

October 31, 2007

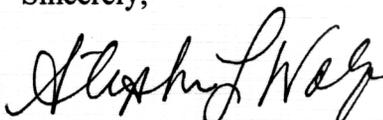
Ms. Karlene Fine  
Executive Director  
Industrial Commission of North Dakota  
600 East Boulevard Avenue  
Bismarck, ND 58505

Dear Ms. Fine:

Subject: Plains CO<sub>2</sub> Reduction Partnership Phase II Quarterly Technical Progress PowerPoint Presentation for the Period July 1 – September 30, 2007;  
Agreement Nos. FY06-LV-143 and GO05-014; EERC Funds 9249 and 9250

Enclosed is a hard copy of the Phase II Quarterly Technical Progress PowerPoint Presentation for the Plains CO<sub>2</sub> Reduction Partnership Program. Also enclosed is a disk containing the Quarterly Technical Progress PowerPoint Presentation. If you have any questions, please contact me by phone at (701) 777-5279 or by e-mail at [esteadman@undeerc.org](mailto:esteadman@undeerc.org).

Sincerely,

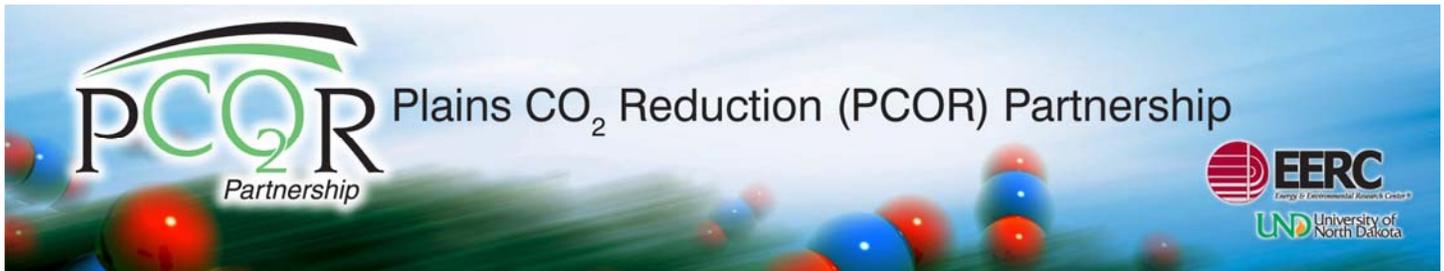
  
for Edward N. Steadman  
Senior Research Advisor

ENS/slw

Enclosures

c/enc: Jeff Burgess, Lignite Energy Council  
Rich Baker, NDIC Department of Mineral Resources, Oil and Gas Division  
Lynn Helms, NDIC Department of Mineral Resources, Oil and Gas Division

c: Tobe Larson, EERC



## PLAINS CO<sub>2</sub> REDUCTION PARTNERSHIP

Phase II Quarterly Technical Progress PowerPoint Presentation

*(for the period July 1 – September 30, 2007)*

*Prepared for:*

Ms. Karlene Fine

Industrial Commission of North Dakota  
600 East Boulevard Avenue  
Bismarck, ND 58505

Agreement Nos. FY06-LV-143; GO05-014;  
EERC Funds 9249 and 9250

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October 2007

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**University of North Dakota**  
**Energy & Environmental Research Center**  
*Plains CO<sub>2</sub> Reduction Partnership*



*Project Summary*

*DE-FC26-05NT42592*

*For the Period*

*July 1 – September 30, 2007*

**National Energy Technology Laboratory**



# Partnership Objectives

The Plains CO<sub>2</sub> Reduction (PCOR) Partnership is a collaborative regional framework to support the testing and demonstration of CO<sub>2</sub> sequestration technologies in the central interior of North America.

The PCOR Partnership project includes ten performance tasks:

- Task 1 – Project Management and Reporting
- Task 2 – Field Validation Test – Williston Basin Oil Field, North Dakota
- Task 3 – Field Validation Test – Zama, Alberta
- Task 4 – Field Validation Test – Lignite in North Dakota
- Task 5 – Terrestrial Validation Test
- Task 6 – Continued Characterization of Regional Sequestration Opportunities
- Task 7 – Research, Safety, Regulatory, and Permitting Issues
- Task 8 – Public Outreach and Education
- Task 9 – Identification of the Commercially Available Sequestration Technologies Ready for Large-Scale Deployment
- Task 10 – Regional Partnership Program Integration



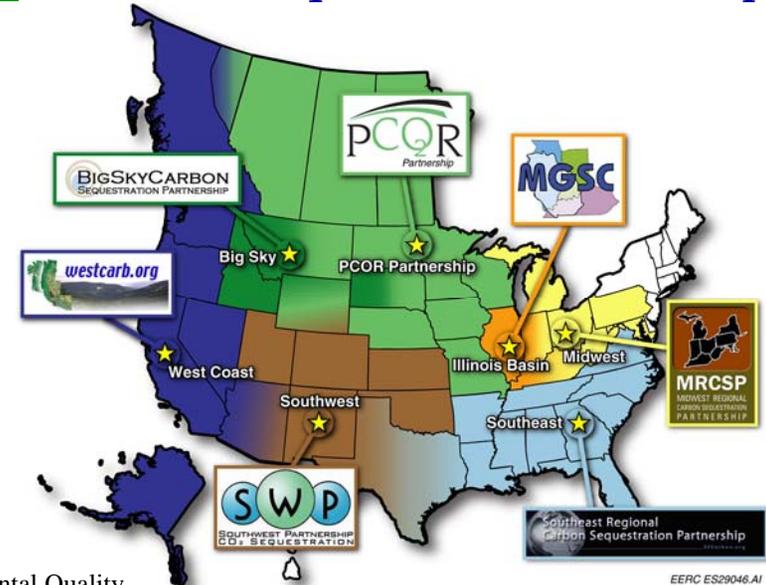
★ University of North Dakota Energy & Environmental Research Center (EERC)

- Advanced Geotechnology, a Division of Hycal Energy Research Laboratories, Ltd.
- Air Products and Chemicals
- Alberta Department of Energy
- Alberta Energy and Utilities Board
- Alberta Geological Survey
- Apache Canada Ltd.
- Basin Electric Power Cooperative
- Blue Source, LLC
- British Columbia Ministry of Energy, Mines and Petroleum Resources
- Carbozyme, Inc.
- Center for Energy & Economic Development (CEED)
- Dakota Gasification Company
- Ducks Unlimited Canada
- Ducks Unlimited, Inc.
- Eagle Operating, Inc.
- Eastern Iowa Community College District
- Enbridge Inc.
- Encore Acquisition Company
- Environment Canada
- Excelsior Energy, Inc.
- Fischer Oil and Gas, Inc.
- Great Northern Power Development, LP
- Great River Energy
- Hess Corporation
- Interstate Oil and Gas Compact Commission
- Iowa Department of Natural Resources – Geological Survey
- Lignite Energy Council
- MEG Energy Corporation
- Melzer Consulting
- Minnesota Geologic Survey – University of Minnesota
- Minnesota Power
- Minnkota Power Cooperative, Inc.
- Missouri Department of Natural Resources
- Missouri River Energy Services
- Montana–Dakota Utilities Co.

**PCOR Partnership Region:**

**Iowa  
Minnesota  
Missouri  
Montana  
Nebraska  
North Dakota  
South Dakota  
Wisconsin  
Wyoming  
Alberta  
British Columbia  
Manitoba  
Saskatchewan**

- Montana Department of Environmental Quality
- National Commission on Energy Policy
- Natural Resources Canada
- Nexant, Inc.
- North American Coal Corporation
- North Dakota Department of Commerce Division of Community Services
- North Dakota Department of Health
- North Dakota Geological Survey
- North Dakota Industrial Commission Department of Mineral Resources, Oil and Gas Division
- North Dakota Industrial Commission Lignite Research, Development and Marketing Program
- North Dakota Industrial Commission Oil and Gas Research Council
- North Dakota Natural Resources Trust
- North Dakota Petroleum Council
- North Dakota State University
- Otter Tail Power Company
- Petroleum Technology Transfer Council



- Prairie Public Television
- Pratt & Whitney Rocketdyne, Inc.
- Ramgen Power Systems, Inc.
- RPS Energy
- Saskatchewan Industry and Resources
- SaskPower
- Schlumberger
- Shell Canada Energy
- Spectra Energy
- Suncor Energy Inc.
- U.S. Department of Energy
- U.S. Geological Survey Northern Prairie Wildlife Research Center
- University of Alberta
- Westmoreland Coal Company
- Western Governors' Association
- Wisconsin Department of Agriculture, Trade and Consumer Protection
- Xcel Energy

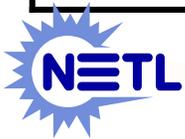
## Partnership Team

Partner Name	City	State	Congressional District
University of North Dakota Energy & Environmental Research Center (EERC)	Grand Forks	North Dakota	At large
Advanced Geotechnology, a Division of Hycal Energy Research Laboratories, Ltd.	Calgary, Alberta		
Air Products and Chemicals	Allentown	Pennsylvania	15
Alberta Department of Energy	Edmonton, Alberta		
Alberta Energy and Utilities Board	Edmonton, Alberta		
Alberta Geological Survey	Edmonton, Alberta		
Apache Canada Ltd.	Calgary, Alberta		
Basin Electric Power Cooperative	Bismarck	North Dakota	At large
Blue Source, LLC	Holladay	Utah	2
British Columbia Ministry of Energy, Mines and Petroleum Resources	Victoria, British Columbia		
Carbozyme, Inc.	Monmouth Junction	New Jersey	4
Center for Energy & Economic Development (CEED)	Alexandria	Virginia	8
Dakota Gasification Company	Bismarck	North Dakota	At large
Ducks Unlimited Canada	Stonewall, Manitoba		
Ducks Unlimited, Inc.	Memphis	Tennessee	9
Eagle Operating, Inc.	Kenmare	North Dakota	At large
Eastern Iowa Community College District	Davenport	Iowa	1



