paper	25,941	10.48%
Petro/Gas	2,051	.81%
Chemical	5,205	2.10%
Bas Metals	2,753	1.11%
Fin Metals	135	.05%
Textiles	2,122	.86%
Mineral Products	7,302	2.95%
Tire Manufacturers	254	.10%
Other	324	.13%

State: Connecticut -- Economics

Study: Assessment of Economic Implications of Connecticut and Federal Sulfur Dioxide Control Policy Options

Key Words: Fuel Switching; Cost

Purpose:

This project examined the economic impact of a change in Connecticut's 1.0% sulfur by weight limitation to 0.5% on state utility customers. The project also evaluated the economic impacts of several federal proposals. These include: (1) a 0.9 pound sulfur dioxide per million BTU limitation without cost sharing sponsored by Senator Mitchell (S-321); and (2) a surcharge on non-nuclear electricity generation and imported power with states sharing the costs of achieving a 10 million ton reduction in the 48 contiguous states (H.R. 3400).

Results:

- o If a 0.5% sulfur by weight limitation is imposed on fuel oil, a 500 kilowatt hour customer in Connecticut would pay between \$ .20 to \$ .55 a month extra in 1987. By 1995, the costs will have increased to \$ .45 to \$ .69 per customer per month.
- o If a 0.9 lb sulfur dioxide per million BTU limitation is imposed by the federal government, a 500 kilowatt customer in Connecticut would pay an additional \$ .33 per month.

- o A 1.0 mill surcharge would cost the average 500 kilowatt per month customer \$.18 to \$.45, while a 4.9 mill surcharge would cost the same customer \$.88 to \$2.18.
- o All proposals generally fall within the \$1.50 per month increase in costs that the Connecticut public perception survey determined to be acceptable to 70% of the utility customers (see Connecticut -- Opinion Survey).
- o Connecticut would accomplish greater in-state reductions of elemental sulfur loadings by participating in a national program than by adopting a state-wide 0.5% sulfur (by weight) limitation on fuel oil. The estimated cost of reducing each ton of elemental sulfur by adopting a 0.5% sulfur-in-fuel limitation is approximately twice the cost of participating in the Federal control program assumed by this study.

State: Connecticut -- Emissions Inventory

Study: Projected Sulfur Oxide Emissions in Connecticut Status Quo and Revision to 0.5% Sulfur Content in Fuel

Key Words: Emissions Inventory; Fuel Switching

Purpose:

This study has a two-fold purpose. First, projections were made of Connecticut's sulfur oxide emissions for the period 1980 through 1995 assuming moderate economic and population growth. Second, the impact of limiting fuel oil sulphur content to 0.5% from the current 1.0% limitation on sulfur oxide emissions was estimated for the years 1987 through 1995.

Results:

CONNECTICUT PROJECTED SULFUR OXIDE EMISSIONS  
(TONS)

	<u>1980</u>	<u>1984</u>	<u>1987</u>	<u>1990</u>	<u>1993</u>	<u>1995</u>
Electric	33,734	59,436	45,252	33,384	28,106	32,011
Industrial	13,711	12,084	12,627	12,803	13,453	13,573
Commercial	4,713	8,807	9,623	10,229	10,626	10,841
Residential	12,428	8,685	9,134	9,423	9,757	9,966
Total	73,601	98,027	85,651	74,854	70,957	73,606



- o The reduction in sulfur oxides from 1984 to 1995 are a result of decreases in fuel oil consumption. These reductions are attributable to increases in nuclear power generation, natural gas burning at two generating units, hydroelectric power purchased from Canada, and purchases from refuse-derived fuel and cogeneration projects.
- o Projected reduction in sulfur oxide emissions with imposition of 0.5% sulfur by weight fuel limitation for fuel oils for 1987 is 22,912; for 1990, 17,981; for 1993, 16,026; for 1995, 17,022.

State: Connecticut -- Opinion Survey

Study: A Survey of Connecticut Residential Electricity  
Customers' Perceptions of Acid Rain Issues

Key Words: Regional Approaches; Public Perceptions

Purpose:

This Connecticut project consisted of a public perception survey designed to ascertain the views of residential electricity customers in the state on acid rain. Telephone interviews of 764 residential electricity customers were conducted at random with the sample apportioned to reflect the distribution of customers with three residential rate classes within each service territory. The sample design provides an overall confidence level of 95% plus or minus 4% for the responses.

Results:

- o 74% (564) of the respondents were aware of acid rain; 28% were very concerned and 48% were somewhat concerned with its impact.
- o Connecticut state action to control acid rain in conjunction with other New England states was favored by 57%. Connecticut's acting on its own was favored by only 10%. Government action was not favored by 2.5% of respondents.
- o While 91% of the respondents believed that more research should be done on acid rain, over 75% believed that more controls should be put in place to reduce acid rain despite the research not being completed.

- o Respondents were queried concerning their willingness to pay successively higher monthly charges for state and/or federal acid rain control programs.

<u>Willingness to Pay</u>	<u>State Program</u>	<u>Federal Program</u>
\$ 1.50 per month	70.5%	67.5%
\$ 5.00 per month	28.9%	26.5%
\$10.00 per month	7.8%	6.7%

State: Florida

Study: Acid Rain Control: A Cost Estimation Model for Florida

Key Words: Cost; Planning Criteria; Fuel Switching; Emissions Trading; Scrubbers; Coal Cleaning

Purpose:

The purpose of the Florida study was to determine the most cost-effective methods of meeting potential federally mandated sulfur dioxide emissions requirements that would apply to electric power plants in Florida. The study focused on specific plants and on the most cost-effective method of reaching or maintaining a regulated level of emissions. The desired result was the lowest-cost sulfur dioxide reduction option for each site in Florida.

Results:

- o There are 90 utility units in Florida which emitted a total of 469,247 tons of sulfur dioxide in 1985. The 68 oil-fired units emitted 67,387 tons of sulfur dioxide or 14.4% of the total. The 22 coal-fired units emitted 401,860 tons of sulfur dioxide or 85.6% of the total.
- o The 22 coal-fired units at 6 plants face the greatest cost of compliance. Coal plants may meet emissions limits at a certain level by either coal switching or by installing scrubbers. However, once the regulations become sufficiently strict, only scrubbers may be used.

- o Many of the Florida coal units are old and are scheduled for retirement either during the study period or shortly thereafter. Therefore, it would be uneconomical to install scrubbers at these plants.
- o For coal plants, a limit of 2.0 pounds of SO<sub>2</sub>/MMBtu may be met by using coal with an approximate sulfur content of 1.2%. The use of .7% sulfur coal would allow compliance with a 1.2 pound SO<sub>2</sub>/MMBtu limit. If 0.4% sulfur coal were available, it could be used to meet a .75 pound SO<sub>2</sub>/MMBtu limit. To obtain 0.4% sulfur coal, however, chemical coal cleaning to remove the organic sulfur would be necessary.
- o For most coal-fired units, the total cost of compliance by use of scrubbers increases as the regulations become more rigorous, while per ton costs of reduction actually decline with the increased stringency of these limits. The reason is that the significant capital expense portion of the total cost of scrubbers is essentially fixed once the scrubber system is installed. This fixed cost is then distributed over more tons of reduction as the standard becomes more strict.
- o Oil switching involves the use of low-sulfur oil. Relatively few capital adjustments are needed to accommodate the new fuel. Most of the costs would thus be reflected in the fuel adjustments.
- o The relatively low actual emissions rates at oil units indicate that most emissions reduction would have to come from coal units. But if legislation were to allow inclusion of oil plants in a state-wide average pounds SO<sub>2</sub>/MMBtu standard, rather than a specific limit at each unit, fewer emissions reductions from coal units would be required. Emissions rates set for each unit would result in a greater overall reduction of SO<sub>2</sub> at each proposed standard.

- o An emissions trading system could result in maintaining the proposed standards with a savings in reduction costs if the assumptions included in the study hold true.

State: Illinois -- IAUSM

Study: Illinois State Advanced Utility Simulation Model  
(IAUSM) STAR Project

Key Words: Control/Cost Modeling; Fuel Switching

Purpose:

The purpose of the project was the investigation of the usefulness of the Illinois State Level Advanced Utility Simulation Model (IAUSM) for evaluating policy scenarios. These scenarios included the allocation of emissions reductions on 1) a cost-effectiveness basis, 2) a uniform rollback, and 3) a minimization of economic impact on Illinois coal mining.

Results:

The major result was that IAUSM was difficult to use and, in fact, did not appear to operate correctly. Illinois does not recommend its use.

State: Indiana

Study: Emissions Inventory Verification

Key Word: Emissions Inventory

Purpose:

The purpose of the project was to verify Indiana's 1985 emissions inventory for large sulfur dioxide and nitrogen oxides emissions sources. Indiana verified all sources with emissions of sulfur dioxide and/or nitrogen oxides greater than 100 tons in 1985.

Results:

- o Approximately 0.6 work-years of effort was required to perform the review conducted by Indiana. This level of effort is expected to be typical of the level of resources required by other states to accomplish this task with a similar number of sources.
- o If daily or monthly emissions or stack parameters (necessary for long-range transport modeling) or other such information is deemed necessary, considerable extra effort would be required.
- o Nitrogen oxides emissions estimates are generally speculative and any national effort to develop an inventory should focus on means of improving these estimates.
- o Sulfur dioxide emissions estimates for the nine highest emitting sources differed by less than 0.1% through the verification process. These nine sources represent 68% of



the sulfur dioxide emissions for 1985. The total discrepancy for sulfur dioxide from all sources was 0.6% and for nitrogen oxides was 3.2%.

- o Such a verification effort may be useful for determining emissions reduction requirements for individual sources but may not be critical for determining a state's emissions reduction target.
- o A total of 124 sources emitted over 100 tons of sulfur dioxide, and 110 sources emitted over 100 tons of nitrogen oxides. There were 81 sources that exceeded over 100 tons of both pollutants.

State: Kentucky

Study: Kentucky State Acid Rain (STAR) Project

Key Words: Planning Criteria; Cost; Fuel Switching; NO<sub>x</sub>  
Reductions; Scrubbers; Coal Cleaning; New  
Technologies

Purpose:

The purpose of the Kentucky study was to identify criteria for evaluating and selecting techniques to control emissions of sulfur dioxide and oxides of nitrogen from large combustion sources. The project was designed to identify (and resolve where possible) issues which might be encountered with a major national control program.

