



# EERC

Energy & Environmental Research Center

UNIVERSITY OF NORTH DAKOTA

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Web Site: [www.undeerc.org](http://www.undeerc.org)

October 31, 2006

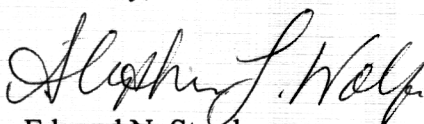
AAD Document Control  
U.S. Department of Energy  
National Energy Technology Laboratory  
PO Box 10940, MS 921-107  
Pittsburgh, PA 15236-0940

Dear AAD Document Control:

Subject: Plains CO<sub>2</sub> Reduction Partnership Quarterly Technical Progress PowerPoint  
Presentation for the Period July 1 – September 30, 2006  
DOE Cooperative Agreement No. DE-FC26-05NT42592

Enclosed are hard copies of the Quarterly Technical Progress PowerPoint Presentation and the Request for Patent Clearance Form 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 call me at (701) 777-5279 or e-mail at [esteadman@undeerc.org](mailto:esteadman@undeerc.org).

Sincerely,

*for*   
Edward N. Steadman  
Senior Research Advisor

ENS/slw

Enclosures

c/enc: John Litynski, NETL  
Sheryl Landis, EERC (Patent Clearance Form)

U.S. DEPARTMENT OF ENERGY  
**REQUEST FOR PATENT CLEARANCE FOR  
RELEASE OF CONTRACTED RESEARCH DOCUMENTS**

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(Previous Editions Obsolete)

TO: ☒ For Technical Reports  
AAD Document Control  
MS 921-107  
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◆ Award No.  
DE-FC26-05NT42592

Name & Phone No. of DOE COR  
John Litynski (304) 285-1339

☐ For Technical Papers/Journal Articles/Presentations  
Mark P. Dvorscak  
U.S. Department of Energy  
9800 S. Cass Avenue  
Argonne, IL 60439  
FAX: (630) 252-2779

**A. Awardee Action (Awardee Completes Part A. 1-5)**

1. Document Title: Plains CO<sub>2</sub> Reduction Partnership
2. Type of Document: ☒ Technical Progress Report ☐ Topical Report ☐ Final Technical Report  
☐ Abstract ☐ Technical Paper ☐ Journal Article ☐ Conference Presentation  
Other (please specify) \_\_\_\_\_
3. Date Clearance Needed: \_\_\_\_\_
- ◆ 4. Results of Review for Possible Inventive Subject Matter:
  - a. ☒ No Subject Invention is believed to be disclosed therein.
  - b. ☐ Describes a possible Subject Invention relating to \_\_\_\_\_
    - i. Awardee Docket No.: \_\_\_\_\_
    - ii. A disclosure of the invention was submitted on \_\_\_\_\_
    - iii. A disclosure of the invention will be submitted by the following date: \_\_\_\_\_
    - iv. A waiver of DOE's patent rights to the awardee: ☐ has been granted, ☐ has been applied for, or  
☐ will be applied for by the following date: \_\_\_\_\_
- ◆ 5. Signed Sheryl Landis Date 10-31-06  
(Awardee)

Name & Phone No. Sheryl E. Landis (701) 777-5124

Address Energy & Environmental Research Center, 15 North 23rd Street, Stop 9018, Grand Forks, ND, 58202-9018

**B. DOE Patent Counsel Action**

- ☐ Patent clearance for release of the above-identified document is granted.
- ☐ Other: \_\_\_\_\_

Signed \_\_\_\_\_  
(Patent Attorney)

Date \_\_\_\_\_



**Plains CO<sub>2</sub> Reduction (PCOR) Partnership**  
*Practical, Environmentally Sound CO<sub>2</sub> Sequestration*



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

Quarterly Technical Progress PowerPoint Presentation

*(for the period July 1 – September 30, 2006)*

*Prepared for:*

AAD Document Control

U.S. Department of Energy  
National Energy Technology Laboratory  
PO Box 10940, MS 921-107  
Pittsburgh, PA 15236-0940

Agreement No. DE-FC26-05NT42592  
Contracting Officer's Representative: John Litynski

*Prepared by:*

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October 2006

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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 Period July 1 –  
September 30, 2006*

**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 – Beaver Lodge, 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





## PCOR Partnership Phase II Partners:

- ★ University of North Dakota Energy & Environmental Research Center (EERC)
  - Advanced Geotechnology Inc.
  - Air Products and Chemicals
  - Alberta Department of Energy
  - Alberta Energy and Utilities Board
  - Alberta Geological Survey
  - Amerada Hess Corporation
  - Apache Canada Ltd.
  - Basin Electric Power Cooperative
  - 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
  - Encore Acquisition Company
  - Environment Canada
  - Excelsior Energy, Inc.
  - Fischer Oil and Gas, Inc.
  - Great Northern Power Development, LP
  - Great River Energy
  - Interstate Oil and Gas Compact Commission
  - Iowa Department of Natural Resources – Geological Survey
  - Lignite Energy Council
  - MEG Energy Corporation
  - Minnesota Power
  - Minnkota Power Cooperative, Inc.
  - Missouri Department of Natural Resources
  - Montana–Dakota Utilities Co.
  - Montana Department of Environmental Quality
  - National Commission on Energy Policy
  - Natural Resources Canada
  - Nexant, Inc.

