

Assessment Tools for Ozone, Particulate Matter, Regional Haze and Atmospheric Deposition - Program 91

Program Overview

Program Description

Implementation of regulatory programs under the Clean Air Act requires the development and application of rigorous air quality models, accurate ambient measurements, and the use of additional assessment tools based on credible atmospheric science. Improved techniques are needed for estimating emissions from various sources and for determining the impact of interstate pollution. These tools and techniques will enable informed rulemaking processes for attainment of National Ambient Air Quality Standards, development of state implementation plans (SIPs), and determinations of Prevention of Significant Deterioration during permitting of power plants. The industry also needs an enhanced understanding of how atmospheric chemical reactions, especially those involving power plant emissions, influence the formation, composition, and health effects of air pollutants. Developing air quality models, improving emissions inventories, and ensuring accurate measurements of air quality, visibility, and deposition are at the focus of the Electric Power Research Institute's (EPRI's) air quality assessment tools program.

This program helps members, policymakers, regulators, and other stakeholders develop scientifically sound air quality management policies and plans to improve air quality and protect public health. The program provides information and tools that enable cost-effective environmental compliance by allocating emission reductions among sources in a manner that will more effectively lead to attainment of air quality standards.

Research Value

Air quality rulemaking continues to be a key issue for power plant owners and operators. Through this program, EPRI advances the science supporting air quality models used for policy development, regulatory decision making, and implementation planning. Timely communication materials facilitate members' ability to respond to questions raised by policymakers, regulators, and other stakeholders. Program research also informs environmental compliance activities, asset management, and long-term strategic planning by members. With this research:

- policy and regulations will benefit from EPRI's high-quality scientific data and modeling tools;
- developers of public policy/regulations will have adequate resources to fully examine all emissions and sources, resulting in effective policies or regulations;
- analysis of additional regulatory options and evaluations of the effectiveness of proposed policies will be performed;
- detailed scientific perspectives on environmental policy and regulatory deliberations of power plant emissions will be provided; and
- collaborations on multimedia environmental issues (such as climate change and water quality/availability) and assessment of new technologies (such as electric transportation and distributed energy resources) will increase.

Approach

Research products include air quality models and ambient measurements that clarify how emissions from different sources contribute to the formation of ozone, particulate matter, regional haze, and atmospheric deposition. Additional products include research on atmospheric chemistry and ambient measurement methods essential to allow health scientists to identify the most harmful air pollution components. These tools are provided to the research and regulatory communities, and their use is encouraged. This program delivers

- independent, objective technical experts who can effectively work with regulatory agencies and the environmental science community;

- the most advanced air quality models with the most accurate representation of power plant emissions and their chemistry and transport in the atmosphere;
- multimedia research on the interactions between air quality and climate change, as well as between air quality and watershed management;
- improved techniques for estimating point and nonpoint emission sources; and
- atmospheric measurements that identify air pollution components associated with adverse health impacts to inform development and application of modeling tools and source-receptor analysis techniques.

Accomplishments

Advanced air quality models and assessment tools based on atmospheric science are critical to informing state and federal air quality management actions in response to more-stringent air pollution standards.

Program accomplishments include the following:

- Assessed environmental impacts of plug-in hybrid electric vehicles
- Developed and received regulatory acceptance of a new algorithm for more-realistic accounting of contributions to regional haze
- Evaluated changes in nitrogen deposition due to power plant emissions controls
- Clarified the role of acids in the formation of secondary organic aerosol, and improved representation in air quality models
- Ensured that the Southeastern Atmospheric Research and Characterization (SEARCH) Network continues to yield valuable information for evaluating poorly represented sources, understanding trends, evaluating models, and providing information for health studies
- Implemented an advanced plume-in-grid module to better characterize specific impacts of power plant emissions on ozone, PM, and atmospheric deposition
- Highlighted the importance of transboundary pollution in regional haze considerations

Current Year Activities

Program R&D for 2010 will focus on the development and application of air quality assessment tools during a significant time in U.S. environmental rulemaking. Key collaborations with EPRI programs on electric transportation and energy storage and on global climate change will be crucial in order to inform policymakers, regulators, and other stakeholders.

