92 Assessment of Air Quality Impacts on Health and the Environment

Program Overview

Program Description

This program generates and delivers information on the health impacts of air pollution to help members, regulators, and other stakeholders develop scientifically sound policies and standards for achieving acceptable air quality to protect public health. The program's health effects information, developed from epidemiology, toxicology, and exposure assessment studies, addresses key scientific uncertainties for health effects of particulate matter (PM), ozone, and other air pollutants. The focus of current research is on determining which components of air pollution are most closely associated with negative health impacts. The program also emphasizes communications in an effort to help members respond to media enquiries and interact with their constituencies. These efforts also provide resources for staff of the Electric Power Research Institute (EPRI) in developing communications materials such as issue briefs, conducting webcasts, and interfacing with regulators, legislators, and other stakeholders regarding EPRI research.

Industry Needs and Issues Addressed

- Industry costs for compliance with the Clean Air Interstate Rule (CAIR) are estimated at more than $50 billion, and requirements for further emissions reductions are possible, as in the recently revised ozone National Ambient Air Quality Standards (NAAQS).
- Continued evidence of health effects from air pollution increases pressure to reduce emissions from all sources, including coal-fired power plants.
- Future coal generation is critical to the national economy but is under increasing scrutiny due to emissions of air pollutants and greenhouse gases.
- Better understanding is needed of the role and relative risks of power plant emissions in contributing to the observed health impacts of air pollution.
- Better science with regard to health impacts is needed in response to anticipated increasingly stringent ozone and PM ambient air quality standards proposals.
- The relative toxicity of fine PM components and other air pollutants needs to be determined using rigorous scientific studies.

Impact

- EPRI carries out highly leveraged, rigorous, and focused research that is critical to the U.S. Environmental Protection Agency's (EPA's) statute-required reconsideration of PM standards.
- EPRI research is instrumental in shifting the scientific community's focus on health-based PM research from a mass basis to a PM components basis.
- EPRI research will be considered in revisions to NAAQS for fine PM, expected in 2010 and 2015.

Key Accomplishments

- The Aerosol Research and Inhalation Epidemiology Study (ARIES) has significantly advanced knowledge of air pollution health effects, especially the differing potencies of PM components.
- More attention is being given to PM components and organic compounds by other researchers, EPA, and state agencies.
- Cohort studies indicate the importance of traffic and organic compounds as predictors of premature mortality.
- The St. Louis Bus Study indicates the importance of short-term, peak exposures related to traffic.
- The Toxicological Evaluation of Realistic Emissions of Source Aerosols (TERESA) Study, examining the health effects of coal-fired power plant emissions, has shown only subtle effects in laboratory animals based on preliminary data

- EPRI's epidemiological research to date shows that the health impacts of sulfates are not significant.
- EPRI provides briefings to state and federal policymakers on its research results.

Current Year Objectives

- Conduct epidemiological studies to better determine the sources and components of air pollution responsible for health effects. Studies will include ARIES, the Detroit Cardiovascular Health Study, and the Children's Air Pollution Asthma Study.
- Conduct toxicological studies to provide additional information on the role played by different air pollutants in adverse health effects. Studies will include TERESA and the Tri City Concentrated Ambient Particle Study (Tri City CAPS).
- Conduct exposure assessment studies to evaluate the characteristics of personal exposures to air pollution. Studies will include the Sources and Composition of Particulate Exposures (SCOPE) series.
- Integrate studies in epidemiology, toxicology, and exposure assessment through evaluation of EPRI and other research, to arrive at robust conclusions regarding health impacts of air pollution.
- Provide targeted communications to members and other stakeholders, including white papers, reviews, issue briefs, webcasts, and briefings as appropriate.

Industry Involvement

- Estimated 2009 funding: $2.9M

Program Technical Lead

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Summary of Projects

Project Number	Project Title	Value
P92.001	Epidemiology and Exposure Studies	This project consists of epidemiology and exposure assessment studies aimed at increasing knowledge of the components of air pollution associated with health effects. Epidemiology studies employ advanced statistical techniques to determine the associations between specific components and various health endpoints. Studies are currently being performed in Atlanta, Dallas, Birmingham, Pittsburgh, St. Louis, Detroit, and New York City.
P92.002	Toxicology Studies	This project consists of field and laboratory toxicological studies providing key information on the health impacts of air pollutants. Current research involves exposure of laboratory animals to specific emissions sources (e.g., power plant emissions), ambient particles, or organic materials, followed by evaluation of a variety of health endpoints. Other air pollution components or sources deemed important from a public health perspective may also be studied.
P92.003	Integrated Assessment of Epidemiology, Toxicology and Exposure Study Results	This project integrates EPRI and other research in epidemiology, toxicology, and exposure assessment in order to arrive at robust estimates of the health effects of specific air pollution components and/or sources. The integration evaluates consistency across studies/disciplines and summarizes the state of scientific knowledge regarding the human health impacts of air pollution.

