

PLAINS CO₂ REDUCTION PARTNERSHIP

Quarterly Technical Report

(for the period January 1–March 31, 2005)

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PLAINS CO₂ REDUCTION PARTNERSHIP

ABSTRACT

The Plains CO₂ Reduction (PCOR) Partnership continues to make great progress. Task 2 (Technology Deployment) focused on developing information regarding deployment issues to support Task 5 (Modeling and Phase II Action Plans) and provided information to be used to assess CO₂ sequestration opportunities in the PCOR Partnership region. Task 2 efforts also included preparation of a draft topical report entitled “Deployment Issues Related to Geologic CO₂ Sequestration in the PCOR Partnership Region,” which is nearing completion. Task 3 (Public Outreach) focused on developing an informational video about CO₂ sequestration. The video will be completed and aired on Prairie Public Television in the next quarter. Progress in Task 4 (Sources, Sinks, and Infrastructure) included the continued collection of data regarding CO₂ sources and sinks and data on the performance and costs for CO₂ separation, capture, treatment, and compression for pipeline transportation. The addition of the Canadian province of Alberta to the PCOR Partnership region expanded the decision support system (DSS) geographic information system database. Task 5 screened and qualitatively assessed sequestration options. Task 5 activities also continue to be useful in structuring data collection and other activities in Tasks 2, 3, and 5.

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PLAINS CO₂ REDUCTION PARTNERSHIP

EXECUTIVE SUMMARY

The Plains CO₂ Reduction (PCOR) Partnership is developing the information needed for a comprehensive regional assessment of CO₂ sequestration potential. Much of the work at this stage of Phase I consists of finalizing work products and other Phase I deliverables. The Technology Deployment task (Task 2) was designed to develop information regarding deployment issues to support the modeling and Phase II action plan development activities by providing information to be used to assess CO₂ sequestration opportunities in the PCOR Partnership region. Task 2 efforts this quarter focused on expanding the topical report entitled “Deployment Issues Related to Geologic CO₂ Sequestration in the PCOR Partnership Region” to include terrestrial deployment issues, including terrestrial MM&V and ecological impacts of terrestrial sequestration. Task 3 (Public Outreach) focused on 1) completing an informational video about CO₂ sequestration, 2) completing public outreach fact sheets, 3) developing materials for focus group meetings, and 4) developing newspaper articles that inform the general public concerning CO₂ sequestration. Progress in Task 4 (Sources, Sinks, and Infrastructure) included the refining of data regarding CO₂ sources and sinks and data on the performance and costs for CO₂ separation, capture, treatment, and compression for pipeline transportation. Task 4 activities included the development of sequestration capacity estimates for the Newcastle Formation, the Inyan Kara Group, and the Viking Formation, sandstone formations that constitute major saline aquifers exhibiting significant sequestration potential. Task 5, which focused on screening and qualitatively assessing sequestration options, identified several regionally important strategies that will help structure the experimental design of potential future sequestration demonstrations. Task 5 activities also continue to be useful in structuring data collection and other activities in Tasks 2, 3, and 5.

PLAINS CO₂ REDUCTION PARTNERSHIP
Quarterly Technical Report
January 1–March 31, 2005

INTRODUCTION

As one of seven Regional Carbon Sequestration Partnerships (RCSPs), the Plains CO₂ Reduction (PCOR) Partnership is working to identify cost-effective CO₂ sequestration options for the PCOR Partnership region and, in future efforts, to facilitate and manage the demonstration and deployment of these technologies. In this phase of the project, the PCOR Partnership is characterizing the technical issues, enhancing the public's understanding of CO₂ sequestration, identifying the most promising opportunities for sequestration in the region, and detailing an action plan for the demonstration of regional CO₂ sequestration opportunities. This report summarizes the activities for this reporting period. The activities are organized into five tasks.

Task 1 is entitled Management, Reporting, and Technical Outreach. Task 2, Technology Deployment, is designed to identify and evaluate technology deployment and regulatory issues and facilitate the preparation of Phase II Action Plans. Task 3, Public Outreach, is designed to raise public awareness regarding CO₂ sequestration and provide input for potential Phase II Action Plans. Task 4, Sources, Sinks, and Infrastructure, focuses on compiling and assessing information on sources, sinks, and options for CO₂ separation and transportation and developing relational and geographic information system (GIS) databases for housing these data. Task 5, Modeling and Phase II Action Plans, aims to systematically and objectively identify promising CO₂ sequestration options using the PCOR Partnership decision support system (DSS), screening tools, and a model.

EXPERIMENTAL

Phase I of the PCOR Partnership project is designed to identify promising CO₂ sequestration options for our region. Until the sequestration options are identified and the most promising near-term options are selected, experimental activities will not take place. The experimental portion of this program is scheduled for the U.S. Department of Energy's (DOE's) Phase II RCSP program.

RESULTS AND DISCUSSION

Task 1 – Management, Reporting, and Technical Outreach

Task 1 activities for this reporting period included:

- Managing overall project activities.

- Informing stakeholders about DOE's Regional Partnership program and the PCOR Partnership.
- Adding new partners to the PCOR Partnership.
- Discussing potential sequestration deployments with prospective industrial partners.

Information about Partnership activities was presented at the following meetings:

- Chapman Conference on Science and Technology of Carbon Sequestration, San Diego, California (January)
- Capture Group Workshop, Urbana, Illinois (March)

Materials for these meetings were sent to the DOE Contracting Officer's Representative (COR) under separate cover.

Excelsior Energy, Inc., joined the PCOR Partnership program this quarter.

Task 2 – Technology Deployment

The goal of Task 2 is to identify and resolve sequestration deployment issues for the PCOR Partnership region, including 1) safety, regulatory, and permitting requirements; 2) public perceptions; 3) ecosystem impacts; and 4) monitoring, mitigation, and verification (MM&V) requirements. Activities conducted during this reporting period included:

- Further development of MM&V strategies for potential geologic and terrestrial carbon storage opportunities in the PCOR Partnership region.
- Updating the topical report entitled "Deployment Issues Related to Geologic CO₂ Sequestration in the PCOR Partnership Region" to encompass terrestrial deployment issues including technologies and methodologies for MM&V and issues related to environmental and ecological impacts of terrestrial sequestration.
- Facilitating preparation of a draft Phase II action plan.
- Participation in monthly internal PCOR Partnership management and general meetings.