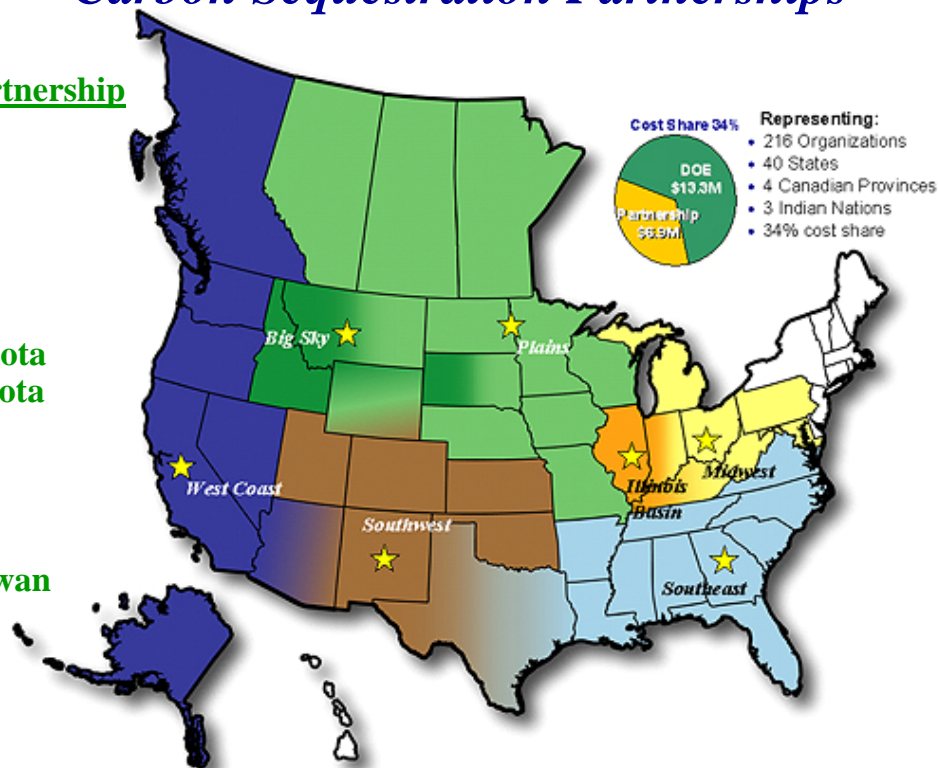


## *National Energy Technology Laboratory Regional Carbon Sequestration Partnerships*

### PCOR Partnership

#### Region:

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



- 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
- Ramgen Power Systems, Inc.
- Saskatchewan Industry and Resources
- SaskPower
- Suncor Energy Inc.
- University of Alberta
- U.S. Department of Energy
- U.S. Geological Survey Northern Prairie Wildlife Research Center
- 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 Inc.	Calgary, Alberta		
Air Products and Chemicals	Allentown	Pennsylvania	15
Alberta Department of Environment	Edmonton, Alberta		
Alberta Energy and Utilities Board	Edmonton, Alberta		
Alberta Geological Survey	Edmonton, Alberta		
Amerada Hess Corporation	Williston	North Dakota	At Large
Apache Canada Ltd.	Calgary, Alberta		
Basin Electric Power Cooperative	Bismarck	North Dakota	At Large
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		

Continued. . .





## Partnership Team (cont.)

Partner Name	City	State	Congressional District
Ducks Unlimited, Inc.	Memphis	Tennessee	9
Eagle Operating, Inc.	Kenmare	North Dakota	At Large
Eastern Iowa Community College District	Davenport	Iowa	1
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
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		
Minnesota Power	Duluth	Minnesota	8



Continued. . .

## Partnership Team (cont.)

Partner Name	City	State	Congressional District
Minnkota Power Cooperative, Inc.	Duluth	Minnesota	8
Missouri Department of Natural Resources	Jefferson City	Missouri	4
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 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



Continued. . .

## Partnership Team (cont.)

Partner Name	City	State	Congressional District
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
Petroleum Technology Transfer Council	Houston	Texas	7
Prairie Public Television	Fargo	North Dakota	At Large
Ramgen Power Systems, Inc.	Bellevue	Washington	8
Saskatchewan Industry and Resources	Regina, Saskatchewan		
SaskPower	Regina, Saskatchewan		
Suncor Energy Inc.	Calgary, Alberta		
University of Alberta	Edmonton, Alberta		
U.S. Geological Survey Northern Prairie Wildlife Research Center	Jamestown	North Dakota	At Large
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 – Beaver Lodge, 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: John Litynski***



# Budget

Start Date	End Date	Government Cost	Performer Cost	Total Cost	Cost Share
10/1/05	9/30/09	\$14,300,000	\$7,089,541	\$21,389,541	33%

- **U.S. Department of Energy (DOE) Costs to Date:           \$2,108,738**
- **Cost Share to Date:   \$583,586**



# Highlights of Progress to Date

## Task 1 – Management and Reporting

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

- Geographic Information System (GIS)/Outreach/Geological Workshop in Lawrence, Kansas (July).
- Meeting with Robert Gleason in South Dakota to view Ducks Unlimited, Inc., sites (July).
- Attended Northern Great Plains Research Laboratory's Friends and Neighbors Day, Mandan, North Dakota (July).
- Meeting with Apache Canada, Ltd., to tour Zama Field Validation Test site and film documentary footage, Zama, Alberta, Canada (August).
- Attended EPA/DOE Technical Meeting, Pittsburgh, Pennsylvania (August).
- PCOR Partnership 2006 Annual Meeting, Calgary, Alberta, Canada (September).
- Participated in acid gas injection field trip being conducted by Energy and Utilities Board (EUB) and Alberta Research Council (ARC), Calgary, Alberta, Canada (September).



