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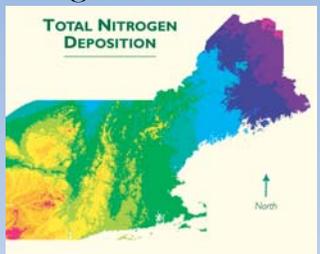


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Reports Evaluate Ozone Modeling, Track Mercury Pollution, Introduce Instrumentation

Three final reports of research sponsored by the Environmental Monitoring, Evaluation, and Protection (EMEP) program have recently been released. In addition to contributing to the base of knowledge about airborne pollution in New York State, two of the reports have implications for policy makers; a third describes a more accurate instrument for monitoring particulate matter.

Assessing the Effects of Transboundary Pollution on New York's Air Quality. New York State Department of Environmental Conservation.

Examining the long-range transport of ozone and its precursors from outside the state using meteorological and air quality databases, researchers found that modeled ozone concentrations from current regional-scale photochemical modeling systems can be skewed by meteorological, emissions, and other model input data. In light of those uncertainties, model simulation periods need to cover longer times than just two-to-three episodic days. The authors believe regulators should consider averaging the model-predicted ozone concentrations over all simulation days instead of using predictions of peak ozone levels on individual days. In addition, model predictions need to be used in the probabilistic form rather than in the deterministic form in evaluating

whether a selected emissions control strategy leads to compliance with air quality standards.

Contributions of Global and Regional Sources to Mercury Deposition in New York State. Atmospheric and Environmental Research, Inc.

This project sought to assess the contributions of local, regional, and global mercury sources to deposition in New York State, and then identify what data are still needed to refine these estimates. A modeling system was used to simulate the atmospheric transport, transformations, and deposition of mercury. Deposition fluxes of mercury were analyzed at three sites—in the Adirondacks, the Finger Lakes, and the Catskills. For the baseline scenario, the model estimates that 11% to 21% of total mercury deposited in New York State originates from within the state; oth-

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October 7–8, 2003
Environmental Monitoring,
Evaluation, and Protection
in New York: Linking
Science and Policy

*See back page
for conference details*

er U.S. states contribute 25–49%; Asia, 13–19%; Europe, 5–7%; Canada, 2–5%; and Africa, South America, Mexico, and Oceania, less than 3% each. Natural sources contributed 16% to 24%. These attribution results must be seen as preliminary, the authors say, because the model performance evaluation showed that mercury wet deposition in the northeastern United States tends to be overpredicted by as much as 50% at some sites.

Major sources of uncertainties that have been identified are mercury emissions (including mercury speciation), the dry deposition of divalent mercury, and for lake mercury cycling models, the sediment burial rate. In addition, knowledge of the atmos-

pheric chemistry of mercury is still incomplete, and laboratory experiments are needed to identify and characterize the most important reactions.

Finally, more mercury measurements—ambient atmospheric concentrations of gaseous elemental mercury, gaseous divalent mercury and particulate divalent mercury; and mercury wet and dry deposition fluxes—are needed to evaluate models. Notwithstanding the uncertainties, this analysis represents the state of the science in understanding mercury fate and transport, and it provides an indication of the relative contributions of local, regional, and global sources of mercury to mercury deposition in New York State.

Development and Demonstration of Continuous Ambient Particulate Monitor (R&P 6400 series), and Development and Demonstration of Innovative Instrument for Ambient Particulate Matter Mass Measurement Standard. Rupprecht & Patashnick Co., Inc.

In this project, the Albany firm Rupprecht & Patashnick refined its sampling instrumentation to measure and monitor ambient PM mass more accurately. More than 150 units have been sold since its introduction to the market in 2000.

To obtain copies of the reports, contact Liz Hanna, ebh@nyserda.org, or visit the NYSERDA website, www.nyserda.org/environment/emereports.html.

About NYSERDA and EMEP

NYSERDA is a public benefit corporation created in 1975 by the New York State Legislature. Its responsibilities include conducting a multifaceted energy and environmental research and development program; administering the New York Energy SmartSM program, a statewide public benefit R&D, energy efficiency, and environmental protection program; making energy more affordable for residential and low-income households; helping industries, schools, hospitals, municipalities, not-for-profits, and the residential sector, including low-income residents, implement energy-efficiency measures; providing energy analysis and planning; managing the Western New York Nuclear Service Center at West Valley; coordinating the State's activities on energy emergencies and nuclear regulatory matters; and monitoring low-level radioactive waste generation and management.

