PROJECT facts

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

Sequestration

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GEOLOGICAL SEQUESTRATION OF CO_2: THE GEO-SEQ PROJECT

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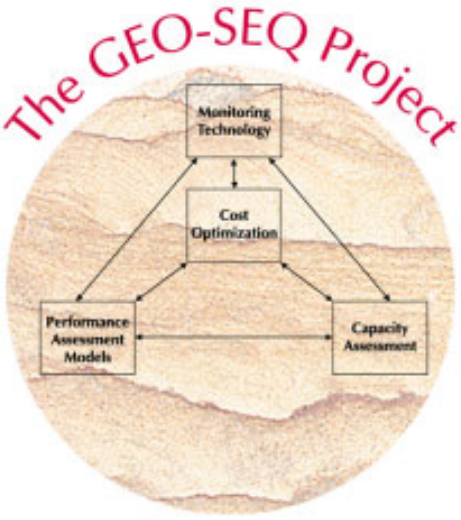
Background

The GEO-SEQ Project has carried out eight separate, but related, tasks that provide new methods and approaches for reducing the cost and risk of geologic sequestration. The results from these tasks provide the basis for the development of a set of best practices for measurement, monitoring, and verification (MMV) of geologic sequestration. The eight tasks included in this project are:

- Co-optimization of carbon sequestration with oil and gas recovery
- Carbon sequestration with enhanced gas recovery
- Co-disposal of CO_2, H_2S, NOx, and SO_2
- Evaluation of geophysical monitoring technologies
- Application of natural and introduced tracers
- Enhancement of numerical simulators for greenhouse gas sequestration in deep unminable coal seams and in oil, gas, and brine formations
- Improving the methodology for capacity assessment
- Frio pilot test

The current focus is a collaboration with the Texas Bureau of Economic Geology to conduct the Frio pilot brine formation CO_2 injection test. The pilot test involves injection of about 3,000 tons of CO_2 into the upper Frio at a depth of about 1,500 m in the South Liberty Field, near Houston, Texas.



Primary Project Goal

The goal is to lower the cost, risk, and time to implement a geologic CO_2 sequestration project. Effective interaction with, and technology transfer to, industrial partners and demonstrable results in each area within three years are paramount goals.

CUSTOMER SERVICE

1-800-553-7681

WEBSITE

www.netl.doe.gov

PARTNERS

Lawrence Berkeley National Laboratory (LBNL)

Lawrence Livermore National Laboratory (LLNL)

Oak Ridge National Laboratory (ORNL)

Netherlands Institute of Geoscience

Stanford University

University of Texas at Austin-Bureau of Economic Geology

Alberta Research Council

BP

ChevronTexaco

En Cana

Statoil

COST

Total Project Value

$15,025,000

DOE/Non-DOE Share

$3,225,000/
$11,800,000

Objectives

- To develop methods to optimize value-added sequestration in oil and gas formations
- To lower the cost of sequestration by understanding the relationship between the cost of separation, compression, transportation, and the well-field and the geologic properties of the injection formation
- To provide an optimized set of monitoring technologies, ready for full-scale field demonstration in oil, gas, and brine formations
- To improve computer simulation models for predicting the performance of CO_2 sequestration in oil, gas, brine, and coal bed formations
- To improve the methodology and information base for assessing the sequestration capacity of oil, gas, brine, and unmineable coal formations
- To conduct an outreach program to provide information to schools and stakeholders

Accomplishments

Screening criteria for selection of oil reservoirs that would co-optimize enhanced oil recovery (EOR) and CO_2 sequestration have been developed, along with an engineering approach to increase CO_2 storage during EOR. Numerical simulation of CO_2 storage with enhanced gas recovery (CSEGR) in depleted gas reservoirs has shown the concept to be viable. Additionally, potential reaction products have been determined using reaction-progress thermodynamic/kinetic calculations. This data is the basis for evaluating the impact of impure waste streams.

A methodology for site specific selection of monitoring technologies was established and demonstrated. Also, the first test of the joint application of crosswell seismic and crosswell electromagnetic measurements for CO_2 monitoring was completed. The baseline data needed for interpretation of tracers used to monitor reservoir processes has been obtained through laboratory isotopic-partitioning experiments and mass-balance isotopic-reaction calculations.

Reservoir simulator code comparison studies for oil, gas, brine, and coal bed reservoirs are underway, providing a mechanism for establishing current capabilities, areas needing improvement, and confidence in simulation models.

A new definition of formation capacity, incorporating intrinsic rock capacity, geometric capacity, formation heterogeneity, and rock porosity was developed for use in assessing sequestration capacity. An assessment of CO_2 sequestration capacity in California was carried out, and factors affecting sequestration capacity of the Frio formation in Texas have been evaluated.

Benefits

The benefits of this project will be lower sequestration costs, lower sequestration risk, decreased time to implementation, and increased public acceptance. By optimizing technologies with collateral benefits for fossil fuel production, lower sequestration costs can be achieved. The risk associated with sequestration can be minimized if needed site selection information is provided. Confidence and safety are increased by demonstrating innovative monitoring and tracking technologies. Pursuing early opportunities to do pilot tests and gaining acceptance can reduce time to implementation by the private sector. Finally, public acceptance can be increased through assuring stakeholders and the public of decreased costs and the certainty of storage permanence.