Continued. . .



# Highlights of Progress to Date (cont.)

## Task 2 – Field Validation Test – Beaver Lodge, North Dakota

- Continued the development of the National Environmental Policy Act (NEPA) document for the Beaver Lodge field validation test.
- Continued a literature search for readily available documents and data specifically related to the Beaver Lodge field.
- Identified data gaps with respect to geochemical, geomechanical, and seismic data for the site.
- Continued the development of an experimental design package for the Beaver Lodge field validation test.
- Participated in a field trip conducted by the Alberta Geological Survey to examine source-to-sink relationships between gas processing facilities and geological formations. Purpose was to develop an updated understanding of the current state of technology with respect to field-based CO<sub>2</sub> sequestration demonstration projects.



Continued. . .

# Highlights of Progress to Date (cont.)

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

- Continued to develop enhanced monitoring, mitigation, and verification (MMV) strategies in conjunction with our subcontractors and other partners.
- Have identified several pinnacles in the Zama area that can be cored to evaluate the effect of  $\text{H}_2\text{S}/\text{CO}_2$  on the system.
- Working with Apache Canada, Ltd., Alberta Energy and Utilities Board (EUB), Natural Resources Canada (NRCan), and others to determine the best approach for completing this additional coring work.
- Working with NRCan and EUB to obtain potential funding for MMV activities.
- Participated in a field trip conducted by the Alberta Geological Survey to examine source-to-sink relationships between gas processing facilities and geological formations. Purpose was to develop an updated understanding of the current state of technology with respect to field-based  $\text{CO}_2$  sequestration demonstration projects.



Continued. . .

# Highlights of Progress to Date (cont.)

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

- Flatland Exploration, a subsidiary of Fischer Oil & Gas, has prepared a drilling procedure for the test hole in Section 36-T159N-R90W.
- Surveying has been completed for the staking of the well sites for the pilot program.
- Met with the State Land Department and Board to obtain permission for the proposed pilot well and received permission from the Land Commissioner.
- Prepared topographical maps and spotted adjacent oil and gas wells.
- Met with the State Land Department, Flatland Exploration, and Harris Construction to discuss the location of and access to the well sites.
- Continued meetings with several EERC staff to discuss logistics, etc., of the STAC, Flatland, PCOR Partnership relationship for the lignite site.
- Submitted draft NEPA for the Lignite Field Validation Test.
- Completed drilling permit applications. They will be submitted to North Dakota Industrial Commission (NDIC) once the well-spacing regime is approved.
- Discussions are ongoing with PCOR Partnership partner, Eagle Operating, to drill the wells and assist with well operations.
- Attended the NDIC Exception hearing for well-spacing requirements for the Lignite Field Validation Test. The outcome of the hearing was positive, and we expect to receive a written order approving our exception to the well-spacing requirements very soon.



Continued. . .

# Highlights of Progress to Date (cont.)

## Task 5 – Terrestrial Validation Test

- Completed project deliverables:
  - Experimental Design Package
  - NEPA Compliance Document
  - Site Health & Safety Plan
  - Regulatory Permitting Action Plan
  - Outreach Action Plan
  - Sampling Protocols
- Completed geological information system (GIS) modeling to evaluate/select field validation sites.
- Prairie Pothole Region carbon field validation sites selected.
- Soil sampling on Sheridan County, North Dakota, sites.
- Ducks Unlimited, Inc. (DU), Project Web site was constructed and is now online and linked to the EERC/PCOR Web site.
- Outreach for Carbon Opportunities – we continue to investigate the investor perspective and opportunities in the carbon market.
- Business model/processes for aggregating and transacting carbon offsets in a voluntary market are being drafted. Legal wording for easement documents for carbon are complete in draft form (offer sheets, easement terms, risk/insurance assessment, pricing options – ongoing research).



Continued. . .

# Highlights of Progress to Date (cont.)

## Task 6 – Continued Characterization of Regional Sequestration Opportunities

### Characterization

- Continued to analyze the gas analysis data from NDIC. There are ~889 analysis sheets that have been entered into the database; however, these 889 analysis sheets represent ~80 wells, which are clustered in one oil field in the Nesson Anticline. NDIC is looking to see if additional gas analysis data would make this information useful in future analyses of well data.
- Neuralog is currently being used to generate data from well logs in the Williston Basin of North Dakota. The logs currently exist as image files and are being converted to LAS format which is the preferred format for oil- and gas-related software programs. Currently, over 150 logs have been digitized throughout western North Dakota. Efforts have focused primarily on the Bowman, Mercer, and Williams Counties and will be used to create detailed depth, porosity, water saturation, and permeability maps for CO<sub>2</sub> sequestration targets.
- Participated in the geological/GIS working group meeting held in Lawrence, Kansas. As a result of this meeting, we have recalculated the geological CO<sub>2</sub> sequestration estimates for saline aquifers. The newest values have significantly dropped the sequestration capacity numbers (about 40–78 percent less than our original values). The other layers (coal, oil/gas) remain unchanged.
- Worked on the development of maps and text for the National Atlas.