The Kentucky study evaluated 12 different scenarios for three levels of emission control stringency for specific sources in Kentucky. Fuel-switching and credit for NO<sub>x</sub> reductions were allowed in some scenarios and prohibited in others. The control scenarios were compared by their effectiveness and efficiency in reducing SO<sub>2</sub> and NO<sub>x</sub> emissions (including the cost-effectiveness of each scenario).

Results:

- o The following six criteria were found useful in predicting the merit of each control technology for each source: technological considerations; economic impact; potential for emissions reduction; contractual obligations; cost to the source; and effect on nitrogen oxides emissions. Two of the

criteria (technological considerations and contractual obligations) were used in determining cost to the source.

- o Six other criteria were found useful as compliance criteria: sulfur content of existing fuel supply; boiler size; boiler capacity factor; retrofit capacity; target reduction level; and control technique limitations.
- o The study determined that the usefulness of a particular criterion in the selection of control techniques may depend on the value selected for other criteria. For example, as higher target reduction levels are specified, the relevance of "cost to the source" declines and the importance of "potential for emissions reduction" increases.
- o The study determined that while switching to lower-sulfur coal was the least expensive SO<sub>2</sub> reduction strategy, coal switching alone would not yield sufficient SO<sub>2</sub> reductions to meet the probable targets of federal legislation.
- o The comparative difficulties of applying technologies to specific facilities were examined and the relative costs of strategies are compared in the following chart:

EFFECT OF ALLOWING CREDIT FOR BOTH SULFUR DIOXIDE AND OXIDES OF  
NITROGEN REMOVAL ON COST PER TON

Control Technique	Mean Cost/Ton for Removing SO <sub>2</sub>	Mean Cost/Ton for Removing Both SO <sub>2</sub> and NO <sub>x</sub>
Duct Sorbent Injection	\$2,528	\$2,413
Coal Cleaning	\$1,477	\$1,427
Gas Conversion 1.2#	\$1,236	\$1,150
Gas Conversion 50%	\$1,527	\$1,406
Natural Gas Reburn (NGR) 15%	\$2,429	\$ 976
Natural Gas Reburn (NGR) 25%	\$2,393	\$1,264
Fluidized Bed (AFBC)	\$9,470	\$3,802

State: Maryland -- State-wide Caps

Study: (Draft) State-wide Caps on Sulfur Emissions in Maryland

Key Words: Emissions Trading; Environmental Dispatch;  
Regional Approaches; Planning Criteria

Purpose:

The report discusses a state-wide percent reduction in allowable emissions requirement and an allowable fuel sulfur content for various source categories. Scenarios examined include: no emissions trading; interstate trading; emissions reduction credit market; importing electricity; emissions fees; and centralized interstate emissions allocation. Public Service Commission and Federal Energy Regulatory Commission general responses to various control scenarios are presented. The report describes the structure and determination of utility rates in Maryland and the types of utility expenses that can be recovered.

Results:

The Maryland study raised the issue of whether a state-wide cap should be set only to meet federal standards, or should be set below the federal standard to allow for future growth? If a state chooses to allow for future growth, how should it apportion emissions reductions and enforce the reductions?

- o Utilities in the state are part of multi-state grids that share electricity. They are continuously making implicit emissions trades by having power generated elsewhere for their clients or by generating power for transmission out of

state. Maryland should allow interstate emissions trading of sulfur emissions. This could be combined with a program controlling sulfur emissions from utilities by a least-cost dispatch approach with a long (annual) or short term emissions cap.

- o Maryland should require a percentage reduction in allowable emissions for several or all source categories. The affected facilities would decide how to meet the required percent reduction. Alternatively, the allowable sulfur content of the fuel could be reduced.
- o Monies collected by the state under an emissions market or fee option program could go to either the general fund, the air quality management and monitoring program, or be used to subsidize the installation and operation of additional emissions control to provide offsets for new or expanding sources.
- o In Maryland, electric rates consist of two components: rate base and fuel adjustment. Fuel adjustment rate changes are easier and can be accomplished more quickly than rate base changes.
- o Some loss of efficiency in producing low-cost electricity would be expected (at least in Maryland) from both a no-emissions-trading scenario and an emissions-trading-reduction scenario. It is anticipated that the increased costs from additional emissions reduction requirements could be recovered by utilities through increased rates.
- o Currently, transmission capacity rather than incentives and disincentives in the rate-making process is limiting environmental dispatch in the eastern United States. This

high usage of transmission capacity reduces the flexibility of the system to engage in more extensive trading or in a grid-wide emissions limitation.

- o An interstate commission may be a successful way of enforcing a grid-wide emissions limit. It would be desirable to clearly delineate the enforcement responsibilities of each participating member in such a commission.

State: Maryland -- Facility Cap

Study: Description of the Emissions Cap at Westvaco Corporation's Luke Mill (Luke, Maryland) and Discussion of Possible Extension of this Emissions Control Approach to Other Major Industrial Sources

Key Word: Industrial Controls

Purpose:

This study reviewed what the State of Maryland has learned from placing a sulfur dioxide emissions cap on a pulp and paper mill owned and operated by Westvaco Corporation in Luke, Maryland. The purpose of the emissions cap is to attain and maintain the sulfur dioxide national ambient air quality standard (NAAQS) in the vicinity of the mill. The cap is a variable tons per 3-hour block average emissions limit based on percent plume buoyancy and a tons per day block average limit. The cap is applied to the combined sulfur dioxide emissions from two coal-fired boilers and one oil-fired boiler vented through a common 600-foot stack.

Results:

- o An emissions cap can allow a source to achieve the sulfur dioxide NAAQS and can provide more flexibility by allowing greater fluctuations, or higher, short-term emissions than could occur with an instantaneous emissions limit (e.g., a lb/second limit).



- o The Luke Mill can meet its emissions cap by varying its load and/or fuel sulfur content. Single or multiple sources may also be able to meet the cap by varying their number of operating hours per season or per year.
- o Compliance monitoring, periodic reporting, and rigorous quality assurance become especially important with emissions caps that can vary with operating hours, load, and/or have seasonal or annual averaging times.
- o A short-term emissions cap may be used as a guideline for attaining a seasonal or annual emissions cap.
- o To properly derive and implement an emissions cap, source modeling may be needed to ensure attainment and maintenance of the NAAQS and PSD increments.
- o A contingency plan, such as an available supply of low-sulfur fuel, may also be needed to ensure compliance with an emissions cap under all circumstances.
- o Non-utilities may be more suitable candidates for emissions caps because they retain the flexibility to downscale production quickly if necessary to maintain a cap. If, however, a cap with a season or annual averaging time is used, rapid changes in production would less likely be needed to maintain the cap.

State:        Massachusetts -- Planning

Study:        Development and Testing of Planning Approach to Acid  
Deposition Control

Key Words:        Fuel Switching; Energy Conservation; Planning  
Criteria; Constraints

Purpose:

This study focused on a number of major issues of concern to states that will carry out an acid rain program. These issues included how to plan for and organize a program, data requirements, identification and testing of criteria to evaluate control techniques and acid deposition control strategies, and alternative acid deposition control strategies. Five alternative strategies were identified and evaluated: (1) cost-effective (absolute), (2) cost-effective (administration), (3) gas substitution, (4) low conservation/alternative energy, and (5) high conservation/alternative energy. The strategies were examined to determine their effectiveness for four different levels of control: (1) 26% reduction, (2) 26% reduction maintained (during implementation period), (3) 35% reduction, and (4) 35% reduction maintained (during implementation period).

Results:

- o     The conservation and alternative energy strategies are superior to the other strategies, while the gas substitution strategy comparatively performs very poorly.
  
- o     No suitable alternatives to the state-federal State Implementation Planning (SIP) planning process were found.

Existing SIP requirements could be adapted if control legislation passed with language that made emissions reductions the functional equivalent of meeting the NAAQS.

- o The SIP process is cumbersome and lengthy but might be improved by "parallel processing." This would allow EPA interaction in phases as the SIP is being developed rather than the current method of serial processing.
- o The planning burden increases if two pollutants are controlled rather than one. The planning effort increases as state flexibility increases. The longer the overall implementation time, the greater the prospects of incorporating complex or innovative controls.
- o Individual state action can only partially protect state resources because acid deposition is an interstate problem.
- o Emissions trading is essentially theoretical either because of the practical problems of implementation or because implementation is at an early stage.
- o Unlike existing air programs, which are driven by attaining NAAQS, cost and socio-economic impacts may be legitimate evaluation criteria.
- o Differences between most congressional bills affect state reduction targets more than the direction and/or magnitude of state planning efforts. Other differences influence the level of detail and/or comprehensiveness of planning efforts but do not require fundamentally different planning approaches.

State:        Massachusetts -- Trading

Study:        Emissions Trading within Acid Deposition Control

Key Words:        Emissions Trading; Regional Approach; Cost

Purpose:

The study evaluated the use of emissions trading as a possible means of controlling acid deposition precursor emissions. The study examined differing approaches to emissions trading program structure and design, and estimates of resources needed to develop and operate a program. The study also contains interviews with New England air agency directors and their experiences with and attitudes toward emissions trading.

The study identifies and examines advantages and disadvantages of emissions trading for stationary sources. Discussion of program structure and design focused on:

- o     who can participate in an emissions reduction credit program
- o     what types of activities (plant shutdown, fuel switching) can be credited
- o     what type of baseline is necessary to develop an effective program
- o     what types of transfers should be allowed.

The study also examined criteria for evaluating emissions trading program rules. The criteria identified were: pollution control, administrative simplicity, clear and simple rules, inclusiveness, and flexibility.

The study also identified resources needed to implement an emissions trading program and presented findings and recommendations.

Results:

- o Although emissions trading offers potential cost savings to the regulated community by providing regulatory flexibility, the administrative burden placed upon air agencies and the resource intensive nature of such a program has led to divided opinion on the practicality of implementing emissions trading on the broad basis required.
- o The larger and less restricted the emissions trading market, the greater the potential cost savings.
- o Regulations are necessary (i.e., emissions trading must not cause NAAQS violations), and institutional barriers are inevitable (i.e., PUC rate regulatory treatment of emissions reduction credits).
- o Setting a proper trade baseline must require that reduction be both real and surplus, not merely fabricated on paper.
- o Prohibiting emissions reduction credits for acid deposition control in non-attainment areas may accelerate attainment. While this may preclude some potentially cost-effective trades, the sacrifice may be worth making.
- o Emissions trading between non-proximate sources may change the spatial distribution of emissions. Therefore, restrictions may need to be placed on trading between non-proximate sources.

