

PROJECT facts

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



GEOLOGICAL SEQUESTRATION OF CO₂: THE GEO-SEQ PROJECT

Background

Growing concern over the potential adverse effects of carbon dioxide (CO₂) buildup in the atmosphere leading to global climate change may require reductions in carbon emissions from industrial, transportation, and other sources. One promising option is the capture of CO₂ from large point sources and subsequent sequestration in geologic formations. For this approach to achieve wide acceptance, assurances that safe, permanent, and verifiable CO₂ geologic storage is attained during sequestration operations must be made. Project results are made available to potential CO₂ storage operators and other interested stakeholders.

The primary performing organizations of the GEO-SEQ project team are Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory, and Oak Ridge National Laboratory. The team participates in three world-class CO₂ storage projects that are endorsed by the Carbon Sequestration Leadership Forum, to conduct studies in geologic environments that span a wide range of formation types relevant to geological storage in the United States. Project expertise and resources are leveraged with investments made by the collaborators conducting the storage projects that include Frio Brine Formation Pilot Tests, South Liberty Field, Texas; Otway Basin Project, Australia; and In Salah Gas Field, Algeria Commercial-Scale CO₂ Storage Project. Technologies developed and tested will be applied to other geologic storage operations.

GEO-SEQ's three primary performing organizations contribute expertise and perform tasks in areas that include, but are not limited to, the following:

- Downhole fluid and gas sampling of reservoir using the novel U-tube sampling system developed in the project
- Design and deployment of geophysical monitoring techniques using active and passive seismic methods

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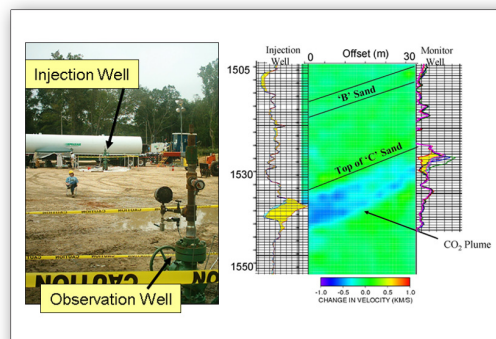
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Frio brine pilot test site (l) and crosshole seismic



Otway Naylor-1 monitoring well completed (top) with seismic (l), geochemical (r), and other reservoir monitoring instrumentation.

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PROJECT DURATION

05/01/2000 to 09/30/2008

COST

Total Project Value
\$25,140,000

DOE/Non-DOE Share
\$13,340,000 / \$11,800,000

CUSTOMER SERVICE

1-800-553-7681

WEBSITE

www.netl.doe.gov

- Design, fabrication, and deployment of innovative downhole instrumentation based on temperature, pressure, and other properties for high-resolution monitoring
- Isotopic, tracer, and reservoir geochemistry techniques to establish pre-injection baseline conditions and to monitor spatial/temporal changes in the reservoir with CO₂ injection
- Reactive chemical transport experiments and simulations to predict rock-fluid-cement-CO₂ interactions to address issues such as permanence of storage and integrity of caprock and engineered barriers

Primary Project Goal

The overall goals of the GEO-SEQ project are to gain knowledge of geologic CO₂ storage processes and mechanisms, monitor CO₂ injection operations, and to simulate reservoir conditions to support storage operations. Project results are made available to potential CO₂ storage operators and other interested stakeholders. The project has two primary objectives: (1) to develop ways to improve predictions of injectivity, capacity, and integrity of saline formations and depleted hydrocarbon reservoirs and (2) to develop and test innovative field-based methods for monitoring CO₂. Field demonstrations provide opportunities to develop and test methodologies in situ, and laboratory experiments and modeling are used to support field predictions and observations.

Objectives

- To provide an optimized set of monitoring technologies ready for full-scale field demonstration in oil, gas, and brine formations
- To improve reservoir simulation models for predicting the performance of CO₂ sequestration in oil, gas, and brine formations
- To improve the methodology and information base for assessing the sequestration capacity, injectivity, and integrity of oil, gas, and brine formations
- To conduct an outreach program to stakeholders

Benefits

Early opportunities to participate in pilot CO₂ injection demonstrations and large-scale storage operations provide field data to assure safe and permanent geologic storage of CO₂ that is verifiable. Innovative monitoring technologies, simulating and predicting reservoir storage conditions, and refining knowledge of reservoir capacity, injectivity, and integrity will lead to confidence in and wide public acceptance of geosequestration. Other benefits of the project will be improvement in the performance and economics of future commercial geologic storage operations that will lead to also decreasing geosequestration risk.

Accomplishments

- Issued a GEO-SEQ Best Practices Manual for Geologic Carbon Dioxide Sequestration: Site Evaluation to Implementation.
- Designed, acquired, and analyzed seismic field data for the Frio brine pilot tests to monitor injected CO₂ plume.
- Designed, acquired, and analyzed geochemical field data for the Frio brine pilot tests to monitor injected CO₂ plume and establish performance of sequestration operations.
- Provided reactive transport modeling support for the Frio brine pilot tests.
- Completed design of a multi-level U-tube geochemical sampler and seismic monitoring system for use at the Naylor-1 monitoring well at the Otway Basin Project.
- Completed Otway project Naylor-1 monitoring well installation that incorporated seismic detectors, U-tube geochemical samplers, and pressure/temperature sensors. Acquired baseline pre-injection data.