

60 EMF Health Assessment and Radio-Frequency Safety

Program Overview

Program Description

This program produces scientific research and information on high-priority residential, community, and occupational health and safety issues related to exposure to electric and magnetic fields (EMF). Program research and scientific expertise also contribute to accurate health risk evaluations and state-of-the-science exposure guideline development. Research results provide input for decision frameworks to aid risk assessment, policy development, and power facility siting and construction decisions. In addition, the program offers research, information, and products for the safe and reliable implementation of new radio-frequency (RF) and wireless technologies in electric power industry environments.

Industry Needs and Issues Addressed

- Public concern about possible health risks from exposure to EMF near existing and proposed transmission lines and substations
- Changing guidelines for public and worker exposure to EMF and contact current
- Potential regulatory decisions that could be costly
- Impact of EMF health risk evaluations concluding that magnetic field exposure is associated with childhood leukemia and, possibly, other health outcomes
- Colocation of RF antennas and other support facilities on electric power system infrastructure
- Federal Communications Commission (FCC) requirements for safety awareness training for workers exposed to RF fields

Impact

- Timely information for improved risk communication and effective issue management that helps avoid costly delays in transmission line and substation siting and construction
- Rigorous research aimed at resolving high-priority EMF health questions
- Science-based exposure guidelines to ensure worker safety and avoid excessive costs
- Enhanced worker RF safety and improved compliance with RF safety regulations
- Avoided costs of delays and service interruptions through improved RF exposure assessment and safety training
- Participation in research and risk assessment decisions that influence EMF policy

Key Accomplishments

- Electric Power Research Institute (EPRI) research results and information have helped issue managers address public and worker concerns about EMF.
- Scientific input has contributed 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.
- RF safety information has guided electric company safety program development.
- EPRI-developed software has facilitated RF exposure assessment in electric company environments.

Current Year Objectives

- Investigate the basis for the epidemiologic association between residential magnetic fields and childhood leukemia
- Develop software to predict shielding of external magnetic fields and attenuation of indoor magnetic fields by structural steel in buildings

- Conduct a feasibility assessment for an innovative epidemiologic study of EMF and miscarriage
- Investigate occupational health and safety issues relevant to power-frequency EMF environments, including interference with cardiac pacemakers and risk of neurodegenerative disease
- Conduct research relevant to EMF and contact-current exposure guideline formulation; monitor guideline revisions and related developments
- Investigate cutting-edge RF safety issues, such as RF burns; create relevant RF safety products, including updated RF exposure assessment software and RF safety workshops and tutorials
- Maintain a vital and creative communication effort that reaches both EMF program members and the larger stakeholder community

Industry Involvement

- Estimated 2009 funding: \$5.2M

Program Technical Lead

Robert Kavet, 650-855-1061, rkavet@epri.com

Summary of Projects

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

Project Set Description: This Project Set offers scientific research and information on high-priority community and residential health issues related to exposure to electric and magnetic fields (EMF). Foremost is the childhood leukemia issue, 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.

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, providing clearly presented research results and information to help participants address public concern about EMF and health.

Project Number	Project Title	Value
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	Cancer 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 2009–2010 will use an in vivo/in vitro model developed in 2008–2009. 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

Project Number	Project Title	Value
		study that avoids selection bias and to replicate a much-publicized UK study of childhood leukemia. In addition, an innovative study of EMF and miscarriage is planned, and software to predict magnetic field shielding by structural steel in buildings is under development.
P60.005	EMF Workstation	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.

Project Descriptions

P60.001 EMF Information Project (048876)

Issue

The issue of possible health effects from exposure to the extremely low frequency (ELF) EMF associated with the electric power system continues to raise concern, especially as power companies plan new transmission and distribution projects 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.

Description

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 both a public web page providing information written specifically for the general public and a semiannual newsletter summarizing EPRI EMF research news and key worldwide 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.