- o There are no direct legal barriers to interstate trading. However, states' SIP rules vary, as do emissions inventories and banking and trading rules. To facilitate trading, divergent state rules and regulations must be reconciled.
- o Experience with emissions trading programs to date indicates that developing an emissions trading program requires more resources than operating one. Start-up costs have been recovered, at least partially, through fees on program participants.

State: Massachusetts -- DEM

Study: Dynamic Emissions Management for Acid Deposition Control

Key Words: Rate versus Target; Maintaining Compliance

Purpose:

The study focused on the information needed to determine the compliance status of all regulated sources and Massachusetts as a whole with possible Federal acid rain legislation. It specifically emphasized the information needed to determine the compliance status of large point sources of SO<sub>2</sub>.

The purpose of dynamic emissions management is to track and maintain compliance with emissions control programs--particularly programs that are based upon relatively long averaging times or emissions caps. Dynamic emissions management involves the following process: emissions information is collected and reviewed before the compliance periods projections are formally submitted; the probability of achieving compliance without taking remedial action is determined; and, if remedial action appears necessary to avoid non-compliance, steps are taken to implement remedial actions.

Results:

- o Short compliance periods (monthly and possibly quarterly) may not allow adequate time to effectively implement the entire dynamic emissions management process within a given compliance period.

- o Compliance periods of longer times (six months to a year) provide greater opportunity for effectively implementing the entire dynamic emissions management process and achieving compliance within a given period.
- o If compliance periods are short, dynamic emissions management would be facilitated if sources and regulators agree in advance on what remedial actions will be taken if determined necessary.
- o If an emissions level standard is adopted, no additional crediting mechanism is needed to account for reductions due to conservation or non-emitting energy.
- o If an emissions rate standard is adopted, some mechanism will be needed to adjust the rate to credit conservation and non-emitting energy.
- o Facilities complying with acid rain control regulations through reduced-sulfur fuel only, require sampling and analyses combined with fuel use information or continuous emissions monitoring (CEM).
- o For sources using pollution control equipment such as scrubbers (wet or dry) or fluidized bed combustion, CEM is the only proven method for providing the type and quantity of SO<sub>2</sub> emissions information needed for acid deposition control programs.



State:        Massachusetts -- Case Study

Study:        A Methodology for Evaluating Acid Rain Control  
Strategies -- A Massachusetts Case Study

Key Words:        Fuel Switching; Energy Conservation; Planning  
Criteria

Purpose:

The purpose of the study was to develop and test a methodology for evaluating various state emissions reduction strategies. The methodology uses five evaluation criteria to test each strategy. The five criteria include: average cost of control (dollars/ton of SO<sub>2</sub> removed); secondary environmental impacts (other air pollutants, liquid and solids disposal, etc.); legal and institutional impacts; average cost to utility customers (dollars/billing period); and fairness. The criteria was then weighted in accordance with the relative importance of each criterion as determined by the State of Massachusetts program.

The methodology was then applied to five different strategies (cost-effective at minimum cost; cost-effective at level of minimum control; gas substitution; low conservation and alternative energy; and high conservation and alternative energy) at four levels of control (26% reduction; 26% reduction maintained through 1995; 35% reduction; and 35% reduction maintained through 1995). These are the same strategies and levels of control which were used in the Massachusetts -- Planning study, Development and Testing of Planning Approach to Acid Deposition Control.

## Results:

- o The conservation and alternative energy strategies are superior to the other strategies, while the gas substitution strategy comparatively performs very poorly.
- o Evaluation criteria were chosen both for their interest to Massachusetts and their ability to be measured in some manner. The criteria may not be the most appropriate for every state.
- o Numerical weighting factors may be applied to selected criteria to establish rankings between different criteria. These weighting factors can be changed to suit the interests of any particular state.
- o It is difficult to measure certain criteria with a single parameter. Some criteria like "fairness" are essentially subjective.
- o The methodology serves as a useful framework for: (1) considering the relative merits of various control strategies through promoting their identification and discussion of the importance of different evaluation criteria, and the best means of measuring them; and (2) demonstrating both the relative merits of different strategies compared to one another as well as the performance of each strategy under the varying control stringencies of the different scenarios.
- o A "short-cut" approach to the methodology was tested in which only two of the five criteria were used. Results indicated that the approach was not a viable alternative.

State: Massachusetts -- Options

Study: Evaluation of Options for Acid Deposition Control  
Program Regulation

Key Words: Rate versus Target; Planning Criteria

Purpose:

The project was developed to assist air program managers in deciding how to structure acid deposition control regulatory programs. The project evaluates regulatory options established to limit sulfur dioxide (SO<sub>2</sub>) emissions. The following options are evaluated: emission limitation type (options: emissions cap, emissions rate, hybrid); cap maintenance provisions (options: offsets growth margins, hybrid); compliance time (options for type: never to exceed limitations, block average, rolling average; options for length: short, long); application of emissions limitations to sources (options: uniform across-the-board, uniform by source category, non-uniform by individual source); and starting date(s) after which regulations apply (options: status quo until 1995, single interim reduction, annual interim reductions).

The study describes regulatory components, identifies options for each, and lists advantages and disadvantages. This information is based on a literature search and discussions with state air program managers, Massachusetts' acid rain work group, and STAR program participants. The study then identified four criteria for evaluating criteria (economic, environmental, administration, and equity) selected during discussions with Massachusetts' air program managers. Finally, the study evaluated each option based upon a literature review and the opinions of a panel of five pollution control specialists.

### Results:

- o With respect to emissions limitation, source emissions caps are favored environmentally. Hybrids -- switching regulated sources from a rate to a cap if they choose alternative compliance strategies -- are also favored environmentally.
- o There does not seem to be consistent agreement on the economic, environmental, or administrative attributes of cap maintenance provisions (i.e., growth margins or offsets).
- o With respect to compliance time, short averaging times or never to exceed limitations are favored environmentally. Never to exceed limitations are also favored administratively if this would require that few sources be regulated without emissions trading. Uniform limitation across-the-board would not be favored economically.
- o A single interim reduction or annually declining emissions requirements are favored environmentally. Annual reductions are least favored economically.
- o A regulation scenario using hybrid emissions limitations is favored over scenarios using source emissions rate or cap limitations exclusively when evaluated using an average of participants' ratings.

State: Metropolitan Washington Council of Governments

Study: Estimation of 1985 Area and Mobile Source Emissions of Sulfur Dioxide and Oxides of Nitrogen in the Washington, D.C. Metropolitan Area

Key Words: Emissions Inventory; EI Methodology Assessment

Purpose:

The purpose of this study was two-fold: (1) to make estimates of 1985 mobile and area source sulfur dioxide and oxides of nitrogen emissions for the Washington metropolitan region utilizing traditional and non-traditional methods; and (2) to document the methods used to assess their utility and practicability for application to other large metropolitan areas.

The study considered four different approaches and eventually used three approaches. These include the Workbook/MOBILE 3 approach, an "Energy Balance/Combustion" Approach, a PEI/DOE "Top Down" Energy Use/Combustion Approach, and a GCA/NAPAP Program Approach.

Results:

SUMMARY OF FINDINGS

AREA AND MOBILE SOURCE  
ESTIMATED 1985 (TONS/YR.) EMISSIONS OF NO<sub>x</sub> AND SO<sub>2</sub>

	Workbook Mobile 3		Energy Balance		PEI/DOE Combustion	
	<u>NO<sub>x</sub></u>	<u>SO<sub>2</sub></u>	<u>NO<sub>x</sub></u>	<u>SO<sub>2</sub></u>	<u>NO<sub>x</sub></u>	<u>SO<sub>2</sub></u>
Mobile Source:	84,767	3,544	83,579	3,998	80,811	3,026
Other Area:	17,403	4,749	23,253	7,234	49,402	22,420
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Total:	102,170	8,293	106,832	11,232	130,213	25,446

ASSESSMENT OF METHODOLOGIES

Criteria	EPA/Workbook MOBILE 3	MWCOG En.Bal.	PEI/DOE Combust.	GCA/ NAPAP
Comprehensiveness:	High	High	High	High
Level of Effort Required:	High	Moderate	Low	Very High
Technical Exper- tise Required:	High	Moderate	Low	Moderate
Data Requirements:	Extensive	Moderate	Low	Extensive
Complexity of Application:	High	Moderate	Low	High

- o For overall credibility, ease of application and economy of effort (assuming agency familiarity with the use of the MOBILE 3 Model), the EPA Workbook/MOBILE 3 modeling approach is the methodology of choice.
- o For ease of application, internal consistency, and flexibility in application to substate areas, the PEI/DOE Combustion approach is, by far, the easiest to apply.
- o For transferability to other analytical purposes (e.g., local and regional energy consumption analysis) and transparency of approach, the MWCOG Energy Balance method provides apparently credible results with moderate levels of input of staff time and expertise.
- o Because of the serious deficiency in availability of documentation, the GCA/NAPAP methodology is by far, the most difficult approach to apply.

State: Michigan

Study: Emissions Inventory Verification Procedures

Key Word: Emissions Inventory

Purpose:

Since the early 1970s, Michigan has conducted an annual inventory for air emissions covering approximately 10,000 stationary sources. Annual inventory updates are conducted on about 4,000 of these sources. Approximately 3,000 of these facilities were assessed an annual surveillance fee. The fee, which was discontinued in 1984, was based in large part on the annual rate of emissions of various pollutants. The annual fee ranged from \$55 to \$16,000 per facility per year. Because the fee was based upon the inventory information collected, it was important that the information be accurate. In addition, it was necessary for the state to develop procedures for verifying the emissions rates and resolving differences between the facility owner and the state. This project attempted to document and describe the procedures that Michigan used to verify emissions rates and determine whether they could be used by other states.

Results:

Four key elements are most important in reviewing and verifying the emissions data.

- o Provide the source owner with the current inventory data at the same time updates or corrections as requested.



- o Any corrections, additions, or changes made by the source owner should be reviewed by agency personnel familiar with the source.
- o After the inventory data has been collected and emissions estimates have been made, screening programs should be utilized to identify those sources with emissions that fall outside accepted bands or are unusually large. Each source identified in the screening process should be rechecked.
- o Source owners should be given the procedures to follow if they wish to question or correct data.

It was assumed that the fee system would result in more accurate emissions estimates. This, however, was not necessarily the case. While the fee system was instrumental in ensuring that the regulatory agency and the source owner agreed on the estimated emissions rates, it did not necessarily improve the accuracy of those estimates.

The advantage of the emissions inventory being tied to a fee system is that all input data must be carefully scrutinized. Therefore, while the fee system does not necessarily guarantee the accuracy in emissions estimates, it does tend to ensure that there is agreement on input data, methods of calculation, and verification of the end results.