Project Number	Project Title	Value
P92.004	Communications	This project will provide succinct descriptions of key research findings and implications on a timely basis, with the goal of facilitating communications to important stakeholders (members, the scientific community, policymakers, and the media). Issue briefs will be prepared, and webcasts will be presented on relevant topics. Presentations to key stakeholders and special workshops will be delivered as appropriate.

Project Descriptions

P92.001 Epidemiology and Exposure Studies (067503)

Issue
National Ambient Air Quality Standards (NAAQS) for criteria air pollutants, including ozone and particulate matter (PM) , are reviewed about every five years. High quality, scientifically robust, and focused epidemiological studies are needed to inform regulators and other stakeholders about health effects of those pollutants in ensuing rounds of the NAAQS review. This information can also prove useful in State Implementation Plan (SIP) development, as a better knowledge base for health effects of different components of PM is developed. Many epidemiological studies do not consider multiple PM and air pollution components and are thus unable to evaluate the likely differing toxicities of these components. It is therefore important to develop studies designed to provide insight into the components and/or sources of air pollution most highly associated with negative health effects. Health studies are the basis for ensuing technology responses by states, and it is critical that these agencies understand which sources may or may not be contributing to observed health effects while meeting mandated standards.

Description
This project consists of specific epidemiology and exposure assessment studies aimed at increasing knowledge of air pollution components leading to health effects. Epidemiology studies following the Aerosol Research and Inhalation Epidemiology Study (ARIES) model in Atlanta will be carried out in several cities, including St. Louis, Dallas, Pittsburgh, and Birmingham. Studies will evaluate both mortality and morbidity endpoints (both cardiovascular and respiratory) when considering the effects of air pollution on human health. Advanced statistical techniques will be employed to determine the associations between specific air pollution components and various health endpoints. Other studies under the ARIES umbrella include the Detroit Cardiovascular Health Study and the Children's Air Pollution Asthma Study. Exposure assessment studies will be performed to increase knowledge of the primary sources of air pollution exposure in specific populations; these studies measure personal exposure to PM, its components, and gaseous pollutants.

Value
- Provides key information to be considered by EPA in the next review of the ozone and fine particulate matter ($PM_{2.5}$) NAAQS.
- Provides credible science to assist in the development of SIPs.
- Supports research designed to better protect public health.
- Provides cost-effective emissions reduction analyses. Acknowledging differences in PM component toxicity could have a significant impact on the costs to implement potential future emissions reductions. Costs to comply with the Clean Air Interstate Rule (CAIR) are estimated at more than $50 billion, and further emissions reductions are possible.
- Provides a realistic estimate of the health impacts of new coal generation.
- Aids members in their communication efforts with regulators and customers.

How to Apply Results

Members are encouraged to communicate project results widely. Members should be proactive in sending key stakeholders the results, making sure that stakeholders understand the results, and suggesting that results be considered as environmental policies are developed, including standards, SIPs, 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. Peer-reviewed scientific papers will be prepared by EPRI staff and contractors to ensure that the results meet the highest scientific standards. These papers will be made available to key stakeholders.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Effects of PM Components on Human Health: Results from key epidemiology and exposure assessment studies will be published in the peer-reviewed literature; these results will provide a richer database and greater understanding of those components of air pollution responsible for observed health effects.	12/31/2009	Peer Literature

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
Effects of PM Sources and Components on Human Health: Results from key epidemiology and exposure assessment studies will be published in the peer-reviewed literature; these results will provide a richer database and greater understanding of those components of air pollution responsible for observed health effects.	2010	Peer Literature

P92.002 Toxicology Studies (067504)

Issue

An improved understanding of air pollution health effects is essential to informed decisionmaking and the development of effective, science-based standards and control strategies. Regulation of particulate matter (PM) components found to be most harmful to human health will result in greater societal benefit compared with a mass-based regulatory approach. One of the hindrances in determining which PM components to control is the lack of robust information on the relative toxicity of different components. Controlled toxicological studies play a pivotal role in determining the sources and components of air pollution most responsible for health effects.

Description

This project consists of field and laboratory toxicological studies providing key information on the health impacts of air pollutants. Current research involves exposure of laboratory rodents to specific emissions sources (e.g., power plant emissions), ambient particles, or organic materials. The project evaluates a variety of health endpoints, including cardiovascular function, pulmonary inflammation, breathing pattern, and oxidative stress. Other air pollution components or sources deemed important from a public health

perspective may also be studied. Experimental designs increase the understanding of the relative toxicity of different PM components.

Value

- Determination of health effects under controlled laboratory conditions enables the evaluation of causation and provides important information on the toxicity of different air pollution sources and components.
- Project research supports better protection of public health by determining which sources and components of air pollution are of most concern for human health.
- Acknowledging differences in PM component toxicity could have a significant impact on the costs to implement potential future emissions reductions. Costs to comply with the Clean Air Interstate Rule (CAIR) are estimated at more than $50 billion, and further emissions reductions are possible.
- Project results will be considered by EPA in the review of the National Ambient Air Quality Standards.
- Research results will be used by state regulatory agencies in the development of State Implementation Plans.