- Enhance air quality models and apply those models in regulatory case studies to clarify the contribution of power plants to ozone, PM, haze, and atmospheric deposition
- Conduct additional experiments to enhance understanding of contributions to regional haze from various emission sources
- Continue to provide comprehensive information on PM sources, chemistry, and composition essential to understanding air quality health effects
- Improve emissions inventories of highly uncertain categories
- Continue developing improved modules to represent organic PM in air quality models
- Develop linkages between air quality and watershed models to assess the contribution of atmospheric deposition from different sources to sensitive ecosystems and waterways
- Collaborate with EPRI programs in electric transportation and energy storage and in global climate change to inform the potential benefit of new technologies and the impact of climate policies on air quality

Estimated 2010 Program Funding

\$2.0M

Program Manager

Eladio Knipping, 650-855-2592, eknippin@epri.com

Summary of Projects

| Project Number | Project Title | Description |
|----------------|---|---|
| P91.001 | Air Quality Model Development, Evaluation and Application | This project enhances the development and application of comprehensive atmospheric models to better inform air quality policies or implementation plans for compliance with air quality regulations. |
| P91.002 | Regional Haze Studies | This project provides critical information for improving the implementation of the Regional Haze Rule, focusing on rigorous and realistic assessments of the contributions of various emission sources to visibility degradation. |
| P91.003 | Improving Emission Inventories | This project will improve the modeling tools, techniques, and emission factor data used to create emission inventories, focusing on ozone and particulate matter precursors from the most uncertain emission sources. |
| P91.004 | Air Quality Measurements and Analysis | This project will improve the detail, spatial resolution, and temporal resolution of atmospheric measurements and related analyses through small-scale field sampling events or as part of larger collaborative field studies. |
| P91.005 | Atmospheric Deposition and Ecosystem Impacts | This project will improve the detail, spatial resolution, and temporal resolution of atmospheric measurements and related analyses through small-scale field sampling events or as part of larger collaborative field studies. |
| P91.006 | Global Change and Air Quality | This project will evaluate whether global change as projected may have a meaningful impact on air quality over the next ten to fifteen years, a time-frame relevant to air quality management. |
| P91.007 | Communications | This project will enhance the value of EPRI research by actively communicating results to members and other key stakeholders, particularly federal and state government policymakers and regulators. |

P91.001 Air Quality Model Development, Evaluation and Application (P21294)

Key Research Question

In response to increasingly stringent environmental regulations, there is a continuing need to enhance three-dimensional air quality models in their representation of the atmospheric chemistry and transport of ozone, particulate matter, regional haze, and atmospheric deposition. These enhancements aim to improve model performance in real-world applications, such as the development of air quality policies or implementation plans (i.e., control strategies) for compliance with air quality regulations. Current air quality models lack an appropriate representation of organic particulate matter, which can be as prevalent as sulfate particles in urban areas and can contribute significantly to regional particle levels. Pertinent to health-oriented studies, these models also do not simulate ultrafine particles well. There is also a critical need to improve the simulation of near-field emissions in urban landscapes by developing new methods to capture sub-grid-scale impacts, which may dominate air quality at a particular site. Many air quality models still lack an embedded plume-in-grid module, a feature that is needed for accurate simulation of the chemistry and transport of power plant emissions. Enhanced models developed in this project will provide the best available tools to stakeholders for developing plans in order to attain ozone and particulate matter standards and meet regional haze goals. For example, these models can be used to assess different control technology and control strategy options. In addition to three-dimensional models, this project will also evaluate the use of receptor models in air quality management. Receptor models interpret measurements of physical and chemical properties pertinent to air quality taken over time at a particular location (the *receptor*) to quantify the

contributions from different sources. Receptor models have been shown in the past to effectively estimate source contributions for primary pollutants and particulate matter. However, in their current state, these models are inappropriate for determining the contribution of sources to levels of secondary pollutants, such as sulfates and nitrates. Nonetheless, the models are widely used ostensibly to identify sources contributing to secondary particulate matter and are applied in weight-of-evidence attainment demonstrations.