## Partnership Team (cont.)

Partner Name	City	State	Congressional District
Enbridge, Inc.	Calgary, Alberta		
Encore Acquisition Company	Fort Worth	Texas	12
Environment Canada	Manitoba and Saskatchewan Provinces		
Excelsior Energy, Inc.	Minnetonka	Minnesota	3
Fischer Oil and Gas, Inc.	Grand Forks	North Dakota	At large
Great Northern Power Development, LP	Townsend	Montana	At large
Great River Energy	Elk River	Minnesota	6
Hess Corporation	Williston	North Dakota	At large
Interstate Oil and Gas Compact Commission	Oklahoma City	Oklahoma	5
Iowa Department of Natural Resources – Geological Survey	Iowa City	Iowa	2
Lignite Energy Council	Bismarck	North Dakota	At large
MEG Energy Corporation	Calgary, Alberta		
Melzer Consulting	Midland	Texas	11
Minnesota Geological Survey – University of Minnesota	St. Paul	Minnesota	4
Minnesota Power	Duluth	Minnesota	8
Minnkota Power Cooperative, Inc.	Grand Forks	North Dakota	At large
Missouri Department of Natural Resources	Jefferson City	Missouri	4
Missouri River Energy Services	Sioux Falls	South Dakota	At large



## Partnership Team (cont.)

Partner Name	City	State	Congressional District
Montana–Dakota Utilities Co.	Bismarck	North Dakota	At large
Montana Department of Environmental Quality	Helena	Montana	At large
National Commission on Energy Policy	Washington	DC	1
Natural Resources Canada	Ottawa, Ontario		
Nexant, Inc.	San Francisco	California	8
North American Coal Corporation	Dallas	Texas	30
North Dakota Department of Commerce Division of Community Services	Bismarck	North Dakota	At large
North Dakota Department of Health	Bismarck	North Dakota	At large
North Dakota Geological Survey	Bismarck	North Dakota	At large
North Dakota Industrial Commission Department of Mineral Resources, Oil and Gas Division	Bismarck	North Dakota	At large
North Dakota Industrial Commission Lignite Research, Development and Marketing Program	Bismarck	North Dakota	At large
North Dakota Industrial Commission Oil and Gas Research Council	Bismarck	North Dakota	At large
North Dakota Natural Resources Trust	Bismarck	North Dakota	At large
North Dakota Petroleum Council	Bismarck	North Dakota	At large
North Dakota State University	Fargo	North Dakota	At large
Otter Tail Power Company	Fergus Falls	Minnesota	7



## Partnership Team (cont.)

Partner Name	City	State	Congressional District
Petroleum Technology Transfer Council	Houston	Texas	7
Prairie Public Television	Fargo	North Dakota	At large
Pratt & Whitney Rocketdyne, Inc.	Canoga Park	California	25
Ramgen Power Systems, Inc.	Bellevue	Washington	8
RPS Energy	Calgary, Alberta		
Saskatchewan Industry and Resources	Regina, Saskatchewan		
SaskPower	Regina, Saskatchewan		
Schlumberger	Sugar Land	Texas	22
Shell Canada Energy	Calgary, Alberta		
Spectra Energy	Vancouver, British Columbia		
Suncor Energy Inc.	Calgary, Alberta		
U.S. Geological Survey Northern Prairie Wildlife Research Center	Jamestown	North Dakota	At large
University of Alberta	Edmonton, Alberta		
Westmoreland Coal Company	Colorado Springs	Colorado	5
Western Governors' Association	Denver	Colorado	1
Wisconsin Department of Agriculture, Trade and Consumer Protection	Madison	Wisconsin	2
Xcel Energy	Golden	Colorado	7



# Partnership Principals

- ***Principal Investigator: Ed Steadman, EERC***
- ***Task Leaders***
  - Task 1 – Project Management and Reporting – **Ed Steadman** and **John Harju**
  - Task 2 – Field Validation Test – Williston Basin Oil Field, North Dakota – **Jim Sorensen**
  - Task 3 – Field Validation Test – Zama, Alberta – **Steve Smith**
  - Task 4 – Field Validation Test – Lignite in North Dakota – **Lisa Botnen** and **Ed Steadman**
  - Task 5 – Terrestrial Validation Test – **Barry Botnen**
  - Task 6 – Continued Characterization of Regional Sequestration Opportunities – **Erin O’Leary**
  - Task 7 – Research, Safety, Regulatory, and Permitting Issues – **Lisa Botnen**
  - Task 8 – Public Outreach and Education – **Dan Daly**
  - Task 9 – Identification of the Commercially Available Sequestration Technologies Ready for Large-Scale Deployment – **Melanie Jensen**
  - Task 10 – Regional Partnership Program Integration – **Ed Steadman**
- ***National Energy Technology Laboratory Project Manager: Darin Damiani***



# Budget

Start Date	End Date	Government Cost	Performer Cost	Total Cost	Cost Share
10/1/05	9/30/09	\$15,913,178	\$10,146,711	\$26,059,889	39%

- U.S. Department of Energy (DOE) Costs to Date: \$6,411,383
- Cost Share to Date: \$9,989,564



# Highlights of Progress to Date

## Task 1 – Project Management and Reporting

- Revisions for Phase III Renewable Application were sent to DOE on July 3 and 23, 2007.
- Submitted the 2007 Carbon Sequestration Peer Review of the PCOR Partnership Carbon Sequestration Program to DOE on July 31, 2007. Attended the Peer Review Meeting, September 17–20, 2007.
- Task 8 Web site update was sent for review on August 31, 2007.
- Submitted the Phase II Continuation Application for Years 3–4 on July 31, 2007.
- Participated in Air Quality VI Conference (September 24–26, 2007, Arlington, Virginia).
- The PCOR Partnership Task 9 Best Practice Manual (November 2006 deliverable) has been revised (submission on October 31, 2007).
- Completed Task 5 (2007 Q4 Milestone) – Fact Sheet 11, “Best Management Practices for Terrestrial Carbon Sequestration on Private Lands in the Prairie Pothole Region,” for September submission. The fact sheet has also been placed on the PCOR Partnership Web site ([www.undeerc.org/PCOR/products/factsheets.asp](http://www.undeerc.org/PCOR/products/factsheets.asp)).



# Highlights of Progress to Date

## Task 1 – Project Management and Reporting (cont.)

- Submitted the Task 8 – Carbon Markets and Trading video draft to DOE for review on September 28, 2007.
- As of September 30, 2007, the PCOR Partnership rose to 69 Phase II partners.
- Second edition of the PCOR Partnership Regional Atlas is final and available for distribution.
- Attended and presented at the 24th Pittsburgh Coal Conference, Johannesburg, South Africa, September 10–14, 2007.

The following are new Phase II members (as of September 30, 2007):

- Enbridge, Inc.
- Minnesota Geological Survey – University of Minnesota
- North American Coal Corporation



# Highlights of Progress to Date (cont.)

## Task 2 – Field Validation Test – Williston Basin Oil Field, North Dakota

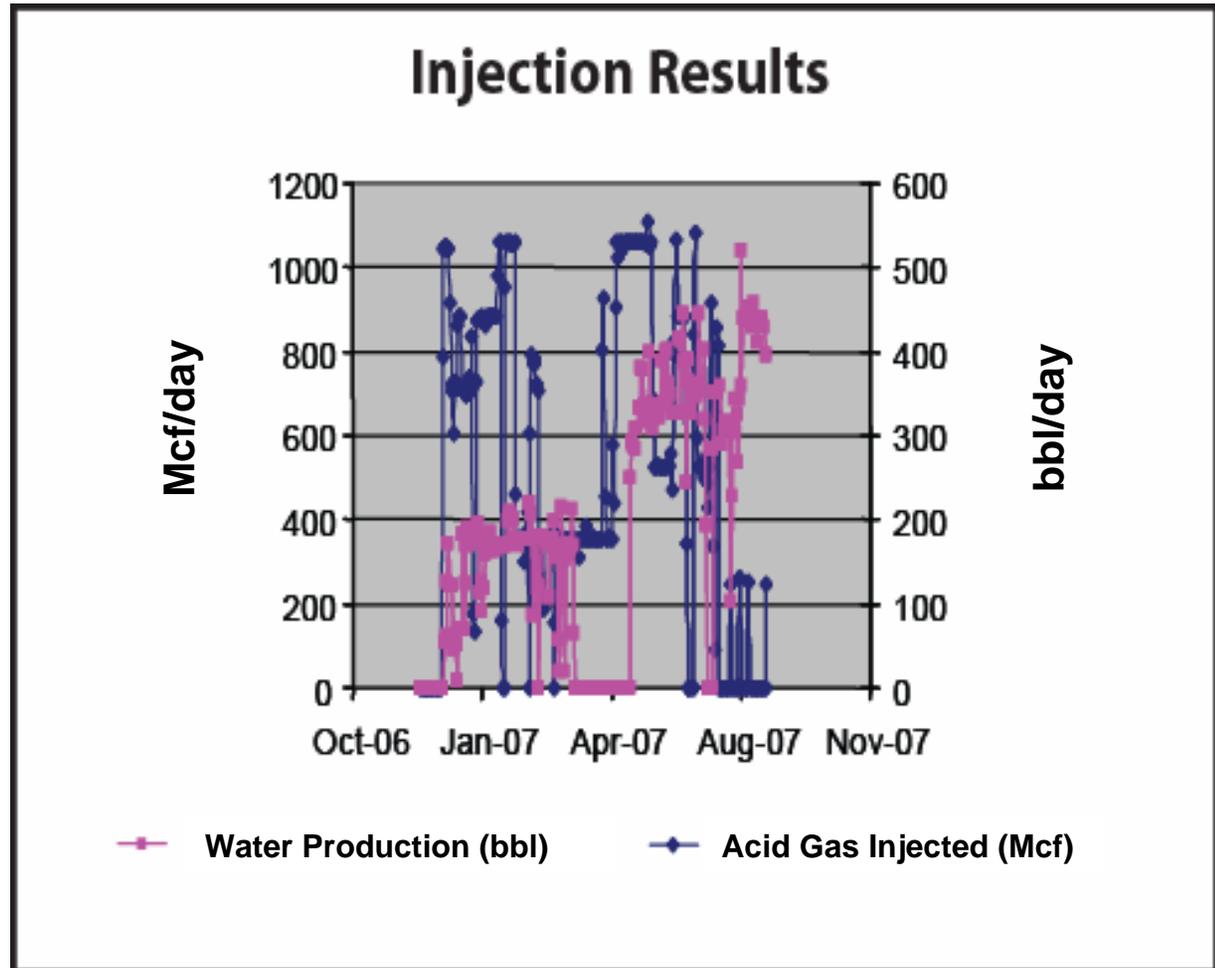
- Continued the development of the National Environmental Policy Act (NEPA) document for the Williston Basin Field Validation Test.
- Continued the development of an Experimental Design Package (EDP) for the Williston Basin Field Validation Test.
- Because of changes in our initial commercial partner's priorities, we are now considering other Williston Basin sequestration targets and partners.
- Initiated the evaluation of additional Williston Basin oil fields to identify candidate fields to host the Task 2 injection and monitoring, mitigation, and verification (MMV) activities.
- Currently meeting with Encore Acquisition Company, the operator of several oil fields in the Williston Basin, including many that are suitable for CO<sub>2</sub>-based enhanced oil recovery (EOR), to discuss Encore's potential involvement with Phase II Task 2 activities.



