PROJECT facts

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

Sequestration

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GEOLOGIC SEQUESTRATION OF CO_2 IN DEEP, UNMINEABLE COALBEDS: AN INTEGRATED RESEARCH AND COMMERCIAL-SCALE FIELD DEMONSTRATION PROJECT

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Background

One approach to sequestering carbon dioxide (CO_2) is to inject it into deep, unminable coal seams. A particular advantage of coalseam sequestration is that coal seams can store several times more CO_2 than the equivalent volume of a conventional gas reservoir because coal has a large surface area. Another advantage of coalseams is that not only does such a process sequester CO_2, but methane is displaced which can be recovered and sold to help offset costs. This process is known as enhanced coalbed methane recovery, or ECBM. Advanced Resources International and their partners are using the only long-term, multi-well ECBM projects that exist in the world today to evaluate the viability of storing CO_2 in deep, unminable coal seams. The two existing ECBM pilots are located in the San Juan Basin in northwest New Mexico and southwestern Colorado. The knowledge gained from studying these projects is being used to verify and validate gas storage mechanisms in coal reservoirs, and to develop a screening model to assess CO_2 sequestration potential in other promising coal basins of the U.S.

The two field pilots, the Allison Unit (operated by Burlington Resources) and the Tiffany Unit (operated by BP America) are demonstrating CO_2 and nitrogen (N_2) ECBM recovery technology respectively. The interest in understanding how N_2 affects the process has important implications for power plant flue gas injection, since N_2 is the primary constituent of flue gas. Currently, the cost of separating CO_2 from flue gas is very high. This project is evaluating an alternative to separation by sequestering the entire flue gas stream. Another reason for considering CO_2/N_2 is that N_2 is also an effective methane displacer, improving methane recoveries and further decreasing the net cost of CO_2 sequestration. The Allison Unit pilot area, which has been in operation since 1995, includes 16 producer wells and 4 injector wells. The Tiffany Unit pilot area, which has been in operation since 1998, in made up of 34 producer wells and 12 injector wells. This demonstration project is providing valuable new information to improve the understanding of formation behavior with CO_2 injection, the ability to predict results and optimize the process through reservoir modeling.

Primary Project Goal

The primary goal of this project is to develop a technical understanding of the CO_2-sequestration/ECBM process by studying the two field projects, integrating this knowledge with laboratory tests, and transferring that new knowledge to industry by developing an easy-to-use screening model that can quickly assess the feasibility of CO_2 sequestration at any given site based on coal seam data and injected gas properties.

Geologic Sequestration of CO_2 in Deep, Unmineable Coalbeds: An Integrated Research and Commercial-Scale Field Demonstration Project

PARTNERS AND PERFORMERS

Advanced Resources International, Inc.

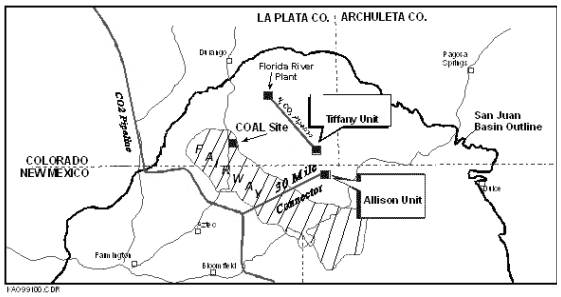
Burlington Resources

BP America

TOTAL ESTIMATED COST

Total Project Value	$5,543,246
DOE	$1,387,224
Non-DOE Share	$4,156,022

Objectives



Location of the Tiffany and Allison Units

- Demonstrate N_2/CO_2 ECBM recovery and CO_2 sequestration in deep, unminable coalbeds.
- Develop a software model that can be used by industry to screen site-specific sequestration opportunities in coalbeds.
- Document field procedures.
- Perform a scoping assessment of the potential for CO_2 sequestration in deep, unmineable coal seams across the U.S.
- Perform supporting research in sorption behavior in various coal types and develop performance studies into multi-component coal sorption behavior, the potential for matrix swelling of the coal with CO_2 injection, and the potential for geochemical reactions between coal moisture and CO_2 that could adversely affect injectivity.
- Transfer results to a broad industrial base.

Accomplishments

The field studies have clearly demonstrated that ECBM via CO_2/N_2 injection and CO_2 sequestration in coal seams is technically feasible. Field and laboratory data has provided important new insights on the process, such as the tendency for coal to "swell" when it comes into contact with CO_2, reducing injectivity. New light has also been shed on the processes of methane displacement by CO_2. These findings will have important implications for designing and implementing future CO_2-sequestration/ECBM projects, and are being incorporated into the project screening model. An national assessment has indicated that this approach has the potential to sequester 90 billion tonnes of CO_2, and provide an additional 150 trillion cubic feet of gas supply for the U.S.

Benefits

The knowledge gained from this project will benefit the electric power generation industry by providing verifiable and valid CO_2 storage mechanisms in coal reservoirs, as well as a new source of clean gas supply. The ability to take advantage of these opportunities will be facilitated by the development of a screening model to assess CO_2 sequestration and ECBM potential.

CO_2 Injector Well at the Allison Unit