State: Midwest Research Institute

Study: Review of Methodologies for Estimating Control Costs  
for Acid Rain Precursors

Key Words: Control Modeling; Planning Criteria

Purpose:

This report summarized the results of a project to review available methods for estimating the costs of measures to control emissions of sulfur dioxide from utility burners. The methods that were reviewed included models, procedures, or other techniques developed and used in the STAR projects, plus those developed by EPA, the Electric Power Research Institute, or other prominent organizations involved in estimating control costs for large utility sources.

Results:

- o The study brings together in one document information on each cost estimating procedure or method.

State: Missouri

Studies: Cost-Effectiveness Analyses of SO<sub>2</sub> Reduction Alternatives at 3 Missouri Lead Smelters and Cost-Effectiveness Analyses of SO<sub>2</sub> Reduction Alternatives at 13 Selected Missouri Utility Power Plants

Key Words: Fuel Switching; Scrubbers; Planning Criteria; Coal Cleaning; Industrial Controls; New Technologies

Purpose:

The Missouri studies examined 13 power plants and 3 primary lead smelters to identify cost-effective sulfur dioxide emissions reduction strategies. The reports examine the site-specific costs of SO<sub>2</sub> removal at each facility. One of the objectives of the study was to identify factors that determine cost-effectiveness. Another was to develop a standardized method of assessing each source so that other states may utilize the procedure. The following strategies were considered: flue gas desulfurization (scrubbing); fuel switching; fuel blending; coal cleaning; least emission dispatching; coal gasification; limestone injection; and fluidized bed combustion. Only scrubbing and coal switching were studied in detail.

Results:

- o Sulfur dioxide emissions in Missouri totaled 1.2 million tons in 1980. This makes Missouri the fifth largest sulfur dioxide emitting state in the country.

- o Of the power plants studied, the average allowable sulfur dioxide emissions rate is 6.2 pounds per million BTU. The highest allowable rate was 12.9 pounds per million BTU.
- o Over 90% of the sulfur dioxide emissions in Missouri are from coal-fired power plants, and the 13 plants studied account for 95% of the utility emissions in the state.
- o The most cost-effective sulfur dioxide emissions strategies for Missouri utilities are coal switching and forced oxidation wet limestone fluidized gas desulfurization scrubbing.
- o Important information to consider in fuel switching is the cost and characteristics of the coal available, transportation costs, boiler design, and changes in particulate emissions caused by changes in sulfur content, especially from electrostatic precipitators.
- o Important considerations when examining the feasibility of flue gas scrubbing at a particular plant are available space, sludge disposal, coal characteristics, boiler size, and capacity utilization.
- o The study applied two pre-selected sulfur dioxide control techniques (coal switching and wet limestone scrubbing) to the power plants and then determined on a plant-by-plant basis the costs, expected emissions reductions, and cost-effectiveness. Using this procedure, the project indicated that allowable sulfur dioxide emissions could be reduced at the 13 power plants by about 82%.

- o The most cost-effective strategy for reducing sulfur dioxide emissions at the lead smelters was increasing the use of the acid plants already installed at two of the three facilities. This would result in annual emissions reduction of 17,200 tons per year.

State: New Hampshire

Study: Development of a Methodology to Evaluate Costs and Impacts of Alternative Acid Rain Control Strategies in New Hampshire

Key Words: Fuel Switching; Scrubbers; Cost; Planning  
Criteria; Rate versus Target; Constraints

Purpose:

In 1985, New Hampshire passed its Acid Rain Control Act of 1985. The act mandates emission reductions of at least 25% by 1991 from 1979-1982 baseline conditions. The act also requires an additional 25% reduction by 1996 if a national acid rain control program is enacted. The New Hampshire study evaluated the cost-effectiveness of six proposed strategies to meet the initial 25% reduction.

Results:

- o According to the New Hampshire emissions inventory, the five largest sources in New Hampshire are power plants owned by Public Service of New Hampshire (PSNH). These account for 84% of the sulfur dioxide emissions in the state. The next three largest emitters are the James River paper mills, which account for 9% of the emissions. The remaining 7% are caused by 25 other major sources.
- o The least-cost solution would be to require fuel switching at three of the five New Hampshire power plants -- Merrimack (coal-fired), Schiller (coal-fired), and Newington (oil-fired). The average cost would be \$459 per ton of sulfur

dioxide removed. Scrubbing would be two to three times more expensive.

- o The next-lowest cost option was to require fuel switching at all major sources in New Hampshire. This strategy would cost an average of \$473 per ton of sulfur dioxide removed.
- o The New Hampshire study also examined the equity concerns of requiring all the SO<sub>2</sub> emissions to be incurred by Public Service of New Hampshire. The New Hampshire law exempted the James River facility from the 25% reduction requirements because it had already reduced its emissions by 67.70% from a baseline year. New Hampshire is considering having Public Service reduce its emissions and having small emitters reimburse the utility for their "share" of reduction responsibilities, thus equitably distributing emissions reduction costs.

The study examined difficulties encountered by applying the state-wide cap:

- o Commitments to NEPOOL foreclosed using facility retirement or conservation to meet emissions reduction requirements.
- o If the state-wide emissions total is near or at the cap, each time a new emitter wants to enter the state, existing sources may be forced to reduce emissions further using expensive controls, or the new source may be prevented from entering the state.
- o Because of its bond rating, Public Service of New Hampshire could not finance a major capital program like a flue desulfurization system in the foreseeable future.

State: New York -- Strategy

Study: Evaluation of Sulfur Dioxide Emissions Reduction Strategies from New York Utilities: A Guide for Other States

Key Words: Fuel Switching; Scrubbers; Cost; Emissions Control Modeling

Purpose:

The New York project studied the effects that federally mandated emissions restrictions could have on the cost and supply of electricity in the area. A model was used to assess the economic costs of emissions reductions by New York utility sources of 30% and 40%. The model was designed to simulate the supply and demand of electric power in the state on an annual basis and to assess the effects of different sulfur-in-fuel requirements on the cost of electricity across the state. Expenses associated with compliance were translated by the model into the electric rates to consumers. Emissions reductions were simulated to occur in 1995 with the reduction calculated from 1985 levels. The model considered three alternatives to meet the emissions reduction requirements--fuel switching, installation of flue gas desulfurization systems, and least emissions dispatch.

Results:

- o Five coal-fired facilities were identified as sources where a 30% reduction could be attained. Use of lower sulfur oil at a large facility provided the additional reduction necessary to reach the 40% reduction target.



- o The 30% reduction could also be attained by purchasing electricity outside the state at substantial cost. This resulted in a 44% increase (constant terms) in the cost to consumers. The impact on electricity rates from fuel switching and flue gas desulfurization were considerably less--between 1.8 and 3.5%.
- o Between 40% and 45% of New York electricity comes from sources that produce sulfur dioxide emissions. For states that have few or no electricity generating sources that generate emissions (i.e., hydroelectric), the resulting increased costs will likely be greater.

State: New York -- Emissions Inventory

Study: Procedures for Estimating State-wide Sulfur Dioxide and Nitrogen Dioxide Air Emissions

Key Words: Emissions Inventory

Purpose:

The purpose of the study was to serve as a guide to other states in developing fuel consumption data for residential, commercial, and industrial sources. The State of New York is used as an example throughout.

Results:

- o Once the fuel consumption data has been developed and major point source fuel has been deleted, it can be used to estimate area fuel emissions.

State: North Carolina

Study: Alternative Emissions Offset Programs

Key Words: Emissions Trading; Planning Criteria

Purpose:

The North Carolina project examined three distinct components needed to develop an acid deposition control program. It developed an emissions inventory, examined economical conventional approaches to meeting the requirements of the Stafford bill, and evaluated alternative offset emissions credit trading strategies to reduce emissions within the state.

The strategies for alternative offset programs studied included ones where the state played an active role in creating and brokering offset credits, and case-by-case programs where the state played a more passive role. Both state-wide offset trading and trading limited to regions within the state were examined. Also considered were strategies allowing offset credit creation by all sources, by major sources only, and by large sources only (greater than 1,000 tons of sulfur dioxide per year).

Results:

Achieving the statutory limits established in the Stafford bill could create economic hardship in North Carolina. The study determined that a statutory target of 1.5 lb/MMBtu could put most of the emissions reduction burden on industrial boilers. The study also determined that an "accommodative approach" to emissions reduction must be made to allow for future growth in the state.

The accommodative approach uses the SIP process to require reductions from emitting facilities.

- o The lowest-cost offset trading program is that which places the fewest restrictions on the number of sources that are allowed to participate in the program and creates credits for trading. Constraints that limit the supply of credits by the size or location of the unit inhibit the matching of least-cost credits with the demand posed by new or expanded industry and drive up costs.
- o Programs based on state-brokered trade are generally less costly than programs based upon case-by-case trading (where the burden of negotiation costs limits the number of trading partners available to supply credits).
- o The extent of state involvement was greatest for brokered cases, where the state acts as both buyer and seller of the offset credits. This function requires the state to establish an administrative apparatus to perform these duties.
- o Case-by-case offset trading where the state role is limited to revising permits involves little administrative cost.

State: Northeast States for Coordinated Air Use Management

Study: Appropriate Emissions Control Techniques for the New England States

Key Words: Cost; Dispatch; Regional Approaches; Emissions Control Modeling; Planning Criteria

Purpose:

The purpose of this project was to develop a regional analysis of air quality emissions control alternatives and to develop tools to allow the states to conduct specific analyses of promising conventional and innovative emissions control techniques. A regional economic emissions control model encompassing all major sources was developed and tested. The cost control techniques and strategies were based on the New England states 1982 emissions inventory.

Results:

The study analyzed nine stationary source control techniques on the basis of: cost, level of control, cost-effectiveness, level of confidence, impact on existing facilities, and retrofit considerations. In addition to stationary source control, the study examined fuel switching and mobile source controls.

- o An emissions cap on sulfur dioxide at 1982 levels in 1995 would be least expensive for the states involved. The approximate cost is \$10 million above the cost of generating electricity to meet the region's expected 1995 demand. ..

- o Maintaining both sulfur dioxide and nitrogen oxides emissions at their 1982 levels combined with high growth (3%) in the demand for electricity was the most expensive scenario studied, costing \$750 million above baseline.
- o Least emission dispatch presents a number of problems in New England. These problems include institutional problems in enforcement and the fact that New England is facing a potential shortage of electric generating capacity.
- o Although the model's applicability may be limited to the Northeast states region, problems could be resolved that would make it a useful tool for other states and the EPA.

