

51 T&D Facilities & Equipment: Environmental Issues

Program Overview

Program Description

This program delivers information, tools, and methods for preventing, characterizing, and remediating soil and water contamination at transmission and distribution (T&D) facilities, such as substations, service centers, pole storage yards, and pole-setting sites. Data and products from the program support development of scientifically sound regulations and cleanup standards for chemicals associated with T&D facilities and operations, as well as providing engineering, science, and business tools to facilitate management of T&D facilities.

Industry Needs and Issues Addressed

- Life-cycle perspective on utility pole management—purchase, use, disposition
- Options for recycle and reuse of retired poles
- Detection, location, and risk assessment for leaks and spills
- Spill prevention, control, and countermeasure (SPCC) planning and implementation
- Remediation of contaminated substation soil and groundwater

Impact

- Savings of \$10 million per year industrywide for used oil management
- Savings of \$1.5 billion per year for creosote and pentachlorophenol poles to be managed as nonhazardous waste
- Savings of \$500,000 at a single site by demonstration of the true risk of a mineral oil spill
- Savings of \$1 million for one company in SPCC planning and implementation

Key Accomplishments

- Environmental decisionmaking profile for utility poles
- Options for remanufacturing/recycling poles
- Mineral Oil Spill Evaluation System (MOSES) software and related electronic tools for spill prevention planning and implementation
- In situ chemical fixation, phytoremediation, and hybrid ion exchange for remediation of arsenic in soil and groundwater

Current Year Objectives

- Investigate poles throughout their life cycle to maintain and expand options for selection, use, and disposition and to facilitate communication
- Evaluate emerging dielectric fluids from purchase through disposition
- Support spill control through improved leak location and detection using microrobots

Industry Involvement

- Estimated 2009 funding: \$1.4M

Program Technical Lead

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Summary of Projects

Project Number	Project Title	Value
P51.001	Utility Poles: Assessment and Impact	This project develops and delivers options for managing utility poles across their life cycle, including selection, storage, use, recycling, and reuse, with minimal health and environmental impacts. The research results provide participants with insights for reducing risks and liabilities from treated wood, nontreated wood, and nonwood poles.
P51.002	Oils: Spill Control, Countermeasures, and Response	This project supports spill prevention planning and implementation. It monitors development of lower-risk dielectric fluids and investigates use of microrobotics for detection and location of leaks from aging T&D infrastructure. It works toward state-of-the-art substation design to maximize performance and minimize environmental impact.
P51.003	PCBs: Mitigation and Remediation	This work aims to reduce compliance costs by providing information to improve risk assessment and facilitate communication with all stakeholder groups, and to save electrical equipment owners tens of thousands to millions of dollars as regulations continue to be developed and PCB spills continue to be discovered and addressed.

Project Descriptions

P51.001 Utility Poles: Assessment and Impact (100315)

Issue

Alternatives to landfilling and giveaway programs for treated wood poles are essential to help companies manage environmental, human health, and financial risks and recover the huge resource represented by wood poles at the end of their useful life. Improved specification of new and replacement poles allows companies to better manage risk throughout the pole life cycle. Optimal processes for prevention of leaching reduce environmental and human health impacts from pole treatments. Information on chlorophenols, dioxins, metals, and supplemental treatment chemicals is critical to obtaining science-based, cost-effective regulatory decisions, as well as supporting optimal business decisions by pole owners. Demonstrating low risk for treated wood can save owners billions of dollars by reducing disposal costs and facilitating recycling. Assessing nonwood alternatives can offer companies lower-risk, reasonable-cost options in some settings.