From its inception, NYSERDA has been charged with improving New York's environment, especially in relation to the emissions associated with the generation and consumption of

energy. NYSERDA has monitored electricity generation emissions and advanced nonpolluting renewable sources of energy since its founding. Research on acid precipitation in the Adirondacks and development of fuel cells for transportation are part of NYSERDA's broad portfolio. Environmental efforts include the support of alternative-fuel vehicles, solar energy, biomass, green building technology, and clean energy sources. Recently, NYSERDA has supported photovoltaic installations at commercial and institutional sites and construction of the 30-megawatt Fenner Wind Project, near Syracuse.

The Environmental Monitoring, Evaluation, and Protection (EMEP) program is part of NYSERDA's New York Energy SmartSM program. EMEP supports research to increase the scientific understanding of the behavior, cycling, and interaction of primary and secondary pollutants related to electricity generation (e.g., sulfur oxides, nitrogen oxides, ozone, particulates, mercury) in the environment so that policy makers can identify effective strategies for mitigating



The Fenner Wind Project, built with support from NYSERDA, is the largest wind farm east of the Mississippi River. PHOTO: JENNIFER HARVEY, NYSERDA.

the impacts of energy production and use. The program also supports research that will increase the understanding of the role of local versus regional sources of air pollution in New York State so that more equitable control strategies can be developed.

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Dr. Scott Ollinger, Research Assistant Professor, Complex Systems Research Center, University of New Hampshire

New EMEP Projects

In spring 2003, the Environmental Monitoring, Evaluation, and Protection program awarded contracts for 15 new cost-shared research projects, for a total of more than \$4 million in NYSERDA funds.

Research organization	Project title
Atmospheric Sciences Research Center, University at Albany	Joint Enhanced Ozone and PM Precursor/PM 2.5 Technology Assessment and Characterization Study in New York
E&S Environmental Chemistry, Inc.	Assessment of Extent to Which Intensively Studied Lakes Are Representative of the Adirondack Mountain Region
U.S. Geological Survey	Potential Recovery of Water Chemistry and Stream Biota from Reduced Levels of Acid Deposition at a Sensitive Watershed in the Catskill Mountains
Clarkson University	Workshop on Incorporation of Receptor Models into PM and Adverse Health Effects Study
Wildlife Conservation Society and Adirondack Cooperative Loon Program	Long-Term Monitoring and Assessment of Mercury Based on Integrated Sampling Efforts Using the Common Loon, Prey Fish, Water, and Sediment
U.S. Geological Survey	Quantifying Atmospheric Nitrogen Sources with New Stable Isotope Techniques
Resources for the Future	Multipollutant Policies for the Electricity Sector and Environmental Quality in the Empire State
Clarkson University	Impact of In- and Out-of-State Power Plants on Semivolatile Pollutants in New York State
NYS Department of Environmental Conservation and Adirondack Lakes Survey Corporation	Strategic Monitoring of Mercury in New York State Fish
U.S. Geological Survey, Adirondack Lakes Survey Corporation, and University of Texas	Assessment of Chemistry and Benthic Communities in Streams of the Oswegatchie-Black River Basins of the Adirondack Region
GE Energy & Environmental Research	Fine PM Precursor Emissions from Biofuel Combustion and Distributed Generation Sources
Navigant Consulting, Inc.	Analysis of New Pollution Control Strategy Utilizing Emission Reduction Credits and Small-Scale Combined Heat and Power Units
Rutgers University	Sampling and Analysis of Organic Components of PM in the New York City Area
Navigant Consulting, Inc.	Quantifying the Environmental Benefits of Increased Deployment of Combined Heat and Power Technologies in New York State and the Impact of Proposed Emissions Standards for Small Distributed Generation
University at Albany	Formation and Transformation of Particles in Motor Engine Exhaust

EMEP Research Priorities

To fill the critical gaps in our understanding of pollution, in 2001 the New York State Energy Research and Development Authority (NYSERDA) began considering the direction for environmental research in New York State over the subsequent five years, with a focus on pollution associated with the generation of electricity. More than 30 external stakeholders contributed to the effort.

“The EMEP program should be viewed as a work in progress,” says Program Manager Janet Joseph. As research findings become available and policies are implemented, she explains, it will be necessary to continually revisit and revise the program to ensure that it effectively addresses environmental issues of concern.

Potential users of the plan include NYSERDA, other state, regional, and national research funding organizations, public benefit organizations, scientists, and policy makers. The goal was to identify critical research that would be policy relevant, interdisciplinary and multimedia (air, water, soils), and usable for researchers and policy makers throughout New York State. The targeted research would also leverage related national research to address regional and state needs.

