

# EMF Health Assessment and Radio-Frequency Safety - Program 60

## Program Overview

### Program Description

The safe and reliable operation of the power delivery system will take on heightened importance as the power grid is upgraded, modernized, and expanded. To meet national energy policy requirements, the grid will include new renewable generating sources. Construction of new or upgraded transmission lines to deliver power from these sources is in many cases likely to fuel public concern about possible health risks from exposure to electric and magnetic fields (EMF). Concerns about EMF-related issues can lead to regulatory decisions that affect project schedules and costs. At the same time, revisions to guidelines for public and worker EMF exposures could result in lower exposure limits. Power companies also need to address growing concern about radio-frequency (RF) exposure from RF antennas installed on grid infrastructure and to adopt practices for compliance with Federal Communications Commission exposure limits.

EPRI EMF Health Assessment and RF Safety Program research and information better positions power companies to address EMF issues. The program's research on high-priority residential, community, and occupational EMF health and safety issues and its scientific expertise contribute to accurate health risk evaluations and state-of-the-science exposure guideline development. Research results also provide input for power facility siting and construction decisions and policy development. The program's commitment to research and public communication on EMF health questions responds to a societal need for answers. In addition, the program offers research, information, and products for the safe and reliable implementation of new RF and wireless technologies in electric power industry environments.

### Research Value

This program supports power companies with transmission line and substation projects through timely information for improved risk communication and effective issue management. The program delivers research aimed at resolving high-priority EMF health questions and provides input for science-based exposure guidelines to address worker safety. EPRI expertise and research results also contribute to research and risk assessment activities that inform EMF policy. In addition, the program maintains an active public communication effort providing accurate public information on EMF and health. The program's RF safety work contributes to accurate RF exposure assessment, enhanced worker safety, and compliance with RF safety regulations.

### Approach

This program provides research, information, analyses, and expertise that help electric power companies and society address residential and occupational EMF health and safety issues. The program also offers RF safety research and products. This program delivers

- timely, reliable EMF research information, including communication materials, relevant background information, and analyses of key external studies;
- access to Gateway Information Services for the latest information on EMF and RF research, health risk evaluations, and regulatory actions;
- experimental and epidemiologic research investigating high-priority residential and occupational EMF health questions;
- EMFWorkstation software for modeling electric and magnetic fields in residential and occupational settings;
- RF exposure characterization research and exposure assessment software; and
- RF safety awareness training seminars and materials.

## Accomplishments

Through its peer-reviewed scientific publications, presentations at scientific meetings and seminars, and service on various advisory panels, the EMF Health Assessment and RF Safety Program has established a reputation within the international scientific community for rigorous, independent, objective research. EMF issue managers report that supporting EPRI EMF research is in itself an appropriate response to public concern.

- Program research results and information help issue managers address public and worker concerns about EMF, take appropriate steps to ensure health and safety, and avoid unnecessary costs.
- Scientific input contributes to accurate EMF health risk evaluations and exposure guideline development, domestically and internationally.
- EPRI software and instrumentation have proved essential for characterizing residential and occupational EMF.
- The program's communication arm provides objective public information resources.
- RF safety information has been used to guide electric power company safety program development and aid compliance with RF safety standards.
- EPRI-developed software has facilitated RF exposure assessment in electric power company environments.

## Current Year Activities

High-priority research and effective communication form the foundation for the 2010 program. Specific efforts will include

- using both epidemiologic and laboratory research strategies to investigate the basis for the epidemiologic association between residential magnetic fields and childhood leukemia;
- conducting a feasibility assessment for an innovative epidemiologic study of EMF and miscarriage;
- investigating occupational health and safety issues relevant to power-frequency EMF environments, including neurodegenerative disease risk and interference with implanted medical devices (such as cardiac pacemakers);
- conducting research relevant to EMF exposure guideline formulation, and monitoring guideline revisions and related developments;
- investigating cutting-edge RF safety issues, such as RF burns, and creating relevant RF safety products, including RF safety workshops and tutorials;
- developing a tutorial DVD that provides a comprehensive background on all aspects of the EMF health issue; and
- maintaining a vital and creative communication effort that reaches both EMF program members and the larger stakeholder community.