Description

This work aims to reduce costs and minimize human health and ecological risks from poles across their life cycle, to inform regulatory and public concerns about poles, and to maintain ongoing \$1.5 billion-per-year cost savings from the nonhazardous waste designation for poles. The project will:

- Develop a decision tool to help companies choose both new and replacement poles
- Explore options for managing poles, including storage, use, recycling, and reuse of poles with minimal health and environmental impacts
- Conduct long-term fate and transport studies of wood treatment chemicals
- Assess both nontreated-wood and nonwood alternatives to treated wood poles as these alternatives are proposed and become commercially available

Value

- Reduces costs and minimizes human health and ecological risks from poles
- Informs regulatory and public concerns about pole use
- Saves the industry \$1.5 billion per year in ongoing cost savings as a result of the nonhazardous waste designation for poles

How to Apply Results

Utility engineers and scientists need to read, understand, and disseminate the results to key stakeholders, both inside and outside utility companies. Internal stakeholders—scientists, engineers, purchasing agents, and others—will incorporate the information into product specifications, O&M procedures, and waste management decisions, as well as environmental policies and procedures and communications programs. External stakeholders, including regulators and members of the public, will use the results as part of environmental decisionmaking and rulemaking. In addition, the Electric Power Research Institute (EPRI) will facilitate broader use and awareness of the results by briefing key stakeholders, including policymakers and other researchers; by developing materials for the public/trade press/media; and by presenting at meetings/seminars.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Recycle and Reuse of Treated Wood Poles: This work will remanufacture products from out-of-service treated southern yellow pine poles and investigate market opportunities such as state departments of transportation.	12/31/2009	Technical Update
Alternatives to Treated Wood for Utility Poles: This work will update the assessment published by EPRI in 2007 of proposed alternatives to treated wood poles. New options are emerging and are being publicized, and existing options are establishing track records. This work will continue to provide current information on the practicality and availability of the options.	12/31/2009	Technical Update
Preventing and Measuring Impacts from Treated Wood Poles: Treated wood and surrounding groundwater and soil samples will continue to be collected and analyzed, and the trends will be evaluated in this long-term fate and transport study.	12/31/2009	Technical Update

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
Decision Tool for Evaluating Options for Poles: This research will expand work completed in 2007 to include additional transmission and distribution pole types and options, as appropriate.	2010	Technical Update
Preventing and Measuring the Impact of Treated Wood Poles: Treated wood and surrounding groundwater and soil samples will continue to be collected and analyzed, and the trends will be evaluated in this long-term fate and transport study.	2011	Technical Update

Product Title & Description	Planned Completion Date	Product Type
Alternatives to Treated Wood for Utility Poles: This work will continue to provide current information on the practicality and availability of options for poles as those options emerge.	2011	Technical Update

P51.002 Oils: Spill Control, Countermeasures, and Response (Q55817)

Issue

Routine use of dielectric fluids may result in leaks, spills, or fires, with resulting human health and environmental impacts. Aging T&D infrastructure exacerbates these problems. Compliance and protection require an understanding of the risk of an incident and the toxicity of the fluids involved. Through laboratory and field work, EPRI researchers study chemical composition, environmental fate and transport, and risks from dielectric fluids, as well as developing tools to facilitate use of the scientific information. Researchers will now investigate the use of microrobots to detect and locate fluid leaks early in their development in order to minimize financial, human health, and environmental impacts.

Description

This work aims to streamline compliance and reduce costs by addressing regulatory and public concerns, evaluating substation retrofit options, and protecting groundwater and soil through improved detection and location of leaks. The project has demonstrated to one state agency that non-PCB capacitor fluids could be managed as synthetic oils, saving hundreds of thousands of dollars for one company. The project will:

- Consider alternatives to commonly used fluids
- Develop improved methods for identification and tracking of underground leaks using microrobots
- Improve state-of-the-art designs for substations to provide enhanced environmental protection

Value

- Streamlines spill prevention and countermeasure compliance by developing information and tools to answer regulatory and public concerns
- Protects groundwater and soil from accidental leaks and spills through improved detection and location
- Demonstrated to one state agency that non-PCB capacitor fluids could be managed as synthetic oils, saving hundreds of thousands of dollars for one company on handling and disposal

