EPRI

innovators
WITH EPRI TECHNOLOGY

EPRI Aids Tucson Electric Power Fuel Oil Spill Evaluation and Site Closure at an Active Power Plant

Groundwater and Combustion By-Products Management Target

"EPRI provided innovative, non-intrusive methods for the evaluation and closure of an oil spill beneath the power plant building at the Springerville Generating Station"

• Prabhu Dayal
Tucson Electric Power Company

Benefits

- EPRI provided research and innovative modeling techniques to characterize and demonstrate the feasibility of in situ and natural biodegradation processes for remediation of a site contaminated by an oil spill. This effort resulted in cost-effective and environmentally protective site closure approved by the Arizona Department of Environmental Quality (ADEQ).
- Tucson Electric Power (TEP) estimates savings of $4 million by demonstrating that passive bioremediation—rather than a soil vapor extraction (SVE) remediation system beneath the Springerville power plant building was the preferred approach. This information avoided further excavation, ensured that no underground utility lines in the spill area were disturbed, and kept a vital power plant running.

Challenge

Across the United States, many power plants use fuel oil either as a primary fuel or for start-up operations. Accidental fuel oil spills typically trigger site remediation and closure activities in accordance with federal and state regulatory requirements. When fuel oil spills occur, they can contaminate soil, groundwater, and pose potential human health risks. TEP faced the daunting task of remediating a fuel oil spill from an underground fuel supply line located below the power plant building at an operating power plant—its Springerville Generating Station (SGS) in Springerville, Arizona. The spilled oil was collecting both on a shallow perched aquifer and beneath the building in underground utilities and monitoring wells. Intrusive remediation techniques such as soil excavation, vacuum enhanced recovery, and soil vapor extraction (SVE) in the power plant building were considered, but would have disrupted utility operations, potentially causing significant revenue loss from the 800-MW generating station.

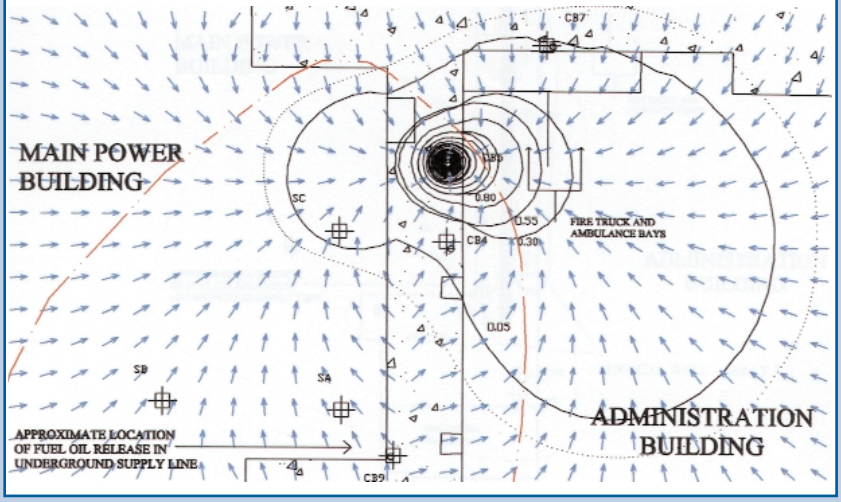
TEP worked with EPRI to develop an approach to address the following four objectives aimed at cost effective regulatory closure of this site that would protect human health and the environment and meet state and federal regulations:

- prevent unacceptable risks to site workers due to exposure to contaminated surface and subsurface soils, groundwater, and air
- remediate the oil spill under the building without jeopardizing the structural integrity of the buildings and underground utilities
- prevent the flow of pollutants from the site
- enable continued power plant operation.

Response

The approach relied on the use of innovative, non-intrusive, and cost-effective technologies and methods. Throughout the process, TEP and ADEQ relied on extensive EPRI information on groundwater modeling, site characterization, health and ecological risk assessment, and technology evaluations. Use of EPRI information and the Vertical and Lateral Organic Distribution (VALOR) software as a screening tool provided critical insights into the way fuel oil spill remediation sites could best be viewed by regulators and site owners. VALOR software is a tool for determining the subsurface distribution of immiscible contaminants. Model runs, evaluations, and validation techniques such as the Vacuum Enhanced Remediation Testing System (VERTS) helped TEP and ADEQ arrive at scientifically-based site management decisions and identified risk-based remedial strategies. Modeling simulations identified the lateral distribution and concentration of residual product, as well as the volatile fraction of subsurface VOCs at the site. These innovative modeling techniques and risk assessments demonstrated to ADEQ that the residual product in the soil is insoluble, non volatile, and fairly innocuous to the environment. These site characteristics, along with the very low VOC concentrations, lend themselves to passive bio-remediation since installing an SVE system under the power plant building would offer no technical advantage and would be very expensive. TEP completed regulatory approved actions, obtained site closure, and met the four objectives—at a significantly lower cost than was originally estimated.

Springerville Fuel Spill



Basis for Benefits

- Using a decision analysis-based cost model, TEP originally estimated that regulatory closure would cost $5 million. Since actual costs totaled less than $1 million, TEP estimates one-time savings of $4 million.

References

- *VALOR Code Version 1.0: A PC Code for Simulating Immiscible Contaminant Transport in Subsurface Systems*, EPRI Final Report, TR-101018, September 1992.
- "VERTS - A Bench-Scale Technique for Evaluating Performance of In-Situ Soil Remediation Techniques," United States Patent 5,789,662, August 1998.
- Prabhu Dayal, "NAPL Remediation by Vacuum Enhanced Recovery: Laboratory and Model Evaluations," Ph.D. Thesis, University of Arizona, April 1996.
- Site Assessment, Evaluation of Remedial Options, Design and Risk Assessment were performed by Environmental Engineering Consultants, Inc., September, 1991; Environmental System and Technologies, Inc., November, 1995; Draper Aden Environmental Modeling, Inc., December, 1996; Environmental Assessment and Remediation Management, Inc., April 1999; and Terrence Johnson, March, 2000.

Products are available from EPRI Customer Service at 1.800.313.3774 (press 2).

For further information, contact:

EPRI
P.O. Box 10412
Palo Alto, CA 94303
(800) 313-3774

Ken Ladwig, Manager
Groundwater and Combustion
By-Product Management
Science & Technology Development
Brookfield, WI 53005
(262) 789-3145
keladwig@epri.com

Adda Quinn, Project Manager
By-Product Management
Land and Groundwater Protection
Science & Technology Development
(650) 855-2478
aquinn@epri.com

Interest Categories

- Groundwater and Combustion By-Products Management
- Contaminated Sites Health and Risk Assessment
- Combustion By-Product Management Sites

EPRI • 3412 Hillview Avenue, Palo Alto, California 94304-1395 USA
P.O. Box 10412, Palo Alto, California 94303-0813 USA
800.313.3774 • 650.855.2121 • askepri@epri.com • www.epri.com