Implementation of the plan’s recommendations will help maximize the use of limited resources. Within the plan, NYSERDA has identified and prioritized research areas to be addressed by the EMEP program, as well as in collaboration with other funding organizations. EMEP will also continue to support long-term monitoring activities in the state.

EMEP research needs fall into three focus areas, representing the major issues related to pollution associated with the generation of electricity:

- atmospheric deposition of sulfur (S), nitrogen (N), and mercury (Hg), and ecosystem response;

- air quality and related health research: particulates (PM), ozone, and copollutants; and
- crosscutting topics.

Acidification and Mercury

Significant gaps in data and research were identified in the areas of acidification and mercury; filling these gaps becomes the challenge to the program:

- Better assess the impact of atmospheric loadings on the State’s ecosystems and develop methodologies to improve the accuracy of dry deposition measurements, since dry deposition often constitutes 50% or more of total deposition of S or N to an ecosystem.

- Increase efforts to assess the extent and severity of effects on base flow and episodic stream chemistry in sensitive watersheds statewide, and establish a baseline from which to assess future recovery.

- Assess effects on sensitive soils with a better characterization of current soil conditions, and in doing so, develop a soil database that supports other research on terrestrial and aquatic effects.

- Assist in mercury source reduction initiatives, identify multiple sources and relative contributions of mercury, and determine mercury ecosystem fluxes, transformation, and transport.

- Continue synthesis studies to in-



Fishing Creek at the Huntington Wildlife Forest is the site of NYSERDA-sponsored ecosystem research projects. PHOTO: MARK WATSON.



Left: Several research institutions, including some that receive funding from EMEP, use the Whiteface Mountain monitoring station in the Adirondacks to track air quality.

PHOTO: UNIVERSITY AT ALBANY ATMOSPHERIC SCIENCES RESEARCH CENTER. Below: NYSERDA supported Rupprecht & Patashnick's development of this real-time, filter-dynamic measurement system for fine particles, which has been field-tested in California.

tegrate existing data and information on the inputs, outputs, and effects of sulfur, nitrogen, and mercury deposition in the state.

Air Quality

The highest priority for air quality research is providing the scientific foundation to develop a state implementation plan (SIP) for complying with the ambient air quality standard for fine particulate matter (PM_{2.5}). This SIP will need to be developed in 2005–2008. Supporting this policy objective involves several research strategies:

- Increase effort on PM_{2.5} source characterization and source-receptor modeling so that sources of PM_{2.5} (emitters of both primary particulates and precursors to secondary particulates) can begin to be identified and control strategies can be developed.

- Increase research related to ammonia and organic contribution to ambient particulate aerosols (which contribute a significant portion of PM_{2.5} mass in New York).

- Better integrate PM health research and field studies (especially building on the wealth of data being collected under the New York PM Supersite program).

- Bring together the PM field studies, survey and monitoring work, and health studies and synthesize the information into a form that will be useful to policy makers. This integrated assessment of PM_{2.5} would start in 2003–2004 and build on the PM Supersite program.

Cross-Cutting Issues

One important cross-cutting, energy-related issue identified during the

comprehensive planning process was the need to better understand the environmental implications of distributed generation. As a result of deregulation and the current energy situation, several kinds of distributed generation equipment are being installed in New York State. The State Department of Environmental Conservation has recently initiated a rulemaking on emissions from such sources. Timely research and analysis on this issue would be extremely useful in developing effective policies and regulations that balance both energy and environmental objectives.

In addition, planners cited a need for more proactive initiatives targeting environmental improvements, including research on mitigation of acidified lakes and the role of biofuels in improving air quality.



NITROGEN POLLUTION

Sources and Solutions

Nitrogen pollution is harming forests, streams, and coastal waters but can be reduced, reports a team of 12 leading scientists in a study released in April. The research, funded in part by NYSERDA, cites air pollution and wastewater effluent as the leading causes of nitrogen pollution to forests and estuaries of the northeastern United States.

“This report confirms the need for cuts in nitrogen oxides...if we want to see healthier people and ecosystems in the next 50 years,” said Sen. James Jeffords (I-VT). The results of the study were presented to the media at the National Press Club in Washington on April 15 and have been published in the journal *BioScience*.

The study synthesizes data on the effects of nitrogen pollution. In some areas forest productivity has been diminished by up to 14% because of nitrogen-induced ozone. In addition, nitrogen-driven pulses of acidity affect approximately 41% of lakes in the Adirondacks and 15% of lakes in New England.

