

PROJECT facts

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

Carbon Sequestration

04/2009



CARBON MANAGEMENT FOR A COAL/BIOMASS TO LIQUIDS PLANT IN NORTHEAST OHIO

Background

This project involves the development of a carbon management plan for a proposed coal and biomass to liquids (CBTL) plant. Activities will include evaluating carbon dioxide (CO₂)-based enhanced oil recovery (EOR) and geologic sequestration opportunities in the region, identifying potential CO₂ and hydrocarbon pipeline routes and design configurations, and an assessment of life-cycle greenhouse gas (GHG) emissions associated with the plant. The basis for this study will be the Baard Energy Ohio River Clean Fuels (ORCF) Project that is planned for construction in Wellsville, Ohio, with operations to commence in 2012. Market conditions provide a clear economic incentive for the production of gasoline, diesel, and jet fuels, with possible co-generation of electrical power and other by-products. Legislation requiring GHG management is expected in the future. Baard Energy has therefore taken the initiative to design a plant that can capture, purify, and use or sequester the CO₂ produced by a CBTL plant.

The project will increase technical understanding and public confidence in building an industry in the United States for converting the nation's abundant supplies of coal and biomass to synthetic fuels to reduce U.S. reliance on expensive and diminishing domestic and foreign crude reserves. The project will also help to determine the economic and environmental benefits and tradeoffs of blending biomass feedstock with coal to produce synthetic fuels, while using the by-product CO₂ for EOR to produce additional fuels that may be cleaner than conventional crude fuels.

Primary Project Goal

The study will close important technology gaps necessary to prove that a CBTL with EOR can achieve the emission standards sought by the Department of Energy's (DOE's) Office of Fossil Energy. Specific objectives of this study are to:

- Demonstrate an effective methodology for using CO₂ in a depleted oil reservoir to gain significant incremental oil production. This geologic site will provide final sequestration for the CO₂ when oil production has ceased. This activity will commence with a single-well "Huff-n-Puff" test using approximately 80 tons of CO₂.

CONTACTS

Sean Plasynski

Sequestration Technology Manager
National Energy Technology
Laboratory
626 Cochran Mill Road
P.O. Box 10940
Pittsburgh, PA 15236-0940
412-386-4867
sean.plasynski@netl.doe.gov

Darin Damiani

Project Manager
National Energy Technology
Laboratory
3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507-0880
304-285-4398
darin.damiani@netl.doe.gov

Craig Conner

Principal Investigator
800 NE Tenney Road,
Suite 110, #104
Vancouver, WA 98685
513-685-4153
cconner@baardenergy.com



Crew member monitoring CO₂ injection operations during the injection phase of the "huff n' puff" test at the Sickafosse-Morris well



PARTNERS

Melzer Consulting
Ohio Geologic Survey
Idaho National Laboratory
Praxair
Gas Analytical Services
SCAL, Inc.
JL Wicks
Range Resources
Wright State University

PERIOD OF PERFORMANCE

08/20/08 to 08/19/09

COST

Total Project Value
\$2,461,254

DOE/Non-DOE Share
\$1,929,847 / \$531,407

ADDRESS

National Energy Technology Laboratory

1450 Queen Avenue SW
Albany, OR 97321-2198
541-967-5892

2175 University Avenue South
Suite 201
Fairbanks, AK 99709
907-452-2559

3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507-0880
304-285-4764

626 Cochran's Mill Road
P.O. Box 10940
Pittsburgh, PA 15236-0940
412-386-4687

One West Third Street,
Suite 1400
Tulsa, OK 74103-3519
918-699-2000

CUSTOMER SERVICE

1-800-553-7681

WEBSITE

www.netl.doe.gov

- Evaluate the technology, energy requirements, and economics to capture, compress, transport, and inject a high-purity CO₂ stream produced by the ORCF project to a carbon capture site in close proximity to the plant. The amount of CO₂ that is co-produced as a result of the chemical energy and the amount of hydrogen production required to gasify the coal and biomass to produce the proper ratio of clean carbon and H₂ necessary for liquid fuels production is significant.
- Assess the life-cycle GHG emissions associated with the production and consumption of replacement fuels and other products produced by the coal and biomass to liquids plant. This activity will be coordinated with, and will also support, the U.S. Environmental Protection Agency (EPA) Office of Transportation/Air Quality, NETL, and other organizations directed by EPA or Congress to establish a consistent and accurate procedure for determining GHG emissions associated with alternative fuels production.

Accomplishments

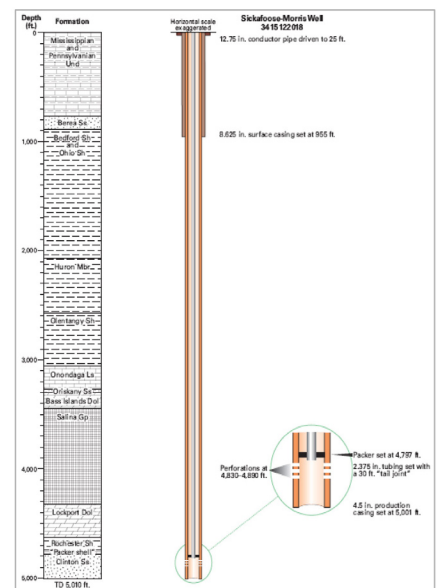
“Huff n’ Puff” Test:

- CO₂ readily accepted by formation.
- Sub-optimal pressures did not materially affect results.
- Significant increase in oil produced over baseline.
- CO₂ clearly diffused in oil; some solution drive achieved.
- Majority of CO₂ entered the rock matrix.
- CO₂ was confined to area around wellbore; no escape detected.
- Indications are positive for CO₂ EOR operations; need confirmation for the next phase involving multiple wells in a pattern sweep.

A final report of the FY 09 project efforts will be completed in the fall of 2009.

Benefits

DOE, the state of Ohio, utility industries, other CO₂ producers, and the oil and gas industry will all benefit from the information generated by this study. This project will assist DOE's Office of Fossil Energy in achieving its primary mission and clean coal conversion goals, while also demonstrating the possibility to exceed the standards established by the EPA in 2007. The knowledge of CO₂ flooding in these types of reservoirs could be applied to other Appalachian Basin reservoirs and potentially help to recover billions of barrels of incremental oil in the region. As a result, new service businesses and revenues to local authorities could be achieved.



Stratigraphy and well design of the Sickafosse-Morris well