Value

- Improves EMF issue management by providing comprehensive, objective, reliable, and timely information and analyses on possible health effects of 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 potential EMF health effects and the results of recent health risk evaluations to concerned workers and the public.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Continuing Updates to EMF Information Project: The EMF Information Project is an ongoing service providing continuous information updates via www.epri.com and e-mail alerts, as well as hard-copy documents.	12/31/2009	Technical Resource
EMF Research Information: EMF research information includes information presented on www.epri.com, technical assessments, "EPRI Comments," and relevant scientific reviews.	12/31/2009	Technical Resource

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
Continuing Updates to EMF Information Project: The EMF Information Project is an ongoing service providing continuous information updates via epri.com and e-mail alerts, as well as hard-copy documents.	2010	Technical Resource
EMF Research Information: EMF research information includes information presented on epri.com, technical assessments, "EPRI Comments," and relevant scientific reviews.	2010	Technical Resource

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

Issue

In vitro and in vivo laboratory models provide important data for evaluating possible risks from environmental exposures. In EMF health science, results from laboratory models provide a strong counterbalance to epidemiologic findings. On the basis of epidemiologic evidence, recent health risk evaluations conclude that magnetic field exposure is associated with childhood leukemia. However, these evaluations acknowledge that the association might be due to bias or confounding by another exposure that is present along with magnetic fields. To test the potential effects of environmental exposures, including contact current and magnetic fields, an experimental model of childhood leukemia development and progression is needed.

Description

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 neonatal mice. Full-scale experiments planned through 2010 will use laboratory models developed in 2006–2008. 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 adaptation of the laboratory model.

Value

- 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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Effect of Contact Current on Leukemogenesis in Mice: In 2009–2010, 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. This paper will discuss research progress through 2009.	12/31/2009	Peer Literature

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
Effect of Contact Current on Leukemogenesis in Mice: 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.	2010	Peer Literature

P60.003 Residential Health Studies (SP0239)

Issue

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 (WHO) 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.

Description

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 2009, 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. Also, following a feasibility study in 2008, a study in 2009 will investigate the relationship between peak magnetic field exposure and miscarriage. An additional 2009 project will develop software to predict shielding of external magnetic fields and attenuation of indoor fields by structural steel in schools, offices, apartment complexes, and other buildings.

Value

- 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 facilities
- Aids assessment of land use near power lines through software that predicts structural steel shielding of external magnetic fields and consequent attenuation of indoor fields

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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
<p>EPRI Magnetic Fields and Miscarriage Study: Feasibility Assessment: Two 2002 California studies reported an association between peak magnetic field exposure and miscarriage. Greater mobility among women who miscarry allows more opportunity to encounter high magnetic fields and may explain these results. A study of miscarriage among women whose pregnancies result from in vitro fertilization could provide further insight, since pregnancies and exposures could be followed from conception. This paper reports on a feasibility assessment.</p>	9/30/2009	Peer Literature
<p>Exposure Assessment in the Draper Study Replication: The 2005 Draper study reported an increased risk of leukemia among UK children whose homes at birth were located as far as 600 meters from high-voltage power lines—a distance at which magnetic fields from the lines would be negligible. To clarify these results, EPRI will replicate the study in California. This paper discusses exposure assessment methods for the EPRI study.</p>	6/30/2009	Peer Literature
<p>Pooled Analysis of Childhood Brain Cancer Studies: Epidemiologic studies of magnetic field exposure and childhood brain cancer have yielded inconsistent results. A pooled analysis of brain cancer studies may provide clearer answers. The pooled analysis may also shed light on the magnetic field–childhood leukemia association: If the association results from selection bias, then bias is likely in relative risk estimates for brain cancer as well.</p>	9/30/2009	Peer Literature
<p>TransExpo Study: Progress Report: The TransExpo Study is an international case-control study of leukemia in children living in apartment buildings with built-in transformers. The study is designed to directly assess selection bias and to focus on children with high magnetic field exposures. This progress report summarizes the results of Phase One of the study, which will determine exposure by the location of apartments relative to transformer rooms. Magnetic field measurements in Phase Two will be completed in 2010.</p>	12/31/2009	Technical Report
<p>Control-Selection Bias Workshop: In its 2007 EMF health risk evaluation, WHO assigned a high priority to research to explain the magnetic field–childhood leukemia association, acknowledging that selection bias is a possible explanation. To discuss possible selection bias in recent childhood leukemia studies, EPRI will convene a workshop of international experts. Recommendations from the workshop will help guide further research.</p>	9/30/2009	Technical Report
<p>EMF Update Webcast: This EMF Health Assessment and RF Safety Program webcast will provide members with current perspectives on the EMF issue. The webcast will also cover recent developments in EMF research.</p>	9/30/2009	Workshop, Training, or Conference
<p>Structural Steel Shielding Software: External magnetic fields induce currents in structural steel building frames that provide effective shielding and consequent attenuation of indoor fields. This easy-to-use software will determine induced current in structural steel and predict shielding effects.</p>	12/31/2009	Software