Future activities include continued development of MM&V strategies for potential sequestration options in the PCOR Partnership region and finalization of the topical report(s) relating to Task 2 activities, including external review.

Task 3 – Public Outreach

Public education and outreach for this reporting period included 1) involvement in PCOR Partnership and RCSP program meetings and conference calls as appropriate; 2) the continued review of critical background documents, particularly those gauging public opinion regarding sequestration and communicating risk; 3) update of the public Web site (www.undeerc.org/pcor) as appropriate; 4) development of fact sheets; 5) continued progress on the 30-minute general audience information video; 6) continued progress on outreach research activities; and 7) activities that support DOE's partnership program effort.

Task 3 personnel performed activities to support RCSP outreach and the program. These activities included taking part in monthly RCSP program outreach conference calls (chaired by Sarah Forbes, National Energy Technology Laboratory [NETL]); reviewing materials; and completing exercises focused on developing a consistent approach to risk communications, including providing a review of the RCSP outreach Q&As.

Other activities included the following:

- Fact Sheets No. 2 (Sequestration Background) and No. 3 (Weyburn Project) were updated.
- Updates were made as needed to the public Web site.
- The public opinion activities were revised in response to DOE's request. The PCOR Partnership's outreach work plan originally called for the development of materials to support a public survey that would be undertaken to measure public opinion before and after a public education campaign (i.e., airing of the Prairie Public Television [PPTV] video and publication of a series of newspaper pieces on sequestration in regional newspapers). In early October, the first of two public survey instruments (questionnaires) was sent to DOE for review after having been reviewed internally by EERC personnel. In response to DOE's request, the EERC agreed to do focus groups instead of a public survey. Planning for the focus groups in the next quarter is under way.
- Draft newspaper articles of about 750 words regarding general sequestration, terrestrial sequestration, and geologic sequestration were prepared and submitted for internal EERC review. These articles will be ready for DOE review in the next quarter and are intended to be run in regional newspapers at the same time that the video is being aired in early spring 2005.
- Work on the education materials was suspended until the video and public opinion pieces were completed.
- Development continued on a 30-minute, general audience video that will be aired during the April–June 2005 quarter.

Task 4 – Sources, Sinks, and Infrastructure

Subtask 4.1 – Task Management

Activities under Subtask 4.1 focused on organizing working groups, assigning specific tasks enumerated under the project work plan, and preparing materials for meetings. The collection and cataloging of relevant literature into the reference manager system continued. PCOR Partnership personnel met with Burlington Resources, Baker, and Montana, to discuss its potential participation in the Partnership.

Subtask 4.2 – Characterization of PCOR Partnership Regional CO₂ Sources

The collection of readily available CO₂ source data for the states and provinces in the PCOR Partnership region continued. Most data were obtained or mathematically derived from the e-GRID and TTN databases.

Subtask 4.3 – Characterization of PCOR Partnership Regional CO₂ Sinks

The acquisition, evaluation, and refinement of data on the geological sinks in the PCOR Partnership region continued. Significant accomplishments were made toward the development and implementation of a method to quantify the CO₂ storage capacity of carbon sequestration units in the region. Data sets and maps were refined to develop sequestration capacity estimates for the Newcastle Formation and the Inyan Kara Group, which are Cretaceous Age sandstone formations that constitute major saline aquifers in the Great Plains. Data sets and maps for the Viking Formation, which is the equivalent of the Newcastle Formation in Alberta, Saskatchewan, and Manitoba, were also compiled and integrated for the purpose of developing sequestration capacity estimates for the Cretaceous system in the Western Canadian Sedimentary Basin.

Subtask 4.3.1 – Evaluation of Alternative Agricultural and Management Practices

No major activities were conducted at the Hettinger Research Extension Center (HREC) research plots, as plot work continues in winter mode. Emphasis has been on the soil science tasks, with a focus on analyzing the soil samples taken last summer, both at the HREC plots and in the broader regional soil survey. A high percentage of the HREC samples have been analyzed. The soils lab staff is working through the samples from the regional survey.

With respect to the agricultural component, all activities were focused on the completion of reports. Efforts were made to finalize a draft topical report analyzing the economic potential for soil carbon sequestration in southwestern North Dakota. A second paper that represents an extensive review of literature addressing the economic potential for terrestrial sequestration based on agriculture, forestry, and related land use changes was initiated. The scope of the review is nationwide, but with special emphasis on the PCOR Partnership region.

Subtask 4.3.2 – Carbon Sequestration in Wetlands

U.S. Geological Survey (USGS) and Ducks Unlimited Canada (DUC), research partners, continued the development of the PCOR Partnership prairie wetland carbon sequestration database for estimating the potential of prairie wetlands to sequester atmospheric carbon. Data gathered thus far suggest that restoration of prairie wetlands has a significant potential to sequester carbon (1).

Task 5 – Modeling and Phase II Action Plans

During the January–March 2005 quarter, regionally important strategies (i.e., source–geologic sink combinations) that merit consideration were identified. These strategies include:

- Injection of CO₂ into a deep carbonate system for enhanced oil recovery (EOR). This would provide additional information about EOR at depths not tested to date and also provide a comparison to the complementary sequestration demonstration at Weyburn.
- Injection of acid gas into a carbonate system for EOR. The results of this activity could also be compared to those from Weyburn and the aforementioned test to assess the effect of a significant H₂S concentration in a CO₂ stream.
- Injection of CO₂ into a lignite seam for sequestration and enhanced coalbed methane (ECBM) production.

Information was gathered in preparation for the preliminary economic calculations that will be performed during the next quarter.

Close communication with the other PCOR Partnership task leaders continued during update meetings. The discussions ensured that the activities performed in the other tasks support the model and action plan development.

Future Task 5 activities include:

- Completing the preliminary economics for the important regional strategies that have potential for large-scale testing and deployment.
- Preparing a topical report describing the matching and screening protocol, the results of the beta check, and the final regional results for Phase I.

CONCLUSIONS

The PCOR Partnership has made significant progress in all activities. Information gathering for sources and sinks has progressed in tandem with deployment issues and final data modeling. Task 5 activities use information from Tasks 2 and 4 while continuing the objective

evaluation of CO₂ sequestration opportunities. The most promising near-term sequestration opportunities with prospective partners were selected for further evaluation.

REFERENCES

1. Euliss, N.H., Gleason, R.A., Olness, A., McDougal, R.L., Murkin, H.R., Robarts, R.D., Bourbonniere, R.A., and Warner, B.G., 2003, North American Prairie Wetlands are Important Carbon Storage Sites: In review.

