

## New Technology to Speed Clean Up and Reduce Costs

*Techniques being tested at Southern California Edison Visalia Pole Yard Superfund Site show impressive results*

In 1997, an innovative pilot-scale steam injection groundwater and vapor extraction system was installed to enhance removal of contaminants in the soil and groundwater at the Southern California Edison (SCE) Visalia Pole Yard Superfund site. Since the pilot began, this new technology is greatly increasing the rate of recovery of contaminants, an outcome which will result in a faster and less expensive cleanup of the site. This pilot system is a cooperative effort between the U.S. Environmental Protection Agency (U.S. EPA), the California Department of Toxic Substances Control (DTSC), the Southern California Edison Company, Lawrence Livermore National Laboratories, and University of California-Berkeley's Environmental Restoration Center.

The technology being used in the pilot-scale system is called Dynamic

Underground Stripping (DUS), based on steam injection techniques which have been used for enhanced oil recovery in many parts of the world

soil and groundwater cleanup. The DUS process includes injecting steam into permeable areas of the soil to displace and

extraction wells.

In 1997, a pilot-scale steam injection groundwater and vapor extraction system was installed at the

Visalia Pole Yard, consisting of fourteen steam injection wells surrounding a plume of soil and groundwater contaminants. Steam is injected into the ground at a depth of 80-100 feet, forcing



*Figure 1: Steam generators at Southern California Edison Visalia Pole Yard Superfund Site*

since the 1930s. In the late 1980s, Dr. Kent Udell of U.C. Berkeley in partnership with Lawrence Livermore National Laboratories pioneered DUS as a technology for

evaporate contaminants combined with heating of low permeability layers using electrical current to evaporate contaminants. Contaminants are then recovered from central

groundwater, creosote, an emulsion of diesel oil and water, and hydrocarbon vapors towards central extraction wells which are used to recover the



contaminants. In the first nine months of operation, approximately 240 million pounds of steam were injected and approximately 540,000 pounds of contaminants were removed from the subsurface. In addition to contaminants being recovered at the central extraction wells at the surface of the ground, some contaminants are also being broken down below the ground into carbon dioxide and water, a process called in situ hydrous pyrolysis/oxidation (HPO). Air is being injected underground to enhance this process and decrease the amount of time that it would take for those contaminants to break down. **This steam injection system has increased the rate of contaminant recovery more than 1000-fold over a conventional "pump and treat" system.** Prior to steam injection, Southern California Edison considered the Visalia Pole Yard as a

long-term liability. Now, in addition to cost savings, SCE has projected that the site will be cleaned up in years instead of decades.

After steam injection is stopped, SCE will continue to inject air to enhance oxidation by HPO and biological

degradation processes. Groundwater extraction and monitoring will continue to ensure that any remaining contaminants do not migrate off-site. The monitoring phase is expected to last a minimum of two years, at which time the amount of

contamination remaining will be determined and any additional measures that may be needed to close the site will be evaluated. ■

## SITE BACKGROUND

From the 1920s to 1980, the SCE Visalia Pole Yard was used to treat wooden power poles with the preservative chemicals creosote and pentachlorophenol (PCP) in diesel oil carrier fluid. Leaking treatment tanks and transfer lines allowed a large volume of creosote and diesel oil containing PCP to enter the soil and groundwater, threatening nearby drinking water wells. The Visalia Pole Yard was added to U.S. EPA's National Priorities List in 1989.

Past remedial activities at the site include installation of a slurry wall to slow contaminant migration in the shallow aquifer, removal of SCE facilities at the site, a



groundwater extraction/on-site treatment system, and removal and off-site disposal of 2,300 cubic yards of contaminated soil. In

1975, a treatment system was installed at the Visalia Pole Yard in which groundwater was extracted and treated on site at a cost of nearly \$1.2 million per year. Although this system effectively reduced the extent of the dissolved plume of creosote components and PCP, it recovered only small amounts of the creosote. The 1994 Record

of Decision for the site estimated a cost of approximately \$45 million for SCE to fully implement the selected cleanup remedy for the Visalia Pole Yard.

## FOR MORE INFORMATION ABOUT THE SOUTHERN CALIFORNIA EDISON VISALIA POLE YARD SITE, PLEASE CONTACT:

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