AIR QUALITY


**PRINCIPAL RESEARCHERS**

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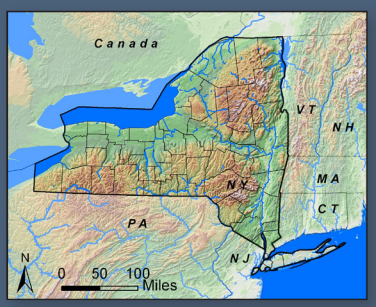
**PROJECT LOCATION**

New York State




Source: E&S Environmental Chemistry, Inc.


**CONTACT INFORMATION**

For more information on this project, go to:
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PROJECT NUMBER 10600

**KEYWORDS**

- Air quality
- Modeling
- Multi-pollutant
- NAAQS
- Public health

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New York Energy $martSM EMEP Environmental Monitoring, Evaluation, & Protection

NYSERDA New York State Energy Research and Development Authority

# Applying the Northeast Regional Multi-Pollutant Policy Analysis Framework to New York

## PROJECT FOCUS

The primary focus of this project is to tailor and improve inputs to the Multi-pollutant Policy Analysis Framework (MPAF) developed by the Northeast States for Coordinated Air Use Management (NESCAUM), for use in New York State. The resulting enhanced modeling framework will help policy analysts at the New York State Department of Environmental Conservation (NYSDEC) to more comprehensively assess emissions reduction measures proposed to achieve air quality targets for ozone ($O_3$) and fine particles ($PM_{2.5}$), and to reduce the negative effects of acid deposition and climate change. Additionally, the project team will model and assign monetary value to the public health and regional economic benefits associated with various emissions reduction strategies; improve climate change modeling; and promote the future use of integrated modeling frameworks in air quality planning in New York, the eight-state NESCAUM region, and states outside the region.

## CONTEXT

New York State has established numerous air quality goals and targets, including attaining and maintaining health-based National Ambient Air Quality Standards (NAAQS) for $O_3$ and $PM_{2.5}$; minimizing air toxics and their associated public health risks; further reducing acid deposition to facilitate ecosystem recovery; meeting regional haze program visibility targets and deadlines; and minimizing and stabilizing climate change by reducing greenhouse gas emissions. Traditionally, the state has addressed air quality concerns on a pollutant-by-pollutant basis. However, this approach often fails to consider interactions among pollutants and their sources. To meet the State's air quality goals most effectively, policymakers must be able to accurately model the potential impacts and interactions of various policy options.

## PROJECT IMPLICATIONS

New York State policymakers may choose from a variety of possible approaches to achieve the State's air quality objectives. However, due to the complexity of pollutant interactions, it is difficult to compare the costs and benefits of various policy options on a pollutant-by-pollutant basis. This project will develop a modeling framework that will permit policymakers to more easily assess the economic and environmental effects of each policy. Specifically, the framework will enable policy analysts at NYSDEC to perform multi-pollutant assessments of various potential emission reduction measures to simultaneously address multiple climate and air quality goals. The framework will also aid in the evaluation of regional impacts, making it a useful tool for the Northeast.

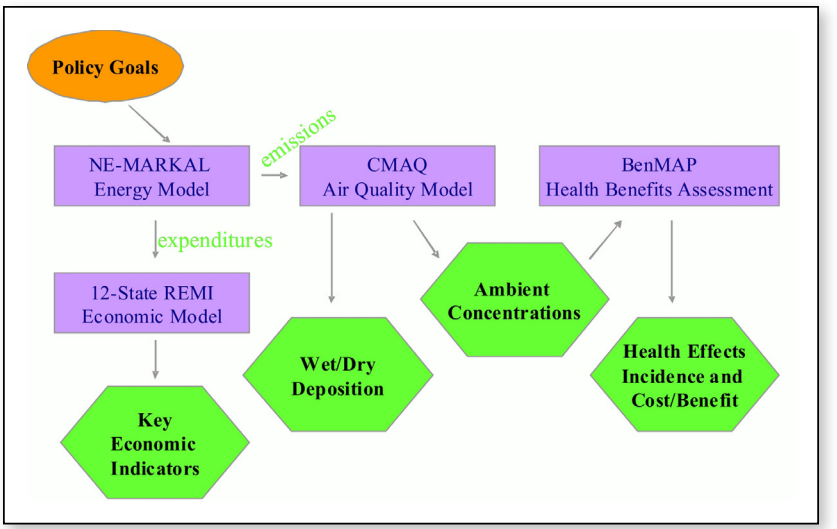
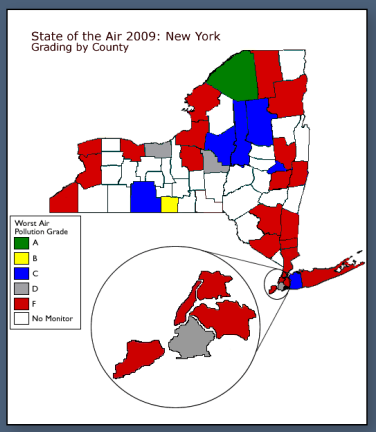



Figure 1. Schematic of NESCAUM Multipollutant Policy Analysis Framework. Source: NESCAUM.