POWERPOINT PROJECT SUMMARY

APPENDIX A

University of North Dakota Energy & Environmental Research Center *Plains CO₂ Reduction Partnership*



Project Summary

DE-PS26-O3NT41982

Last Updated: March 31, 2005

National Energy Technology Laboratory



Partnership Objectives

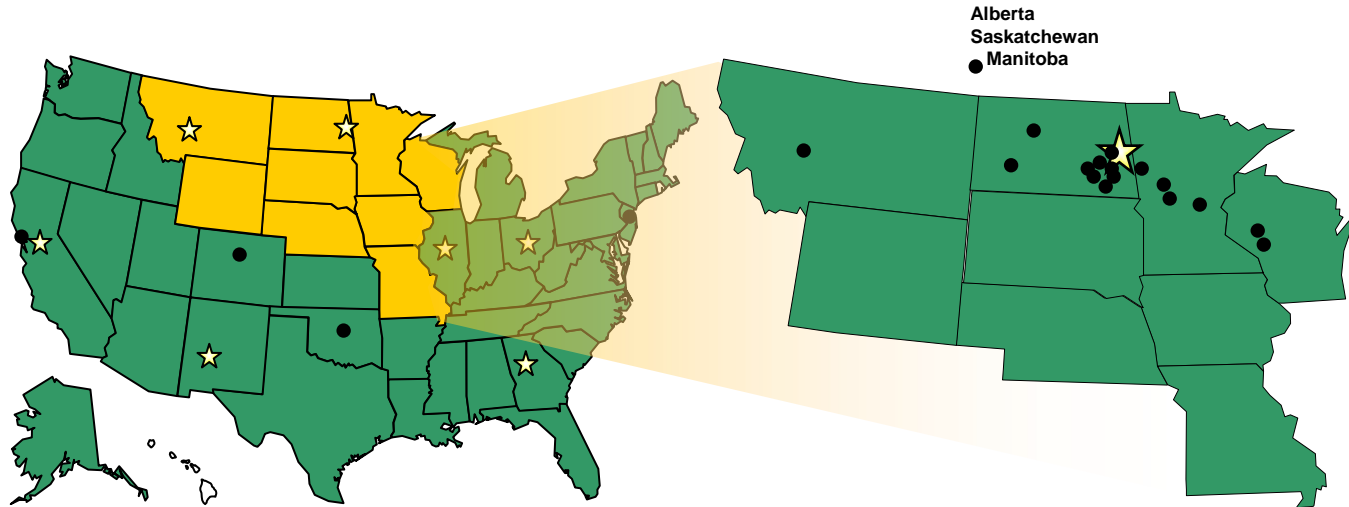
The Plains CO₂ Reduction (PCOR) Partnership is a collaborative regional framework to support the testing and demonstration of CO₂ sequestration technologies in the Great Plains of North America.

The PCOR Partnership project includes five performance tasks:

- 1) Project Management, Reporting, and Technical Outreach
- 2) Identification and Resolution of Technology Deployment Issues
- 3) Public Perception and Outreach
- 4) Characterization of Regional Opportunities
- 5) Technology Selection and Action Plans



Plains CO₂ Reduction Partnership



Partners:

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

- Alberta Department of Environment
- Alberta Energy & Utilities Board
- Alberta Energy Research Institute
- Amerada Hess Corporation
- Basin Electric Power Cooperative
- Bechtel Corporation
- Center for Energy & Economic Development
- Chicago Climate Exchange
- Dakota Gasification Company
- Ducks Unlimited Canada
- Eagle Operating, Inc.
- Encore Acquisition Company
- Environment Canada
- Excelsior Energy, Inc.

- Fischer Oil and Gas, Inc.
- Great Northern Power Development
- Great River Energy
- Interstate Oil and Gas Compact Commission
- Kiewit Mining Group
- Lignite Energy Council
- Manitoba Hydro
- Minnesota Pollution Control Agency
- Minnkota Power Cooperative, Inc.
- Montana–Dakota Utilities Co.
- Montana Department of Environmental Quality
- Montana Public Service Commission
- Natural Resources Trust
- Nexant, Inc.
- North Dakota Department of Health
- North Dakota Geological Survey

- NDIC Oil and Gas Division
- NDIC Research & Development Program
- North Dakota Petroleum Council
- North Dakota State University
- Otter Tail Power Company
- Petroleum Technology Research Centre
- Petroleum Technology Transfer Council
- Prairie Public Television
- SaskPower
- Saskatchewan Industry and Resources
- Tesoro Refinery
- University of Regina
- U.S. Geological Survey – Northern Prairie Wildlife Research Center
- Western Governors' Association
- Xcel Energy

Region Covered:

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



Partnership Team

Partner Name	City	State	Cong. Dist.
Univ. of North Dakota—Energy & Environmental Research Center (EERC)	Grand Forks	ND	At Large
Alberta Department of Environment	Edmonton, Alberta		
Alberta Energy & Utilities Board	Edmonton, Alberta		
Alberta Energy Research Institute	Edmonton, Alberta		
Amerada Hess Corporation	Williston	ND	At Large
Basin Electric Power Cooperative	Bismarck	ND	At Large
Bechtel Corporation	San Francisco	CA	8
Center for Energy & Economic Development	Alexandria	VA	8
Chicago Climate Exchange	Chicago	IL	7
Dakota Gasification Company	Bismarck	ND	At Large
Ducks Unlimited Canada	Stonewall, Manitoba		
Eagle Operating, Inc.	Kenmare	ND	At Large
Encore Acquisition Company	Fort Worth	TX	12
Environment Canada	Alberta, Manitoba, and Saskatchewan Provinces		
Excelsior Energy, Inc.	Minnetonka	MN	3
Fischer Oil and Gas, Inc.	Grand Forks	ND	At Large
Great Northern Power Development	Townsend	MT	At Large
Great River Energy	Elk River	MN	6
Interstate Oil and Gas Compact Commission (IOGCC)	Oklahoma City	OK	5
Kiewit Mining Group	Decker	MT	At Large
Lignite Energy Council	Bismarck	ND	At Large
Manitoba Hydro	Winnipeg, Manitoba		



Partnership Team (cont.)