Continued. . .

# Highlights of Progress to Date (cont.)

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

### Characterization (cont.)

- The 400,000+ wells from Alberta, Canada, have been imported into the test database. It was determined that about 100,000 of the 450,000 wells in the Alberta dataset were duplicate wells with different license information. We are working on eliminating the duplicates.
- Summarized information on coalfields and general information on potential sequestration opportunities and added this to the Decision Support System (DSS).
- Participated in GIS working group calls and conference calls regarding the National Atlas.
- Worked on getting the Iowa Geological Survey subcontract in place for Years 2–4.



Continued. . .



# Highlights of Progress to Date (cont.)

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

### Decision Support System (DSS)

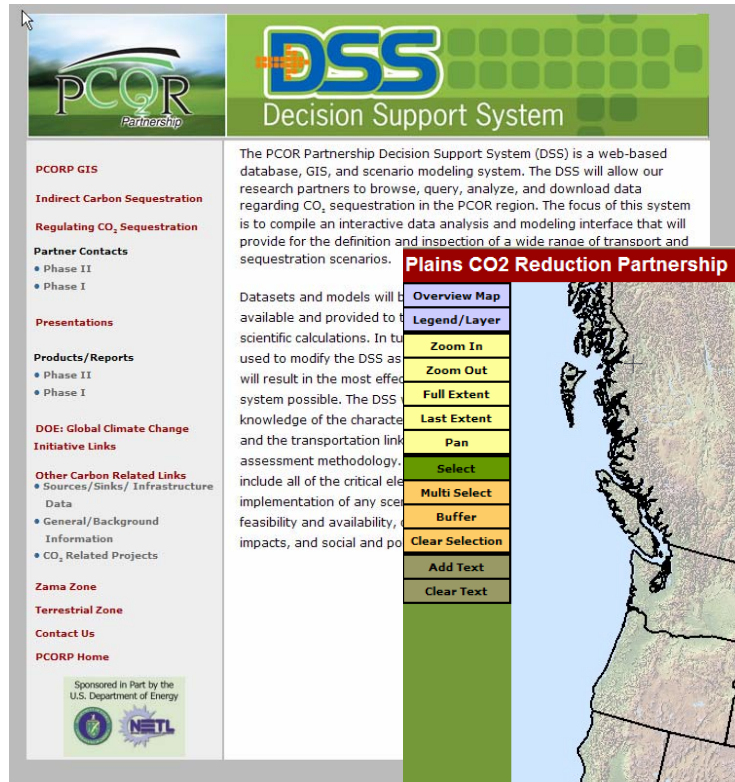
- A new version of the DSS was released on July 14 (see next slide). The large list of enhancements was reported in the previous quarterly. Additional enhancements were released in September. These include stratigraphic layer, coal layer, new eco-region definitions, and the ability to add or clear multiple text boxes.
- Created a T-zone for terrestrial research teams – this is in our test site and is under review by the terrestrial team.
- Began work on an HTML-based (Web) help file that will replace the previous help document.
- Continued development of the Spatial Database Engine (SDE) on our test server.
- Began work on a method to allow nonmembers to review the DSS using a Web system whereby we do not have to grant temporary passwords. In this scenario, a PCOR Partnership team member would be using the Web while a prospective member was “watching” on his/her computer. This method could also be used as a training tool for partners.
- Provided support to members on utilizing the DSS.



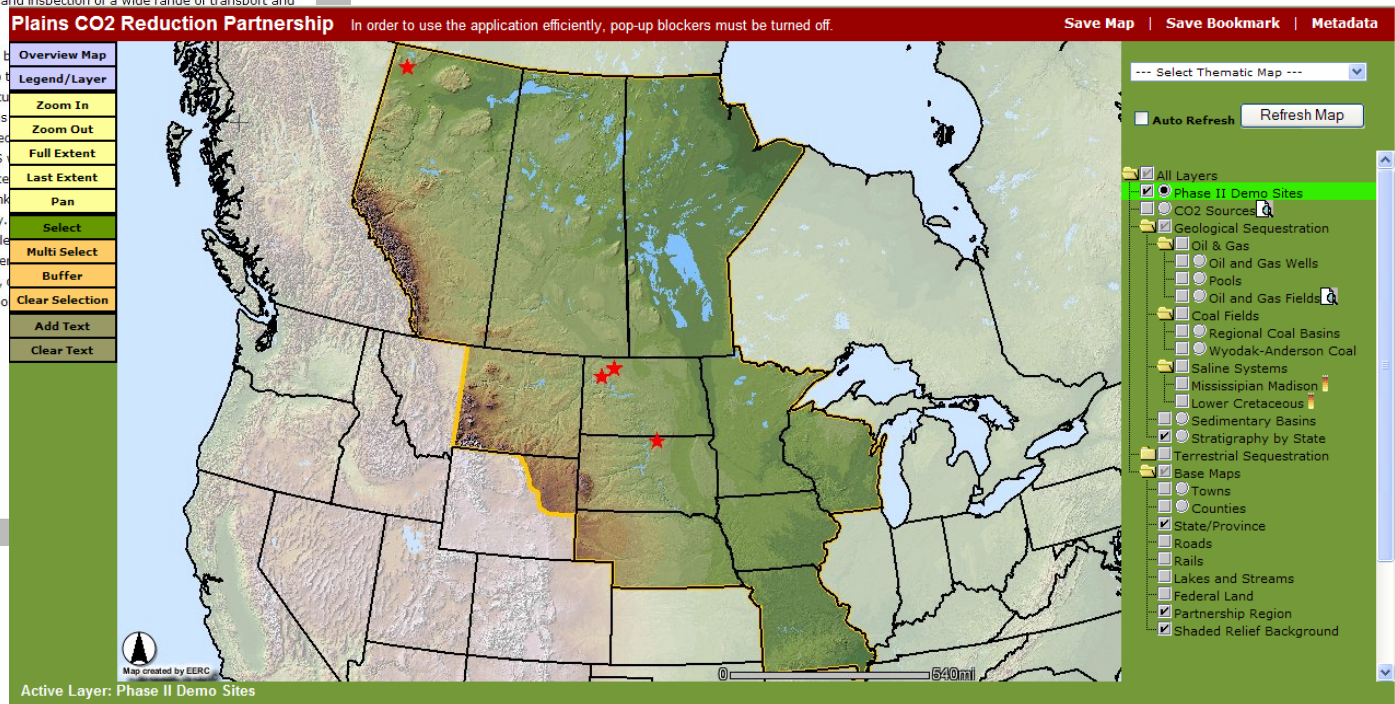
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# Highlights of Progress to Date (cont.)