State: Northeast States for Coordinated Air Use Management

Study: Maintaining State Emissions Levels

Key Words: Rate versus Target; Deposition Modeling; Regional Approaches

Purpose:

This project included representatives from nine Northeast states and two EPA Regional Offices and began with the premise that an emissions reduction standard is likely to be instituted at the federal level. This project examined the various forms that such a standard could take, including an accommodative option, offset option, average emissions rate option, and using deposition modeling to develop a reduction or maintenance program following development of the program options. Air agency directors and their staffs were interviewed about the advantages and disadvantages of the different strategies.

The study analyzed the various emissions reduction standards from the perspectives of the participating states. In addition to responding to the control options, the states addressed emissions inventory development, maintenance of program options, resource requirements, interstate trading opportunities, and equity considerations.

## Results:

- o The accommodative option requires states to establish (or be given) and document an increment for emissions growth at some level set below the state-wide emissions cap, which provides an available emissions allotment to accommodate future growth.
- o The offset option would permit new sources or modifications to existing sources with no net increase of emissions. The basic premise is always to require an equivalent offset for all emissions increases from a source.
- o No state involved in the study preferred an emissions cap (in terms of tons per year) as a method of maintaining emissions because Northeast states felt that the average emissions rate approach could be implemented and enforced more easily than the accommodative or offset option.
- o For states with low annual emissions, use of the average emissions rate option partially solves constraints to growth in emissions since this approach does not limit a single state's total emissions.
- o With the exception of New York (where deposition modeling has already been used in response to state legislation), the states were interested in an approach based upon deposition modeling but believed that the current state-of-the-art models could not support such a program on a national or regional level.
- o Northeast states expressed little confidence in their ability to develop a regional program with the exception of a multi-state, multi-company trading program.



State: Northeast States for Coordinated Air Use Management

Study: Air Quality and Energy Conservation: Cutting the Cost of Clean Air

Key Words: Energy Conservation; Public Utility Commissions;  
Regional Approaches

Purpose:

The project focused on the relationship between energy conservation and acid rain control and examined the role that energy conservation can play in reducing emissions. NESCAUM organized a work group consisting of staff from state air quality agencies, energy offices, public utility commissions, representatives from utilities, research organizations, and public interest groups throughout the country.

Two workshops were held in December 1987 and April 1988 for the work group to discuss air quality programs and barriers to energy conservation programs. The workshop participants discussed the major provisions of federal and state acid rain legislation, recommended changes to that legislation to encourage energy conservation, developing and implementing least-cost energy plans, externalities in utility planning, and managing successful conservation programs.

Results:

- o Energy conservation can play an effective and economical role in reducing emissions.

- o In contrast to energy conservation, conventional acid rain control techniques do not produce as many environmental, socio-economic, or business benefits. In fact, they add to power generation costs, do not stabilize demand or supply, and may create undesirable secondary problems (i.e., scrubber wastes).
- o Passive programs, such as appliance efficiency standards, can achieve significant long-term savings in electricity once marketing to consumers has produced significant turnover in appliances.
- o In the Midwest, which has excess generating capacity, energy conservation may reduce the cost of complying with acid rain legislation. In contrast, the Northeast states are facing a tight supply of electricity. This means that using conservation may result in postponing new generating capacity, but may not result in significant emissions reductions.
- o Public utility commissions are responsible for seeing that the region's power needs are met. This often conflicts with reducing emissions. Any departure from the current mandate of least-cost planning may require legislation, since consumers would be asked to pay for benefits which arguably should be paid for by taxpayers.
- o The economic advantages of conservation become clear when it is analyzed along with other energy supply options as a part of least-cost planning.
- o Increasing dependency on cogeneration could result in a large number of small emissions sources. Air programs, therefore, need to plan their programs resources accordingly.
- o Conservation is more likely to play an effective role in an acid rain control program that places an absolute limit, or cap, on emissions rather than in a program that measures compliance by emissions rates.

- o Better tools and approaches for predicting emissions reductions resulting from conservation will help encourage its use as part of an acid rain program.
- o Conservation programs can be effective if planners recognize that barriers exist and design programs that surmount these barriers.

State: Northeast States for Coordinated Air Use Management

Study: Education and Communication between the New England Air Quality Control Divisions and Public Utility Commission

Key Words: Public Utility Commissions; Dispatch; Regional Approaches; Planning Criteria

Purpose:

Three workshops, attended by air, energy PUCs, and federal agencies from seven Northeast states and Wisconsin, were held to foster communication and cooperation between Northeast air quality control agencies and public utility commissions. Communication between these agencies is often minimal, which limits their ability to cooperate on issues of mutual concern.

Results:

The NESCAUM project provided participants with an understanding of the interrelationships between acid deposition control and electricity capacity in the New England states. Some of the topics discussed in the workshops were:

- o Siting of new generating facilities: How can PUC and air agency application reviewing processes be accommodated? What criteria should be used when siting a facility?

- o Energy Supply: What are the constraints on the supply network? What are the impacts of using load management? What information is necessary to make decisions?
- o Rate-making process: When should front loading of costs for small generators be encouraged? How will emissions reductions taken within a service area for benefits outside the territory be jointly reviewed?

Among the conclusions reached were:

- o New England does not have a great deal of flexibility in using environmental dispatch because of existing supply constraints.
- o State air quality control agencies and public utility commissions each have their own procedures for reviewing applications for new facilities. These differences are based upon the fact that each agency has different goals in mind when reviewing applications. Agencies must learn to accommodate both air quality goals and the demand for power in the region.
- o Facilities with an average emissions rate below 1.2 pounds of sulfur dioxide per million BTU should not be included in developing the average emissions rate.

State: Ohio

Study: Estimation of the Cost of Reducing Sulfur Dioxide Emissions in Ohio

Key Words: Scrubbers; Coal Cleaning; Fuel Switching;  
Cost; NO<sub>x</sub> Reductions

Purpose:

The purpose of the Ohio study was to estimate more accurately the costs associated with reducing sulfur dioxide and nitrogen oxide emissions from electric utility boilers. Past studies may have overlooked several factors which led to underestimated expenses of retrofit technologies. The Ohio study focused on five of the most representative of Ohio's 31 power plants. The study examined both commercially available and emerging emissions technologies.

Results:

- o Emissions control costs may be considerably higher than previous studies have indicated.
- o Costs of flue gas desulfurization at the five plants ranged from \$573 per ton of sulfur dioxide removed to \$2,192 per ton.
- o Physical coal cleaning was generally found to be more cost-effective than flue gas desulfurization, but the amount of sulfur dioxide removal is limited.

- o Coal substitution and blending was often found to be the most cost-effective technique, but no fuel price premium was assigned to this option. Expected premiums, either now or in the future, may make this option considerably less attractive.
- o Emerging control technologies--which include indirect spray drying, furnace sorbent injection, natural gas re-burning, and selective catalytic reduction--were generally found to be more cost-effective than commercial technologies. The amount of sulfur dioxide reduction is, however, generally limited from 40% to 70%.

State: PEI Associates, Inc.

Study: Issues Associated with the Expanded Use of CEMs for Potential Acid Rain Emissions Reduction Initiatives

Key Words: Cost; Emissions Rate Limit; Emissions Cap

Purpose:

The use of continuous emission monitors (CEMs) to measure compliance in an acid rain control program is frequently mentioned in various legislative approaches to acid rain control. State air agencies generally have had little or no experience with continuous emission monitoring to meet either a total emissions cap or an emissions rate limit. The project focused on identifying and seeking resolutions to some of the uncertainties and problems related to expanded use of CEMs for acid rain control programs.

Results:

- o Currently, the U.S. lacks a well-defined national policy on the use of CEMs for checking compliance and enforcement. Current policies are not uniform (i.e., new and existing sources are subject to different standards and compliance requirements). This is a sore point with many sources, and many regard the agencies' policies as unfair. In addition, many agencies and sources believe that the current data requirements are redundant. The EPA needs to formulate a policy that will reduce data handling without compromising the quality.



- o Much apprehension exists about the accuracy and quality of data generated by CEM systems. Some recent studies carried out by the EPA, however, suggest that with proper care and maintenance, CEM systems give fairly reliable data. More studies and field surveys of actual operating CEM Systems may be required to establish the performance capabilities. The technology has been used successfully abroad to verify continuous compliance. Therefore, it is important to establish the quality of U.S. instruments with those used abroad.
- o Although high capital and operating cost are valid concerns, as the technology is further developed, these costs could come down. In the long run, installing CEM Systems may 1) reduce every quarter, 2) gain public and agency good will for the company, 3) help the source to reduce emissions and to operate the process optimally, and 4) reduce the paperwork required to establish compliance.
- o The way the program is currently envisioned there could be an increased administrative load for both the air agency and the emissions source. By using telemetry, however, the Agency can reduce the frequency at which the sources have to file emissions reports, which would reduce the paperwork and the official formalities. Also, as the program develops, the Agency can use an approach similar to that used in Germany, where the amount of data that needs to be handled is considerably reduced.

State: Pennsylvania

Study: Pennsylvania STAR Project, Phase I -- Data Base Refinement and Pennsylvania STAR Project, Phase II -- Strategy Development

Key Words: Emissions Inventory; Scrubbers; Cost; Industrial Controls; Constraints; CEM

Purpose:

The Pennsylvania project consisted of two phases. In the first stage, various emissions inventories for the state were compared. The second phase examined how a 50% reduction in sulfur dioxide emissions from 1985 levels could be achieved in Pennsylvania.

Results:

- o Utilities generate the bulk of total Pennsylvania point source emissions for both sulfur dioxide (88%) and oxides of nitrogen (84%). Process emissions contribute only 5% for each pollutant.
- o Total sulfur dioxide emissions in Pennsylvania declined 23% from 1980 to 1985. Oxides of nitrogen emissions changed little over the same period.
- o CEM data for SO<sub>2</sub> was compared to inventory data and EIA data. Generally, agreement was reasonable except that for scrubbed units, CEM data was greatly superior.