Partner Name	City	State	Cong. Dist.
Minnesota Pollution Control Agency	St. Paul	MN	
Minnkota Power Cooperative, Inc.	Grand Forks	ND	At Large
Montana–Dakota Utilities Co.	Bismarck	ND	At Large
Montana Department of Environmental Quality	Helena	MT	At Large
Montana Public Service Commission	Helena	MT	At Large
Natural Resources Trust	Bismarck	ND	At Large
Nexant, Inc.	San Francisco	CA	8
North Dakota Department of Health	Bismarck	ND	At Large
North Dakota Geological Survey	Bismarck	ND	At Large
NDIC Oil and Gas Division	Bismarck	ND	At Large
North Dakota Petroleum Council	Bismarck	ND	At Large
North Dakota State Univ.	Fargo	ND	At Large
Otter Tail Power Company	Fergus Falls	MN	7
Petroleum Technology Research Centre	Regina, Saskatchewan		
Petroleum Technology Transfer Council	Houston	TX	7
Prairie Public Television	Fargo	ND	At Large
SaskPower	Regina, Saskatchewan		
Saskatchewan Industry and Resources	Regina, Saskatchewan		
Tesoro Refinery	Mandan	ND	At Large
University of Regina	Regina, Saskatchewan		
U.S. Geological Survey – Northern Prairie Wildlife Research Center	Jamestown	ND	At Large
Western Governors Assoc.	Denver	CO	1
Xcel Energy	Golden	CO	7



Partnership Principals

- ***Principal Investigator: Ed Steadman, Energy & Environmental Research Center***
- ***Task Leaders***
 - *Task 1 Management and Reporting – Ed Steadman*
 - *Task 2 Technology Deployment – John Harju and Thea Reilkoff*
 - *Task 3 Public Outreach – Dan Daly*
 - *Task 4 Sources, Sinks, and Infrastructure – Jim Sorensen*
 - *Task 5 Modeling – Melanie Jensen*
 - *Information Management System – Erin O’Leary*
- ***NETL Project Manager: John Litynski***



Budget

Start Date	End Date	Government Cost	Performer Cost	Total Cost	Cost Share
9/30/03	9/30/05	\$2,455,164	\$828,063	\$3,283,227	25.2%

- **DOE Costs to Date: \$1,633,036**
- **Cost Share to Date: \$493,848**



Highlights of Progress to Date

- **Task 1 Management and Reporting**

Presented at and/or participated in the following meetings:

- *Chapman Conference on Science and Technology of Carbon Sequestration, San Diego, CA (January)*
- *Capture Group Workshop, Urbana, IL (March)*



Highlights of Progress to Date (cont.)

- **Task 2 – Technology Deployment**
 - *Further development of measurement, mitigation, and verification strategies for potential geologic and terrestrial sequestration opportunities in the PCOR Partnership region.*
 - *Prepared updates to the topical report entitled “Deployment Issues Related to Geologic CO₂ Sequestration in the PCOR Partnership Region” to encompass terrestrial deployment issues including technologies and methodologies for MM&V and issues related to environmental and ecological impacts of terrestrial sequestration.*
 - *Facilitated preparation of draft Phase II action plan.*



Highlights of Progress to Date (cont.)

PCOR Plains CO₂ Reduction (PCOR) Partnership
Practical, Environmentally Sound CO₂ Sequestration

Carbon Dioxide (CO₂) Sequestration – Controlling CO₂ Emissions to the Atmosphere Through Capture and Long-Term Storage

What Is CO₂ Sequestration?
Sequestration is the capture and long-term storage of CO₂, either before or after it has entered the atmosphere. Sequestration is one of several actions aimed at controlling the release of anthropogenic CO₂. There are two types of sequestration: direct and indirect.

What Is CO₂?
Carbon dioxide is a gas composed of one atom of carbon and two atoms of oxygen. CO₂ occurs naturally in the atmosphere, is essential to plant life, and, as a greenhouse gas, helps create the greenhouse effect that keeps our planet habitable. CO₂ is used to put the bubbles in soft drinks, as a coolant (dry ice), and in the extinguishers.

Carbon Dioxide (CO₂) Sequestration – Controlling CO₂ Emissions to the Atmosphere Through Capture and Long-Term Storage

The Need to Control Human CO₂
Each year, humans release about 7 billion metric tons of carbon equivalent to 26 billion metric tons of CO₂ to the atmosphere from farming, cement making, and fossil fuel use.¹ These activities take carbon out of long-term storage in soils, rocks, and fossil fuels and put it back into the atmosphere. There is concern that this anthropogenic CO₂ will cause additional warming in the atmosphere that could affect climate on a global scale.²

PCOR Plains CO₂ Reduction (PCOR) Partnership
Practical, Environmentally Sound CO₂ Sequestration

The Weyburn Oil Field – A Model for Value-Added Direct CO₂ Sequestration

What is value-added sequestration?

- "Value added" means that the sequestration value of a product or process has been increased through change in processes or processing.
- Overcomes that use CO₂ to help produce oil or natural gas and the Weyburn CO₂ project and storage creates an additional economic benefit or value for the CO₂ that is not realized in the traditional use of CO₂.
- The Weyburn CO₂ project is the first of its kind in the world.

What is the role of CO₂ in the Weyburn oil field?
The Weyburn oil field has produced 180 million barrels of oil since its discovery in 1954. In the late 1990s, oil production had decreased to the point that the oil field was being considered for abandonment even though operations have that additional oil remained in the production zones. In 2000, EnCana Resources initiated a CO₂ pilot project designed to recover an estimated 10 million barrels of this additional, "unaccounted for" oil. This action is expected to extend the life of the oil field until 2025 and bring significant economic benefits to the region. Over the life of the CO₂ flood, about 10 million metric tons of CO₂ will be sequestered in the production zones, which is the equivalent of taking 3.2 million cars off the road for 1 year.

Where does the CO₂ come from for Weyburn?
The CO₂ for the Weyburn CO₂ flood and sequestration activities comes from the Great Plains Synthetic Plant owned by the Dakota Gasification Company in Bismarck, North Dakota. Each year, the Synthetic Plant converts about 6 million tons of lignite coal to 14 billion cubic feet of synthetic natural gas. The coal gasification process produces nearly pure streams of several by-products, including CO₂. A portion of this CO₂ is transported 320 km (200 mi) by pipeline from the Synthetic Plant north to the Weyburn oil field for use in CO₂ flooding and sequestration.¹

The Great Plains Synthetic Plant (Dakota Gasification Company) in Bismarck, North Dakota, generates the CO₂ used in CO₂ sequestration in the Weyburn, Saskatchewan, oil field.
Sequestration can be safe and effective given the right combination of site characterization, site monitoring, geologic conditions, and site operations. The Weyburn project is one of the sequestration activities involving members of the PCOR Partnership.