## Estimated 2010 Program Funding

\$5.2M

## Program Manager

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## Summary of Projects

### PS60A EMF Health Assessment: Community and Residential Studies (055840)

#### Project Set Description

The Community and Residential Studies Project Set offers scientific research and information on high-priority community and residential health issues related to EMF. Foremost is childhood leukemia, which continues to generate public concern in areas designated for new power line and substation projects. Epidemiologic, exposure assessment, and laboratory research in this Project Set focuses on investigating the basis for the reported association between residential magnetic fields and childhood leukemia. In addition, 2010 research is investigating magnetic field exposure in relation to miscarriage.

This Project Set includes EMFWorkstation software for modeling both electric and magnetic fields in residential and occupational settings. Also included is the EMF Information Project, which provides clearly presented research results and information to help participants address public concern about EMF and health.

Project Number	Project Title	Description
P60.001	EMF Information Project	The EMF Information Project provides timely, reliable EMF research information, including communication materials, relevant background information, and "EPRI Comments" on key studies. In conjunction with Resource Strategies' ELF Gateway, this project provides e-mailed reports on new research results, scientific meetings, health risk assessments, and regulatory actions.
P60.002	Laboratory Studies Using Cell and Animal Models	The aim of this research is to study potential effects of contact current and, possibly, magnetic field exposure in an experimental mouse model of childhood environmental leukemogenesis. Work in 2010 will focus on testing the model with "positive control" exposures, followed by an EMF phase of the research. Mouse models are essential in research to identify factors involved in disease development.
P60.003	Residential Health Studies	This project includes health studies, analyses of existing data, and evaluations of current knowledge to elucidate the epidemiologic association between magnetic fields and childhood leukemia. Research is in progress to conduct an international case-control study that avoids selection bias and to replicate a much-publicized UK study of childhood leukemia. New research will further investigate magnetic field exposure in relation to survival among children with a leukemia diagnosis. In addition, an innovative study of EMF and miscarriage is planned following a pilot phase in 2009.
P60.005	EMFWorkstation	EMFWorkstation software is a powerful, flexible set of tools for modeling both electric and magnetic fields in residential, commercial, or occupational environments and for evaluating field management options. EMFWorkstation will be maintained for compatibility with current PC operating systems, and any reported problems will be fixed. New features will be added only as requested by EPRI members.

## P60.001 EMF Information Project (048876)

### Key Research Question

The issue of possible health effects from exposure to the extremely low frequency (ELF) EMF associated with the electric power system continues to generate concern, especially as power companies plan new transmission and distribution projects to deliver electricity from new renewable energy resources and to cope with increasing electricity demand. To address public and worker health and safety concerns and effectively manage the EMF issue, power companies need to stay current on EMF research and have ready access to credible, up-to-date information.

### Approach

The EMF Information Project provides timely, reliable EMF research information through hard-copy and electronic media. Participants receive communication materials, relevant background information, and “EPRI Comments” on key studies. In addition, this project includes a public EMF web page and a public newsletter that summarizes both EPRI EMF research news and key worldwide EMF news events. In conjunction with Resource Strategies’ ELF Gateway, this project provides e-mailed reports on newly published research results, health risk assessments, scientific meetings, and regulatory actions. An ELF Gateway website with a searchable database of EMF information is available to participants.

### Impact

- Improves EMF issue management by providing comprehensive, objective, reliable, and timely information and analyses on possible health effects from exposure to EMF
- Provides issue managers with information to address public and worker concerns about health risks and take appropriate steps to ensure health and safety and to avoid unnecessary costs.

### How to Apply Results

EMF issue managers will use the materials and information this project provides to stay current on EMF health effects research, health risk evaluations, and regulatory actions. Managers can also use this information to communicate current knowledge about possible EMF health effects and the results of recent health risk evaluations to concerned workers and the public.