Approach

This project develops and evaluates computational air quality models. It enhances model capability and reliability for air quality management applications. Advancing the science and thoroughly evaluating the models increases confidence in their use for environmental policies and regulations development. In addition, this project applies the models to regulatory case studies and helps regulators understand which sources contribute to ozone, particulate, regional haze, and atmospheric deposition. Major project activities include

- development of enhanced modules for accurately simulating the different components of particulate matter, especially organic particles, in air quality models;
- enhancement of EPRI's advanced plume-in-grid module in order to better characterize the impact of power plant emissions on ozone, particulate matter, and atmospheric deposition;
- improvements to modules simulating cloud chemistry and processing of gases and particulate matter;
- development and evaluation of superior air quality modeling systems for simulating the chemistry, transport, and deposition of atmospheric gases and particles in the environment;
- model applications to examine the latest regulatory issues pertaining to ozone, particulate matter, regional haze, and atmospheric deposition;
- evaluation and application of various receptor models and data analysis techniques to apportion atmospheric pollutants to different sources in specific U.S. locations; and
- review of different receptor models to document strengths and weaknesses of each model and development of guidance on proper use and appropriate interpretation of the results.

Impact

- EPRI's advanced plume-in-grid modules will help electric companies—as well as decision makers and other stakeholders—to better characterize the impact of power plant emissions on ozone and particulate matter formation and atmospheric deposition.
- Advancing the science within these models and evaluating them thoroughly increases confidence in their use for developing future environmental policies and regulations.
- Applications of the models in regulatory case studies will help regulators understand which sources contribute to ozone, particulate, regional haze, and atmospheric deposition.
- Case studies using these models could result in more cost-effective rules, as regulators could replace overly simplistic assumptions in existing tools with air quality models based on credible, sound science.
- EPRI research will provide guidance on the proper use of receptor models and appropriate interpretation of results.

How to Apply Results

EPRI members and other stakeholders can apply and use enhancements in air quality models in several ways:

- Air quality models can be used by members or their consultants for applications pertinent to the operation of their facilities.
- Air quality models can be used by federal and state agencies when developing environmental policies and regulations.
- Air quality models can be used by regulatory agencies in development of state implementation plans to meet air quality goals.
- Modules developed by EPRI in other modeling systems can be adopted into air quality models.

EPRI will facilitate regulatory approval of models and their enhancement by working in collaboration with federal regulatory agencies and submitting the model enhancements for formal review and adoption. Members can increase the probability of use of EPRI models by working cooperatively with state regulators and encouraging the use of those models. EPRI will also work with members in developing cooperative projects that enhance application and use of these models. In addition, EPRI will facilitate broader use and awareness of the EPRI modeling results by providing timely communication materials, including content available through EPRI's public Internet site, and through continuing service on various advisory panels.

2010 Products

| Product Title & Description | Planned Completion Date | Product Type |
|---|-------------------------|-----------------|
| <p>Case Study: Contributions of Emission Sources to Ozone and Particulate Matter Concentrations: The EPRI modeling framework will be applied to examine how different control strategies might be able to meet new air quality standards for ozone and particulate matter promulgated by the U.S. Environmental Protection Agency (EPA). Both local and regional controls will be considered in developing control strategies. Evaluating both regional and local controls will aid understanding of how different emissions contribute to nonattainment designations and which controls are most effective in order to meet new air quality standards. The results will be published in a technical report and communicated to key stakeholders, including regulators and policymakers in federal and state agencies.</p> | 12/31/10 | Peer Literature |

P91.002 Regional Haze Studies (103321)

