

# ENVIRONMENTAL MONITORING, EVALUATION, AND PROTECTION (EMEP)

A CASE STUDY PREPARED BY OAK RIDGE NATIONAL LABORATORY AND THE  
NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY

Energy production and use have had a profound effect on the quality of New York's environment and the health and welfare of the State's residents. Power plants emissions constitute one of the largest sources of pollutants that affect critical ecosystems and the State's water and forest resources. Moreover, since prevailing wind patterns transport air pollution across state boundaries, New York is subject to significant air pollution emanating from states to the south and west. Many of these states have environmental laws less demanding than New York's, making their energy production costs less. And now, under restructuring, these plant owners seek to expand their sales of cheaper electricity to New York.

New York's electric utilities, individually and through associations, have historically provided a stable funding for environmental research. However, with restructuring, they are no longer in the generating business, and thus, aren't obligated to sponsor environmental research. The goals of the **New York Energy Smart**<sup>SM</sup> Environmental Monitoring, Evaluation, and Protection (EMEP) Program are to

(1) provide policy-relevant research to improve scientific understanding of electricity-related pollution; (2) assess the impact of electricity generation, relative to other sources of pollution; and (3) provide

information to policy makers who develop environmental regulation and law.

## PROGRAM OVERVIEW

NYSERDA's first step in developing and managing the EMEP program was to establish an 11-member Program Advisory Group (PAG) with representatives from the New York State Departments of Public Service (DPS), Environmental Conservation (DEC), Health (DOH), members of the environmental community, New York utilities, U.S. EPA, and the New York Academy of Science. After an expedited review, the PAG approved six research projects initiated by the Empire State Electric Energy Research

**Arbutus Pond, Central Adirondack Park Region, is a study site to evaluate the recovery of acidification of surface water in the Adirondacks.**





**Obtaining samples for water quality analysis is a challenge in the Adirondacks. Despite observed decreases in sulfate deposition, data indicate limited recovery from acidification in many Adirondack lakes.**

Corporation (ESEERCO) and identified by the Public Service Commission (PSC) in the System Benefits Charge (SBC) order as being crucial to policy development. The six projects are shown in Table 1.

In December 1998, NYSEERDA issued a broad, \$1.5 million environmental quality solicitation with the goal of filling research gaps while complementing the existing six research projects. Thirty short proposals were submitted and subsequently six proposers were asked to submit long proposals for consideration for funding. Following review by the PAG, the four projects listed in Table 2 were selected for funding. The first two projects address the emerging health and policy issue of fine particles in the atmosphere. The third project focuses on gaps in research on factors that limit recovery of

acidified lakes in New York. The fourth project studies transboundary ozone pollution. Work has commenced on all of these projects.

Two additional projects, listed in Table 3, were selected under the \$500,000 solicitation for the development of innovative environmental instrumentation.

## PROGRAM FEATURES

The EMEP program incorporates the following features:

- **Integration of science and policy:** A key criterion in evaluating proposed projects for funding is the extent to which the research has policy relevance. As shown in Figure 1, a portion of the EMEP budget is allocated to ensure the integration of scientific research and environmental policy-making within