- o A comparison of emissions by utility operators versus owners was made showing substantial changes in the distribution of emissions.
- o Applying BACT (scrubbers) by size or least cost appears to be the most desirable sulfur dioxide allocation method for the utility sector in Pennsylvania.
- o Another option worthy of serious consideration is the application of a 1.2 lbs SO<sub>2</sub>/MMBtu emission limit at the operator level. Under this scheme, approximately 590 thousand tons of SO<sub>2</sub> would be removed at a cost of \$290 million. This plan has a cost-effectiveness of \$490/ton. This is the most equitable plan for all of the utility operators.
- o Dual alkali flue gas desulfurization systems were considered for uncontrolled industrial coal-fired boilers emitting over 100 tons per year of sulfur dioxide. Costs were generally 2-3 times as much per ton as for utility emissions. This demonstrates the ineffectiveness of controlling a large number of units, each having a relatively small reduction potential.
- o In Pennsylvania, most large industrial sources have the potential to reduce emissions by 50% to 90% with FGD systems. Most emit less than 200 tons per year; therefore, achieving a reduction of even 30,000 tons/year (2%) would require controlling over 100 sources in six different industries.

Caution must be used in comparing the costs from this study with the costs provided in similar studies. Many factors enter into the determination of the final costs such as the costing method and the levelization factor and carrying charge rate used. The main purpose of this project was not to determine the specific costs of reduction alternatives but rather to provide a basis for comparison among the alternatives.

State: South Coast Air Quality Management District

Study: Development of a Photochemical Air Quality Model with Extensions to Calculate Aerosol Dynamics and Visibility (September 1987)

Key Word: Deposition Modeling

Purpose:

California's South Coast Air Quality Management District has developed the Urban Airshed Model (UAM) for use in the Southern California area. Although the model is normally used to predict ozone and NO<sub>2</sub> formation, it can be extended to predict PM<sub>10</sub> visibility, and dry acid deposition as well. The model was extended and applied to the Los Angeles area and evaluated on August 8-9, 1984. Extensive ozone, NO<sub>2</sub>, PM<sub>10</sub>, and visibility monitoring data were collected.

Results:

- o Simulation results for ozone and NO<sub>2</sub> indicate that the model performs fairly well in the treatment of gas-phase chemistry.
- o Aerosol concentration predictions are reasonable given the level of effort involved in developing the model and the paucity of measurements of aerosol concentrations. The uncertainties in aerosol measurement predictions imply a less stringent evaluation of model performance for PM<sub>10</sub>. The model also gives better predictions of longer-term average (24-hour) concentration of aerosols as compared to the shorter-term averages (8-hour).

- o Although the model results are encouraging, additional work is required to fully understand the model's response to different meteorological and emissions parameters. In its present form, the model cannot be used as a regulatory tool.
- o The extended UAM can be a usable application tool once further refinements are made. A field measurement program in the South Coast Air Basin is collecting meteorological and air quality data needed to further develop air quality models such as the extended UAM. The data for further model development will not be available until 1988.
- o A major acid rain control program should consider the interrelationships of various control strategies for acid formation and other air quality control programs.

State: Tennessee

Study: A Study of SO<sub>2</sub> Emissions Reduction for a  
Multi-state Utility

Key Words: Cost; Rate versus Target; Planning Criteria;  
Fuel Switching; Scrubbers; Regional Approaches

Purpose:

The study examined the effectiveness, cost, and enforceability of four alternative strategies--a systems cap, a state cap, a plant cap, and a plant emissions rate limitation--for reducing sulfur dioxide emissions on the Tennessee Valley Authority (TVA) power system. A systems cap strategy, which would impose an upper limit on the number of tons the TVA power system as a whole could emit, would allow TVA to choose how the cap would be met. A state cap strategy would impose a limit on sulfur dioxide emissions that the TVA plants in each state could emit, while a plant cap strategy would impose a similar upper limit on each plant. A plant emissions rate limitation strategy would impose a maximum allowable emissions rate on each TVA plant, which would not exceed its tons-per-year cap. For each strategy, TVA analyzed ways to achieve its share of either a 5, 10, or 12 million ton national reduction, assuming that the entire amount would be achieved by reducing emissions at utility sources alone.

Results:

- o Annual costs for the 5 million ton reduction would range from \$0 to \$255 million. The use of low-sulfur coal would be the predominant control method. TVA's revenue requirements in 1995 would increase from 0 to 4.5%.
- o Annual costs for the 10 million ton reduction would range from \$335 million to \$940 million. Low-sulfur coal would be used extensively, but scrubber retrofits would also be required. Increases in revenue requirements in 1995 would range from 8.1 to 20.3%.
- o Annual costs for the 12 million ton reduction would range from \$540 million to \$1.23 billion. Extensive scrubbing would be required. Increases in 1995 revenue requirements would range from 12.4 to 26.4%.
- o A plant emissions limitation strategy would result in much higher compliance costs. The system cap strategy is the most cost-effective and would reduce costs 50% to 100% more than the plant emissions limitation strategy.
- o Compared to the air quality that could occur around TVA plants in 1995 if no acid rain control legislation is enacted, all of the reduction cases would result in overall air quality improvement. The more inflexible strategies would usually result in a greater system-wide reduction and greater overall air quality improvement.



- o Enforcement of emissions reduction under the plant emissions limitation strategy would rely on the approach already authorized by Section 110 of the Clean Air Act.
- o A systems cap strategy poses the additional requirement of cooperation among states.

State: Vermont

Study: Sensitivity to Alternative Maintenance Plan  
Provisions in a State with Low Emissions

Key Words: Rate versus Target

Purpose:

Vermont is a small, rural state with few large emissions sources and a low emissions base. The purpose of the Vermont study was to determine whether such a state could meet emissions reduction standards under various scenarios of economic development.

The study consisted of three phases. The first phase involved reviewing existing inventories, identifying and correcting deficiencies, and compiling, in compatible form, data on the 180 largest emissions sources in Vermont for the period of 1980 to 1984. The second phase projected a number of possible future emissions scenarios. The third phase examined whether the required emissions reductions to demonstrate maintenance could be achieved in sufficient quantity by Vermont.

The study considered two types of emissions caps. The first is a total emissions cap where states cannot exceed a specified level of emissions in terms of tons per year. The second is an overall emissions rate limit, which would be defined in terms of the amount of emissions per unit of production (i.e., lbs per MMBtu).

### Results:

- o The choice of base year may determine whether or not an emissions tons target can be achieved.
- o An emissions rate limit of 1.2 lbs./MMBtu could be maintained by Vermont under all development scenarios by establishing a state-wide 1.0% sulfur-in-fuel regulation.
- o Permitting any new, large emissions source would make it virtually impossible for Vermont to maintain an emissions tons target.
- o The development of a regional emissions target would offer the possibility of interstate emissions offsets being available from the larger states in the region for use by the smaller states. Such an offset would be a small percentage of a large state's total emissions and, therefore, could be politically feasible.
- o Generally, it appears that the more sources included in the emissions target (e.g., all point sources vs. only large point sources), the less difficult it is for a small state like Vermont to meet the target.
- o From Vermont's perspective, it would be inequitable to impose a maintenance program on low SO<sub>2</sub> emitting states which would restrict their growth solely because the state had started from a very low baseline.

- o The emissions rate limit in conjunction with regional emissions targets may be the most equitable approach from the perspective of small, rural states like Vermont with few large emissions sources and a low emissions base.

State: Western States Acid Rain Project

Study: Final Report on the Western States Acid Rain  
(WESTAR) Project

Key Words: Emissions Inventory; Deposition Modeling;  
Regional Approaches; Industrial Controls; NO<sub>x</sub>  
Reductions; Cost

Purpose:

The project was a two-phase, multi-task project that investigated acid rain issues in twelve states.

Results:

- o The 1985 NAPAP is probably the best available inventory of sources in the Western states. It will not, however, reflect year-to-year variability that is unique to the West, and in many cases will be inaccurate and probably will not be available in a timely fashion.
- o Important criteria to consider in developing an acid deposition model for the West are the need to minimize cost, the complexity of the terrain, and flexibility to handle visibility and ozone. The models with the greatest potential of meeting the criteria are ERT/MESOPUFF-II and SAI/RIVAD.

- o None of the sampling efforts planned or underway will acquire all of the necessary data needed for conducting receptor modeling in the West. Coordination among the sponsors is lacking, and most studies do not design their sampling efforts with receptor modeling in mind.
- o Two issues that represent potentially significant roadblocks to implementing an effective acid deposition program are: (1) the current lack of data and tools to evaluate source/receptor relationships, define standards, and identify areas requiring protection from acid deposition; and (2) the lack of a mechanism to resolve interstate conflicts successfully.
- o The most cost-effective controls of sulfur dioxide of 20% or less can be obtained from industrial boilers. Reductions greater than 20% would require extensive control of smelters and some electric utility boilers.
- o The marginal cost of control for the 30% sulfur dioxide reduction scenario is more than double the marginal cost of the 20% reduction scenario. The cost-effectiveness of both sulfur dioxide and oxides of nitrogen controls diminishes rapidly for reduction targets greater than 20%.
- o Oxides of nitrogen emissions are best obtained through further control of utility boilers. Tighter control of oxides of nitrogen emissions from automobiles is also economical if region-wide reductions greater than 20% are required.

- o A twelve state regional approach can achieve emissions reduction targets for sulfur dioxide at significantly less cost than a state-by-state approach. A regional approach would require legislation that would establish regional reduction targets instead of state-specific targets and would allow interstate emissions trading.

State:        Wisconsin -- Tri-State Study

Study:        Advanced Utilities Simulation Model

Key Words:        Regional Approaches; Fuel Switching; Cost;  
                         Plant Retirement; Emissions Control Modeling;  
                         Life Extension; Emissions Trading

Purpose:

Wisconsin used the Advanced Utilities Simulation Model to examine how a cost-effective sulfur dioxide emissions reduction program might be achieved in the state. The study also considered whether it might be cost-effective to develop a regional air emissions reduction program (which would also include Minnesota and Michigan) rather than a state program.

Results:

- o     A 50% reduction in 1995 in sulfur dioxide emissions could be achieved in Wisconsin by switching coal power plants to low-sulfur coals.
- o     Marginal costs for sulfur dioxide control in Minnesota and Michigan were less than in Wisconsin for certain units at the 50% state-wide reduction level.
- o     Whether early retirement of power plants is an economically feasible strategy for emissions reduction depends upon the following: (1) the level of excess generating capacity on the utility system; (2) whether the facility is needed to maintain transmission system



stability; and (3) the cost for alternative emissions reduction steps at the same facility.

- o Power plant life extension, which has become more widespread as the cost of new power plants has risen, affects emissions reductions in two ways: (1) older, higher emitting plants may be in service longer than originally anticipated, which affects forecasts of future emissions levels; and (2) by including emissions reduction steps in the course of a life extension program, it is possible that reduction may be achieved more inexpensively than if undertaken separately.
- o Emissions trading or leasing is a viable option for utility systems with excess generating capacity. Emissions reduction plans that impose source-specific limitations, however, preclude environmental dispatch as a compliance option.
- o State public utility commissions have a clear role in overseeing emissions trading made by utilities that they regulate.