Key Research Question

EPA's Regional Haze Rule (RHR) is a long-term regulation that requires visibility in Class I areas to return to natural levels by 2064. In attributing haze to emissions from a specific source, an important step is calculating the relationship between fine particle composition and haze by estimating how much light is scattered or absorbed by sulfate, nitrate, organic materials, black carbon, and other particulate matter components. EPRI's research developed a new algorithm for calculating haze indices and attributing haze levels to specific components. This algorithm has been accepted by EPA. Many outstanding issues still remain in understanding the relationship between particle composition and haze, and further research is needed. These issues will be addressed by collection of new particle and visibility data at Class I areas and by focused laboratory studies. Another key parameter in the RHR is the definition of natural visibility conditions for each Class I area that must be achieved by 2064. EPA's definition of this endpoint does not include transboundary anthropogenic pollutants, as well as new science pertinent to understanding naturally occurring levels of particles contributing to haze. Although EPRI research has demonstrated that states need to recognize the importance of transboundary pollution when developing plans for meeting regional haze progress goals, significant uncertainty remains in estimating the transboundary contribution of organic aerosol concentrations.

Approach

EPRI research has played a crucial role in developing a new approach to implementing the RHR and its adoption by EPA. However, many outstanding issues still remain in understanding regional haze impacts from different sources, and further research is needed. These issues will be addressed by collection of new particle and visibility data at Class I areas and by focused laboratory studies. There is a need to conduct experiments at different sites to obtain a robust dataset that can be used to resolve the outstanding issues. The experiments need to be completed in the next three years so that there is collective data that can be synthesized to provide information for further improving regional haze rule implementation methodology prior to the second implementation phase of the RHR, with a sufficient lag time to allow for dissemination of results and for scientific and stakeholder review. EPRI research on these issues will provide a more rigorous and realistic assessment of the contributions of various emission sources to visibility degradation in Class I areas.

Specific tasks include

- new advanced experimental studies at various national parks during different seasons to provide data that will be used to further develop better understanding of the contribution of different sources to regional haze; and
- focused experimental studies to understand how field and laboratory protocols used to measure, collect, and analyze particulate matter may bias estimates of regional haze.

Impact

- Improves decision making by developing advanced methods for attributing haze to specific sources
- Provides a more rigorous and realistic assessment of contributions from various emission sources to visibility degradation in Class I areas
- Informs state agencies about haze in general—and the contribution of power plants to haze in particular—as the agencies prepare state implementation plans aimed at defining the most cost-effective measures to address local and regional air quality concerns

How to Apply Results

Members are encouraged to communicate project results widely. Members should be proactive in sending results to key stakeholders, making sure that stakeholders understand the results, and suggesting that these results be considered in development of environmental policies, including standards, state implementation policies, and other regulatory decisions. EPRI staff will work with members to these ends. In addition to member efforts, EPRI will facilitate broader use and awareness of the results by briefing key stakeholders, including regulatory and other government agencies; developing materials for the trade press/media; keeping EPRI's public web page current; and continuing service on various advisory panels.

2010 Products

| Product Title & Description | Planned Completion Date | Product Type |
|--|-------------------------|-----------------|
| Evaluation of Field and Laboratory Protocols Applied for Regional Haze Rule Regulation: This deliverable will complement the above studies with focused experimental studies to understand how field and laboratory protocols used to measure, collect, and analyze particulate matter may bias estimates of regional haze. | 12/31/10 | Peer Literature |

P91.003 Improving Emission Inventories (052314)

Key Research Question

Accurate emission inventories are essential to designing sound control strategies to mitigate air pollution. Power plant emissions of SO₂ and NO_x are currently measured with continuous emission monitors (CEMs). However, emissions from many source categories— particularly those associated with on-road and nonroad mobile sources and agriculture—are estimated using computer models based on limited and often obsolete data. Emissions from other categories, such as local industrial sources, are not regularly monitored or modeled and are often missing from inventories at this time. These issues can allow for large uncertainties in emissions estimates and thus in three-dimensional air quality models, which rely on emissions inventory data as inputs. These uncertainties in emissions can lead to incorrect allocation of the relative contributions of various sources to pollutant concentrations in the atmosphere. Since air quality management practices rely on use of the air quality models, these issues can affect subsequent policymaking and regulatory processes.