**TABLE 1: PROJECTS IDENTIFIED BY THE PUBLIC SERVICE COMMISSION IN THE SBC ORDER**

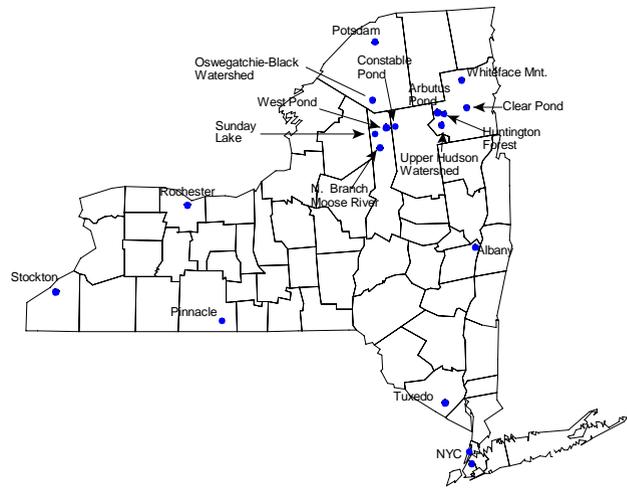
STUDY TITLE	SITE	INSTITUTION	RATIONALE
Mercury in Adirondack Wetlands, Lakes, and Terrestrial Systems	Sunday Lake	TetraTech, Inc., Syracuse University, Cornell College, Smith College	Develop and apply a model that simulates the in-lake processes that influence the level of mercury in fish tissue.
Clinical Studies of Exposure to Ultrafine Particles	Rochester (clinical)	University of Rochester Medical Center	It is not yet known which component in fine particles causes adverse health effects. This knowledge will be important in assessing the benefits of regulating larger particles.
Analysis of Ozone and Fine Particles in the Northeast	Statewide (modeling)	SUNY-Albany	Increase understanding of factors affecting levels of ozone and fine particles.
Evaluation of the Recovery from Acidification of Surface Waters in the Adirondacks	Arbutus Pond	SUNY College of Environmental Science and Forestry	Provide data to increase understanding of factors that effect recovery of surface waters and the role of forest maturity on nitrate leaching.
Long-Term Monitoring Program for Evaluating Changes in Water Quality in Adirondack Lakes	52 lakes in the Adirondacks	Adirondack Lakes Survey Corporation	Provide data to increase understanding of how well surface waters are responding to acid rain reductions. These data will be useful to assess changes in environmental quality that may take place over the course of utility restructuring.
Enhanced Measurements of Oxidants, PM2.5 and Their Precursors	Whiteface Mountain, Pinnacle State Park, NYC/Queens	SUNY-Albany	Investigate the effect of ozone precursors on ozone and particulate matter to assist policy-makers in evaluating the effectiveness of emission controls.

New York. The program sponsors an annual forum for policy-makers and scientists to share information on research initiatives of importance to New York's environmental policy. NYSERDA also plans to commission several research digests for policy-makers.

**• Peer and stakeholder review:**

The 11-member Program Advisory Group represents multiple stakeholders including New York State agencies, environmental groups, and the U.S. EPA. In addition to the PAG, the Science Advisory Committee was formed to provide research project guidance. The six members of the Science Advisory Committee are nationally recog-

**Field station and research sites: existing and planned.**



**TABLE 2: PROJECTS FROM THE ENVIRONMENTAL QUALITY SOLICITATION**

STUDY TITLE	SITE	INSTITUTION	RATIONALE
Source Apportionment of Fine Particle in New York City	New York City, Tuxedo	New York University Medical Center	Identify the sources of PM 2.5 arising from distant sources outside of local control. Study results will be needed in developing State Implementation Plans.
Impact of In- and Out-of-State Power Plants on Semi-volatile Pollutants in New York State	Potsdam, Stockton	Clarkson University, State University of New York	Identify regional sources of fine particles in New York State. Electric generating plants can be a significant source of fine particles. Research will be useful in developing State Implementation Plans for complying with new air quality standards.
Effects of Atmospheric Deposition of Sulfur, Nitrogen, and Mercury on Adirondack Ecosystems	Huntington Forest, Oswegatchie-Black Watershed, Constable, West Clear Ponds, Upper Hudson Watershed, Moose River	SUNY College of Environmental Science and Forestry	Increase understanding of factors retarding recovery of lakes from acid deposition.
Assessing the Effects of Transboundary Air Pollution On New York's Air Quality	Canadian-NYS border, statewide (modeling)	New York State DEC	Enhance ability of DEC to model transboundary pollution impacts. Transboundary pollution into NYS could become an increasingly significant concern with the restructuring of the utility industry and the potential for increased generation in the Midwest.