### 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>Continuing Updates to EMF Information Project:</b> The EMF Information Project is an ongoing service providing continuous information updates via epri.com and e-mail alerts. The project may also provide hard-copy documents.	12/31/10	Technical Resource
<b>EMF Research Information:</b> EMF research information includes information presented on epri.com, technical assessments, “EPRI Comments,” and relevant scientific reviews.	12/31/10	Technical Resource

## Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<b>Continuing Updates to EMF Information Project:</b> The EMF Information Project is an ongoing service providing continuous information updates via epri.com and e-mail alerts. The project may also provide hard-copy documents.	12/31/11	Technical Resource
<b>EMF Research Information:</b> EMF research information includes information presented on epri.com, technical assessments, "EPRI Comments," and relevant scientific reviews.	12/31/11	Technical Resource

## P60.002 Laboratory Studies Using Cell and Animal Models (SP1736)

### Key Research Question

In vitro and in vivo laboratory models provide important data for evaluating possible health risks from environmental exposures. In EMF health science, results from laboratory models provide a strong counterbalance to epidemiologic findings. For childhood leukemia, virtually all of the laboratory evidence fails to support epidemiologic evidence of an association with magnetic field exposure. However, no adequate in vivo model of acute lymphoblastic leukemia (ALL), the most common form of childhood leukemia, currently exists. The World Health Organization (WHO) has assigned a high priority to research to develop a rodent model. Such a model is needed to test the potential effects of environmental exposures, including contact current and magnetic fields, on childhood leukemia development and progression.

### Approach

The aim of this research is to develop an in vivo or in vitro approach (or both) that is adaptable for studying potential leukemogenic effects of contact current and, possibly, magnetic field exposure in young mice. Full-scale experiments planned through 2011 will use laboratory models developed in 2009-2010. Recent research in the Childhood Leukemia Survival Study and in a subsequent German study points to a possible association of magnetic field exposure with leukemia progression, indicating an additional potential adaptation of the laboratory model.

### Impact

- This research provides essential information for health risk assessments by clarifying the plausibility and dose-response characteristics of effects from electric and magnetic fields and contact current through careful examination of relevant exposures, cell systems, and whole animals.
- By providing accurate experimental evidence for health risk assessments, this research contributes to sound public health policy and helps members address public concern about health risks.
- This research, combined with epidemiologic and exposure assessment studies, will provide accurate scientific information that will help address public concern about power facility siting, construction, and operation.

### How to Apply Results

Publication of research results in the peer-reviewed literature provides accurate information that EMF issue managers can communicate to address concerns about health risks. Publication of research results also demonstrates the electric power industry's commitment to resolving uncertainties about EMF and health through active support of the highest quality research. Project involvement will keep members informed in advance of formal release of the results in the peer-reviewed literature. In addition, EPRI will facilitate broader use and awareness of results by briefing key stakeholders, including policymakers and policy researchers; developing materials for the trade press and the media; presenting at meetings and seminars; and continuing service on various advisory panels.

## Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<b>Effect of Contact Current on Leukemogenesis in Mice:</b> After development of the basic mouse model of childhood leukemogenesis with appropriate positive controls, the model system will be exposed to contact current to determine whether this exposure stimulates leukemogenesis.	12/31/11	Peer Literature

## P60.003 Residential Health Studies (SP0239)

### Key Research Question

On the basis of the epidemiologic association between magnetic fields and childhood leukemia, risk assessments by agencies such as the International Agency for Research on Cancer and the National Institute of Environmental Health Sciences concluded that magnetic fields are a possible carcinogen. In 2007, the World Health Organization released an assessment that supported this conclusion while noting that uncertainties remain. Uncertainties surround other health endpoints as well, including miscarriage. Other groups have also commented on EMF health research; in 2007, the Stakeholder Advisory Group on ELF EMFs in the United Kingdom and the international BioInitiative Working Group issued reports that received considerable attention. Along with well-conducted, focused research to resolve scientific uncertainties, effective communication is essential to accurately address developments in EMF health research.