# Highlights of Progress to Date (cont.)

## Task 3 – Field Validation Test – Zama, Alberta

- Injection of between 400,000 and 1 mmcf/day of 70% CO<sub>2</sub> and 30% H<sub>2</sub>S has continued since December 2006 at Zama. To date, a cumulative total of 9000 tons has been injected.

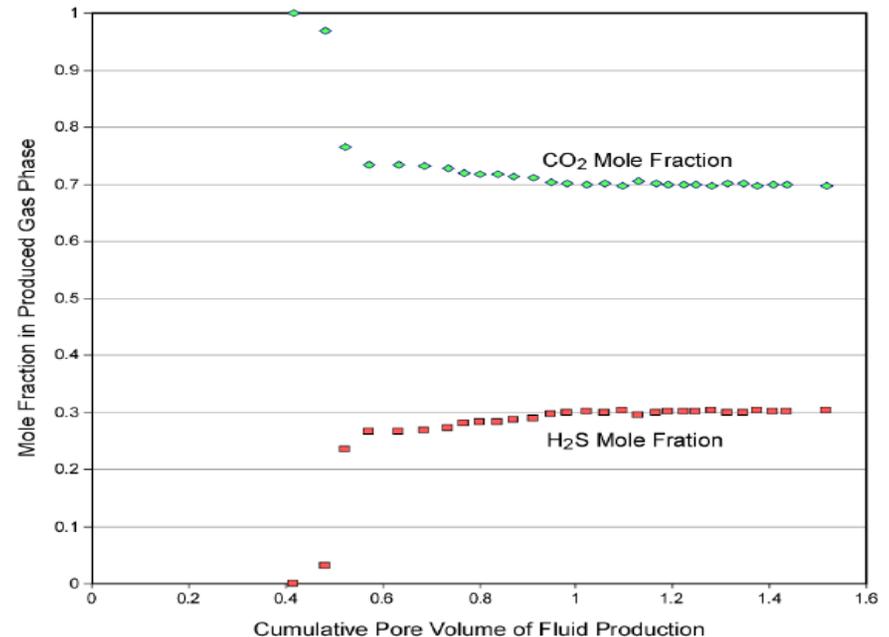


# Highlights of Progress to Date (cont.)

## Task 3 – Field Validation Test – Zama, Alberta (cont.)

### Acid Gas–Brine Partitioning

- Were conducted to assess the potential for early detection of acid gas in case of leakage into overlying saline formations.
- Were performed at 140°F and 1960 psi, the conditions of the Zama F-pool pinnacle reservoir.
- Brine composition is 119,000 ppm TDS.
- Results indicate CO<sub>2</sub> will lead H<sub>2</sub>S in the sweep displacement front.
- May provide warning of a potential future breakthrough of acid gas.

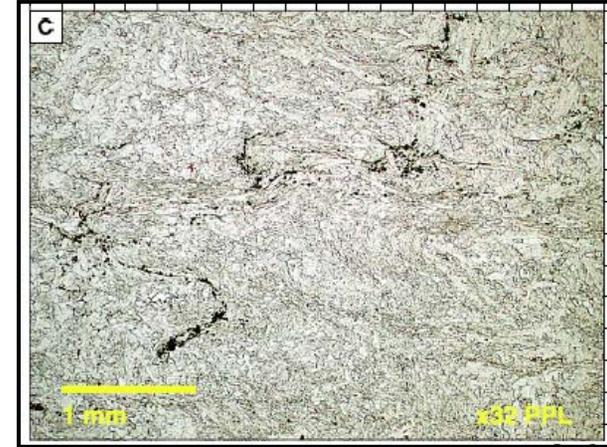


# Highlights of Progress to Date (cont.)

## Task 3 – Field Validation Test – Zama, Alberta (cont.)

### Relative Permeability Analysis

- Were done to determine CO<sub>2</sub> and formation brine displacement characteristics of the pinnacle caprock (anhydrite).
- Prior to testing:
  - Capillary pressure testing was done to determine pore throat opening size
  - Petrographic analysis was conducted
- Two samples were tested using formation brine, CO<sub>2</sub>, H<sub>2</sub>S, and an acid gas mixture of 70% CO<sub>2</sub> and 30% H<sub>2</sub>S.
- Results show very low permeability in the caprock, indicating low potential for natural fluid flow out of the pinnacle.



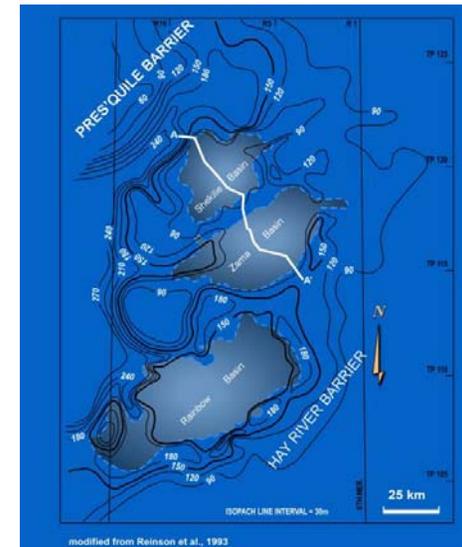
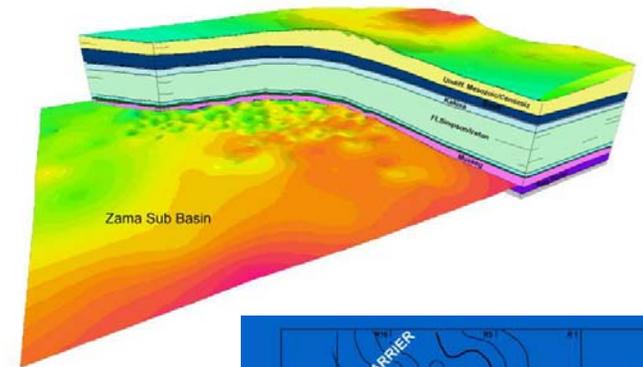
Test Phase	Permeability, mD	Relative Permeability Fraction
Initial Absolute Brine Permeability	0.0001680000	1.0000
Supercritical Acid Gas Permeability	0.0000000050	0.0000298
Post Acid Gas Brine Permeability	<0.0000000010	Too small to measure

# Highlights of Progress to Date (cont.)

## Task 3 – Field Validation Test – Zama, Alberta (cont.)

### Geology and Hydrogeology

- Were conducted to better understand the storage characteristics of regional saline formation systems and the fate of acid gas in case of leakage outside the pinnacle.
- The results indicate there is minimal potential for acid-gas migration to shallower strata and potable groundwater.
- Leakage migration, should it occur, would be a very slow process (thousands of years) and would likely be limited to much less than a kilometer from the site because of dissolution, dispersion, and residual gas trapping along the migration pathway.

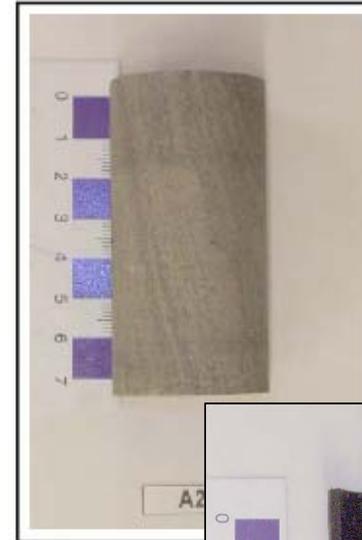


# Highlights of Progress to Date (cont.)

## Task 3 – Field Validation Test – Zama, Alberta (cont.)

### Rock Mechanics Activities

- Lab testing of eight core samples has occurred:
  - Primarily dolomite from the Keg River Reservoir and dolomite and anhydrite from the Muskeg caprock.
- Tests include:
  - Bulk density.
  - Acoustic velocity.
  - Uniaxial strength.
  - Triaxial strength.
  - Residual friction measurements.
- Results indicate that the caprock is significantly stiffer than the reservoir rock and is, therefore, a competent seal.



# Highlights of Progress to Date (cont.)

## Task 3 – Field Validation Test – Zama, Alberta (cont.)

### MMV Activities

- Monitoring of reservoir dynamics is ongoing.
- Reservoir dynamics data (pressure and fluid analyses) have shown no evidence of acid gas migration from the pinnacle.
- The monitoring well in overlying Slave Point Formation has been sampled four times since injection and shows no evidence of acid gas.