**PROJECT STATUS**
Ongoing

Valley fog and pollution near Pittsburgh, PA. Source: NOAA's National Weather Service (NWS) Collection.




New York ozone and particulate matter air pollution by county. Counties are graded on their ambient air quality measured over three years, 2005-2007, based on the U.S. EPA air quality index. Source: American Lung Association in New York.

Since 1975, the New York State Energy Research and Development Authority (NYSERDA) has developed and implemented innovative products and processes to enhance the State's energy efficiency, economic growth, and environmental protection. One of NYSERDA's key efforts, the Environmental Monitoring, Evaluation, and Protection (EMEP) Program, supports energy-related environmental research. The EMEP Program is funded by a System Benefits Charge (SBC) collected by the State's investor-owned utilities. NYSERDA administers the SBC program under an agreement with the Public Service Commission.

## METHODOLOGY

The NESCAUM investigators and their NYSDEC and NYSERDA colleagues will first review federal, State and regional air quality goals, and then assess emission reduction strategies that could be used to achieve them. These goals and strategies will be represented in the regional MPAF modeling system (Figure 1), including all necessary data and constraints to allow the model to properly consider control technology options, costs, and associated emissions. The project team will also integrate and make use of several other tools and databases, including the Northeast Market Allocation Model (NE-MARKAL) (Figure 2); the Regional Economic Model, Inc. (REMI); the Sparse Matrix Operator Kernel Emissions (SMOKE) Modeling System; the Community Multi-scale Air Quality (CMAQ) model; and the Environmental Benefits Mapping and Analysis Program (BenMAP).

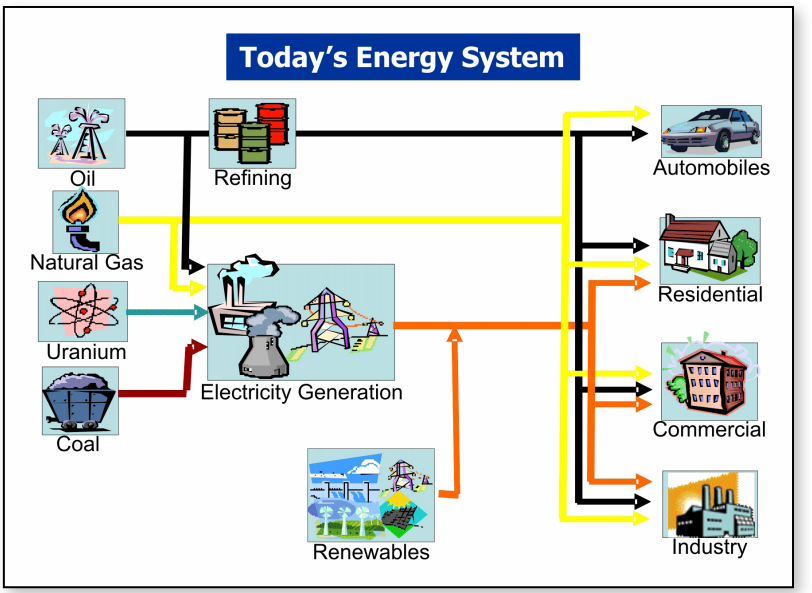



Figure 2. Schematic of NE-MARKAL highlighting the five sectors (transportation, residential, commercial, industrial and electricity generation) and their energy interconnections. Source: U.S. EPA Office of Research and Development.

Using the enhanced modeling framework, researchers will assess a series of scenarios using the possible emission reduction measures and strategies developed earlier in the study. Potential solutions, trade-offs, and cross-sector interactions will be analyzed. The enhanced MPAF model will generate least-cost solutions that achieve multi-pollutant targets and associated environmental-public health benefits. Additionally, the model will include economic analysis of anticipated public health benefits. Finally, researchers will identify policy challenges and capacity building needs that should be addressed for states to successfully use these tools in the future.

## FINDINGS

A reference case was established to represent the current and "business-as-usual" future states of the energy system in New York State. Researchers, for example, confirmed that each electric generating unit (EGU) facility was properly characterized over the historical period of the model (2002-2008), in addition to incorporating information on planned retirements of existing EGUs, or construction of new ones. Emissions of major pollutants (e.g.sulfur dioxide ($SO_2$) and nitrogen oxide($NO_x$)) for all sectors were calibrated to an existing emissions inventory developed for air quality modeling (MANE-VU 2002). This baseline calibration provides a key link between NE-MARKAL output and input for use in future air quality modeling.

With the reference case completed, policies that affect the energy system can be introduced to NE-MARKAL to assess their potential effect on future emissions. NYSDEC and NYSERDA staff developed a list of policies to input into the NE-MARKAL model, primarily focused on the transportation and electricity generation sectors. These policies were then characterized in the model and the project team is currently assessing their effects on a policy-by-policy basis.

Once each policy has been reviewed individually, the team will determine a suite of policies to be run collectively. This will improve understanding of the interactions among different policies. Two scenarios (suites of policies) will be developed to represent potential approaches that air quality planners might consider. The potential future emissions will be assessed and used in air quality model analyses. Resultant projected pollutant concentrations will then be input into BenMAP to model the public health impacts associated with each policy scenario.