### Approach

EPRI's approach to resolving the childhood leukemia question is to support high-quality, hypothesis-based health studies; to further analyze and integrate available data; and to periodically synthesize and evaluate the state of knowledge. Research in this project has investigated the potential roles of selection bias and contact current in explaining the association between residential magnetic fields and childhood leukemia. Selection bias will continue to be a primary research focus. In 2010, the selection bias hypothesis will be investigated in the TransExpo Study, an international study of magnetic fields and leukemia among children living in apartments above transformer rooms; this study is designed to minimize selection bias and to examine a highly exposed study population. With the cooperation of California's largest electric companies, EPRI will replicate the 2005 Draper study, conducted in the United Kingdom, of residence near power lines and childhood leukemia. An expert panel will evaluate whether acute lymphoblastic leukemia among children with Down syndrome can serve as a model for this disease in the general population of children without Down syndrome. Also, following a feasibility study in 2009, a study in 2010 will investigate the relationship between magnetic field exposure and miscarriage.

### Impact

- Improves risk assessment and public understanding by providing timely data and analyses to help resolve key uncertainties related to residential EMF exposure and childhood leukemia
- Clarifies results of previous studies reporting an association between magnetic field exposure and miscarriage
- Addresses public concern about residential proximity to electrical installations

### How to Apply Results

Publication of the results in the peer-reviewed literature provides accurate information that EMF issue managers can communicate to address concerns about health risks. Publication of research results also demonstrates the electric power industry's commitment to resolving uncertainties about EMF and health through active support of the highest quality research. Project involvement will keep members informed in advance of formal release of the results in the peer-reviewed literature. In addition, EPRI will facilitate broader use and awareness of results by briefing key stakeholders, including policymakers and policy researchers;

developing materials for the trade press and the media; presenting at meetings and seminars; developing software tools; organizing topical workshops and webcasts; and continuing participation on various advisory panels.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>Study of Residences Located Above Transformer Stations (TransExpo Study):</b> The TransExpo Study, an international study of magnetic fields and leukemia among children living in apartment buildings with transformer rooms, is designed to minimize selection bias and to examine a highly exposed study population.	12/31/10	Technical Report
<b>Pilot Study of Magnetic Field Exposure and Miscarriage:</b> In 2002, two California studies reported an association between miscarriage and daily peak magnetic field exposure above a specific threshold. The reported association could actually be due to differences in mobility between women with healthy pregnancies and women who miscarry. This pilot study will determine the feasibility of a study of magnetic field exposure, mobility, and miscarriage among women whose pregnancies result from assisted reproductive technologies, such as in vitro fertilization.	12/31/10	Peer Literature

## Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<b>Childhood Leukemia Survival in EMF Study Populations:</b> Two recent epidemiologic follow-up studies reported poorer survival among children with leukemia who were exposed to measured magnetic fields of 0.2–0.3 $\mu$ T. However, these results were based on very small numbers of cases and are thus imprecise. To further investigate, this analysis will pool cases from other studies of EMF and childhood leukemia.	06/30/11	Peer Literature
<b>Childhood Leukemia among Children with Down Syndrome:</b> This paper will discuss an expert panel's evaluation of whether ALL among children with Down syndrome can serve as a model for this disease in the general population of children without Down syndrome.	12/31/11	Peer Literature
<b>Residence near Power Lines and Childhood Cancer:</b> This study will replicate the 2005 Draper study, which reported that residing within 600 meters of overhead transmission lines increased leukemia risk among UK children. The replication study will use improved exposure assessment methods and will include calculated magnetic fields and, for houses near power lines, measured fields.	12/31/12	Peer Literature

## P60.005 EMF Workstation (SP1246)

### Key Research Question

Cost-effective magnetic field management requires a versatile software tool for characterizing magnetic fields in residential neighborhoods and substations, neighborhoods located next to substations, and commercial and occupational environments.

## Approach

Over the past few years, EMFWorkstation ranked among the top ten most frequently ordered software products from EPRI. The original EMFWorkstation and its successor EMF Modeler were powerful and flexible sets of tools for modeling electric and magnetic field environments in residential, commercial, or occupational settings. As EMF Modeler incorporated additional features of EMFWorkstation, EPRI renamed the software EMFWorkstation 2005. This product provided a cost-effective method for evaluating different magnetic field management options. The EMFWorkstation 200X software will be maintained for compatibility with contemporary PC operating systems, and new features will be included in new releases only as members request them through input at advisory meetings. In addition, any reported problems will be fixed.

