

PROJECT facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY



SHALLOW CARBON SEQUESTRATION DEMONSTRATION PROJECT

Background

The Shallow Carbon Sequestration Pilot Demonstration Project is a cooperative effort involving City Utilities of Springfield (CU); Missouri Department of Natural Resources (MDNR); Missouri State University (MSU); Missouri University of Science & Technology (MS&T); AmerenUE; Aquila, Inc.; Associated Electric Cooperative, Inc.; Empire District Electric Company; and Kansas City Power & Light. The purpose of this project is to assess the feasibility of carbon sequestration at Missouri power plant sites. The six electric utilities involved in the project account for approximately 90 percent of the electric generating capacity in Missouri.

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Description

The pilot demonstration will evaluate the feasibility of utilizing the Lamotte and Reagan Formations (St. Francois Aquifer) for carbon sequestration at individual power plant sites in Missouri. Given that the depths of the Lamotte and Reagan Formations are less than the general depth that carbon dioxide (CO₂) can be injected in supercritical phase, injection would have to occur in the gas phase. Much of the research planned in the pilot demonstration is focused on characterizing the interaction of gaseous CO₂ with the groundwater and the host rock and determining how, and to what degree, hydrodynamic, solubility, and mineral trapping will occur. The pilot demonstration can be divided into five separate phases. Phase I involved the initial analysis of Lamotte core at MS&T in 2006. Phase II will involve site exploration and site characterization activities (seismic survey, drilling, coring, pumping tests, and groundwater monitoring) at City Utilities' Southwest Power Station (SWPS) project site. Phase III will involve studies at MDNR, MSU, and MS&T, as well as preparation of the injection well permit application at CU. If the findings of Phases II and III are positive, Phase IV will involve construction of the Class V injection well, installation of temporary injection equipment (compressor and tankage), and performance of the injection test. Phase V will involve assimilation of all project data and findings into a comprehensive final report.

Primary Project Goal

The primary project goal is to evaluate the feasibility of carbon sequestration at individual power plant sites in Missouri. Since approximately 80 percent of the state's electric generation is provided by coal-fired power plants, and the plants are generally located great distances from the large geological basins targeted by the U.S. Department of Energy's Regional Carbon Sequestration Partnerships, Missouri has a large stake in the success of onsite carbon sequestration. Missouri appears to have the proper geology for carbon sequestration, as the Lamotte and Reagan Formations seem to be viable repositories for CO₂ and are capped by competent confining formations – the Derby-Doerun and Davis Formations. However, these formations occur at depths that will require injection of CO₂ in the gas phase, rather



PARTNERS

Missouri Department of Natural Resources

Missouri State University

Missouri University of Science and Technology

AmerenUE

Aquila, Inc

Associated Electric Cooperative, Inc.

Empire District Electric Company

Kansas City Power & Light

COST

Total Project Value

\$2,952,936

DOE/Non-DOE Share

\$2,362,349 / \$590,587

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than the supercritical phase. This project will evaluate the viability of gas-phase injection and associated trapping mechanisms and, if successful, will provide Missouri power plants with a viable alternative to the construction of a network of pipelines and compression stations to transfer CO₂ to other states for sequestration.

Objectives

- Determine the suitability of the Lamotte and Reagan Formations for carbon sequestration.
- Determine the competency of the Davis and Derby-Doerun Formations' confining layer.
- Determine the maximum sustainable injection rate of CO₂ into the Lamotte and Reagan Formations.
- Evaluate the trapping mechanisms that result from gas-phase injection of CO₂ into the Lamotte and Reagan Formations.

Benefits

Missouri electric utilities must establish methods to reduce CO₂ emissions in a safe, effective, and economical manner, or face the prospect of carbon taxes that may double electric rates in the state. The alternatives to carbon taxes are: (1) the transportation of captured CO₂ for sequestration in other states through an expensive network of pipelines and compression stations that will take decades to build and/or (2) the sequestration of captured CO₂ beneath individual power plant sites. The Shallow Carbon Sequestration Pilot Demonstration is a unique project that will add to the body of knowledge on carbon sequestration and, if successful, will provide Missouri electric utilities with a viable means to reduce CO₂ emissions. If gas-phase sequestration is successful in Missouri, the technology may also be transferable to other power plants located in similar geological settings across the Nation.



The Shallow Carbon Sequestration Pilot Demonstration will be conducted at City Utilities' SWPS.