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



The DSS has a new home page as well as many improvements to the organization and functionality of the DSS.



Continued. . .

# Highlights of Progress to Date (cont.)

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

### General

- Continued review of recent publications relating to regulating CO<sub>2</sub> sequestration and MMV issues.
- Began outline for analysis and reporting of carbon market strategies.
- Met with officials from Excelsior Energy to discuss their Carbon Management Plan and testimony that will be required at their public hearings.
- Reviewed Global Warming Pollution Reduction Act introduced by Senator Jeffords.
- Reviewed Supreme Court Case regarding whether or not EPA should regulate greenhouse gases, especially carbon dioxide from cars, under Section 202(a)(1) of the Clean Air Act.
- IOGCC 2006 Midyear Meeting, Billings, Montana (May).
- PCOR Partnership became a member of the Environmental Markets Association.



Continued. . .

# Highlights of Progress to Date (cont.)

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

### Lignite Field Validation Test

- Reviewed paperwork and drilling procedures for the Lignite Field Validation Test.
- Had several planning meetings with EERC staff to discuss logistics, etc., of the STAC, Flatland, PCOR Partnership relationship for the lignite site.
- Submitted draft NEPA for the Lignite Field Validation Test.
- Submitted a letter and supporting documentation to NDIC to be on the docket at a public hearing to ask for an exception to well-spacing requirements for the STAC and Lignite Field Validation Test.
- Attended the NDIC Exception hearing for well-spacing requirements for the Lignite Field Validation Test.



Continued. . .

# Highlights of Progress to Date (cont.)

## Task 8 – Public Outreach and Education

- Prairie Public Television subcontract approved.
- Draft final Outreach PowerPoint submitted on schedule May 30, 2006.
- Two draft final Site Outreach plans (for Tasks 3 and 5) submitted on schedule April 30, 2006.
- Draft final of Fact Sheet 7, Zama project, submitted on schedule (July 31, 2006).
- Draft final of public Web site to NETL submitted on schedule (August 31, 2006).
- Work under way on Phase II Documentary 1 – Carbon Market Trading (due January 2007).
  - Filming and interviews completed in Brazil (January 2006), Alexandria (May 2006), Europe (June 2006), and Zama, Alberta, Canada (August 2006).
  - Interview and location footage reviewed (August – September 2006).
  - Storyboard and plans for additional footage and interviews in progress.
- Collaboration on Regional Carbon Sequestration Program (RCSP) Outreach Working Group activities.



Continued. . .

# Highlights of Progress to Date (cont.)

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

- Prepared information summarizing the regional CO<sub>2</sub> sources for use on the PCOR Partnership public Web site.
- Prepared a summary table of CO<sub>2</sub> capture technologies.
- Participated in a kickoff meeting with representatives from Excelsior Energy, Northern Natural Gas Company, and ConocoPhillips to discuss the development of CO<sub>2</sub> management options for the Mesaba Energy project.
- Recruited speakers and organized a CO<sub>2</sub> Capture, Separation, Compression, and Transportation workshop to be held in conjunction with the PCOR Partnership Annual Meeting.
- Prepared a summary of CO<sub>2</sub> capture technologies for use in a paper that will be presented at the Western Fuels Conference to be held in October.



Continued. . .



# Highlights of Progress to Date (cont.)

## Task 10 – Regional Partnership Program Integration

- Membership discussions continued with numerous organizations.
- Participation continued in geologic, outreach, capture and separation, and GIS working group conference calls.
- Working with Dawn Deel, U.S. DOE, on National Atlas.

The following are new Phase II members:

- Advanced Geotechnology Inc.
- Air Products and Chemicals
- Alberta Department of Energy
- Alberta Geological Survey
- Carbozyme, Inc.
- MEG Energy Corporation
- Missouri Department of Natural Resources
- National Commission on Energy Policy
- University of Alberta



# Project Tasks and Status

Task 1 – 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



Continued. . .

## Project Tasks and Status (cont.)

Task 2 – Field Validation Test at Beaver Lodge, North Dakota		
Activity	Description	Status
1	Project Design	Ongoing
2	Project Implementation	Future activity
3	Project Operations	Future activity
4	Closeout and Reporting	Future activity



Continued. . .