Approach

Current methods for estimating, rather than measuring, emissions can impact air quality assessments based on emissions inventory data, and thus dramatically affect subsequent policymaking and regulatory processes. This project will improve the modeling tools and techniques used to create emission inventories, as well as the emission factor data used as inputs to these inventory calculations. Emissions of ozone precursors (volatile organics and nitrogen oxides) as well as particulate matter precursors (such as sulfate, nitrate, and ammonia), are of interest. The focus will be on sources with the most uncertain or limited amount of available emissions data, and could include both modeling and measurement studies. Improvements to on-road and nonroad mobile emission source models will continue, with a focus on updating engine activity patterns and emissions of nitrogen oxides and particulate matter. Volatile organic emissions will be studied as opportunities arise. Investigations of sources of nitrogen-containing chemicals (such as ammonia) through improved measurement techniques (such as those developed through the Technology Innovation program) or inverse modeling studies will help clarify particulate matter concentrations and transformations.

Impact

- Expands knowledge of emissions sources of uncertain magnitude that contribute to ozone and particulate matter levels
- Investigates options for potential emissions offsets for electric utilities resulting from vehicle/engine replacement or other actions.
- Improves decision making by helping to determine the extent to which different sources are contributing to air pollution, enabling electric utilities, other industry, regulators, policymakers, and other stakeholders to determine the most efficient, cost-effective measures to address local and regional air quality concerns

How to Apply Results

Members are encouraged to communicate project results widely. Members should be proactive in sending results to key stakeholders, making sure that stakeholders understand the results, and suggesting that these results be considered in development of environmental policies, state implementation plans, and other regulatory decisions. EPRI staff will work with members to these ends. In addition to member efforts, EPRI will facilitate broader use and awareness of the results by briefing key stakeholders, including regulatory and other government agencies; developing materials for the trade press/media; keeping EPRI's public web page current; and continuing service on various advisory panels.

2010 Products

| Product Title & Description | Planned Completion Date | Product Type |
|--|-------------------------|-----------------|
| Evaluation and Improvement of Emissions Inventories: This product will provide information to improve mobile source emissions by updating engine activity patterns and emissions of nitrogen oxides, volatile organics, and particulate matter, as well as emissions of nitrogen-containing chemicals, such as ammonia, through measurement and modeling studies. | 12/31/10 | Peer Literature |

Future Year Products

| Product Title & Description | Planned Completion Date | Product Type |
|---|-------------------------|-----------------|
| Evaluation and Improvement of Emissions Inventories: This product will provide information to enhance knowledge and improve tools and techniques for estimating emissions from the most uncertain source categories to allow for an improved air quality management decision-making process. | 12/30/11 | Peer Literature |

P91.004 Air Quality Measurements and Analysis (069212)

Key Research Question

Improving the detail and resolution of atmospheric measurements is essential for understanding the various transformation processes of emissions in the atmosphere and best representing those processes in atmospheric models. It is also crucial for studying the human health and ecosystem effects of air pollution. High quality, highly time resolved measurements are required for evaluation of three-dimensional air quality modeling tools. Such measurements also provide the necessary input to source-receptor models, which are used in weight-of-evidence analyses to determine sources contributing to pollution at a receptor site. However, most modeling studies rely only on ambient measurements from national monitoring networks, which for particulate matter and its constituents are often taken only as 24-hour average or cumulative measurements, which can obscure or miss rapid changes in atmospheric composition and processing. In addition, these networks typically use instruments designed first and foremost to be easy to operate and maintain, many of which are becoming increasingly outdated. Often, these methods may not provide the highest quality data in terms of chemical specificity, detection limits, or number of chemicals measured. Finally, static networks cannot cover all spatial and temporal locations of interest. Lack of high-resolution measurement data implies that air quality models are not subject to rigorous evaluation, and use of those models can result in misinterpretation of model results with subsequent impacts to air quality management strategies.