State:        Wisconsin -- Public Service Commissions

Study:        STAR Report and the Potential Role of Public  
Service Commissions in Implementing National Acid  
Rain Control Policies

Key Words:     Public Utility Commissions; Emissions Trading;  
Cost; Energy Conservation; Environmental  
Dispatch

Purpose:

The Wisconsin Public Service Commission (PSC) report analyzed the following means of reducing emissions from utility systems: energy conservation; least emissions or environmental dispatch; early plant retirement; bulk power purchases; electric rate design; and power plant life extension. Potential roles that could be played by PUCs in implementing and monitoring interstate emissions reduction agreements are discussed in the report. Historic interactions between the Wisconsin PSC and the Wisconsin Department of Natural Resources (DNR) on air quality matters are reviewed. Finally, the Wisconsin DNR and PSC jointly sponsored a conference on "The Potential Role of Public Service Commissions (PSCs) in Implementing National Acid Rain Control Policies."

## Results:

- o Depending upon the level of emissions reduction required, an energy conservation reduction strategy may substantially lower the cost to consumers of emissions reductions as well as the overall cost of providing energy services.
- o The viability of early power plant retirement will vary with each specific situation. In general, early retirement will be more economical for utility systems with considerable excess generating capacity and a few older plants with high SO<sub>2</sub> emissions reduction costs.
- o Bulk power purchases may reasonably be considered as an emissions reduction measure where other clean-up options are costly and other utilities have capacity for sale. The overall impact on emissions of both utilities should, however, be considered. While the purchasing utility's emissions will decrease, the seller's will possibly increase. If regulations vary among companies or among regions, the impact of using power purchases to reduce emissions in one area may result in increased emissions in another. Those responsible for administering emissions reduction rules will need to consider possible regional impacts of power sales and purchases.
- o The Wisconsin PSC and the Wisconsin DNR have a long history of cooperation. This relationship has been formalized in a Cooperative Agreement.

- o The Wisconsin DNR had established a 3.2 lbs. SO<sub>2</sub> per million BTUs of heat input at each power plant. The DNR allowed utilities to request a variance if compliance would result in an unreasonable hardship. At DNR's request, the PSC agreed to take on the responsibility of advising DNR on the reasonableness of utility hardship claims. DNR retains the final responsibility for granting or denying waiver requests.
- o Wisconsin recently adopted an emissions rate limit to be in place by 1993. It calls for a corporate-wide emissions rate (utility by utility) of 1.2 pounds of SO<sub>2</sub> per million BTUs of heat input. This would be averaged on a corporate basis over all the fossil-fueled plants. In addition, an overall SO<sub>2</sub> emissions target of 325,000 tons per year was included. This was set as a target rather than a cap to give utilities additional flexibility. However, since approaching the target would lead to legislative and DNR review of the utilities performance, it is believed that the utilities would be leery of approaching the target.
- o Utilities maintain that emissions trading must be allowed if acid rain control is to be conducted in a reasonable, cost-effective manner. Agencies, however, are concerned about the effect that trading would have on agency resources.
- o Although it appears that the current trend among policy-makers is to remove any subsidy provision from acid rain legislation, the concept is strongly supported by Illinois, Ohio, and Indiana, all of which would incur great cost to meet proposed limits.

- o Many states and utilities are of the opinion that reductions should be set in two of more phases to provide more time to design and implement the means to achieve mandated emissions reduction. They believe that clean coal technology cannot be in place on a commercial scale by 1993.
- o Information on nitrogen oxide emissions is too insufficient to include these emissions in acid rain legislation.
- o Acid rain legislation will likely define the nature and extent of communication and coordination between air pollution control agencies and public utility commissions.

State:      Wisconsin -- Model Program

Study:      Model State Acid Rain Control Program

Key Words:      Planning Criteria; Emissions Trading; Energy  
Conservation; Environmental Dispatch; Cost;  
Industrial Controls; Plant Retirement

Purpose:

The goal of Wisconsin's model program was to develop a management plan that would allow state decision-makers to quickly implement an emissions reduction program if mandated by the federal government. Because it is not known what form such a program might take, five alternative control plans were developed for electric utilities and three alternative control plans were prepared for industrial sources. Each plan was evaluated according to the following criteria: cost and control methods; secondary environmental impacts; legal enforceability and compliance requirements; and socio-economic impacts.

Results:

- o      Regardless of the reduction level, if the choice of control techniques is left to the states, then the opportunity to design cost-effective reduction strategies maximized.
- o      The overall cost of meeting sulfur dioxide emissions reduction requirements could be lessened if emissions control requirements are integrated within the broader context of state-wide utility planning.

- o Opportunities to lower the overall cost of meeting state-wide emissions requirements may exist if trading of emissions sources is allowed.
- o Conservation has the potential, depending upon the reduction level, of substantially lowering emissions reduction costs to consumers as well as lowering the overall costs of providing energy services.
- o Environmental dispatch can play a role in reducing the cost of sulfur dioxide control in a state with excess capacity. As the reduction requirements become more stringent, the value of this option lessens.
- o The disposal of solid waste could become a significant problem in states where scrubbers are needed to meet the reduction level.
- o In general, as an emissions reduction program becomes more flexible, the legal enforceability and compliance issues become more complex and time consuming.

# **State Acid Rain Program**

## **Results of the State Survey**

### **Appendix B**

**Office of Air and Radiation  
Office of Atmospheric and Indoor Air Programs  
Emerging Programs Staff**

**U.S. Environmental Protection Agency  
401 M Street, SW  
Washington, DC 20460**

**March 1989**



# **Results of the State Survey**

## **on the**

### **State Acid Rain Program**

On November 8, 1988, STAPPA/ALAPCO mailed fifty-nine surveys to state and local air agencies and planning organizations to solicit their views on the usefulness of the STAR Program. As of December 20, 1988, a total of thirty-three responded; twenty-four of these participated in the STAR Program and nine did not. First, the responses of the non-participating States are summarized briefly; then responses of the participating States are summarized in more detail.

Non-participating States generally indicated interest in STAR project results but were almost evenly divided on the question of whether they wanted to be involved in future programs of this type. Many of the non-participants cited resource constraints for "what if" planning and indicated that regular Section 105 funding was falling short on the permanent, high-priority areas. On the question of whether States should institutionalize on-going strategic planning, respondents were evenly divided. Some indicated that current resources are inadequate to meet EPA's day-to-day requirements and would not permit contingency planning. Some believed such planning to be a good idea. One indicated that this should be an EPA function. Even non-participating States were familiar with STAR UPDATE memoranda from EPA and were interested in the progress of the Program.

The remaining twenty-four respondents participated either directly in the STAR Program or indirectly through regional projects. Over 90% of the respondents indicated a desire to be involved in another program like STAR, although several (even some indicating interest) would be reluctant to participate because of shortage of financial and staff resources. Several participating States and organizations exceeded initial estimates of time and cost, and contributed some of their own funding to complete the projects. Over 70% of respondents indicated that they were able to participate only because the Section 105 funding mechanism was used. Almost a third of those responding indicated difficulty participating in activities like STAR due to difficulty in

accepting "one-time" funding. The choice of Section 105 to fund STAR projects gave some States the impression that STAR activities were "taking away" from funds that would have been better spent on "base-line" programs required by the Clean Air Act. This suggests that EPA might have done a better job emphasizing the supplemental nature of the special Congressional appropriation.

Three-quarters of the respondents indicated that EPA successfully maintained a "policy-neutral" posture relative to the need for a control program; but, only 50% believed that maintaining this posture was useful. Some respondents believed that a "policy-neutral" position restricts the flow of useful, constructive information to the Congress, such that proposed legislation cannot incorporate important findings, thus continuing the risk of "bad" legislation. Additionally, this policy may inhibit State enthusiasm because studies are undertaken without certainty that they will be useful. Additional detail on State responses may be found in the closing section of this summary.

More than half of the respondents maintained an awareness of the STAR Program through STAR UPDATE memoranda from EPA, participation in national workshops, through STAPPA/ALAPCO, and through personal contacts with EPA staff and STAR participants. Responding States were evenly divided in their opinions on the role of the Regional Offices of EPA: a third believed the Regions played an important and effective role; a third believed their role was only somewhat important and effective; and a third believed that the Regional Offices were not important or effective. Only about half of the respondents indicated that other mechanisms (outside of STAR) were used to prepare for a potential acid rain control program. Of these mechanisms, States most frequently used meetings or conferences sponsored by environmental or citizen groups; followed by an even split between: in-state interagency meetings, State-sponsored meetings or workshops, Regional Office meetings, industry-sponsored meetings, and contractor studies initiated by EPA.

Over 60% of respondents indicated that States should consider using a portion of program resources to institutionalize on-going strategic planning to identify and assess emerging issues and future program needs. Of the dissenting third, resource constraints were cited as a primary reason for not undertaking such an effort. One State indicated that any contingency planning effort has difficulty demonstrating a cost-effective expenditure of resources.

In response to the question of the importance placed by the State on the STAR Program, States indicated that participation in the STAR Program was very important for examining potential implementation issues, identifying data needed for program implementation, identifying actual program benefits and costs, and improving inter-state air pollution control program interactions. The STAR Program was moderately important for improving the recognition of the diversity of source types, control costs, impacts, and regulatory processes among the States, and for identifying program resource needs.

## Details of Response and Summary of State Comments

Responses of participating States are summarized and tabulated in the same sequence as the original questionnaire. Comments provided by States are included without attribution. A blank copy of the questionnaire is included at the end of the tabulation.

### **Knowledge of STAR Program**

***How familiar are you with the STAR projects and results? (Please check as many answers as appropriate).***

- |    |     |                                                                        |
|----|-----|------------------------------------------------------------------------|
| 14 | 58% | I am knowledgeable of my own project.                                  |
| 15 | 63% | I am knowledgeable of projects in my general region.                   |
| 6  | 25% | I am generally knowledgeable of all STAR projects.                     |
| 2  | 8%  | I am not knowledgeable but want to gain knowledge of the STAR results. |

***Based on your present knowledge, would you want to be involved if other STAR-like initiatives were developed by EPA and the States?***

- |    |     |                                                                            |
|----|-----|----------------------------------------------------------------------------|
| 22 | 92% | Yes, my state would want to be involved again in other STAR-like programs. |
|----|-----|----------------------------------------------------------------------------|

#### **Comments:**

- our state] benefited significantly from participating in the STAR project. However, the resources devoted to its completion exceeded Section 105 funds allocated for that purpose. Although [we] continue to believe that such projects are valuable, they also must compete with other more immediate programs and legal obligations for inadequate resources.
- if time and resources permit.