# Highlights of Progress to Date (cont.)

## Task 4 – Field Validation Test – Lignite in North Dakota

- The applicability of various MMV technologies (tiltmeter survey, gravity survey, tracer study, and seismic survey) to the lignite test continues to be researched and evaluated.
- The progress report, quarterly report, and peer review document were completed.
- An initial draft of a CO<sub>2</sub> flood design for the validation test was completed. This will be revised as more data become available.
- Agreements have been finalized with various service providers, including those completing various field tests and logging services.
- A meeting was held with Apogee Scientific to discuss its sensing equipment.
- Core was taken from the center well (injection) and is being analyzed by Terratek.
- Sundry Notices were submitted to the North Dakota Industrial Commission (NDIC) for variations in sample-collecting intervals in three of the observation wells. Sundry Notices were also submitted informing the state of the status of pit reclamation.



# Highlights of Progress to Date (cont.)

## Task 4 – Field Validation Test – Lignite in North Dakota (cont.)

- A public meeting was held in Bowbells, North Dakota. This meeting was held at the request of the Burke County Commission. The commissioners, other local officials, and approximately four people from the general public were in attendance. The meeting went well and an update meeting will be held once some preliminary results of the testing are available, most likely this winter.



# Highlights of Progress to Date (cont.)

## Task 4 – Field Validation Test – Lignite in North Dakota (cont.)

- All five wells have been drilled, cemented, and logged. On well #36-16, open-hole logs were not run because of a severe bridging problem at 117 feet. After multiple attempts to complete the logging, it was concluded that obtaining open-hole logs would not be possible. The State of North Dakota was contacted, and an open-hole log waiver was requested and received. A cased-hole neutron log as well as a cement bond log were run on this well. A cement bond log was also run on the other four wells.
- The zones of interest in all five wells have been perforated, and initial swabbing has occurred.
- Form 6 Completion Notices were submitted the North Dakota Oil and Gas Division for all five wells. Supplemental completion forms will be submitted when appropriate.
- A meeting was conducted with Schlumberger to go over processing techniques and initial data analysis.
- Core analysis and log interpretation by Terratek and Schlumberger are continuing. Additional core analysis will be completed by the EERC and the National Energy Technology Laboratory (NETL).
- Model development and baseline characterization are continuing.
- CO<sub>2</sub> sources for injection have been contacted, and various delivery methods are being evaluated.



# Highlights of Progress to Date (cont.)

## Task 5 – Terrestrial Validation Test

Prior to the initiation of field activities, the following deliverables were completed:

- Experimental Design Package (EDP)
- NEPA Compliance Document
- Site Health and Safety Plan (SHSP)
- Regulatory Permitting Action Plan (RPAP)
- Outreach Action Plan (OAP)
- Sampling Protocols

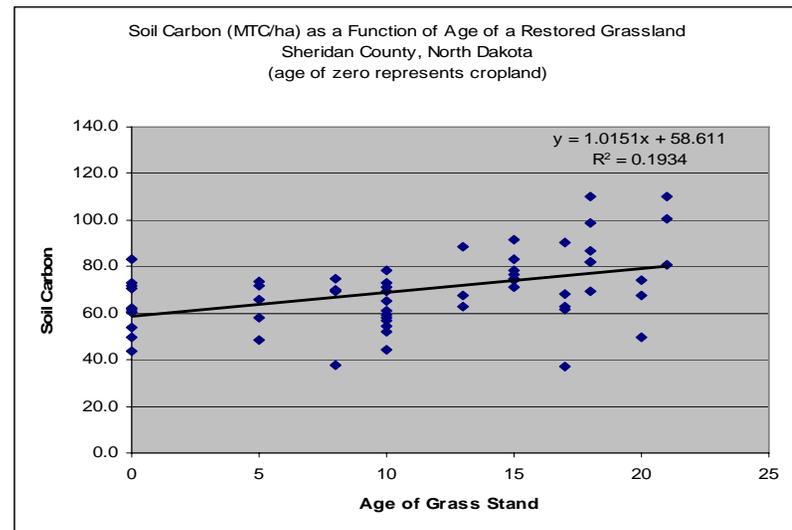


# Highlights of Progress to Date (cont.)

## Task 5 – Terrestrial Validation Test (cont.)

### Review of 2006 Grassland Sampling Event

- During the 2006 field season, approximately 2080 acres of native grassland, restored grassland, and cropland were sampled in Sheridan County, North Dakota.
- The data from the 2006 sampling have been analyzed by Dr. Larry Cihacek at North Dakota State University (NDSU). The results show a positive relationship between age of grass stand and soil carbon (see figure below).
- The loss of soil organic carbon from native grassland after it is converted to cropland averaged 43.4 Mg SOC/ha.



# Highlights of Progress to Date (cont.)

## Task 5 – Terrestrial Validation Test (cont.)

### Review of 2007 Field Activities

- Grassland sampling for 2007 has been completed. Samples were collected in north-central South Dakota, south-central South Dakota, and western Minnesota. The sampling began in June 2007 in north-central South Dakota. A total of 191 points and 1910 acres were sampled, generating 382 soil samples. All of the samples have been processed and are in the lab being analyzed. A total of 257 points were sampled on 2570 acres in south-central South Dakota, generating 524 samples. These samples are currently being processed and will be analyzed this fall and winter. The western Minnesota sampling has just been completed, and 221 points were sampled on 2210 acres, generating 442 samples to be processed and analyzed.



# Highlights of Progress to Date (cont.)

## Task 5 – Terrestrial Validation Test (cont.)

### Review of 2007 Field Activities

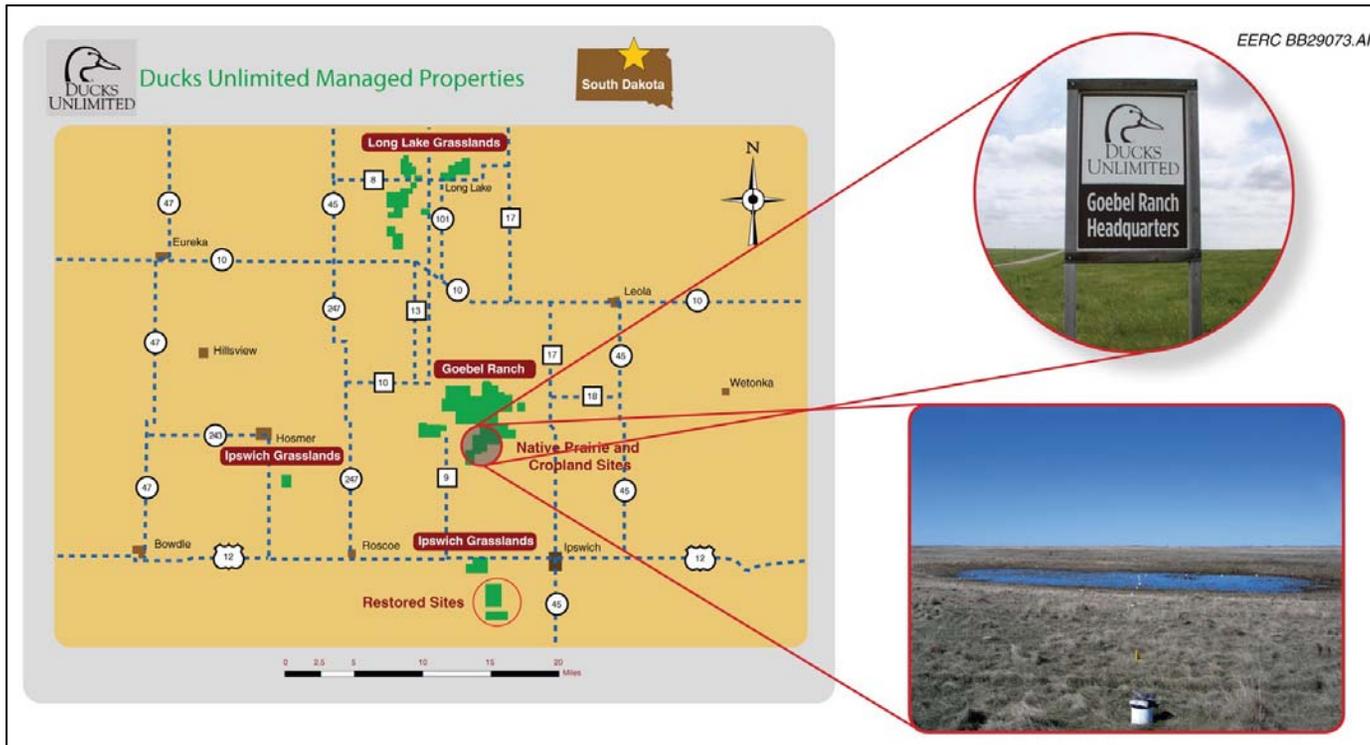
- Landcover classification on SPOT (Satellite Pour l' Observation de la Terre) imagery is being developed using eCognition software to analyze the distribution of native and planted cover in portions of the PCOR Partnership region. The product will be used in a grassland loss model and coupled with field test results to estimate the potential of terrestrial sequestration from grasslands in the PCOR Partnership region. The results of this modeling will help identify field locations for the 2008 sampling season.
- One 40-acre restoration was seeded (June 22, 2007) into a monoculture of switchgrass to evaluate its ability to sequester carbon when grown to produce biomass for ethanol production.



# Highlights of Progress to Date (cont.)

## Task 5 – Terrestrial Validation Test (cont.)

- The U.S. Geological Survey (USGS) Northern Prairie Wildlife Research Center identified a population of potential wetland sample replicates on Ducks Unlimited, Inc. (DU), property in South Dakota for monitoring of greenhouse gas (GHG) fluxes from grazed and hayed areas over time.



# Highlights of Progress to Date (cont.)

## Task 5 – Terrestrial Validation Test (cont.)

- Researchers from the USGS collected greenhouse gas (carbon dioxide, methane, nitrous oxide) flux data from 17 wetland catchments located on DU Goebel Ranch and Ipswich Grasslands property and privately owned properties in Edmunds County, South Dakota.
  - This sample of wetlands included restored (idled and hayed), native (idled and grazed), and cropland catchments.
  - Gas emissions have been collected biweekly along 39 transects established in the 17 wetlands. Wetlands were sampled bimonthly from April to October 2007.
    - During this period, more than 7000 individual gas flux samples were collected in conjunction with measurements of variables that influence gas emissions such as soil moisture, temperature, rainfall, and water depth.
  - Other activities completed include conducting vegetation and topographic surveys, installation of vegetative enclosures and temperature loggers, establishment of photo-stations, and collection of soil samples for determination of physical and chemical properties.