How to Apply Results

Members are encouraged to communicate project results widely. Members should be proactive in sending key stakeholders the results, making sure that stakeholders understand the results, and suggesting that results be considered as environmental policies are developed, 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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Source-Oriented Animal Studies of Air Pollution: Key findings from the toxicological research will be published in the peer-reviewed literature, thereby increasing the database of these important studies examining air pollution sources and components and health effects.	12/31/2009	Peer Literature

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
Component-Oriented Animal Studies of Air Pollution: Key findings from the toxicological research will be published in the peer-reviewed literature, thereby increasing the database of these important studies examining air pollution sources and components and health effects.	2010	Peer Literature

P92.003 Integrated Assessment of Epidemiology, Toxicology and Exposure Study Results (100192)

Issue

Health concerns drive the regulatory agenda for air pollutants, including ozone and fine particulate matter ($PM_{2.5}$). Regulating those pollution sources that are most strongly linked with adverse health effects will provide the most protection to public health. This regulatory paradigm is dependent on sound epidemiological, toxicological, and exposure assessment studies that evaluate the differing toxicities of air pollution components, including PM constituents. Ultimately, integration across these three disciplines represents a powerful approach for robust estimates of the health effects of specific air pollution components and/or sources.

Description

This project will consider epidemiological, toxicological, and exposure assessment research on air pollution and health, conducted by both EPRI and others. The project will emphasize research related to the sources and components of air pollution associated with adverse health impacts. Consistency of findings across disciplines will be evaluated, and the state of scientific knowledge regarding the human health impacts of air pollution will be summarized. EPRI results will also be placed in the context of the broader scientific literature.

Value

- Project results can be used by members in communications with stakeholders, including regulatory agencies and public interest groups.
- Results can be considered by EPA in its reviews every five years of the National Ambient Air Quality Standards (NAAQS) for ozone and PM.
- Research findings that are common across epidemiology, toxicology, and exposure assessment studies suggest more confidence in the overall results.

How to Apply Results

Members are encouraged to communicate project results widely. Members should be proactive in sending key stakeholders the results, making sure that stakeholders understand the results, and suggesting that results be considered as environmental policies are developed, 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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Integration of Air Quality Health Research: Results from epidemiological, toxicological, and exposure studies will be discussed and integrated in a series of briefings, white papers, and other documents to be prepared by EPRI staff. The EPRI research results will also be placed within the context of broader research results.	12/31/2009	Technical Update

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
Update: Meta-Analysis of EPRI Air Quality Epidemiology Studies: Results from epidemiological, toxicological, and exposure studies will be discussed and integrated in a series of briefings, white papers, and other documents to be prepared by EPRI staff. The EPRI research results will also be placed within the context of broader research results.	2010	Technical Update

P92.004 Communications (052313)

Issue
Given that health concerns drive the regulatory agenda for several pollutants, including ozone and fine particulate matter ($PM_{2.5}$), it is important that research results in this area be actively communicated to inform the public and other stakeholders. Informing key stakeholders of the latest scientific findings on health issues is extremely valuable, given EPRI's objective and credible research results and its standing in the scientific community.

Description
This project will provide succinct descriptions of key research findings and implications on a timely basis. The goal is to provide tools and information to aid members in communicating research findings to lay audiences, such as the popular media and policymakers. Communications efforts aimed at preparing two-page issue briefs will continue; current briefs will be continually updated and new issue briefs will be prepared as needed. Webcasts will be presented on relevant topics. Presentations to key stakeholders and detailed communications tools will be prepared on an as-needed basis. Special workshops will be convened as appropriate to aid member communication efforts on key air quality issues.

Value
- Results of significant research are effectively communicated to members, the public, the media, regulatory/policy communities, and other stakeholders, thus improving decisionmaking and supporting science-based policy.
- The review of external studies (reports and papers) helps members stay up to date on the latest research findings from other groups.
- This project facilitates informed interaction with decisionmakers by providing timely and succinct communications materials.

How to Apply Results
Members should review the various communications supplied by EPRI (website summaries, issue briefs, presentation materials) for information that is relevant to their key air quality concerns. In turn, they should work with their corporate communications departments and local, state, and federal liaisons to proactively communicate the research findings to the appropriate stakeholder groups. To this end, EPRI staff will aid member representatives. In addition, EPRI will facilitate the use of the results by a broader audience through briefings to key stakeholders, including regulatory and other government agencies, as pivotal studies appear and as the need arises based on federal or state issues.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Air Quality Communications Materials and Activities: Relevant communications materials will be prepared and provided to members to help them understand the current state of knowledge about the health effects of air pollution. This will be done in a way that facilitates members' ability to respond to questions that may be raised by customers, regulators, and other stakeholders.	12/31/2009	Technical Resource

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
Air Quality Communications Materials and Activities: Relevant communications materials will be prepared and provided to members to help them understand the current state of knowledge about the health effects of air pollution. This will be done in a way that facilitates their ability to respond to questions that may be raised by customers, regulators, and other stakeholders.	2010	Technical Resource