## Impact

- This product provides a versatile tool for characterizing and evaluating magnetic fields in residential, commercial, and occupational environments.
- EPRI software is the only integrated EMF management software available offering accurate results for complex environments in a user-friendly product.

## How to Apply Results

Participants (including industrial hygienists and design engineers) can use EMFWorkstation software to model magnetic field environments in residential, commercial, and occupational settings and evaluate magnetic field management options. Participants can use the output of the models to explain field levels to regulators and other interested parties.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>EMFWorkstation 2010:</b> EMFWorkstation 2010 will have added capabilities as members request them.	12/31/10	Software

## Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<b>EMFWorkstation 2011:</b> EMFWorkstation 2011 will have added capabilities as members request them.	12/31/11	Software

## PS60B EMF Health Assessment: Occupational Studies (055841)

### Project Set Description

The Occupational Studies Project Set produces scientific research and information on important occupational health issues related to EMF exposure. In addition, this Project Set delivers research that addresses the technical basis for exposure guidelines. Current exposure guidelines protect against neurostimulatory effects arising through known biophysical mechanisms; however, guideline limits have not yet incorporated advances in dosimetry, dose-effect relationships, and exposure modeling. EPRI Occupational Studies research is responsible for a major portion of the research on these cutting-edge topics.

EPRI occupational health studies focus on neurodegenerative diseases, particularly amyotrophic lateral sclerosis (ALS) and Alzheimer disease among electrical and other workers. In addition, continuing work monitors new research on EMF and contact current interference with cardiac pacemakers and other implanted medical devices in occupational environments.

Project Number	Project Title	Description
P60.004	EMF Occupational Health and Safety	This project provides a comprehensive assessment of potential links between EMF exposure and health effects among electrical and other workers. In accord with World Health Organization research priorities, work in 2010 will focus on neurodegenerative diseases. This project also includes monitoring of occupational exposure guidelines for EMF and contact current and investigation of related scientific and technical issues. In addition, the project addresses potential interference with implanted medical devices.

## P60.004 EMF Occupational Health and Safety (065538)

### Key Research Question

Epidemiologic studies have investigated health effects possibly associated with work in electrical occupations and with occupational exposure to EMF, contact current, and spark discharge. In its 2007 EMF health risk assessment, the World Health Organization (WHO) assigned a high priority to research on ALS in electrical occupations. WHO also assigned a high priority to research on magnetic field exposure in relation to Alzheimer disease. Another concern is EMF and contact current interference with cardiac pacemakers and other implanted medical devices. Worker and public safety also depends on accurate exposure assessment and compliance with guideline limits. Well-conducted research is critical in order to address these issues and develop cost-effective work practices that protect health and safety. In addition, cutting-edge research is essential for formulating appropriate guidelines.

### Approach

This project provides a comprehensive assessment of potential links between EMF exposure and health effects among electrical and other workers. A job-exposure matrix (JEM) for electrical factors in electricity industry work environments was developed in 2008; work in conjunction with Program 62 (Occupational Health and Safety) will expand the JEM to include a fuller inventory of workplace exposures. The electrical component of the JEM will provide data for a population-based analysis of electrical work and ALS. A comprehensive quantitative review will evaluate the existing epidemiologic evidence on a possible relationship between occupational EMF environments and neurodegenerative diseases, including ALS and Alzheimer disease. This project also addresses safety concerns related to potential interference with implanted medical devices in EMF environments. In addition, the project delivers research on scientific and technical issues related to occupational exposure guidelines for EMF and contact current, as well as monitoring of guideline developments. The primary research issues influencing exposure guideline limits are biologic dose-effect characteristics; EMF, contact current, and spark discharge dosimetry; and exposure assessment.

### Impact

- Addresses concerns about worker health and safety by clarifying possible health effects of EMF exposure among electrical and other workers and by assessing occupational exposures. Knowledge about exposures and health effects can aid development of cost-effective, protective work practices, resulting in reduced liabilities.
- Potentially reduces costs associated with guideline compliance by providing scientific input to the formulation of guidelines that are consistent with safety for workers and the general public in EMF environments. Valid input of this nature avoids unnecessarily conservative guidelines, which can result in excessive costs (such as the cost of overly protective gear and of equipment shutdowns) and inconvenient work practices.