Approach

EPRI research on atmospheric measurements, their interpretation, and relevant instrumentation has played a key role in conducting health studies, developing and validating air quality modeling tools, and determining applicability of source attribution and receptor modeling analyses. This project will continue to improve the detail and spatial and temporal resolution of atmospheric measurements through both planned projects and projects of opportunity. Planned projects would include small-scale field sampling events that supplement the work performed at heavily instrumented sites of interest. An example of such projects is the 2008 August Mini-Intensive Gas and Aerosol Study to investigate interactions of biogenic and anthropogenic emissions, which leveraged resources available in the SEARCH network. Alternatively, EPRI will participate in specialized field studies in collaboration with government agencies or research institutions. This work will complement and extend the existing suite of atmospheric measurements, allow for critical evaluation of measurement techniques and data analysis/interpretation, allow flexibility to address unanticipated questions by nature of the collaborative efforts, and take advantage of large multiresearcher datasets.

Impact

- Improves the detail and resolution of atmospheric measurements, enabling health researchers to determine how the various components of air pollution contribute to observed health effects in the environment and informing the development and application of air quality modeling tools and source-receptor analysis techniques
- Provides comprehensive data from state-of-the-art measurement techniques to complement or improve upon those that are available in current national monitoring networks and databases and that are used for determining air quality and management strategies
- Enhances knowledge about the various sources contributing to air pollution, enabling electric utilities, industry, regulators, policymakers, and other stakeholders to determine the most efficient, cost-effective measures to address local and regional air quality concerns

How to Apply Results

Members are encouraged to communicate project results widely. Members should be proactive in sending results to key stakeholders, making sure that stakeholders understand the results, and suggesting that these results be considered in development of environmental policies, including standards, state implementation plans, and other regulatory decisions. EPRI staff will work with members to these ends. In addition to member efforts, EPRI will facilitate broader use and awareness of the results by briefing key stakeholders, including

regulatory and other government agencies; developing materials for the trade press/media; keeping EPRI's public web page current; and continuing service on various advisory panels.

2010 Products

| Product Title & Description | Planned Completion Date | Product Type |
|--|-------------------------|-----------------|
| Advanced Air Quality Measurements and Analysis: This product will incorporate information to assist in analyzing the interactions and contributions of emissions sources on air quality by using results obtained through the deployment of advanced instrumentation. | 12/30/10 | Peer Literature |

Future Year Products

| Product Title & Description | Planned Completion Date | Product Type |
|--|-------------------------|-----------------|
| Advanced Air Quality Measurements and Analysis: This product will allow implementation of enhanced measurement and analysis techniques to better inform air quality management decisions. | 12/31/11 | Peer Literature |

P91.005 Atmospheric Deposition and Ecosystem Impacts (069213)

Key Research Question

Atmospheric deposition of acids and nutrients can influence the biogeochemistry of ecosystems. Deposition of several atmospheric pollutants can lead to acidification, which has been associated with a decline in forest tree species and loss of biodiversity in aquatic ecosystems. Nutrient deposition has been associated with disruption in the biodiversity of ecosystems and eutrophication of waterbodies, which can contribute to toxic algal blooms and fish hypoxia. In the past several years, there has been increasing focus by the regulatory and scientific community on atmospheric deposition as it relates to acid and nutrient loading in ecosystems. EPA has assembled an Integrated Nitrogen Committee under its Scientific Advisory Board and is emphasizing ecological impacts in the consideration of secondary standards for SO₂ and NO_x by the Clean Air Scientific Advisory Committee. Despite the renewed interest in these ecological impacts, the tools used to evaluate atmospheric deposition are inadequate to inform current decisions and policies. EPA relies on wet deposition networks with no consideration for dry deposition, and it uses static modeling tools (i.e., tools that cannot be reconfigured to explore "what-if" scenarios and evaluate the nonlinear impacts of control strategies) to inform policymaking, such as the determination of total maximum daily loads (TMDLs). Moreover, the Federal Land Managers' Air Quality Related Values Work Group (FLAG)—a coalition of EPA, the National Park Service, the U.S. Fish and Wildlife Service, and the U.S. Forest Service—is once again considering the allocation of critical loads as a methodology to protect sensitive ecosystems from the impact of atmospheric deposition, despite the methodology's overly simplistic approach to addressing ecological concerns.