**TABLE 3: EMEP PROJECTS TO DEVELOP AND DEMONSTRATE AMBIENT POLLUTION MONITORING INSTRUMENTS**

STUDY TITLE	INSTITUTION	RATIONALE
Development and Demonstration of Continuous Ambient Particulate Monitor	Rupprecht and Patashnick Co.	Develop a "continuous" particulate monitor that provides on-site readings of particle mass comparable to readings produced using EPA's PM2.5 Federal Reference Method.
Innovative Instrument for an Ambient Air Particulate Matter Mass Measurement Standard	Rupprecht and Patashnick Co.	Develop a "real-time" mass-based instrument that will provide a standard for the measurement of fine particles in ambient air.



Rupprecht & Patashnick's patented "tapered element oscillating micro-balance" used to take real-time measurements of fine particle mass.

nized experts in atmospheric chemistry, hydrology, ecology, health sciences, statistics, and science-policy integration. The Science Advisory Committee promotes discussion of opportunities for enhanced collaborations among EMEP researchers.

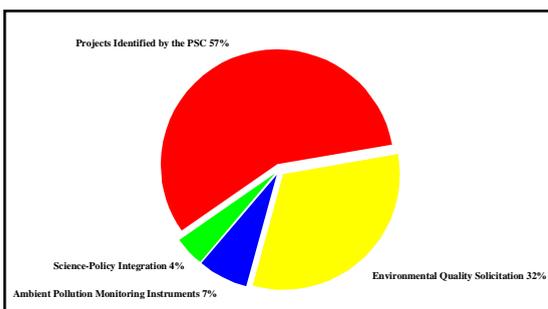
- Supports a New York-based research infrastructure:** A critical objective of the EMEP program is to develop a research infrastructure within New York State that will improve the scientific understanding of electricity-related pollutants and their impacts on the State.
- Leverages additional research resources:** A key consideration in the selection of research projects is the extent of co-funding from other organizations. The EMEP program has succeeded in attracting \$7 million of co-funding from various sources. To date, co-funding represents 54% of the total project costs of almost \$13 million.

Several EMEP projects have been combined under an umbrella program and have leveraged \$3.5 million of EPA funds to establish a Particulate Matter (PM) "Supersite" in New York City. In addition, EPA has selected two EMEP research partners (University of Rochester and New York University Medical Center) as Particulate Matter Health Research Centers.

## RESEARCH PROFILES

### DEVELOPMENT OF A NEW PARTICULATE MASS MONITORING DEVICE

Figure 1: Allocation of EMEP funding.



Rupprecht & Patashnick Co. is collaborating with NYSERDA, a university consortium, and the Center for Advanced Thin Film Technology in a \$1.3

million study (\$450,000 of SBC funding) to develop and demonstrate an instrument that improves on the current, filter-based method, used to measure fine particle mass. As mandated by the EPA, the New York State Department of Environmental Conservation is taking daily measurements of PM<sub>2.5</sub>, at approximately 40 locations throughout the State, using the current method that requires the collection of particles over a 24-hour period. This method is intrinsically inaccurate because the collected particles are exposed to varying conditions of temperature, pressure, and humidity that produce unpredictable effects on the mass of the particles. In addition, filter-based monitors must be weighed, under controlled laboratory conditions, before and after each measurement, increasing monitoring costs.

Benefits of the proposed instrument are: 1) more accurate "real-time" data on ambient air fine particle mass; 2) a less-expensive means for long-term data collection, 3) improved data for use in health effects research, 4) development of effective compliance strategies, and 5) potential future development by New York-based institutions and companies.

### ENHANCED MEASUREMENT OF OXIDANTS, FINE PARTICLES, AND THEIR PRECURSORS

The Atmospheric Sciences Research Center (ASRC) at the University at Albany is a leader in research on the photochemical production of ozone and acid-forming pollutants in the atmosphere. The Center has been measuring ozone and its precursors (various chemicals that react together or with sunlight to produce ozone) at Whiteface Mountain in northern New York since 1980, and at Pinnacle State Park in southwestern New York since 1995. These measurement sites provide the only long-term record of the impact of regional air pollution impacts on New York State.