## How to Apply Results

Power company occupational health and safety staff will use this work to assess worker exposures to EMF, contact current, and spark discharge and make informed decisions on any interventions that may be necessary or advisable. For workers with cardiac pacemakers and other implanted medical devices, exposure assessment can identify work areas that should be avoided. Participants will also assess exposure to ensure compliance with exposure guidelines. In addition, health effects research results will help EMF issue managers address concerns about potential health risks. EPRI will facilitate broader use and awareness of the results by briefing key stakeholders, including policymakers and policy researchers; developing materials for the trade press and the media; presenting at meetings and seminars; and continuing participation on various advisory panels.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>The Relationship of Neurodegenerative Diseases to Electrical Occupational Environments:</b> Epidemiologic studies have reported an association between occupational EMF exposure and the neurodegenerative disease ALS. Some studies have also reported an association with Alzheimer disease. However, confounding by electric shock or other exposures is possible. This research will investigate EMF, contact current, and electric shock in relation to ALS, Alzheimer disease, and other neurodegenerative diseases.	12/31/10	Peer Literature
<b>Electromagnetic Interference with Implanted Medical Devices:</b> This report will provide an update on implantable medical devices, sources of electromagnetic interference that can affect device functioning, and development of standards that limit interference.	06/30/10	Technical Report
<b>Personal EMF Exposure Monitor:</b> To alert electric company employees with implanted medical devices to potential sources of electromagnetic interference, this research will develop an EMF exposure monitor that can emit an alarm signal, light up, or vibrate when it encounters high electric or magnetic fields.	12/31/10	Hardware
<b>EMF Exposure Guideline Development:</b> EMF exposure guidelines protect against acute neurostimulatory effects. For power-frequency magnetic fields, guideline exposure limits are based on field levels that induce visually perceived flickering sensations known as magnetophosphenes. This technical update summarizes relevant scientific data and discusses whether magnetophosphenes are an appropriate basis for guideline limits.	09/30/10	Technical Update

## PS60C EMF Health Assessment: Radio-Frequency Safety and Wireless Technology (060358)

### Project Set Description

The Radio-Frequency Safety and Wireless Technology Project Set focuses mainly on RF exposure assessment and RF safety awareness training. Exposure assessment research includes development of an RF safety training video on RF burns and an evaluation of personal RF exposure monitor accuracy under practical conditions. Accurate exposure assessment and knowledge about conditions that could lead to RF burns form the basis for development of safe work practices that minimize worker exposures and permit work near sources of high RF fields to proceed without costly interruptions and delays.

This Project Set also provides RF Gateway e-mail and Internet information services to keep participants informed about worldwide research on possible biologic and health effects of RF exposure, as well as major scientific meetings, health risk evaluations, and regulatory actions. This information, along with EPRI technical

information on topics relevant to RF safety, helps RF issue managers effectively address RF health and safety concerns.

Project Number	Project Title	Description
P60.006	RF Information Project	The RF Information Project provides the latest RF research results and other relevant information in hard-copy and electronic form. It includes RF Gateway information services, which delivers e-mailed news briefs on research results, key scientific meetings, health risk evaluations, and regulatory actions. This information is also available to participants from a searchable database on the RF Gateway website.
P60.007	RF Exposure Assessment	Research in this project builds on the foundation established through 2008 in exposure characterization (source description, measurement techniques, and exposure modeling), dosimetry, and safety program design. In 2010 the project will deliver a DVD on RF burns and continue to offer safety training seminars as required. Work to compile the <i>RF Safety Reference Book</i> will also begin. Additional work will include an evaluation of personal RF exposure monitor accuracy under practical conditions.