- |   |    |                                                                                      |
|---|----|--------------------------------------------------------------------------------------|
| 1 | 4% | Yes, my state was not involved but would want to be in future programs of this type. |
| 1 | 4% | No, my state would not want to participate in future one time programs like STAR.    |

**Comments:**

- The reason that we would feel reluctant to participate in any future one-time projects is not a bad reflection on STAR; we simply do not have, because of funding (and staff) shortage, staff resources which can be diverted any more for one-time limited-duration projects unless they are “critical,” even if funding is available to theoretically compensate for the staff resources spent.

**Program Management and Funding**

***How did you maintain an awareness of the STAR program? (Please check as many answers as appropriate.)***

- |    |     |                                                                                                 |
|----|-----|-------------------------------------------------------------------------------------------------|
| 14 | 58% | Through STAPPA/ALAPCO's Acid Rain Committee and general STAPPA/ALAPCO meetings and newsletters. |
| 15 | 63% | Through participation in either or both STAR workshops.                                         |
| 2  | 8%  | Through STAR-TRAK (EPA's computer project tracking system).                                     |
| 17 | 71% | Through STAR UPDATE memorandums from EPA.                                                       |
| 6  | 25% | Through my EPA Regional Office.                                                                 |
| 13 | 54% | Through personal contact with individuals involved in the STAR projects.                        |
| 2  | 8%  | Through other sources -- Western States Acid Rain Project                                       |

***Did the Regional Offices play an important and effective role in this program?***

- |   |     |                         |
|---|-----|-------------------------|
| 7 | 29% | <b><u>Yes.</u></b> How? |
|---|-----|-------------------------|

**Comments:**

- periodic correspondence/communication.
- facilitated in the management of the project and the acquisition of outside expertise.
- in negotiation of scope of work and project monitoring.

- Region I (not our Regional office) administered the projects in which we participated and appeared to provide adequate contract/organizational support.
- helpful in review of project products and attended and participated in meetings.
- by assisting with the funding of STAR projects.

7 29% **Somewhat**, How and why not more?

**Comments:**

- mostly funding.
- partially funded project coordinator; little policy lead involvement.
- regional office tracked the project but did not review its content.
- most important to quickly approve project with minimum realization of efforts.
- served to focus effort within the time schedule, yet allowed flexibility in our state's STAR project.

8 33% **No**, Why not?

**Comments:**

- [(comments summarized from lengthy comment) State was originally enthusiastic about their project. The Region advocated an EPA contractor that the State did not want to use. State "expended a tremendous amount of resources" only to be frustrated and delayed by the Regional Office. Project was cancelled.]
- they were not involved in [our] project.
- only provided contract oversight; new ground was being broken and EPA Regional office had no experience.
- the WESTAR project was managed by the Western States and not EPA.
- little involvement because we did not ask for it.
- regional offices did not (usually) attend WESTAR meetings.
- not interested.
- Region 10 played no role -- acid rain low priority.

2 8% **No response.**

***In your opinion, did EPA maintain a “policy neutral” posture relative to the need for an acid rain control program? Please give examples.***

18 75% **Yes**

**Comments:**

- was willing to fund innovative regulatory reduction plans.
- there was no policy lead involvement from EPA.
- they kept denying that there was any policy implications.
- STAR project discussions rarely if ever addressed appropriateness of a control program.
- EPA was not involved with our project.
- workshop presentations were “policy neutral.”
- open-mindedness and exploration of topics from various perspectives by David Bassett.
- EPA placed restrictions, however, in the scope of our project (i.e., no source attribution work).
- but, I think it was generally a waste of time on EPA’s part.
- did not preclude analysis of alternatives that would support a given posture, based on our state project.
- EPA staffed WESTAR; meetings were “facts” oriented.

4 17% **No**

**Comments:**

- there were conflicts between regional offices and headquarters as to what areas were responsible for the alleged acid rain problems.
- Region 1 felt there should be an acid rain program.
- EPA had at that time no acid rain policy -- it was difficult to change their postures to support efforts.
- they emphasized the need for time to complete NAPAP projects.

2 8% **No response**

4 17%	6 25%	9 38%	4 17%	1 4%	Understanding implementation time frames.
9 38%	6 25%	7 29%	1 4%	1 4%	Identifying actual control program benefits and costs.
9 38%	4 17%	7 29%	3 12%	1 4%	Improving interstate air pollution control program interactions.
7 29%	11 46%	5 21%	0	1 4%	Improving the recognition of the diversity of source types, control costs, impacts, and regulatory processes among the States.
4 17%	8 33%	9 38%	1 4%	2 8%	Providing a national focus for the discussion of acid deposition issues and concerns.
1 4%	0	0	4 17%	19 79%	No benefits resulted.
1 4%	0	0	1 4%	22 92%	My state did not participate.

***Should States consider using a small part of their program resources to institutionalize on-going strategic planning to indentify and assess emerging issues and future program needs? Why or why not?***

15 63% **Yes**

**Comments:**

- helps reduce crisis management although limited funding makes this difficult.
- a regional association like WESTAR is needed to discuss issues associated with regional air pollution.
- long term funding will decrease if States do not stay on the "point" for emerging issues.
- very important to constantly look ahead; prepare background for new issues -- CO<sub>2</sub>, stratospheric ozone.
- because the agency will need to respond to these issues regardless, it is better to prepare (plan) ahead of time.
- it is cost-effective to work together, but choose a better project than acid rain.
- we do this already to keep from being taken by surprise. We cannot always do something about it, but we are able to prepare as best as possible.

- planning increases the chances of program success.
- I consider that part of the role of air quality agencies.
- several of the West's most important air quality problems are regional in scope and must be approached from an interstate basis. Coordination of other program areas is enhanced.
- State acid rain control projects may have a major impact on future development of the State.
- the State programs are on the front lines so to speak. They become aware of emerging issues which are not sensed on a national level so readily. This should not preclude national EPA leadership.
- it's more efficient to identify potential problems and plan for their resolution (prevention) than to react after the fact.

***Should States consider using a small part of their program resources to institutionalize on-going strategic planning to indentify and assess emerging issues and future program needs? why or why not? (Question repeated for clarity)***

8    33%    **No**

**Comments:**

- it takes all of existing resources to maintain the core programs. There are no equitable trade-offs that have been identified.
- low priority; controls from existing programs also control acid precipitation.
- resources are too limited and most issues require focused, national attention. Periodically, issues such as acid rain may justify this type of effort.
- insufficient funding available.
- it is already being done. There is no need to make it a grant commitment.
- funds are already spread too thin.
- even though this should be done, the shortage of funding means that even some "critical" projects are not funded, much less something like this that is never seen as critical at the moment.
- it is too difficult to keep funds and to show resources are cost effective. Also, issues/programs change too quickly.

1    4%    **No response**



***What other mechanisms outside of the STAR program, have you used for within-state, multi-state, or state/federal interaction in preparing for a potential acid rain control program? How useful were they (3 - very useful, 2 - moderately useful, 1 - somewhat useful, 0 - not useful)?***

<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>	<u>no resp.</u>	
5	7	3	0	9	Within-State interagency meetings
21%	29%	12%		38%	
6	4	1	1	12	State sponsored workshops or meetings with other States.
25%	17%	4%	4%	50%	
3	6	3	2	10	Regional EPA sponsored meetings with States.
12%	25%	12%	8%	42%	
2	3	4	3	12	EPA originated contractor studies.
8%	12%	17%	12%	50%	
2	4	3	2	13	Industry sponsored meetings or conferences.
8%	17%	12%	8%	54%	
1	8	1	1	13	Environmental or citizen group sponsored meetings or conferences.
4%	33%	4%	4%	54%	
1	1	0	0	22	Other.
4%	4%			92%	

**Comments:**

- interagency analysis of proposed acid rain legislation.
- reports from industry and environmental groups.
- WESTAR has been the only mechanism. APCA technical papers/journals have been source of research info, but not control program analysis.

## GENERAL COMMENTS

- [our state] was an active participant in the WESTAR group. We found the interaction with air quality officials from other Western States to be beneficial. EPA needs to fund additional work on a regional level. WESTAR needs to be continued and to receive EPA funds to sponsor research and monitoring of importance to the West on various air quality issues: acid deposition, visibility degradation, and smoke management.
- The Western States STAR project was very productive in terms of positioning the West for future policy decisions. However, it does not appear that the findings of the study will be used for this purpose. EPA needs to give attention to ensuring that the results of such studies will have more than a shelf life.
- Resources, financial and manpower, were very limited given the magnitude of the research tasks. Personnel assigned to the STAR project were drawn from non-air pollution control operations and thus true STAR project costs to the State are substantially greater than program funding indicates.

There continues to be a deficiency in the formulation of policy options that reflect the acid deposition reduction requirements to protect sensitive water bodies. Even within New England it seems each State will be proceeding in its own initiatives. A greater coordination of efforts will be required in working out a national program.

- In retrospect, programs such as STAR should focus on a more narrow range of issues. An executive summary with bullet-like information should be distributed to succinctly identify program's key findings. To justify several million dollars investment, state and federal policymakers, legislators, and others who may have impact on language in federal legislation must be provided brief, understandable key points which can be championed.
- Because the topic was "new" in terms of regulations and there were a number of different approaches being considered in Congress, the STAR projects considered a large number of implementation issues. It would be easier to focus on the really important issues if the number were reduced.
- I believe the WESTAR organization is a valuable forum to solve Western problems, but I do not perceive acid rain to be a major Western problem. Some problems which I believe are important center around  $PM_{10}$  and CO SIP development, valley stagnation modeling, and permit review.

- With as many things going on in air pollution control as there is, [we] have not been able to justify spending time on evaluating acid rain legislation regarding impacts on our electric and smelter industry. The STAR study was and is useful to us as it provides insight into the problems and cost of SO<sub>2</sub> control that we would not have otherwise had.

I hope that when acid rain legislation goes through, the Congress will have realized the need for funding state and local agency efforts to implement the acid rain bill.

- We participated in the WESTAR project. Aside from the acid deposition work of the group, we found that WESTAR provided an important forum for discussion of regional issues; development of Western positions on air issues (as a Western NESCAUM) and exchange of views on a variety of program topics. As you know, the Western states would like to continue the association to deal with regional haze, PM -10, ozone, and slash burning.
- I hope that EPA will seriously consider other STAR-like project funding in the future. It has been very useful to us.