# Highlights of Progress to Date (cont.)

## Task 5 – Terrestrial Validation Test, Additional Products (cont.)

### Fact Sheets

#### Best Management Practices

- Existing information has been synthesized on the impacts of grazing and other land use management options on carbon sequestration, and a fact sheet was prepared and has been approved by DOE.

#### Indirect Benefits

- Other economic and environmental incentives that may result from agricultural land restoration, such as water quality, erosion control, flood buffering, recreational, and wildlife benefits, are being identified.

#### Additional Fact Sheets

- Fact sheets are being completed on:
  - Native prairie preservation
  - Grassland restoration
  - Leakage
  - Avoided emissions
  - Biotic values of the Prairie Pothole Region (PPR)



# Highlights of Progress to Date (cont.)

## Task 5 – Terrestrial Validation Test, Additional Products (cont.)

### Topical Report

#### Business Flow Processes

In anticipation of market trading of offsets in the PCOR Partnership region, business flow processes are being defined to provide a transparent framework for transacting carbon credits resulting from wetland/grassland sequestration under a variety of business scenarios. The following items have been or will be submitted to DOE as stand-alone documents and as part of a business processes package:

- Prospectus for grassland carbon offset sale in the PPR (complete)
- General term sheet for grassland carbon offset sale with investor in the PPR (complete)
- DU carbon sequestration fact sheet for investors (complete)
- Private carbon/easement legal document (complete, will submit to DOE in next quarter)
- Agreement with landowner and DU to market carbon on their behalf (in draft form)
- Conveyance of GHG rights document to transfer carbon rights from landowner to DU for an aggregated transaction (complete, will submit this quarter)



# Highlights of Progress to Date (cont.)

## Task 5 – Terrestrial Validation Test, Additional Products (cont.)

### Topical Report, cont.

#### Business Flow Processes

The complexities of the business flow processes of the emerging voluntary market have motivated the creation of a topical report providing a primer on carbon market basics and participants. The topical report is complete and is currently under review internally and by market participants covered in the report. A draft will be submitted to DOE in the next quarter.

Topics covered include:

- Evaluation of DOE guidelines for aggregators and terrestrial offset providers (draft form).
- Evaluation of state/regional GHG or cap-and-trade program rules and policies (in process).
- Overview of voluntary carbon market, active players, certification standards, market activity, etc. (in process).



# Highlights of Progress to Date (cont.)

## Task 5 – Terrestrial Validation Test (cont.)

### Outreach

- Documents have been developed to answer potential wetlands/grassland carbon sequestration questions for investors on issues such as leakage, biotic values of the PPR, emissions offsets due to tillage practices, and sequestration rates. Two outreach brochures have been completed and are currently available.
- DU has updated the PCOR Partnership Terrestrial Project Web site on [www.ducks.org/Conservation/EcoAssets/2530/PCORPartnership.html](http://www.ducks.org/Conservation/EcoAssets/2530/PCORPartnership.html). A project update report and links to the fact sheets that have been completed for Phase II have been added to the PCOR Partnership “Partners Only” Web site.
- The PCOR Partnership will collaborate with DU in providing outreach at the regional and national level. For a complete listing of outreach activities, refer to the previously mentioned OAP.



# Highlights of Progress to Date (cont.)

## Task 6 – Continued Characterization of Regional Sequestration Opportunities

### Characterization

- The source team is working on a complete Quality Assurance/Quality Control (QA/QC) review of the source database, including resolving overlap issues with Big Sky and Southwest Partnership. The Southwest Partnership has decided that the sources for the northeast portion of Wyoming will be covered by the PCOR Partnership. The PCOR Partnership is working with Big Sky so that any overlapping sources will display the exact same information so that NATCARB will not have any issues with duplicate data. There is a November deadline to have these issues resolved.
- The analysis of the Broom Creek saline formation is still in progress, focusing on the Washburn study area, a 6000-square-mile area in west-central North Dakota. Well log files which currently exist as image (raster) files are being converted to the Log ASCII Standard (LAS) format (vector) using Neurolog. These logs are then imported into Schlumberger's Petrel software package which is used to develop detailed reservoir simulation models of the potential storage site. The results of the Petrel model are imported into Schlumberger's ECLIPSE software to further model the movement of CO<sub>2</sub> in the subsurface.
- Stratigraphic and well log databases for the next potential target zones were begun: the Deadwood and Winnipeg Formations.



# Highlights of Progress to Date (cont.)

## Task 6 – Continued Characterization of Regional Sequestration Opportunities (cont.)

### Characterization (cont.)

- Fischer Oil and Gas Inc. activities included the following:
  - Finishing the drafts for six topical reports (formation outlines).
  - Continued lignite characterization for central North Dakota.
  - Worked with PCOR Partnership staff on the model for the Washburn Project area of the Broom Creek saline formation.
  - Continued work on a log database for AQ1 aquifer layer (Ordovician Red River, Winnipeg, and Deadwood Formations).



# Highlights of Progress to Date (cont.)

## Task 6 – Continued Characterization of Regional Sequestration Opportunities (cont.)

### Characterization (cont).

- Iowa Geologic Survey (IGS) activities included the following:
  - Completed draft coverages and metadata for isopach and TDS maps for stratigraphic units identified as Year One products. Effort focused on the 16 southwesternmost counties of Iowa, where initial reviews indicate the greatest thickness of confining beds, aquifer depths, salinities and, therefore, sequestration potentials is present.
  - Continued an inventory of IGS records of oil and gas exploration wells and wells drilled as part of natural gas storage exploration and operations. During the previous quarter, IGS inventoried all of the approximately 135 oil and gas tests in its archives. This quarter IGS essentially completed the inventory of the gas storage-related wells. The inventory describes each file and highlights particularly relevant materials in the files, such as stratigraphic and geophysical logs, porosity and permeability tests, water quality analyses, drill stem test data, cored intervals, etc.



# Highlights of Progress to Date (cont.)

## Task 6 – Continued Characterization of Regional Sequestration Opportunities (cont.)

### Characterization (cont).

- The PCOR Partnership held a meeting with Lynn Helms, Dave Hvinden, Ed Murphy, and Steve Nordeng at NDIC to discuss the gas analysis Web site. NDIC will review the Web site and provide feedback for graphing capabilities. Several items for development were identified:
  - Create a thematic map that displays a bar chart of the earliest or latest analytical result of a chosen component over all formations for each well.
  - Simplify the graphing options by identifying two or three standard graphs.
  - Add a gas plant layer to the site.
- Created and populated a database of references regarding terrestrial sequestration activities in the PCOR Partnership region.



# Highlights of Progress to Date (cont.)

## Task 6 – Continued Characterization of Regional Sequestration Opportunities (cont.)

### Characterization (cont).

- The PCOR Partnership worked with the BC Ministry of Energy, Mines, and Petroleum Resources regarding oil pool information for British Columbia. We have provided them with a list of data elements that we would like to obtain for each pool, along with a description of the GIS layers that we currently have for British Columbia.
- The PCOR Partnership requested an updated version of the North Dakota formation tops database from NDIC.
- Working on a subcontract with Missouri Geological Survey for regional characterization of Missouri.
- Continued work on the final report for the Class II injection well study.
- Held internal meetings with the geologic, terrestrial, regulatory, and source task leaders to develop plans for regional characterization for Phase II and Phase III.



# Highlights of Progress to Date (cont.)

## Task 6 – Continued Characterization of Regional Sequestration Opportunities (cont.)

### Decision Support System (DSS)

- The following improvements were made to the DSS:
  - Added monthly updates.
  - Added a link to the terrestrial pages to display a list of relevant studies regarding terrestrial sequestration.
  - Added the total estimated capacities to the saline legends.
  - Replaced the Alberta Basin with the Western Canadian Sedimentary Basin.
  - Added functionality to print the displayed map as a pdf document at 300 dpi. The option is available from the top menu by clicking on “Print Map.”
  - Updated reference documents as appropriate.
  - Created a script to determine whether or not a person has the pop-up blocker turned on. If the blocker is turned on, the user will receive a message informing them that they should turn it off for this site so that they can use all of the functionality in the DSS.
  - Increased the “dot” size for displaying sources so that they are more visible on the screen.



# Highlights of Progress to Date (cont.)

## Task 6 – Continued Characterization of Regional Sequestration Opportunities (cont.)

### DSS

- Configured the new PCOR Partnership ArcGIS Server 9.2 to run existing ArcIMS projects. This allows developers to maintain and host existing 9.1 projects while using the new development capabilities of the Microsoft .Net Framework found in version 9.2. Resolved license manager issues with Neuralog and Eclipse applications.

### Other Activities

- Participated in geologic and GIS working group calls.
- Worked on the Gap Assessment Report for submission on October 31, 2007.
- Worked on slides, forms, and requests for information for the Phase II continuation application, the Phase III proposal, and the peer review meeting.



# Highlights of Progress to Date (cont.)

## Task 7 – Research, Safety, Regulatory, and Permitting Issues

### General

- Reviewed the IOGCC report entitled “Storage of Carbon Dioxide in Geologic Structures, A Legal and Regulatory Guide for States and Provinces.”
- Reviewed a portion of the Farm Bill that gives the government authority to set performance standards for carbon credits from agriculture and forestry.
- Analyzed the regulatory requirements that are involved in designing a CO<sub>2</sub> flood for enhanced resource recovery.
- Completed progress report, peer review, and quarterly report.
- Continue to follow the developments of various state and regional initiatives.
- Continued analysis of carbon market strategies.
- Continued to follow legislative actions occurring in Congress.
- Continued review of recent publications relating to regulating CO<sub>2</sub> sequestration and MMV issues.
- Comments were provided to the NDIC, Department of Mineral Resources, Oil and Gas Division on its proposed new chapter to the North Dakota Administrative Code (NDAC), Geologic Storage of Carbon Dioxide Chapter 43-02-04.1



# Highlights of Progress to Date (cont.)

## Task 7 – Research, Safety, Regulatory, and Permitting Issues (cont.)

### Regulatory Issues Related to the Lignite Field Validation Test (Task 4)

- Sundry Notices were submitted to the NDIC for variations in sample-collecting intervals in three of the observation wells for the Lignite Field Validation Test.
- Sundry Notices were also submitted informing the state of the status of pit reclamation for the Lignite Field Validation Test.
- Form 6 Completion Notices were submitted to the North Dakota Oil and Gas Division for all five wells for the Lignite Field Validation Test. Supplemental completion forms will be submitted when appropriate.
- Work has begun to prepare the Underground Injection Control permit for CO<sub>2</sub> injection.