## Project Tasks and Status (cont.)

Task 3 – Field Validation Test at Zama, Alberta		
Activity	Description	Status
1	Project Design	Complete
2	Project Implementation	Still waiting on injection into specific pinnacle structure. All subcontractors have begun their activities.
3	Project Operations	Future activity
4	Closeout and Reporting	Future activity



Continued. . .

# Project Tasks and Status (cont.)

Task 4 – Field Validation Test of North Dakota Lignite		
Task	Description	Status
1	Project Design	Ongoing
2	Project Implementation	Future activity
3	Project Operations	Future activity
4	Closeout and Reporting	Future activity



Continued. . .

# Project Tasks and Status (cont.)

Task 5 – Terrestrial Validation Test		
Task	Description	Status
1	Project Design	Ongoing
2	Project Implementation	Ongoing
3	Project Operations	Initiating
4	Closeout and Reporting	Ongoing



Continued. . .



## Project Tasks and Status (cont.)

Task 6 – Characterization of Regional Characterization Opportunities		
Task	Description	Status
1	Regional Characterization Gap Assessment	First assessment completed (February 28, 2006) (Second assessment due third budget period)
2	Data Collection	Ongoing
3	Improvements to the PCOR Partnership Decision Support System	Ongoing. New site released on 7/14/06.
4	Reporting	Ongoing



Continued. . .

# Project Tasks and Status (cont.)

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



Continued. . .

# Project Tasks and Status (cont.)

Task 8 – Public Outreach and Education		
Activity	Description	Status
1	Outreach Planning	General Outreach Action Plan completed. Outreach plans for validation projects T and G2 submitted on schedule. Outreach plans for validation projects G1 and G3 will be initiated in Year 2, Quarter 2.
2	Web Site	Phase II update submitted on schedule. Annual updates planned.
3	Outreach Booth	Will be initiated in Year 2, Quarter 1.
4	Outreach PowerPoint	Submitted on schedule. Annual updates planned.
5	Fact Sheets	Fact Sheet 6 completed. Fact Sheet 7 submitted on schedule. Fact Sheet 8 will be initiated in Year 2, Quarter 1. Fact Sheet 9 will be initiated in Year 2, Quarter 2. Fact Sheet 10 will be initiated in Year 2, Quarter 4.



Continued. . .

# Project Tasks and Status (cont.)

Task 8 – Public Outreach and Education		
Activity	Description	Status
6	Television Programs	Documentary 1 – Carbon Market Trading, in progress Documentary 2 – due Year 3, Quarter 2 Documentary 3 – due Year 3, Quarter 4 Documentary 4 – due Year 4, Quarter 3
7	Reporting	Report for Year 1, Quarter 1, 2, and 3 completed Progress report – due Year 2, Quarter 4 Best Practices Manual – due Year 4, Quarter 3



Continued. . .

# Project Tasks and Status (cont.)

Task 9 – Identification of the Commercially Available Sequestration Technologies Ready for Large-Scale Deployment		
Task	Description	Status
1	Economic Assessment of Regional Sequestration Opportunities	In progress
2	New Sequestration Approaches	In progress
3	Reporting	Ongoing



Continued. . .

# Project Tasks and Status (cont.)

Task 10 – Regional Partnership Program Integration		
Task	Description	Status
1	Development of Regional Partnership Program Integration Plan	Completed (July 18, 2006)
2	Integration of Partnership Program Activities	Ongoing
3	Reporting	Ongoing



# Project Milestones

Milestone	Description	Status
<b>Task 1 – Management and Reporting</b>		
1	Design Project Management and Reporting Plan	Completed (December 30, 2005)
2	Manage writing of Progress Report	Ongoing
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 at Beaver Lodge, North Dakota</b>		
1	Finalization of site-specific monitoring, mitigation, and verification (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	Future activity

Continued. . .



## Project Milestones (cont.)

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

Continued. . .





## Project Milestones (cont.)

Milestone	Description	Status
<b>Task 3 – Field Validation Test at Zama, Alberta</b>		
1	H <sub>2</sub> S/CO <sub>2</sub> injection commences	Anticipated at any time
2	Reservoir modeling	Currently obtaining existing model. Will review and modify as needed.
3	Data acquisition and design	Ongoing → 80% complete
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	Future activity
10	Progress Report 60 days prior to conclusion of Budget Period 1	Complete
11	Geochemistry of the surface to subsurface	Future activity
12	Assessment of leakage potential as a result of injection	Ongoing
13	Regional Technology Implementation Plan detailing MMV activities at an ongoing oil-producing facility	Future activity



Continued. . .

# Project Milestones (cont.)

Milestone	Description	Status
<b>Task 4 – Field Validation Test of North Dakota Lignite</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	Future activity
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	Future activity
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	Regional Technology Implementation Plan detailing MMV activities at an ongoing oil-producing facility	Future activity

Continued. . .



# 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	Future activity
5	Preparation and distribution of materials to solicit participation	Initiating
6	Indirect benefits	Ongoing
7	Regional partnerships for CO <sub>2</sub> sequestration	Future activity
8	Land use management practices that increase SOC	Future activity
9	Business flow process for carbon credit trading	Ongoing
10	Economic feasibility of CO <sub>2</sub> sequestration	Ongoing
11	Regional Technology Implementation Plan	Future activity
12	Compiling design criteria	Ongoing
13	Develop Web-based landowner outreach strategy	Ongoing
14	Data compilation and analysis	Future activity

Continued. . .