• Task 3 – Public Outreach

- Fact Sheet No. 2 (sequestration background) and Fact Sheet No. 3 (Weyburn project) were completed.
- The public Web site was updated.
- Focus groups are scheduled for mid-April in Williston, ND; materials are completed and recruitment is under way.
- The video is finalized, closed-captioning is under way, DVD cover design is under way, and a broadcast date on Prairie Public Television is set for May 12, 2005.
- Drafts of sequestration newspaper articles are ready for final EERC review.

Highlights of Progress to Date (cont.)

- **Task 4 – Sources, Sinks, and Infrastructure**

- Source data for all states and provinces in the region that have been collected and compiled into the GIS database were refined.
- Reconnaissance-level estimates of CO₂ storage capacity of selected oil fields in all states and the provinces of Saskatchewan and Manitoba have been developed. CO₂ capacity has been estimated for over 1500 oil fields in the PCOR Partnership region.
- Reconnaissance-level estimates of CO₂ storage capacity have been developed for the Anderson–Wyodak coal seam of the Wyoming portion of the Powder River Basin.
- Reconnaissance-level estimates of CO₂ storage capacity for the Madison Group saline aquifer have been developed.



Highlights of Progress to Date (cont.)

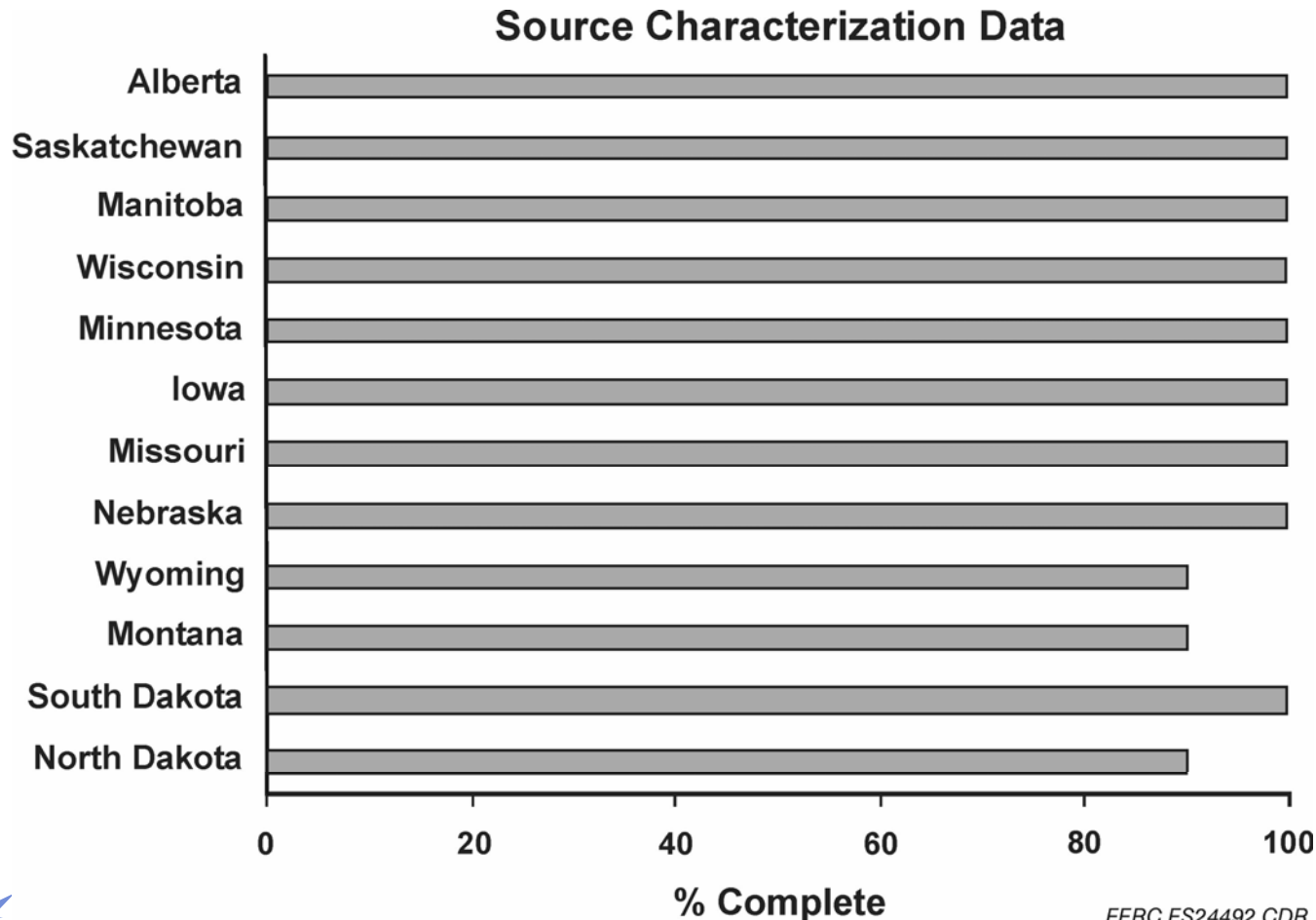
- **Task 4 – Sources, Sinks, and Infrastructure**

- *Sequestration capacity estimates were made from data sets and maps for the Newcastle Formation and the Inyan Kara Group.*
- *A draft topical report analyzing the economic potential for soil carbon sequestration in southwestern North Dakota is in final review.*
- *An extensive review of literature addressing the economic potential for terrestrial sequestration based on agriculture, forestry, and related land use changes is being prepared.*
- *The development of the prairie wetland carbon sequestration database for estimating the sequestration potential for atmospheric carbon continued.*



Highlights of Progress to Date (cont.)