# Highlights of Progress to Date (cont.)

## Task 8 – Public Outreach and Education

- Draft of public Web site to NETL submitted on schedule (August 31, 2006).
- Work under way on Phase II Documentary 2 – Terrestrial Sequestration
  - Filming and interviews in southeastern United States for DU sites (February – March 2007).
  - Filming and interviews in North Dakota for soil sampling (May 2007).
  - Arrangements made to film and interview in California in August 2007 (June 2007).
- Outreach PowerPoint update submitted on schedule (February 28, 2007).
- Outreach booth draft final submitted on schedule (April 30, 2007).
- OAP for Lignite Field Validation Test submitted on schedule (April 30, 2007).
- Fact Sheet 10 (Lignite Field Validation Test) submitted on schedule (May 30, 2007).
- Continued collaboration on Regional Carbon Sequestration Program (RCSP) outreach working group activities.
- Phase II Documentary 1 (Carbon Market Trading) was submitted to NETL on schedule at the end of September 2007 (deadline extension granted to September 30, 2007, to accommodate change in scope).



# Highlights of Progress to Date (cont.)

## Task 9 – Identification of the Commercially Available Sequestration Technologies Ready for Large-Scale Deployment

- Received outside reviewers' comments and began incorporating them into the wind power best practices manual.
- Prepared a document describing both the databases and methodology used to calculate CO<sub>2</sub> emissions from the various regional point source types.
- Updated the majority of the master CO<sub>2</sub> emission data that make up the sources portion of the DSS.
- Worked with the Big Sky Partnership to eliminate differences that currently exist for 62 CO<sub>2</sub> point sources that are shared by both the Big Sky and PCOR Partnerships.
- Began preparing a topical report for the PCOR Partnership partners that details how the CO<sub>2</sub> source data are determined.



# Highlights of Progress to Date (cont.)

## Task 10 – Regional Partnership Program Integration

- Met with Encore Acquisition Company to discuss collaborative business opportunities for Phases II and III.
- Discussed Phase II activities with Westmoreland Coal Company and Missouri River Energy Services.
- Membership discussions continued with numerous organizations on Phase II opportunities and also future Phase III activities.
- Participation continued in geologic, outreach, capture and transportation, and GIS working group conference calls.
- Currently working on Regional Partnership Integration Fact Sheet to be submitted as a value-added product to DOE.



# Project Tasks and Status

Task 1 – Project Management and Reporting		
Activity	Description	Status
1	Design project management and reporting plan	Completed (December 30, 2005)
2	Perform project management	Ongoing
3	Develop PCOR Partnership Phase II final report	Future activity (due September 30, 2009)



# Project Tasks and Status (cont.)

Task 2 – Field Validation Test – Williston Basin Oil Field, North Dakota		
Activity	Description	Status
1	Project design	Ongoing
2	Project implementation	Ongoing
3	Project operations	Future activity
4	Closeout and reporting	Future activity



# Project Tasks and Status (cont.)

Task 3 – Field Validation Test – Zama, Alberta		
Activity	Description	Status
1	Project design	Completed
2	Project implementation	Completed
3	Project operations	Ongoing
4	Closeout and reporting	Future activity



# Project Tasks and Status (cont.)

Task 4 – Field Validation Test – Lignite in North Dakota		
Activity	Description	Status
1	Project design	Ongoing
2	Project implementation	Ongoing
3	Project operations	Initiating
4	Closeout and reporting	Future activity



# Project Tasks and Status (cont.)

Task 5 – Terrestrial Validation Test		
Activity	Description	Status
1	Project design	Ongoing
2	Project implementation	Ongoing
3	Project operations	Ongoing
4	Closeout and reporting	Ongoing



# Project Tasks and Status (cont.)

Task 6 – Continued Characterization of Regional Sequestration Opportunities		
Activity	Description	Status
1	Regional characterization gap assessment (RCGA)	First assessment completed (February 28, 2006) (second assessment due third budget period)
2	Data collection	Ongoing
3	Improvements to the PCOR Partnership DSS	Ongoing. Updated site release dates: <ul style="list-style-type: none"> <li>• July 2006</li> <li>• December 2006</li> <li>• February 2007</li> <li>• April 2007</li> <li>• September 2007</li> </ul>
4	Reporting	Ongoing



# Project Tasks and Status (cont.)

Task 7 – Research, Safety, Regulatory, and Permitting Issues		
Activity	Description	Status
1	Existing regulations related to the sequestration of CO <sub>2</sub> identified and tracked	Ongoing
2	New regulatory guidelines collated for projects implemented and commercially ready future sequestration projects	Ongoing
3	Reporting	Ongoing



# Project Tasks and Status (cont.)

Task 8 – Public Outreach and Education		
Activity	Description	Status
1	Outreach planning	Task 2 OAP – In progress (tentatively due August 31, 2008) Task 3 OAP – Completed (April 28, 2006) Task 4 OAP – Completed (July 27, 2007) Task 5 OAP – Completed (April 28, 2006) Task 8 OAP – Completed (February 28, 2006)
2	Web site	Phase II update submitted on schedule (August 31, 2006) Annual updates planned
3	Outreach booth	Completed (April 30, 2007)
4	Outreach PowerPoint	Completed (May 31, 2006) 2007 update completed Annual updates planned



# Project Tasks and Status (cont.)

Task 8 – Public Outreach and Education (cont.)		
Activity	Description	Status
5	Fact sheets	<p>Fact Sheet 6 (value-added product): Regional Sequestration Potential – Field Validation Tests (completed December 31, 2006)</p> <p>Fact Sheet 7: Zama Acid Gas Project (completed July 31, 2006)</p> <p>Fact Sheet 8: CO<sub>2</sub> Sequestration Through Habitat Restoration – Defining Best Terrestrial Sequestration Practices for Landowners (completed December 29, 2006)</p> <p>Fact Sheet 9 (value-added product): Cobenefits of Terrestrial Carbon Sequestration in the PCOR Partnership Region (completed February 28, 2007)</p> <p>Fact Sheet 10: CO<sub>2</sub> Sequestration Validation Test in a Deep, Unminable Lignite Seam (completed May 31, 2007)</p> <p>Fact Sheet 12: Deep Oil Field CO<sub>2</sub> Sequestration Verification Test – in progress (due October 31, 2007)</p>



# Project Tasks and Status (cont.)

Task 8 – Public Outreach and Education (cont.)		
Activity	Description	Status
6	Documentaries	Documentary 1 – submitted for review on schedule September 28, 2007 Documentary 2 – in progress (due January 31, 2008) Documentary 3 – future activity (due September 30, 2008) Documentary 4 – future activity (due June 30, 2009)
7	Reporting	Ongoing



# Project Tasks and Status (cont.)

Task 9 – Identification of the Commercially Available Sequestration Technologies Ready for Large-Scale Deployment		
Activity	Description	Status
1	Economic assessment of regional sequestration opportunities	Ongoing
2	New sequestration approaches	Wind Power Best Practices Manual – external review comments are being incorporated  Carbon management plan (CMP) for Excelsior Energy – rough draft CMP completed, final draft and best practice manual in preparation
3	Reporting	Ongoing



# Project Tasks and Status (cont.)

Task 10 – Regional Partnership Program Integration		
Activity	Description	Status
1	Development of regional partnership program integration plan (RPPIP)	Completed (July 17, 2006)
2	Integration of partnership program activities	Ongoing
3	Reporting	Ongoing



# Project Milestones

Milestone	Description	Status
<b>Task 1 – Project Management and Reporting</b>		
1	Design project management and reporting plan	Completed (December 30, 2005)
2	Manage writing of progress report	Initiated (due July 31, 2007, for inclusion in continuation application for Budget Period 2)
3	Provide overall project management	Ongoing
4	Provide quarterly and semiannual reports	Ongoing
5	PCOR Partnership Phase I wrap-up/Phase II kickoff meeting	Completed (November 1–2, 2005)
<b>Task 2 – Field Validation Test – Williston Basin Oil Field, North Dakota</b>		
1	Finalization of site-specific MMV plan	Ongoing
2	Initiation of baseline characterization activities	Ongoing
3	Historical data collection	Ongoing
4	Identification of data gaps	Ongoing
5	Analytical activities on reservoir and caprock core samples	Ongoing



# Project Milestones (cont.)

Milestone	Description	Status
<b>Task 2 – Field Validation Test – Williston Basin Oil Field, North Dakota (cont.)</b>		
6	Identification of specific well locations within the Beaver Lodge field	Ongoing
7	Facilitate the development of a site-specific plan for the installation and/or application of selected MMV technologies	Ongoing
8	Facilitate the identification of infrastructure requirements	Future activity
9	Finalization of operating partner CO <sub>2</sub> flood design	Future activity
10	Installation of CO <sub>2</sub> delivery system by operating partner	Future activity
11	Collection of site-specific baseline surface and subsurface data	Ongoing
12	Installation of CO <sub>2</sub> injection wells by operating partner	Future activity
13	Progress reports 60 days prior to conclusion of Budget Period 1	Initiated (due July 31, 2007 for inclusion in continuation application for Budget Period 2)
14	Regional Technology Implementation Plan (RTIP) detailing MMV activities at an ongoing oil-producing facility	Future activity (due July 31, 2009)



