PROJECT facts

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

Carbon Sequestration

04/2008

CO_2 Sequestration Potential of Texas Low-Rank Coals

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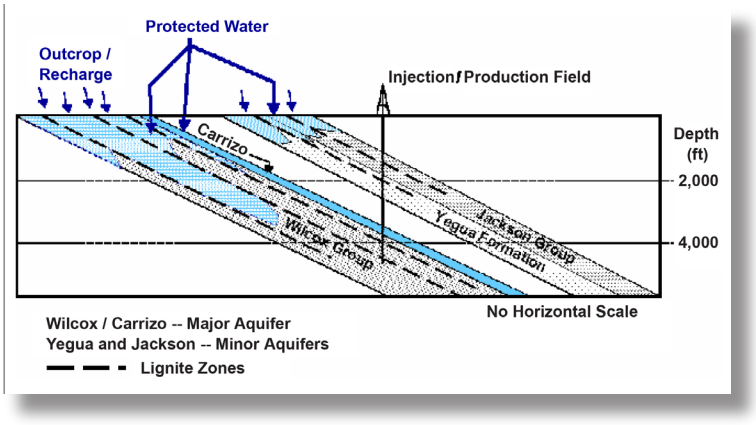
Background

Fossil fuel combustion is the primary source of emissions of carbon dioxide (CO_2), a major greenhouse gas. Sequestration of CO_2 by injecting it into geologic formations, such as coal seams, may offer a viable method for reducing atmospheric CO_2 emissions. Injection into coal seams has the potential added benefit of enhanced coalbed methane recovery. The potential for CO_2 sequestration in low-rank coals, while as yet undetermined, is believed to differ significantly from that for bituminous coals. To evaluate the feasibility and the environmental, technical, and economic impacts of CO_2 sequestration in Texas low-rank coal beds, the Texas Engineering Experimental Station is conducting a four-year study to characterize coals located near major electrical power plants. Potential CO_2 sequestration sites have been identified in coals near three Texas power plants. These power plants emit over 30 million metric tons of CO_2 annually, accounting for nearly 15 percent of Texas' point-source emissions.

It has been widely reported that coals will adsorb approximately twice as much CO_2 as methane, but tests of a limited number of samples from the northern Great Plains and Texas indicate that low-rank coals may adsorb 6-18 times as much CO_2 as methane. CO_2 injection can improve methane recovery and help maintain reservoir pressure, thus offsetting operating costs by reducing the amount of gas compression required.

Primary Project Goal

The primary goal of this project is to evaluate the feasibility and environmental and economic impacts of sequestration of CO_2 in Texas low-rank coal seams.



Schematic presentation of multizone sequestration/production potential at some sites.

PARTNERS

Texas Engineering Experiment Station

Anadarko Petroleum Corporation

PERFORMANCE PERIOD

09/01/2002 to 08/31/2006

COST

Total Project Value
$450,000

DOE/Non-DOE Share
$360,000 / $90,000

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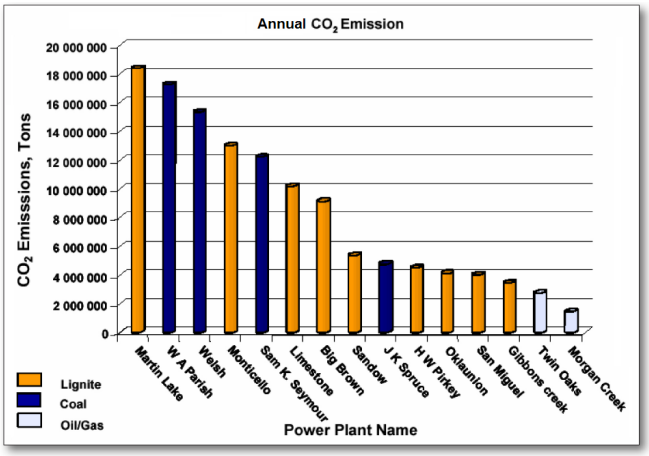
Objectives

Specific project objectives are to:

- Determine the technical and economic feasibility and volume of CO_2 that could be sequestrated in Texas coal seams.
- Determine locations and quantities of anthropogenic CO_2 sources near possible coal injection sites.
- Determine the potential for enhanced coalbed methane recovery as an added benefit of sequestration.

Benefits

Texas is one of the largest emitters of CO_2 in the United States. However, Texas also has huge reserves of low-rank coal, and much of this coal is in deep seams in close proximity to large power plants. Thus, there is great potential for sequestering CO_2 in these coal seams while simultaneously producing large volumes of coalbed methane to help offset sequestration costs. Such projects could make a significant contribution towards meeting the goal of reducing greenhouse gas intensity (pounds of CO_2 emitted per dollar of Gross Domestic Product) by 18 percent by 2012.



Amount of CO_2 emitted and fuel type by power plant, 15 largest Texas CO_2 emitters.

Accomplishments

Potential sites for geologic sequestration of CO_2 with possibilities for enhanced recovery of coalbed methane near three of Texas' largest power plants have been identified. In cooperation with Anadarko Petroleum, core samples were obtained and analyzed to determine gas content and sorption properties, and permeability tests were conducted in Wilcox coals in the vicinity of the Sam K. Seymour power plant in East-Central Texas. Probabilistic reservoir modeling studies of injection of gas compositions ranging from 100 percent CO_2 to flue gas (87 percent N2-13 percent CO_2) indicate that methane resources and CO_2 sequestration potential in East-Central Texas low-rank coals are significant, with potential produced methane volumes of 0.3 to 1.3 billion cubic feet (Bcf) and potential CO_2 sequestration volumes of 0.3 to 3.0 Bcf per 80-acre 5-spot pattern. Economic modeling studies indicate that CO_2 sequestration and enhanced coalbed methane production are marginally economic to uneconomic at current U.S. conditions (gas price of $7 to $8 per million standard cubic foot (Mscf) and CO_2 sequestration credits of $0.07 per Mscf), and that moderately higher gas prices and/or CO_2 sequestration credits are required for economic projects.