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
Study of Residences Located Above Transformer Stations (TransExpo Study): Phase One of the TransExpo Study proceeded without contact with subjects. In Phase Two, subjects will be contacted to request access to residences for magnetic field measurements. An association between magnetic fields and childhood leukemia in Phase Two, but not Phase One, would indicate that selection bias is responsible.	2010	Technical Report
Childhood Leukemia Survival in EMF Study Populations: Two recent epidemiologic case-control studies reported poorer survival among children with leukemia who were exposed to measured magnetic fields >0.2–0.3 μ T. However, these results were based on very small numbers of cases and are thus imprecise. To further investigate, this follow-up analysis will pool cases from other studies of EMF and childhood leukemia.	2010	Peer Literature

P60.005 EMF Workstation (SP1246)

Issue

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.

Description

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.

Value

- 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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
EMF Workstation 2009: EMFWorkstation 2009 will have added capabilities, including 23 additional enhanced applets fully incorporated into the software, as the budget permits.	12/31/2009	Software

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
EMF Workstation 2010: EMF Workstation 2010 will have added capabilities as members request them.	2010	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 exposure to electric and magnetic fields (EMF). In addition, this Project Set delivers research for exposure guideline development. Current exposure guidelines protect against acute neuromuscular 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 work is responsible for a major portion of the research on these cutting-edge topics.

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

Project Number	Project Title	Value
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 (WHO) research priorities, work in 2009 will focus on ALS. 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.

Project Descriptions

P60.004 EMF Occupational Health and Safety (065538)

Issue

Epidemiologic studies have investigated possible health effects associated with work in electrical occupations and with occupational exposure to EMF, contact current, and spark discharge. In its 2007 EMF health risk assessment, WHO assigned research on ALS in electrical occupations a high priority. Another concern for electrical and other workers is EMF and contact current interference with cardiac pacemakers. 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.

Description

This project provides a comprehensive assessment of potential links between EMF exposure and health effects among electrical and other workers. Development of a job-exposure matrix (JEM) for electrical factors in electricity industry work environments began 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. 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 biological dose-effect characteristics; EMF, contact current, and spark discharge dosimetry; and exposure assessment.

Value

- 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, 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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
EMF and Contact Current Interference with Implanted Medical Devices: Power-frequency and radio-frequency EMF and contact current can interfere with the functioning of cardiac pacemakers and other implanted medical devices. This report will provide an updated literature review on potential interference with implanted medical devices in EMF environments.	12/31/2009	Technical Report
The Relationship of ALS to Electrical Occupational Environments: Epidemiologic studies have found an association between occupational EMF exposure and the neurodegenerative disease ALS. However, confounding by electric shock or other exposures is possible. This research will investigate EMF, contact current, and electric shock in relation to ALS. The research will incorporate data from recent JEMs.	12/31/2009	Peer Literature
Magnetophosphenes as the Basis for EMF Exposure Guidelines: Guidelines limiting exposure to power-frequency EMF focus on prevention of acute neural stimulation. Currently, guideline basic restrictions are based on neural stimulation levels that produce visually perceived flashes of light known as magnetophosphenes. This paper discusses recent research showing that basic restrictions are well below neural stimulation thresholds and questions the appropriateness of using magnetophosphenes as their basis.	9/30/2009	Peer Literature