# Project Milestones (cont.)

Milestone	Description	Status
<b>Task 3 – Field Validation Test – Zama, Alberta</b>		
1	H <sub>2</sub> S/CO <sub>2</sub> injection commences	Injection was initiated in December 2006
2	Reservoir modeling	Planning for model modification under way
3	Data acquisition and design	Ongoing
4	Geologic characterization of the region (northwestern Alberta/northeastern British Columbia)	Ongoing
5	Establish hydrogeology of the study area	Ongoing
6	Conduct geomechanical tests of reservoir and caprock core samples to determine the mechanical integrity of those formations; results will be used to predict pressure that can be applied to the pinnacle before the sealing formation will be fractured.	Ongoing
7	Significant achievements/MMV updates	Future activity
8	Stress regimes of the injection zone	Ongoing
9	Assessment of influence of underlying aquifers	Ongoing
10	Progress report 60 days prior to conclusion of Budget Period 1	Completed
11	Geochemistry of the surface to subsurface	Planning phase
12	Assessment of leakage potential as a result of injection	Ongoing
13	RTIP detailing MMV activities at an ongoing oil-producing facility	Future activity (due July 31, 2009)



# Project Milestones (cont.)

Milestone	Description	Status
<b>Task 4 – Field Validation Test – Lignite in North Dakota</b>		
1	Initiation of baseline characterization activities	Completed (December 30, 2005)
2	Identification of specific well locations within the North Dakota lignite CBM test	Completed
3	Finalization of CO <sub>2</sub> flood design	Draft Completed (July 13, 2007)
4	Collection of site-specific baseline surface and subsurface data	Ongoing
5	Installation of selected MMV technologies	Future activity
6	Progress report 60 days prior to conclusion of Budget Period 1	Completed (July 31, 2007)
7	Finalization of site-specific MMV plan	Ongoing
8	Installation of CO <sub>2</sub> delivery system	Future activity
9	Installation of CO <sub>2</sub> injection wells	Future activity
10	Initial injection of CO <sub>2</sub> into subsurface	Future activity
11	Initial collection of MMV data	Future activity
12	Review and analysis of results of first year of operation	Future activity
13	Review and analysis of results of second year of operation	Future activity
14	RTIP detailing MMV activities at an ongoing oil-producing facility	Future activity



# Project Milestones (cont.)

Milestone	Description	Status
<b>Task 5 – Terrestrial Validation Test</b>		
1	Develop an experimental design package	Completed (February 28, 2006)
2	Safety, regulatory, and permitting	Completed (March 31, 2006)
3	GIS modeling to extrapolate survey site information to region	Ongoing
4	Progress report 60 days prior to conclusion of Budget Period 1	Completed (July 31, 2007)
5	Preparation and distribution of materials to solicit participation	Ongoing
6	Indirect benefits	Completed (March 2007)
7	Regional partnerships for CO <sub>2</sub> sequestration	Future activity
8	Land use management practices that increase SOC	Complete (September 2007)
9	Business flow process for carbon credit trading	Ongoing
10	Economic feasibility of CO <sub>2</sub> sequestration	Ongoing
11	RTIP	Future activity
12	Compiling design criteria	Ongoing
13	Develop Web-based landowner outreach strategy	Ongoing
14	Data compilation and analysis	Ongoing



# Project Milestones (cont.)

Milestone	Description	Status
<b>Task 6 – Continued Characterization of Regional Sequestration Opportunities</b>		
1	Conduct DSS data gap assessment (Budget Period 1)	Completed (February 28, 2006)
2	Place updated DSS into production	Updated site released: July 2006, December 2006, February 2007, April 2007
3	Progress report 60 days prior to conclusion of Budget Period 1	Initiated (due July 31, 2007, for inclusion in continuation application for Budget Period 2)
4	Conduct data gap assessment (Budget Period 3)	Future activity
5	Create field project data warehouse and put into production	Zama site completed (June 30, 2006) Terrestrial site completed (November 2006)
<b>Task 7 – Research, Safety, Regulatory, and Permitting Issues</b>		
1	Provide regulatory support to Tasks 3 and 5 field validation testing	Ongoing
2	Provide summary of regulations related to four Phase II validation tests	Ongoing
3	Provide regulatory input to progress report	Completed (July 31, 2007)
4	Provide regulatory support to Tasks 2 and 4	Ongoing
5	Progress report 60 days prior to conclusion of Budget Period 1	Completed (July 31, 2007)
6	Road map document produced	Future activity



# Project Milestones (cont.)

Milestone	Description	Status
<b>Task 8 – Public Outreach and Education</b>		
1	Fact sheet production	Fact Sheet 6 – completed (December 31, 2005) Fact Sheet 7 – completed (July 31, 2006) Fact Sheet 8 – completed (December 29, 2006) Fact Sheet 9 – completed (February 28, 2007) Fact Sheet 10 – completed (May 31, 2007) Fact Sheet 12 – in progress (due October 31, 2007)
2	OAP	Task 2 OAP – future activity (tentatively due August 31, 2008) Task 3 OAP – completed (April 28, 2006) Task 4 OAP – completed (July 27, 2007) Task 5 OAP – completed (April 30, 2006) Task 8 OAP – completed (February 28, 2006)
3	PowerPoint presentation	Completed (May 31, 2006) 2007 update completed (February 28, 2007)
4	Update to PCOR Partnership Web site	2006 update submitted on schedule August 31, 2006, and approved by NETL in September 2006. 2007 update submitted for review on schedule August 31, 2007, and approved by NETL in September 2007.



# Project Milestones (cont.)

Milestone	Description	Status
<b>Task 8 – Public Outreach and Education, cont.</b>		
5	First Phase II video produced with Prairie Public Television (PPTV) (carbon credit trading)	Submitted to NETL for review on schedule September 30, 2007
6	Outreach booth	Completed (April 30, 2007)
7	Progress report 60 days prior to conclusion of Budget Period 1	Initiated (due July 31, 2007, for inclusion in continuation application for Budget Period 2)
8	Second Phase II video produced with PPTV (terrestrial)	In progress (due January 30, 2008)
9	Third Phase II video produced with PPTV (geologic)	In progress (due September 30, 2008)
10	Fourth Phase II video produced with PPTV (CO <sub>2</sub> sequestration overview)	Future activity (due June 30, 2009)
11	Best Practices Manual (BPM) detailing outreach activities	Future activity
12	Balancing the regional and general outreach with needs at the specific field validation test locations	Ongoing
13	Keeping regional outreach activity in tune with the national RCSP program message and goals	Ongoing



# Project Milestones (cont.)

Milestone	Description	Status
<b>Task 8 – Public Outreach and Education (cont.)</b>		
14	Ensuring appropriate feedback opportunities for input and review by partners in the outreach process	Ongoing
15	Documentation of impact of outreach activities	Future activity
<b>Task 9 – Identification of the Commercially Available Sequestration Technologies Ready for Large-Scale Deployment</b>		
1	Economic assessment of regional sequestration opportunities	Ongoing
2	New sequestration approaches – wind power	Draft submitted on December 1, 2006
3	New sequestration approaches – Excelsior Energy	Draft white paper submitted to Excelsior (December 31, 2006)
5	Progress report 60 days prior to conclusion of Budget Period 1	Initiated (due July 31, 2007, for inclusion in continuation application for Budget Period 2)
<b>Task 10 – Regional Partnership Program Integration</b>		
1	Development of RPPIP	Completed (July 17, 2006)
2	PCOR Partnership annual meeting	2006 completed (September 14, 2006 , Calgary, Alberta)
3	Progress report 60 days prior to conclusion of Budget Period 1	Initiated (due July 31, 2007, for inclusion in continuation application for Budget Period 2)
4	Participation in DOE Regional Partnership Working Groups	Ongoing



# Project Recognition

## Presented at and/or participated in the following meetings/conferences:

- July 10, 2007: Phase III discussions with Encore Acquisition Company, North Dakota Petroleum Council, Air Products, and Westmoreland Coal Company, Grand Forks, North Dakota.
- July 24, 2007: Met with NDIC and North Dakota Geological Survey to discuss the gas analysis project, Bismarck, North Dakota.
- August 2, 2007: Meeting with Hess Corporation to discuss Phase II and III, Williston, North Dakota.
- August 4, 2007: Anticipated drilling date/Spud Meeting for Lignite Field Validation Test, Burke County, North Dakota.
- August 14, 2007: Office of Science Review Washington, D.C.
- August 16–20, 2007: American Petroleum Institute meeting, Dickinson, North Dakota.
- August 23, 2007: Capacity Working Group Meeting, Houston, Texas.
- August 28, 2007: Missouri River Energy Meeting (Phase II membership discussion), EERC, Grand Forks, North Dakota.
- September 4–7, 2007: Zama Quarterly Meeting, Calgary, Alberta.
- September 10–14, 2007: 24th Pittsburgh Coal Conference, Johannesburg, South Africa.



# Project Recognition, cont.

## Presented at and/or participated in the following meetings/conference, cont.

- September 17–20, 2007: Peer Review of the CS Program, Pittsburgh, Pennsylvania.
- September 18–20, 2007: North Dakota Petroleum Council 26th Annual Meeting, Medora, North Dakota.
- September 24–26, 2007: Air Quality VI, Arlington, Virginia.
- September 27, 2007: North Dakota Association of Oil and Gas Counties Annual Meeting, Williston, North Dakota.
- September 28, 2007: Society of Exploration of Geophysicists Post Convention Workshop on “CO<sub>2</sub> Sequestration Monitoring,” San Antonio, Texas.