# Project Milestones (cont.)

Milestone	Description	Status
<b>Task 6 – Characterization of Regional Characterization Opportunities</b>		
1	Conduct DSS data gap assessment (1st Budget Period)	Completed (February 28, 2006)
2	Place updated DSS into production	Completed (July 2006).
3	Progress Report 60 days prior to conclusion of Budget Period 1	Future activity
4	Conduct data gap assessment (3rd Budget Period)	Future activity
5	Create field project data warehouse and put into production	Zama site completed (June 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	Future activity
4	Provide regulatory support to Tasks 2 and 4	Ongoing
5	Progress Report 60 days prior to conclusion of Budget Period 1	Future activity
6	Road map document produced	Future activity



Continued. . .

# Project Milestones (cont.)

Milestone	Description	Status
<b>Task 8 – Public Outreach and Education</b>		
1	Fact sheet production	Fact Sheet 6 completed Fact Sheet 7 submitted on schedule
2	Outreach Action Plan	Completed (February 28, 2006)
3	PowerPoint presentation	Submitted on schedule
4	Update to PCOR Partnership Web site	Submitted on schedule
5	First Phase II video produced with Prairie Public Television (PPTV) (carbon credit trading)	In progress
6	Outreach booth	
7	Progress Report 60 days prior to conclusion of Budget Period 1	Future activity
8	Second Phase II video produced with PPTV (terrestrial)	Future activity
9	Third Phase II video produced with PPTV (geologic)	Future activity
10	Fourth Phase II video produced with PPTV (CO <sub>2</sub> sequestration overview)	Future activity
11	Best Practices Manual 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

Continued. . .



# 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	Ongoing
3	New sequestration approaches – Excelsior Energy	Ongoing
5	Progress Report 60 days prior to conclusion of Budget Period 1	Future activity
<b>Task 10 – Regional Partnership Program Integration</b>		
1	Development of Regional Partnership Program Integration Plan	Completed (July 18, 2006)
2	PCOR Partnership Annual Meeting	Completed (September 14, 2006 Calgary, Alberta)
3	Progress Report 60 days prior to conclusion of Budget Period 1	Future activity
4	Participation in DOE Regional Partnership Working Groups	Ongoing



# Project Recognition

## Meetings/Conferences

- North Dakota State Teacher's Meeting, Bismarck, North Dakota (April).
- Geographic Information System (GIS)/Outreach/Geological Workshop in Lawrence, Kansas, July 10–12, 2006.
- Meeting with Apache Canada, Ltd., to tour Zama Field Validation Test site and film documentary footage, Zama, Alberta, August 2–4, 2006.
- Meet with Robert Gleason in South Dakota to view Ducks Unlimited, Inc., sites, July 25–27, 2006.
- Attended Northern Great Plains Research Laboratory's Friends and Neighbors Day, Mandan, North Dakota, July 20, 2006. The EERC/PCOR Partnership had an informational booth.
- Sixth Annual Environmental Systems Research Institute (ESRI) Education User Conference (GIS-related), San Diego, California, August 5–8, 2006.
- PCOR Partnership 2006 Annual Meeting (September 13–15, 2006, Calgary, Alberta).
- Attended EPA/DOE Technical Meeting, August 9, 2006, Pittsburgh, PA.
- PCOR Partnership 2006 Annual Meeting (September 13–15, 2006, Calgary, Alberta) and participated in acid gas injection field trip being conducted by Energy and Utilities Board (EUB) and Albany Research Center (ARC) while up in Calgary.



# Project Deliverables

Deliverable	Description	Status
<b>Task 1 – Management and Reporting</b>		
1	Project Management Plan	Completed (December 30, 2005)
2	Quarterly reports	Ongoing
3	Continuation application for Budget Period 2	Future activity
4	Attendance/presentations at technical meetings	Ongoing
5	PCOR Partnership meetings/workshops	Ongoing
6	PCOR Partnership Phase II Final Report	Future activity
<b>Task 2 – Field Validation Test at Beaver Lodge, North Dakota</b>		
1	Experimental design package and NEPA compliance document	Ongoing
2	Site health and safety plan	Future activity
3	Outreach action plan	Future activity
4	Regulatory permitting action plan	Future activity
5	Sampling protocols	Future activity
6	Progress report	Future activity
7	Regional Technology Implementation Plan	Future activity



Continued. . .



## Project Deliverables (cont.)

Deliverable	Description	Status
<b>Task 3 – Field Validation Test at Zama, Alberta</b>		
1	Experimental design package and NEPA compliance document	Completed (February 28, 2006)
2	Site health and safety plan	Completed (March 31, 2006)
3	Outreach action plan	Completed (April 28, 2006)
4	Regulatory permitting action plan	Completed (March 27, 2006)
5	Sampling protocols	Completed (June 30, 2006)
6	Progress report	Future activity
7	Regional Technology Implementation Plan	Future activity
<b>Task 4 – Field Validation Test of North Dakota Lignite</b>		
1	Experimental design package and NEPA compliance document	Ongoing
2	Site health and safety plan	Ongoing
3	Outreach action plan	Future activity
4	Regulatory permitting action plan	Ongoing
5	Sampling protocols	Future activity
6	Progress report	Future activity
7	Regional Technology Implementation Plan	Future activity



Continued. . .