“In all the watersheds we examined, airborne emissions of nitrogen and nitrogen discharged from waste-

water treatment plants were the overwhelming sources of nitrogen pollution to forests and coastal waters in the Northeast,” said coauthor David Whittall of the Hubbard Brook Research Foundation, the group that organized the study.

The authors report that the Clean Air Act Amendments of 1990 will not reduce nitrogen emissions enough to prevent damage to northeastern forests and reverse acid rain effects in lakes and streams. The analysis shows that additional reductions in total nitrogen emissions of 30% or more are needed to reduce nitrogen runoff to less harmful levels.

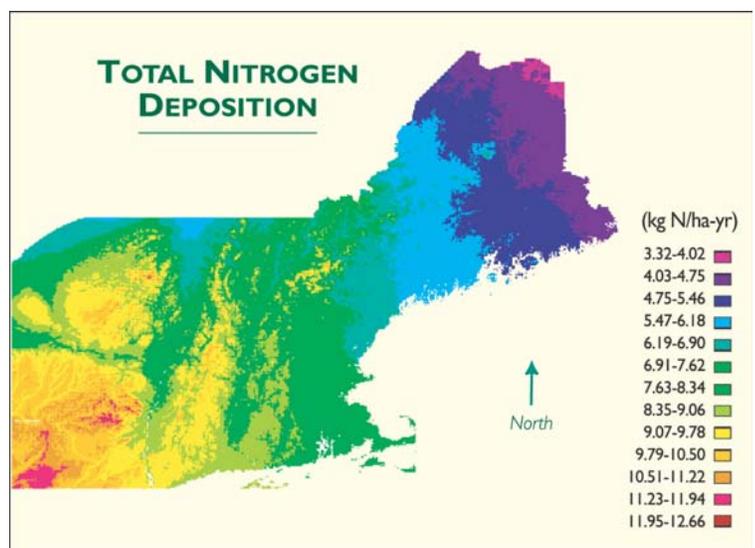
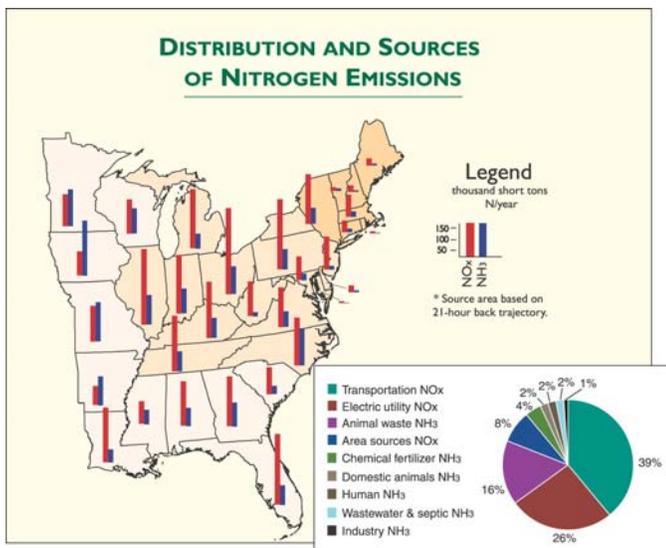
“Despite the reductions in sulfur emissions that have been achieved..., little progress has been made in reducing total emissions of nitrogen,” noted lead author Charles Driscoll, of the Department of Civil and Environmental Engineering at Syracuse University; “airborne nitrogen pollution continues to be a serious problem for Northeast forests and streams.”

The researchers also assessed nitrogen pollution in estuaries, which receive much of the nitrogen produced

in the region’s watersheds. Excess nitrogen can lead to eutrophication of coastal waters, depleting oxygen levels and degrading sea grass habitat.

This study confirms other evidence concerning the severity of nitrogen pollution nationwide and the need for new policies to address the problem. Controls on vehicle and utility emissions of nitrogen oxides result in the largest reductions in airborne nitrogen pollution, according to the report. Additional controls on sulfur emissions from electric utilities are needed to approach chemical recovery from acid rain. The authors say that an integrated plan would achieve the greatest overall reductions.

The paper “Nitrogen Pollution in the Northeastern United States: Sources, Effects and Management Options” can be downloaded from the *BioScience* website, <http://www.aibs.org/bioscienceonline/>. A summary of the *BioScience* article and a report for the general public can be found at www.hubbardbrook.org/hbrf/nitrogen and also on the NYSERDA EMEP webpage, final reports section (www.nyserda.org/environment/emepreports.html).



Research with an Attitude

PROFILE: Daniel J. Jacob, EMEP Science Adviser

Scientific research is a matter of solving puzzles, says Daniel J. Jacob. An EMEP science adviser, he approaches questions of atmospheric chemistry with the strategic thinking of a serious chess player—which he is.

