PROJECT facts

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

Sequestration

2/2006

STORED CO_2 AND METHANE LEAKAGE RISK ASSESSMENT AND MONITORING TOOL DEVELOPMENT: CO_2 CAPTURE PROJECT PHASE 2

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Background

This project supports the U.S. initiatives for reducing greenhouse gas intensity and improving domestic energy security by enhancing the potential for carbon sequestration in deep, unminable coal seams. It addresses three critical topics that require further work to gain broad public acceptance for geological sequestration: (1) integrity of coalbed methane geologic systems, (2) optimization of the coalbed storage process, and (3) reliable monitoring and verification of CO_2 storage and flow in coalbeds. This project builds on past CO_2 Capture Project (CCP) sponsored work in this area.

The program addresses monitoring, verification, and risk assessment of CO_2 geologic sequestration to include coal beds. A numerical modeling study will use a state of the art coal bed methane (CBM) simulator to define the physical and operational boundaries and tradeoffs for safe and effective CO_2 storage accompanying CO_2 enhanced coal bed methane (ECBM) recovery. A novel geophysical study (to be accomplished under a related Field Work Proposal to Lawrence Berkeley National Laboratory) will assess the ability of non-seismic techniques to adequately monitor gas movement in, and leakage from, coal beds and other reservoirs under CO_2 flood at considerable cost savings over conventional, albeit higher resolution, seismic techniques.

An aerial thermal hyperspectral monitoring approach will test the feasibility of large area CO_2 and methane leakage detection that could eliminate the need for an extensive ground based monitoring infrastructure and the associated operational costs. The potential advances in CO_2 and methane leakage risk assessment, detection, and mitigation will provide assurance for geological storage at substantial cost savings. The two gas monitoring technologies, novel non-seismic geophysical techniques and aerial hyperspectral detection of seepage, are innovative approaches that offer considerable cost savings over conventional techniques.

Primary Project Goal

The primary project goal is to improve the science and technology of CO_2 sequestration monitoring, verification, and risk assessment as applied to geological storage sites, including coal beds. This study aims to reduce the risk of CO_2 and methane leakage from ECBM recovery projects by optimizing operational boundaries to methane production and CO_2 injection.

PARTNERS

BP America Inc.

Sproule Associates, Inc.

University of California – Santa Cruz

Lawrence Berkeley National Laboratory

COST

Total Project Value

$601,240

DOE/Non-DOE Share

$300,620 / $300,620

CUSTOMER SERVICE

1-800-553-7681

WEBSITE

www.netl.doe.gov

Objectives

The objectives of this project are:

- To establish CO_2 injection and methane production procedures in deep, unminable coals that will avoid CO_2 and methane leakage by using a state of the art coal bed methane simulator to define the physical and operational boundaries and tradeoffs for safe and effective CO_2 storage.

- To develop cost-effective technology to monitor the movement of CO_2 and CH_4 in subsurface coals by conducting a novel geophysical study to assess the ability of non-seismic techniques to adequately monitor gas movement in, and leakage from, storage zones at considerable cost savings over conventional monitoring techniques.

- To develop technology for detecting CO_2 and methane leakage at the surface using an aerial thermal hyperspectral monitoring approach that has the potential for large area CO_2 and methane leakage detection.

Accomplishments

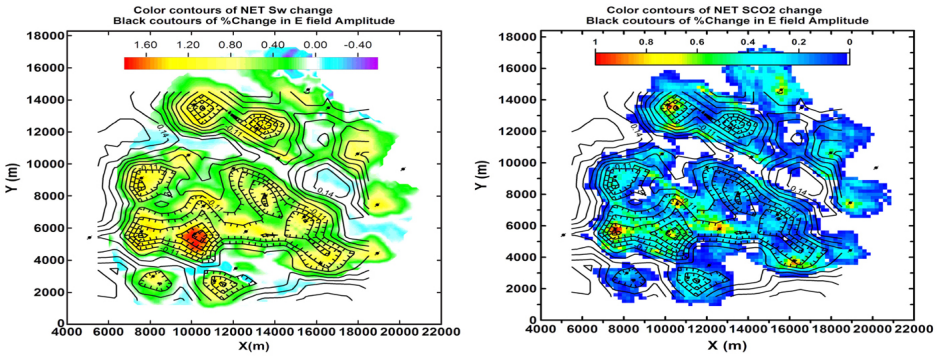
- Publicly available geological and engineering data from an existing coalbed methane operation has been obtained.

- A basic simulation model has been completed and initial simulations are underway.

- Evaluations of (1) alternative test sites for aerial thermal hyperspectral monitoring and (2) available methods to detect CO_2 and CH_4 absorptions have been initiated.

Benefits

Growing concern over the potential adverse effects of CO_2 buildup in the atmosphere on the global climate may require reductions in carbon emissions from power plants. One promising option is capture of CO_2 from large point sources and sequestration in geologic formations. However, for this approach to achieve wide acceptance, there will need to be assurances that the sequestration projects can be monitored to ensure their safety. This work will provide improved information and advanced technologies for CO_2 and methane leakage risk assessment, detection, and mitigation. It will advance and expand the use of deep coals for CO_2 storage and will provide improved means for monitoring and verifying the geological storage of CO_2 in coals, at substantial cost savings. These technologies will help expand the viable options for geologically storing CO_2 emissions from coal based energy and power generation.



Correlation of % change in E field amplitude from surface electromagnetic measurements with (a) net change in water saturation and (b) net change in CO_2 saturation.