- **Task 4 – Sources, Sinks, and Infrastructure (cont.)**
 - *Status of source characterization data*

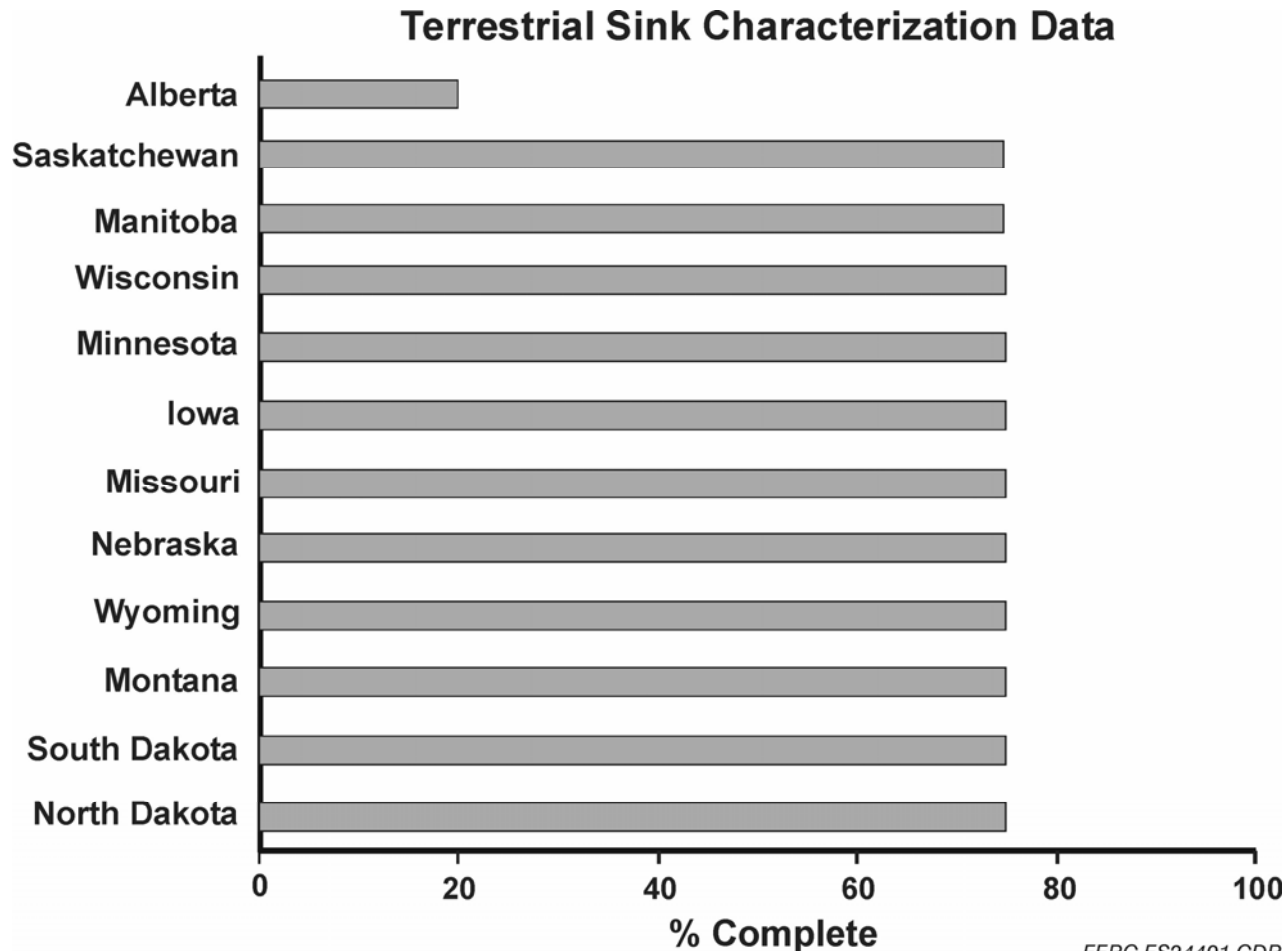


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Highlights of Progress to Date (cont.)

- **Task 4 – Sources, Sinks, and Infrastructure (cont.)**
 - *Status of terrestrial sink characterization data*