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
The Relationship of ALS to Electrical Occupational Environments: Epidemiologic studies have found an association between occupational EMF exposure and the neurodegenerative disease ALS. However, confounding by electric shock or other exposures is possible. This research will investigate EMF, contact current, and electric shock in relation to ALS.	2010	Peer Literature

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

Project Set Description: Currently, research in this Project Set focuses mainly on radio-frequency (RF) exposure assessment and RF safety awareness training. Exposure assessment research includes further development of software to assess RF exposure levels at different locations for various RF antennas installed on electric power company structures. The software allows users to identify work areas where maximum permissible exposure limits may be exceeded. Accurate exposure assessment forms 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 biological and health effects of RF exposure, as well as major scientific meetings, health risk evaluations, and regulatory actions. This information, along with

technical information on topics relevant to RF safety provided in this Project Set, helps RF issue managers effectively address RF health and safety concerns.

Project Number	Project Title	Value
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, delivering 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 technique, and exposure modeling), dosimetry, and safety program design. In 2009 the project will deliver a DVD on RF burns, launch a series of safety training seminars, and produce the <i>RF Safety Reference Book</i> . Additional work will include continuing analysis of guideline compliance and a pilot assessment of occupational exposure.

Project Descriptions

P60.006 RF Information Project (052381)

Issue

Rapid expansion of RF and wireless communications technologies and colocation of new antennas and other support facilities 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.

Description

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. In 2009, this project will also provide guidance on RF burn avoidance for electric company staff to assist in implementation of RF safety programs.

Value

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

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 biological effects of exposure to RF fields and about current RF exposure guidelines to concerned employees and members of the public. Guidance on identifying situations that could lead to RF burns can be used in comprehensive employee RF safety training programs.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
RF Information Project: 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.	12/31/2009	Technical Resource
Avoiding RF Burn Situations: This resource paper will provide guidance for electric company staff on RF burn avoidance to assist in implementation of RF safety programs.	12/31/2009	Technical Update

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
RF Information Project: 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.	2010	Technical Resource

P60.007 RF Exposure Assessment (052382)

Issue

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 will provide practical guidance on exposure limit compliance. New work will extend into understanding conditions leading to RF burns to workers.

Description

To facilitate assessment of exposure in an RF environment at different locations for various RF sources, this project includes development of a practical report on compliance with basic restrictions for RF exposure using the specific absorption rate (SAR) modeling previously completed by EPRI. Work in 2009 will focus on practical application of SAR modeling. Also in 2009, this project will include additional work on RF burns that may occur during work with tools, since compliance with RF field exposure limits does not guarantee protection against RF burns. Work will also start on a new multiyear effort to produce the *RF Safety Reference Book*.

Value

- This research enables development of more-effective maintenance practices that minimize worker exposures and permits work near RF and wireless installations without costly interruptions and delays.
- Improvement of 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 work on avoiding RF burns to identify work areas or 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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Compliance with Basic Restrictions for RF Exposure: This comprehensive guide will help electric power companies ensure compliance with basic restrictions in RF exposure standards and guidelines. Key topics will include regulatory requirements, training, measurements, exposure modeling, safety program elements, and safety program audit and maintenance.	12/31/2009	Technical Update
RF Burns During Work with Tools: This resource paper identifies work areas and situations in which RF burns may occur during work with tools. This knowledge is essential for avoiding RF burns, which may occur even when RF field exposure limits are not exceeded. RF burn safety is essential to comprehensive RF safety programs.	12/31/2009	Technical Update

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
RF Safety Reference Book: 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 be a reliable resource for RF safety staff.	2011	Technical Report