# Project Deliverables

Deliverable	Description	Status
<b>Task 1 – Project Management and Reporting</b>		
1	Project management plan	Completed (December 30, 2005)
2	Quarterly reports	Ongoing
3	Continuation application for Budget Period 2	Initiated (due July 31, 2007, for inclusion in continuation application for Budget Period 2)
4	Attendance/presentations at technical meetings	Ongoing
5	PCOR Partnership meetings/workshops	Ongoing
6	PCOR Partnership Phase II final report	Future activity (due September 30, 2009)
<b>Task 2 – Field Validation Test – Williston Basin Oil Field, North Dakota</b>		
1	NEPA compliance document	Initiated (tentatively due April 30, 2008)
2	EDP	Future activity (tentatively due May 30, 2008)
3	SHSP	Future activity (tentatively due June 30, 2008)
4	OAP	Future activity (tentatively due June 30, 2008)
5	RPAP	Initiated (tentatively due May 30, 2008)
6	Sampling protocols	Future activity (tentatively due July 31, 2008)
7	Progress report	Completed (due July 31, 2007, for inclusion in continuation application for Budget Period 2)
8	RTIP	Future activity (tentatively due July 31, 2009)



# Project Deliverables (cont.)

Deliverable	Description	Status
<b>Task 3 – Field Validation Test – Zama, Alberta</b>		
1	EDP and NEPA compliance document	Completed (February 28, 2006)
2	SHSP	Completed (March 31, 2006)
3	OAP	Completed (April 28, 2006)
4	RPAP	Completed (March 27, 2006)
5	Sampling protocols	Completed (June 30, 2006)
6	Progress report	Completed
7	RTIP	Future activity (due July 31, 2009)
<b>Task 4 – Field Validation Test – Lignite in North Dakota</b>		
1	EDP and NEPA compliance document	Completed NEPA November 2006. Completed EDP February 2007.
2	SHSP	Completed (March 31, 2007)
3	OAP	Completed (April 30, 2007)
4	RPAP	Completed (March 31, 2007)
5	Sampling protocols	Completed (June 30, 2007)
6	Progress report	Completed (July 31, 2007)
7	RTIP	Future activity (due July 31, 2009)



# Project Deliverables (cont.)

Deliverable	Description	Status
<b>Task 5 – Terrestrial Validation Test</b>		
1	EDP and NEPA compliance document	Completed (February 28, 2006)
2	SHSP	Completed (February 28, 2006)
3	OAP	Completed (April 28, 2006)
4	RPAP	Completed (March 31, 2006)
5	Sampling protocols	Completed (June 21, 2006)
6	Progress report	Completed (July 31, 2007)
7	RTIP	Future activity (due July 31, 2009)
<b>Task 6 – Continued Characterization of Regional Sequestration Opportunities</b>		
1	RCGA – Budget Period 1	Completed (February 28, 2006)
2	Progress report	Completed (September, 2007, for inclusion in continuation application for Budget Period 2)
3	RCGA – Budget Period 2	Future activity (due October 31, 2007)
4	Regional atlas	Future activity (due June 30, 2009)
<b>Task 7 – Research, Safety, Regulatory, and Permitting Issues</b>		
1	Progress report	Completed (July 31, 2007)
2	Road map document	Future activity (due June 30, 2009)



# Project Deliverables (cont.)

Deliverable	Description	Status
<b>Task 8 – Public Outreach and Education</b>		
1	Fact sheets	<p>Fact Sheet 6 – completed (December 31, 2005)</p> <p>Fact Sheet 7 – completed (July 31, 2006)</p> <p>Fact Sheet 8 – completed (December 29, 2006)</p> <p>Fact Sheet 9 – completed (February 28, 2007)</p> <p>Fact Sheet 10 – completed (May 31, 2007)</p> <p>Fact Sheet 11 – in progress (due October 31, 2007)</p>
2	OAP	<p>Task 2 OAP – future activity (tentatively due August 31, 2008)</p> <p>Task 3 OAP – completed (April 30, 2006)</p> <p>Task 4 OAP – completed (April 30, 2007)</p> <p>Task 5 OAP – completed (April 30, 2006)</p> <p>Task 8 OAP – completed (February 28, 2006)</p>
4	PowerPoint presentations	Completed (May 31, 2006), 2007 update completed (February 28, 2007), annual updates planned



# Project Deliverables (cont.)

Deliverable	Description	Status
<b>Task 8 – Public Outreach and Education, cont.</b>		
5	Videos	<p>Documentary 1 – Carbon Market Trading, submitted for review on schedule September 30, 2007</p> <p>Documentary 2 – in progress (due January 2008)</p> <p>Documentary 3 – future activity (due September 30, 2008)</p> <p>Documentary 4 – future activity (due June 30, 2009)</p>
6	Web site update	<p>Phase II update complete (August 31, 2006), live April 2007</p> <p>Annual updates planned</p>
7	Outreach booth	Completed (April 30, 2007)
8	Progress report	Completed (July 31, 2007) for inclusion in continuation application for Budget Period 2



# Project Deliverables (cont.)

Deliverable	Description	Status
<b>Task 9 – Identification of the Commercially Available Sequestration Technologies Ready for Large-Scale Deployment</b>		
1	BPM – regional sequestration opportunities	Future activity (due July 31, 2008)
2	BPM – Excelsior Energy, Inc.	Initiated (due November 30, 2007)
3	BPM – wind energy	Draft submitted, external review comments being incorporated
4	Progress report	Initiated (due July 31, 2007 for inclusion in continuation application for Budget Period 2)
<b>Task 10 – Regional Partnership Program Integration</b>		
1	RPPI Plan	Completed (July 17, 2006)
2	Progress report	Initiated (due July 31, 2007, for inclusion in continuation application for Budget Period 2)



# Next Steps

## **Task 1 – Project Management and Reporting**

- Continue to ensure timely production of deliverables and overall project management.
- Increase the involvement of all PCOR Partnership partners.

## **Task 2 – Field Validation Test – Williston Basin Oil Field, North Dakota**

- Identify oil fields that may be suitable candidates to host Task 2 activities.
- Work with new operating partner to evaluate and select new Williston Basin host site for Task 2.
- Finalization of NEPA document.
- Finalization of EDP.
- Finalization of OAP.
- Finalization of SHSP.
- Identification of potential subcontractors for selected MMV activities.

## **Task 3 – Field Validation Test – Zama, Alberta**

- Project meetings and site visit in September 2007.
- Continue efforts to collect and analyze “new” core samples exposed to acid gas in the reservoir.
- Continue geochemical planning to determine effects of acid gas on carbonate systems containing oil and gas in a brine mixture.



# Next Steps (cont.)

## **Task 4 – Field Validation Test – Lignite in North Dakota**

- Continue baseline characterization and model development.
- Continue to develop CO<sub>2</sub> flood design when field data become available.
- Finalize MMV and sampling plan when field data become available.
- Continue to work on securing CO<sub>2</sub> for injection.

## **Task 5 – Terrestrial Validation Test**

- Publish NDSU wetlands paper.
- Continue with field activities.
- Process samples.
- Continue to produce business flow documents.
- Continue to produce fact sheets.
- Continue to evaluate terrestrial carbon markets.



# Next Steps (cont.)

## **Task 6 – Continued Characterization of Regional Sequestration Opportunities**

- Continue to update the DSS with regional characterization information.
- Work on data overlap/missing data between states that overlap with other partnerships.

## **Task 7 – Research, Safety, Regulatory, and Permitting Issues**

- Provide guidance with regard to regulatory issues to other task leaders.
- Continue to analyze the development and activity of carbon markets.
- Continue to assess regulatory developments at the state, provincial, federal and international level.
- Continue to pursue regulatory partners.



# Next Steps (cont.)

## Task 8 – Public Outreach and Education

- Incorporate internal and NETL review comments into Carbon Markets and Trading Documentary (November 2007).
- Submit Williston Basin Field Validation Test fact sheet (due October 31, 2007).
- Initiate Williston Basin Validation Test OAP (due August 2008).
- Continue preparation of all Phase II documentaries.

## Task 9 – Identification of the Commercially Available Sequestration Technologies Ready for Large-Scale Deployment

- Complete the check of CO<sub>2</sub> emission values for all sources in the DSS GIS data set to ensure that the most current data are included; update the data set with additional sources as they are identified.
- Complete the topical report on identification and calculation of CO<sub>2</sub> emissions in the PCOR Partnership region.
- Work with the other capture and transportation working group members to develop an interpartnership CO<sub>2</sub> emissions determination methodology.
- Rectify the remaining data differences for the CO<sub>2</sub> point sources shared with the Big Sky Partnership.
- Fill DSS infrastructure data gaps.
- Finalize the BPM for wind power to provide energy required for pipeline compression of CO<sub>2</sub>.
- Finalize the Excelsior Energy Carbon Management Plan and prepare a BPM for carbon management plans.



# Next Steps (cont.)

## **Task 9 – Identification of the Commercially Available Sequestration Technologies Ready for Large-Scale Deployment, cont.**

- Continue implementation of the use of appropriate pipeline and capture cost models into the Task 9 work.
- Calculate the replacement power needed if capture is employed to reduce regional emissions.
- Complete the module explaining capture and separation for inclusion on the PCOR Partnership Web site.

## **Task 10 – Regional Partnership Integration**

- Increase development to integrate all RCSPs.
- Continue to participation in conferences/meetings for the betterment of the RCSPs.



# Upcoming Issues

## **Task 1 – Project Management and Reporting**

- None anticipated at this time.

## **Task 2 – Field Validation Test – Williston Basin Oil Field, North Dakota**

- Possible adjustments to the 2007–2008 field work schedule (to accommodate industrial partner schedules).

## **Task 3 – Field Validation Test – Zama, Alberta**

- Core collection through zone of acid gas disposal. Will provide insight into mineralogical changes after in situ exposure to acid gas.

## **Task 4 – Field Validation Test – Lignite in North Dakota**

- Secure CO<sub>2</sub> for injection.

## **Task 5 – Terrestrial Validation Test**

- None anticipated at this time.

## **Task 6 – Continued Characterization of Regional Sequestration Opportunities**

- None anticipated at this time.

## **Task 7 – Research, Safety, Regulatory, and Permitting Issues**

- None anticipated at this time.

## **Task 8 – Public Outreach and Education**

- Finalize interviews and locations for documentaries.

## **Task 9 – Identification of the Commercially Available Sequestration Technologies Ready for Large-Scale Deployment**

- None anticipated at this time.

## **Task 10 – Regional Partnership Integration**

- None anticipated at this time.