How to Apply Results

Scientists and engineers will use the results of fate and transport studies on dielectric fluids to inform development of regulations, assess sites and simulate migration, negotiate site cleanup endpoints, detect and locate leaks, and communicate with all stakeholder groups, including regulators and members of the public. Scientists and engineers will use the results of remediation studies to prepare and implement action plans for contaminated sites. As new information, products, and tools are developed, program participants will have first access and will apply results to environmental decisions. In addition, EPRI will facilitate broader use and awareness of the results by briefing key stakeholders, including policymakers and other researchers; developing materials for the public/trade press/media; organizing design workshops; and presenting at meetings/seminars.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Detection and Location of Leaks and Plumes: Using microrobots, this work will investigate new methods of identifying oil leaks and plumes moving through soil that result from spills above the surface and leaks from cables and underground piping.	12/31/2009	Technical Update
Alternate Dielectric Fluids: This work will continue and expand earlier work that identified and assessed emerging fluids for environmental performance.	12/31/2009	Technical Update
State-of-the-Art Designs: The work will investigate state-of-the-art designs for transmission facilities and substations for optimal environmental performance. The project will begin with a workshop to investigate possible paths and focus for the project.	9/30/2009	Technical Resource

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
Detection and Location of Leaks and Plumes: Using microrobots, this work will investigate new methods of identifying oil leaks and plumes moving through soil that result from spills above the surface and leaks from cables and underground piping.	2010	Technical Update
Alternate Dielectric Fluids: This work will continue and expand earlier work that identified and assessed emerging fluids for environmental performance.	2011	Technical Update
State-of-the-Art Designs: The work will investigate state-of-the-art designs for transmission facilities and substations for optimal environmental performance.	2011	Technical Update

P51.003 PCBs: Mitigation and Remediation (100778)

Issue

Historical spills have introduced polychlorinated biphenyls (PCBs) into the environment at electric utility sites. Even after two decades of regulatory control, PCB spills continue to occur and be discovered. Industry has made a huge investment in excavation and landfilling. This option is expensive and limited, and reliable, cost-effective alternatives are needed. Now regulators and risk assessors are focusing on individual PCB congeners, especially the dioxinlike congeners, and are requiring congener-specific monitoring at some sites. Information about monitoring methods and changes to PCB congener mixes over time is needed.

Description

This work aims to reduce compliance costs by providing information to improve risk assessment and facilitate communication with all stakeholder groups, and to save electrical equipment owners tens of thousands to millions of dollars as regulations continue to develop and as PCB spills continue to be discovered and addressed. This project will:

- Strengthen risk assessment, improve monitoring, and evaluate promising remedial approaches
- Track and explore issues related to PCB congeners
- Investigate changes in PCB congener mix and resulting toxicity in use and in the environment

Value

- Reduces compliance costs by providing information on actual PCB species and their potential impact and health risk
- Helps understand and reduce risks related to PCB exposures
- Improves risk assessment and facilitates communication with all stakeholder groups
- Saves electrical equipment owners tens of thousands to millions of dollars as regulations continue to develop and PCB spills continue to be discovered and addressed

How to Apply Results

Scientists and engineers will use the results of congener-based studies to inform regulations development, assess sites and simulate migration, negotiate site cleanup endpoints, and communicate with all stakeholder groups, including policymakers, other researchers, trade press, and media. They will use remediation study results to prepare and implement action plans for contaminated sites. As new information, products, and tools are developed, program participants will have first access and will apply results to environmental decisions. Working with participating utility company scientists and engineers, EPRI staff may communicate directly with regulators or with members of the public. External stakeholders, including regulators and members of the public, will use the results as part of environmental decisionmaking and rulemaking.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
PCB Remediation Studies: This work will investigate in situ, minimally disruptive bioremediation of PCB-contaminated soil and sediment by dehalogenation. This option should be particularly applicable in locations that are hard to access and environments that are sensitive to disruptions, where conventional dig-and-haul solutions cannot be implemented.	12/31/2009	Technical Update

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
Addressing PCBs in Sediments: This research will examine options for addressing PCB-contaminated sediments, focusing on alternatives to dredging such as reactive capping and natural attenuation. The work will consider regulatory and other issues surrounding PCB-contaminated sediments, including the immediate and long-term impacts of various actions.	2010	Technical Update
Congener-Specific PCB Issues: This work will update the analysis of congener-specific PCB issues published by EPRI in 2007 and will include information from specific states and U.S. Environmental Protection Agency regions.	2011	Technical Update