Approach

EPRI will address the major gaps in the understanding of the sources contributing to atmospheric deposition, as well as the impacts of acid and nutrient deposition to ecosystems, by carrying out a suite of focused projects over several years. These include

- a critical evaluation and review of different methods used to address atmospheric deposition concerns to sensitive ecosystems, such as critical loads, regional TMDLs, and secondary standards to criteria pollutants under the National Ambient Air Quality Standards;
- development and testing of dry deposition measurement techniques to assess its contribution to total deposition;

- application of isotopic techniques to examine the contribution from various sources to atmospheric deposition and comparison with other model-based apportionment techniques; and
- continued enhancement of the linkage between air quality and watershed models, thereby providing a dynamic tool to inform policymakers and support exploration of emerging issues, such as the inclusion of atmospheric deposition reduction credits in water quality trading schemes.

Impact

- Improves decision making by determining the extent to which different sources are contributing to atmospheric deposition
- Improves deposition measurements to help improve the representation of atmospheric deposition in air quality models
- Enhances the linkages between air quality and watershed models, thereby enabling informed environmental policy
- Conducts analysis of the best methods for regulators and policymakers to address atmospheric deposition concerns

How to Apply Results

Members are encouraged to communicate project results widely. Members should be proactive in sending results to key stakeholders, making sure that stakeholders understand the results, and suggesting that these results be considered in development of environmental policies, state implementation plans, and other regulatory decisions. EPRI staff will work with members to these ends. In addition to member efforts, EPRI will facilitate broader use and awareness of the results by briefing key stakeholders, including regulatory and other government agencies; developing materials for the trade press/media; keeping EPRI's public web page current; and continuing service on various advisory panels.

2010 Products

| Product Title & Description | Planned Completion Date | Product Type |
|--|-------------------------|-----------------|
| Critical Review of Atmospheric Deposition Impacts in Ecosystems: This product will allow evaluation of different methodologies for addressing atmospheric deposition concerns and review their adequacy in protecting sensitive ecosystems. | 12/30/10 | Peer Literature |

P91.006 Global Change and Air Quality (069214)

Key Research Question

Air quality is highly sensitive to meteorological conditions. Many meteorological parameters (e.g., boundary layer heights, temperature, wind velocities, stagnation events, and humidity) change year to year due to short-term natural variability in the system. However, these meteorological parameters are also projected to change due to long-term changes in the climate system. These changes, along with concomitant impacts to biogenic emissions and wildfire emissions, are referred to as global change and can affect air quality. Air quality management decisions currently assume that meteorological conditions stay the same over time, notwithstanding year-to-year variations. However, many regulatory bodies (including EPA and state agencies) are increasing their focus on air quality impacts of global change and their importance in air quality management decisions. Recent research shows that ozone concentrations are likely to increase in the future based on emerging climate scenarios (2050 to 2100 time frame). However, air quality management plans are implemented over a period of ten to fifteen years from the present; it is not clear if any changes in air quality due to any global change over that time frame would be significant in comparison to air quality changes occurring due to interannual meteorological variability. As the need to integrate air quality and climate goals in regulatory policy is increasingly being recognized, it is critical to better understand the interactions between air quality and regional climate.

Approach

When examining the impact of global change on air quality, most researchers simulate future conditions in 2050 or beyond so as to capture a large enough distinction between the present and future conditions. However, it may not be suitable to scale results to a shorter time period (ten to fifteen years) over which air quality management policies implement emissions reductions. The research proposed here will use current modeling tools available to evaluate whether changes projected to occur on a global scale in the ten- to fifteen-year time frame may have any notable impact on air quality. There is also a need to develop more-advanced modeling tools for better understanding of air quality and regional climate interactions. Rather than develop such new tools independently, EPRI will leverage resources working with other research organizations exploring similar issues.