# Project Deliverables (cont.)

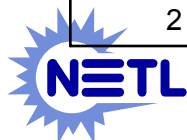
Deliverable	Description	Status
<b>Task 5 – Terrestrial Validation Test</b>		
1	Experimental design package and NEPA compliance document	Completed (February 28, 2006)
2	Site health and safety plan	Completed (February 28, 2006)
3	Outreach action plan	Completed (April 28, 2006)
4	Regulatory permitting action plan	Completed (March 31, 2006)
5	Sampling protocols	Completed (June 21, 2006)
6	Progress report	Future activity
7	Regional Technology Implementation Plan	Future activity
<b>Task 6 – Characterization of Regional Characterization Opportunities</b>		
1	Regional characterization gap assessment – Budget Period 1	Completed (February 28, 2006)
2	Progress report	Future activity
3	Regional characterization gap assessment – Budget Period 2	Future activity
4	Regional atlas	Future activity
<b>Task 7 – Research, Safety, Regulatory, and Permitting Issues</b>		
1	Progress report	Future activity
2	Road map document	Future activity



Continued. . .

## Project Deliverables (cont.)

Deliverable	Description	Status
<b>Task 8 – Public Outreach and Education</b>		
1	Fact sheets	Fact Sheet 6 completed; Fact Sheet 7 submitted on schedule; Fact Sheets 8, 9, and 10 future activities
2	Outreach action plan	Completed (February 28, 2006)
4	PowerPoint presentations	Completed first presentation (May 31, 2006) updates to follow (future activity)
5	Videos	Documentary 1 in progress; Documentaries 2, 3, and 4 future activities
6	Web site update	Submitted on schedule
7	Outreach booth	Future activity
8	Progress report	Year 1, Quarter 1, 2 and 3 reports completed
<b>Task 9 – Identification of the Commercially Available Sequestration Technologies Ready for Large-Scale Deployment</b>		
1	Best Practices Manual – Regional Sequestration Opportunities	Future activity
2	Best Practices Manual – Excelsior Energy, Inc.	Future activity
3	Best Practices Manual – Wind Energy	Future activity
4	Progress report	Future activity
<b>Task 10 – Regional Partnership Program Integration</b>		
1	Regional Partnership Program Integration Plan	Completed (July 18, 2006)
2	Progress report	Ongoing



# Next Steps

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

- Continue to ensure timely production of deliverables and overall project management.

## **Task 2 – Field Validation Test – Beaver Lodge, North Dakota**

- Finalization of Amerada Hess CO<sub>2</sub> flood EOR pilot project plans.
- Identification of potential subcontractors for selected MMV activities.

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

- Project meetings November and December.
- Enhance role of APA Petroleum Engineering.
- Determine additional cost-effective MMV techniques to employ.



Continued. . .

# Next Steps (cont.)

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

- Final NEPA document will be submitted to DOE in the beginning of October.
- After the exception order for well spacing is received, the drilling permits will be filed with the state.
- Once additional funding has been approved, PCOR subcontractor, Eagle Operating will begin to drill the test wells.
- Continue to work on securing CO<sub>2</sub> for injection in 2007.

## Task 5 – Terrestrial Validation Test

- Select sites to be sampled and/or restored (current activity).
- Visit sites to establish baselines (current activity).
- Implement sampling protocols.
- Continue to evaluate terrestrial carbon markets.



Continued. . .

## Next Steps (cont.)

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

- Create terrestrial specific data warehouse for terrestrial demonstration project.
- Implement changes to DSS resulting from analysis provided by Jim Evans, EERC.

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

- Provide input to all Field Validation Test task leaders in the development of NEPA compliance documents, site health and safety plans, regulatory permitting action plans, and experimental design packages.
- Provide guidance with regard to regulatory issues to other task leaders.
- Continue to assess regulatory developments.
- Continue to pursue regulatory partners.



Continued. . .

## Next Steps (cont.)

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

- Complete Fact Sheet 7 (NETL comments received).
- Complete Web update (NETL comments received).
- Continue preparation of Documentary 1 (due January 2007).
- Initiate Fact Sheet 8 (due December 2006)

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

- Compare existing source data with updated data sets from the U.S. Environmental Protection Agency (EPA) and others.
- Fill DSS infrastructure data gaps.
- Complete the evaluation of the use of wind power to provide a portion of the energy required for pipeline compression of CO<sub>2</sub> and prepare the Best Practices Manual.
- Begin development of the carbon management plan for the planned Excelsior Energy IGCC plant.

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

- Increase development to integrate all Regional Carbon Sequestration Partnerships.



# Upcoming Issues

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

- None anticipated at this time.

## **Task 2 – Field Validation Test – Beaver Lodge, North Dakota**

- None anticipated at this time.

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

- None anticipated at this time.

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

- The costs of drilling wells and purchasing CO<sub>2</sub> for the lignite demonstration project continue to be a concern. The current budget does not include funds for drilling the wells, and significant cuts will have to be made in the areas of monitoring, mitigation, and verification (MMV) if additional funding for drilling and CO<sub>2</sub> purchase is not obtained.

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

- None anticipated at this time.

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

- None anticipated at this time.



Continued. . .



# Upcoming Issues (cont.)

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

- None anticipated at this time.

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

- None anticipated at this time.

## **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.