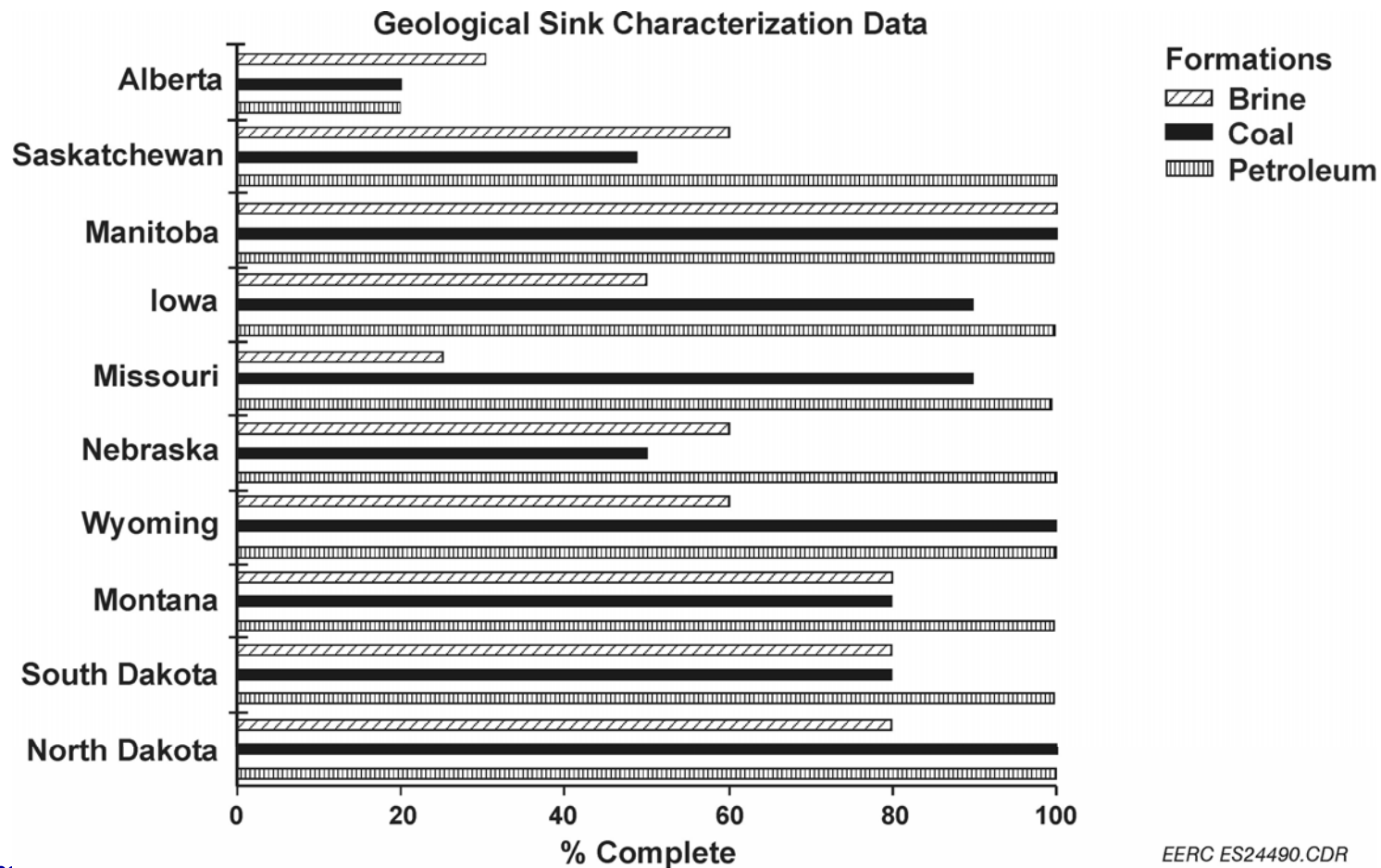


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Highlights of Progress to Date (cont.)

- **Task 4 – Sources, Sinks, and Infrastructure (cont.)**
 - Status of geological sink characterization data



EERC ES24490.CDR

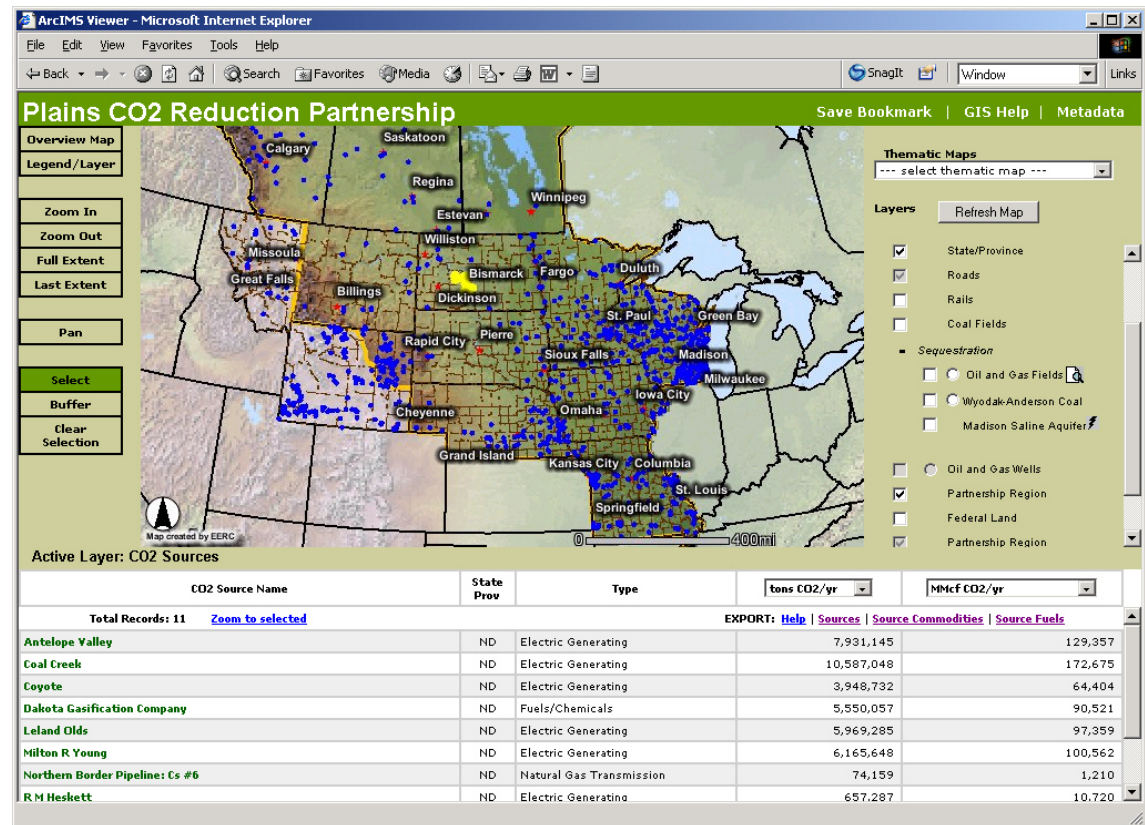
Highlights of Progress to Date (cont.)

- Information Management System**

Features under Development

Save Bookmark: Saves map at current extent and layer settings to Favorites folder for retrieval at a later date.

Layer Visibility: The complete layer list is visible at all scales. Specific layers become enabled or disabled at specific scales.



Highlights of Progress to Date (cont.)

- **Task 5 – Modeling**

- *Three regionally important strategies that merit further investigation were identified.*
- *Information about these strategies, their specific CO₂ sources, and the geologic sinks was gathered in preparation for the performance of preliminary economic calculations.*



Project Tasks and Status

Task 1 – Management and Reporting		
Activity	Description	Status
1	Negotiations and contract award	Completed
2	Informational monthly meetings of the task leaders	Ongoing
3	Informational monthly meetings of the “whole” (to include an informal presentation)	Ongoing
4	U.S. Department of Energy quarterly reports and PowerPoint update (quarterly)	Ongoing
5	Technical fact sheets on regional sources, sinks, and candidate sequestration projects	As-needed basis
6	Annual carbon sequestration conference	Planned for next quarter
7	Advisory committee meeting	Meeting held October 14–15, 2004
8	Advisory meeting comments/statements (to be sent approximately one month after meetings)	Ongoing
9	All meeting and publicly presented materials	As-needed basis
10	DOE Regional Carbon Sequestration Partnership meetings	Future activity



Project Tasks and Status

Task 2 – Technology Development		
Activity	Description	Status
1	Establish working group	Completed
2	Obtain relevant regulations and permitting requirements	Completed
3	Review ecosystem studies; assess environmental impacts	Completed
4	Identify monitoring technologies and existing verification plans	Completed
5	Develop verification strategy	In progress
6	Develop preliminary input for action plan for Phase II	Completed
7	Facilitate preparation of draft Phase II action plan	Ongoing