## P60.006 RF Information Project (052381)

### Key Research Question

Rapid expansion of RF and wireless communications technologies and colocation of new antennas and other support installations on electric power system infrastructure have led to concern about exposure to RF fields. Electric power company employees may be exposed to RF energy during work near third-party installations on transmission towers and other power system facilities, and during work near paging, two-way radio, broadcast, and other RF and wireless technologies. Safety awareness training and accurate exposure assessment for workers will allow electric power companies to respond to concerns about exposure with reliable, up-to-date information and will facilitate compliance with company occupational health and safety policy.

### Approach

This project provides members with the latest RF research results and with background information on relevant topics through hard-copy materials and through RF Gateway services. RF Gateway information, delivered via e-mail, includes news briefs on research, major scientific meetings, health risk evaluations, and regulatory actions. In addition, members have access to an RF Gateway website with a searchable database of RF information.

### Impact

- Improves RF issue management by providing background information on relevant topics and timely information on worldwide research on the potential biologic and health effects of RF exposure
- Provides RF issue managers with information to address public and worker concerns about health and safety

### How to Apply Results

RF issue managers will use the materials and information this project provides to keep abreast of RF health effects research, health risk evaluations, and regulatory actions. Issue managers can communicate current knowledge about the potential biologic effects of exposure to RF fields and about current RF exposure guidelines to concerned employees and members of the public.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>RF Information Project:</b> This project will provide technical background material and e-mailed news briefs and alerts on a range of topics of interest to RF safety managers.	12/31/10	Technical Resource

## Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<b>RF Information Project:</b> This project will provide technical background material and e-mailed news briefs and alerts on a range of topics of interest to RF safety managers.	12/31/11	Technical Resource

## P60.007 RF Exposure Assessment (052382)

### Key Research Question

Accurate exposure assessment is critical for minimizing worker exposures near RF and wireless facilities and demonstrating compliance with Federal Communications Commission and other RF exposure guidelines. Exposure assessment can be facilitated by reliable software for modeling RF fields, dependable RF measurements, and improved dosimetry to estimate the internal body dose corresponding to external fields. Advanced dosimetry previously developed by EPRI provides practical guidance on exposure limit compliance. EPRI RF burns research provides the basis for a 2010 training video that will help electric company staff understand conditions that could lead to RF burns.

### Approach

In 2010, this project will include development of an instructional DVD on RF burns, conditions in electric company environments that can lead to RF burns, and appropriate safety measures. Research in this project will evaluate the accuracy of personal RF exposure monitors under real-world conditions. Work will also start on a new multiyear effort to produce the *RF Safety Reference Book*.

### Impact

- This research enables development of more-effective maintenance practices that minimize worker exposures and permit work near RF and wireless installations without costly interruptions and delays.
- Improved exposure assessment through advanced SAR modeling using accurate computer models of the human body may help facilitate safe work practices near operating RF emitters and allow work in locations where existing standards for RF exposure may be unnecessarily conservative.
- The *RF Safety Reference Book* will be a key resource for RF safety committees and employee RF safety training programs.

### How to Apply Results

Industrial hygienists and other occupational health and safety staff will use the video on RF burns to train workers to recognize and avoid situations where RF burns may occur. RF burn safety is an important component of a comprehensive RF safety program. The new *RF Safety Reference Book* can be introduced in a series of safety training seminars. Personal RF exposure monitor testing will help users optimize monitor use to achieve accurate readings. This work may also point the way to development of improved monitors.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>RF Burns Safety Video:</b> The RF burns safety video will help educate electric company staff about RF burns, conditions in which burns could occur, and safety measures for avoiding burns. The video will improve the effectiveness of any RF safety training program.	12/31/10	Technical Update

## Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<b>Evaluation of RF Exposure Monitor Accuracy:</b> A 2011 technical report will summarize the results of an evaluation of personal RF exposure monitor accuracy under practical conditions (everyday wear, wear with tool belts, and effects of different body postures and monitor placement on the body).	12/31/11	Technical Report
<b>RF Safety Reference Book:</b> The <i>RF Safety Reference Book</i> will provide comprehensive information on a wide range of RF safety topics in a practical format. The reference book will include a CD or DVD containing EPRI's RF modeling software and RF measurement training video. Together, the reference book and CD will compile and update all EPRI RF safety work in the best available source of RF safety information.	12/31/12	Technical Report