The \$5 million EMEP research project (\$1.5 million of SBC funding) will expand the measurement activities at the two sites. The project will collect regional ambient air quality data (ozone, ozone precursors, PM2.5) at Whiteface Mountain, Pinnacle State Park, and three urban locations of mutual interest to ASRC and NYS Department of Environmental Conservation.

By increasing understanding of how ozone precursors are related to ozone and particulate matter, and by tracking progress in current emission control programs, the project will provide a scientific basis for decisions in the management of air quality in New York. The data generated by this program, if sustained over the long run, will also help policy-makers assess the consequences of utility deregulation on emission patterns within and upwind of New York State.

## **PROGRAM PERFORMANCE: INITIAL FEEDBACK**

According to a member of the Program Advisory Group, NYSERDA's approach is "very scientifically credible," as demonstrated in peer review and by holding researchers responsible for having their work published in peer-reviewed journals. Also, there has been significant communication between NYSERDA and the U.S. EPA to avoid any redundancies and ensure that empirical data is incorporated into information that the EPA considers when it develops policy.

Members of the Science Advisory Committee view the research program as integrated, policy-relevant, and critical to the development of effective strategies to mitigate the environmental impacts of electric power generation that may actually increase under deregulation. In addition to the positive feedback, the committee has identified two areas for improvement: (1) increased coordination with other regional research projects, and (2) expansions of studies beyond the Adirondacks to include other ecosystems in New York and across North America.

The committee has also expressed the view that the program budget may be too limited to answer the toughest research questions, such as, how reductions in nitrogen emissions affect episodic acidification of lakes and streams.

NYSERDA has incorporated suggestions made by the Science Advisory Board. Program Opportunity Notice 540-00, issued in May 2000, requires the principal investigator to prepare a short paper summarizing the usefulness of the research for policy formulation. To this end, principal investigators are strongly encouraged to collaborate with policy analysts in preparing these papers and use interdisciplinary teams including environmental scientists, social scientists, and public policy analysts.



**The ASRC weather tower on the summit of Whiteface Mountain houses fine particle sampling instruments.**

*"The combined emphasis on ozone, acid deposition, fine particles, and mercury, as well as emphasis on atmospheric and ecosystem processes, will be useful in policy making not only for the State of New York, but for the whole county."*

**– EMEP Science Advisor**

*"There seems to be a nationwide trend for decreasing support of environmental monitoring, despite the fact that the data obtained through monitoring is often the most directly related to key policy questions. I would strongly encourage the EMEP program to maintain monitoring as a key component of the program."*

**– EMEP SCIENCE ADVISOR**

NYSERDA has also asked researchers to document how they synthesize existing data and how they plan to integrate study results across study sites, regions (e.g., Catskills, Adirondacks), and different research groups.

While this research program has a long time horizon, a number of accomplishments deserve attention:

**1. Comprehensive research program:** In little over a year, NYSERDA has established both a Program Advisory Group and a Science Advisory Committee, issued four Program Opportunity Notices, and established a comprehensive portfolio of projects that is on its way to providing useful information for policy decisions.

**2. Science and Policy Conference:** On December 7-8, 1999, the EMEP program co-sponsored a conference that brought together policy makers and scientists to

share information on environmental research initiatives in New York State. This conference represented a significant departure from most scientific conferences in that nearly 200 New York decision-makers and scientists were provided the opportunity to consider and discuss critical policy implications of basic and applied environmental research.

**3. Leveraged Federal Resources:** The EMEP program has already brought millions of dollars in federal resources to address several New York State environmental problems.

These are initial, but nonetheless important steps in a long-term process to (1) develop a scientific community in New York that leads the nation in studying the health and environmental implications of deregulated energy markets, and (2) integrate good science with policy at both the State and federal levels.

*"In general, I found the research program to be of the highest quality. The principal investigators are considered some of the top researchers in the field. The program seems to be ahead of the rest of the field."*

*- EMEP Science Advisor*

For further information about New York Energy \$mart<sup>SM</sup> programs, contact NYSERDA's Communications Department at: (518) 862-1090, ext. 3250; or visit our website: [www.nyserda.org](http://www.nyserda.org)

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