Jacob is the Gordon McKay Professor of Atmospheric Chemistry and Environmental Engineering in the Division of Engineering and Applied Science, Department of Earth and Planetary Sciences, at Harvard University. When he was born in 1958, his father was a postdoc in Brookhaven National Lab. Maurice Jacob's academic career took the family in rapid succession to Caltech, Paris, Palo Alto, New Haven, Chicago, and finally Geneva, where Daniel spent his high school years. His main interest at the time, he recalls, was competitive chess. After graduating in 1975, he attended the Lycee du Parc in Lyon for the Classes Préparatoires aux Grandes Ecoles d'Ingenieurs, an intense regimen that required him to give up chess (though he still relishes the challenge and will take on all comers).

He was admitted to the Ecole Supérieure de Physique et Chimie in Paris in 1977 and graduated as a chemical engineer in 1980, though he confesses to having little interest in his studies. He sang and played guitar in a rock band—"of questionable talent," he says—and dabbled in politics, "an



Daniel and Janice Jacob.

unhealthy pastime which I now regret." In his final year there, however, he spent a semester doing research on solar cells at Rhone Poulenc. The work engaged him, and he began to seriously consider a career in research.

Concern about the environment drew him to environmental engineering. On the recommendation of his father, he completed a one-year master's in environmental engineering at Caltech. "A young French guy in LA is in Candyland," Jacob says, "and I had a wonderful time."

While at Caltech working on his Ph.D., he grew increasingly passionate about research. "It was during that time," he says, "that I got to develop an attitude toward research. Research is puzzle solving, it is play; if you think of it as a job, you should do something else."

He also discovered that a research career was a good match for his personality—his competitive nature, ability to focus, and tendency to question authority. He graduated in 1985 and joined the faculty at Harvard in 1987.

With Jennifer Logan as his coleader, Jacob has formed the Harvard University Atmospheric Chemistry Modeling Group, whose goal is to understand the chemical composition of the atmosphere and its perturbation by human activity. The group works on global three-dimensional modeling of atmospheric chemistry and climate change, aircraft measurement campaigns, satellite data retrievals, and analyses of atmospheric observations.

He enjoys outdoor sports with his wife Janice and their two sons. A dual citizen of the United States and France, he takes his family back to France every summer. "My paradise is the village of Prefailles in Brittany, where I spent all my summers as a child," Jacob says. "It's the most beautiful spot on earth."

continued from page 2

To provide better environmental data for decision making, EMEP helps companies in New York develop and commercialize improved instrumentation to measure pollutants associated with electricity generation. In addition, it provides a forum for policy makers and scientists to share information on critical environmental research initiatives in New York to max-

imize the value of limited research dollars and increase the relevance of environmental research to policy makers.

Funds for NYSERDA's programs come from a system benefits charge paid by the State's investor-owned utilities and are administered under an agreement with the Public Service Commission.



EMEAP team members include, from left, Senior Project Manager Barry Liebowitz, Program Manager Janet Joseph, Project Manager Ellen Burkhard, and Senior Project Manager Mark Watson.

Upcoming Conference: Linking Science and Policy

On October 7–8, policy makers and nationally renowned scientists will share information on environmental research initiatives in New York State. The conference, “Environmental Monitoring, Evaluation, and Protection in New York: Linking Science and Policy,” highlights the New York Energy SmartSM Environmental Program, which provides policy-relevant research to improve our understanding of environmental pollution related to electricity generation.

Come learn about...

- the latest research findings on fine particles, ozone, acid rain, mercury deposition, and nitrogen in New York State
- energy-related environmental policy initiatives
- pollution control

Sponsors: New York State Energy Research and Development Authority • New York State Department of Public Service • New York State Department of Environmental Conservation • New York State Department of Health • U.S. Environmental Protection Agency • U.S. Geological Survey • Adirondack Council • Center for Clean Air Policy • Clean Air Task Force • Environmental Energy Alliance of New York • New York Academy of Sciences • Northeast States for Coordinated Air Use Management

The conference will be held at the Albany Marriott, 189 Wolf Road, Albany. For more information, call toll-free 1-866-NYSERDA, or visit us on the web at www.nyserdera.org.

2001 Proceedings Now Available

Proceedings of the 2001 EMEP Conference have been published in a special edition of *Environmental Pollution* (volume 123, issue 3). This special edition of a peer-reviewed selection of conference papers has been sent to all conference attendees. A few additional copies are available from NYSERDA. Please send your requests to Liz Hanna, ebh@nyserdera.org.



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