Impact

- Enhances scientific knowledge of interactions between air quality and regional climate
- Provides estimates of future conditions that may be useful to other EPRI research programs evaluating the impact of global change on other parameters (e.g., penetration of electric technologies in the market place)
- Improves decision making by helping to determine the extent to which global change may be impacting regional and local air quality

How to Apply Results

Members are encouraged to communicate project results widely. Members should be proactive in sending results to key stakeholders, making sure that stakeholders understand the results, and suggesting that these results be considered in development of environmental policies. EPRI staff will work with members to these ends. In addition to member efforts, EPRI will facilitate broader use and awareness of the results by briefing key stakeholders, including regulatory and other government agencies; developing materials for the trade press/media; keeping EPRI's public web page current; and continuing service on various advisory panels.

2010 Products

| Product Title & Description | Planned Completion Date | Product Type |
|--|-------------------------|-----------------|
| Effect of Air Quality Policies on Climate Change: This product will improve understanding of the climatic implications of anthropogenic SO ₂ and carbonaceous particulate matter (PM) emissions in the United States, and the consequences of future domestic emission control strategies to reduce PM levels. | 12/30/10 | Peer Literature |

Future Year Products

| Product Title & Description | Planned Completion Date | Product Type |
|--|-------------------------|-----------------|
| Air Quality Management in the Context of Global Change and Natural Meteorological Variability: This product will inform air quality management decisions in a ten- to fifteen-year time frame by determining the significance of any climate signal within the context of natural meteorological variability. | 12/30/11 | Peer Literature |

P91.007 Communications (060356)

Key Research Question

EPRI research on various air quality issues will have enhanced value to members and society if the results are actively communicated to and applied by key stakeholders, particularly federal and state government policymakers and regulators. EPRI's reputation for credible research results and its standing in the scientific community provide opportunities for informing key stakeholders of the latest scientific findings on air quality issues. EPRI members have recognized the critical nature of the communication materials provided to date and continue to underscore the importance of continuously updating these materials as new information becomes available.

Approach

Effective communication of EPRI research on air quality issues is essential for the results to be considered and applied by the policymaking and regulatory communities. Communications activities under this program inform decision making and support the development of scientifically sound environmental policy through effective dissemination of significant research results to EPRI members, policymakers, regulators, scientists, and the public at large. These results are communicated via

- succinct descriptions of key EPRI research findings and their implications on a timely basis;
- presentations, briefings, and testimony to key stakeholders;
- detailed summary papers on EPRI research and analysis on major issues; and
- critical reviews of external studies published in technical reports or technical papers.

Impact

- Informs decision making and supports the development of scientifically sound environmental policy through effective dissemination of significant research results to EPRI members, policymakers, regulators, scientists, and the public at large
- Helps EPRI members stay current on the latest research findings from other groups through reviews of external studies (technical reports and scientific papers)
- Facilitates informed interaction between EPRI members and decision makers through succinct communications materials, targeted presentations, and detailed reports on a timely basis
- Ensures that costly air quality regulations are based on sound science and that investments in technology to reduce emissions provide maximum societal value

How to Apply Results

Members should review the communications materials for information that is relevant to their stakeholders, policymakers, and regulators. This information is useful to member company corporate communications departments and local, state, and federal liaisons in creating messages and plans to proactively communicate the research findings to appropriate stakeholder groups. In addition, EPRI facilitates the application of the results through briefings and testimony to key stakeholders, including state and federal government agencies, as pivotal studies appear or as state or federal actions dictate.

2010 Products

| Product Title & Description | Planned Completion Date | Product Type |
|--|-------------------------|--------------------|
| Air Quality Communication Materials: Relevant communications materials will be prepared and provided to members and the broader stakeholder community to help them understand and communicate the current state of knowledge on ozone, particulate matter, regional haze, and atmospheric deposition. Communication materials will be prepared in a way to respond to questions that may be raised by policymakers, regulators, or other stakeholders or internally in their companies. | 12/31/10 | Technical Resource |