Project Tasks and Status

Task 3 – Public Outreach		
Activity	Description	Status
Working Group		
1	Working group contact list	Completed
2	Outreach/education plan DRAFT	Completed
3	Meeting/conference call (outreach working group)	See 5
4	Outreach/education plan FINAL	In progress
5	Meeting (coincident with fall PCOR Partnership meeting)	Informal discussions at the PCOR Partnership meeting and provided materials to select partners for review
Web Site		
1	Initial	Completed
2	Expanded	Ongoing
Fact Sheets		
1	PCOR Partnership description	Completed
2	Weyburn project	Ongoing
3	Sequestration basics	Ongoing
4	PCOR Partnership sources/sinks indirect	Replaced by other products
5	PCOR Partnership sources/sinks direct	Replaced by other products



Project Tasks and Status

Task 3 – Public Outreach (cont.)		
Activity	Description	Status
Middle School Education Activities		
1	Inventory available curriculum and regional training sessions	In progress
2	Obtain middle school curricula	In progress
3	Curricula outreach	In progress
4	Decisions on other school outreach opportunities	In progress
Public Information Campaign		
1	30-minute Prairie Public Television (PPTV) video	In progress (revised based on NETL comments; DVD cover design initiated; closed-captioning completed; broadcast on Prairie Public Television set for May 12, 2005)
2	Five-article series on sequestration in major regional newspapers	In progress (changed to three article set to match with video; public release set for early spring 2005)
3	Assessment of public knowledge	In progress (focus groups scheduled for mid-April in Williston, ND; materials finalized; attendee recruitment in progress)



Project Tasks and Status

Task 4 – Sources, Sinks, and Infrastructure		
Activity	Description	Status
Task Management and Support		
1	Literature reviews	In progress
Source Characterization		
1	Acquire existing databases	All states and Canadian provinces complete
2	Data collection and reduction	In progress
3	Data entry into PCOR Partnership databases	In progress
Infrastructure Characterization		
1	Acquire existing databases	In progress
2	Data collection and entry	In progress
Sink Characterization		
1	Acquire existing databases	All states, Manitoba, Saskatchewan complete, Alberta in progress
2	Data evaluation and reduction	In progress
3	Data entry into PCOR Partnership databases	In progress
4	Field experiments at Hettinger Research Extension Center	In progress
5	Soil carbon testing	In progress
6	Farm economic simulation model	In progress
7	Carbon sequestration in wetlands	In progress



Project Tasks and Status

Information Management System		
Task	Description	Status
1	Create foundation for geographic information system (GIS) application and database storage	Completed
2	Create and populate databases – Define fields and data types	In progress
3	Refine GIS Web site – Ability to view detailed characterization information – Interactive features for analysis	In progress



Project Tasks and Status

Task 5 – Modeling		
Task	Description	Status
1	Draft of model variables (sources, sinks, and infrastructure)	Completed
2	Second draft of model	Completed
3	Development of preliminary dataset for testing	Completed
4	Alpha version of model	Completed
5	Completion of model assessment of primary action plans/alpha	Completed
6	Beta version of model	Completed
7	Completion of model assessment of primary action plans/beta	Completed
8	Final model results for DOE action plans	Action plans are in progress



Project Milestones

Milestone	Description	Status
Management, Reporting, and Technical Outreach		
1	Negotiate and award contract	Completed
2	Final report	Future activity
Technology Deployment Issues		
1	Detailed work plan	Completed
2	Final task report	In progress
3	Input for scenario selection/action plans	In progress
Public Outreach		
1	Detailed work plan	Completed
2	Middle school education materials	In progress
3	30-minute general video	In progress
4	10-minute technology videos	(workplan revised, no longer required)
Regional Characterization		
1	Detailed work plan	Completed
2	Final task report	In Progress
Data Management, Scenario Selection, and Action Plans		
1	Detailed work plan	Completed
2	Scenario screening	Completed
3	Scenario modeling	Completed
4	Scenario action plans	In progress



Project Recognition

Meetings/Conferences

- *NATCARB GIS workshop, Kansas City, MI (February)*
- *Chapman Conference on Science and Technology of Carbon Sequestration, San Diego, CA (January)*
- *Meeting with Burlington Resources, Baker, MT (January)*
- *Capture Group Workshop, Urbana, IL (March)*
- *Meeting with Alberta Energy and Utilities Board, Edmonton and Calgary, AB (January)*
- *Meeting with Dakota Gasification Company, Bismarck, ND (January)*
- *Meeting with Excelsior Energy, Inc. (January)*
- *Meeting with University of Regina and Saskatchewan Industry & Resources (January)*
- *Meeting with Encore Acquisition Company (January)*
- *Market Place, Bismarck, ND (January)*
- *Ducks Unlimited Canada Annual Carbon Meeting, Winnipeg, MB (January)*
- *Third USDA Symposium on Greenhouse Gases and Carbon Sequestration in Agriculture and Forestry, Baltimore, MD (March)*



Project Deliverables

Deliverable	Description	Status – Date of Completion
1	What Is CO ₂ Sequestration?	Completed, revisions as needed
2	CO ₂ Sequestration – Controlling CO ₂ Emissions to the Atmosphere Through Capture and Long-Term Storage	Completed
3	The Weyburn Oil Field – A Model for Value-Added Direct CO ₂ Sequestration	Completed
4	Carbon Sequestration Video, "Nature in the Balance"	5/4/2005
5	Focus group results	6/17/2005
6	Wetland Carbon Sinks in the Glaciated North American Prairie	5/30/2005
7	Geological sequestration Fact sheet	Replaced by Topical Reports
8	Newspaper articles regarding carbon sequestration	5/2/2005
9	PCOR Partnership Web site	Ongoing
10	CO ₂ Source Characterization of the PCOR Partnership Region	6/24/2005
11	Carbon Separation and Capture	6/8/2005
12	Geologic CO ₂ Sequestration Potential of the Wyodak–Anderson Coal Zone in the Powder River Basin	Completed
13	Mission Canyon Formation Outline	4/29/2005
14	Sequestration Potential of the Madison of the Northern Great Plains Aquifer System (Madison Geological Sequestration Unit)	6/30/2005



Project Deliverables

Deliverable	Description	Status – Date of Completion
15	The Influence of Tectonics on the Potential Leakage of CO ₂ from Deep Geological Sequestration Units in the Williston Basin	6/1/2005
16	Overview of Williston Basin Geology as It Relates to CO ₂ Sequestration	4/29/2005
17	Geologically Sequestered CO ₂ Leakage: A Literature Survey	7/15/2005
18	Sequestration Potential of Petroleum Reservoirs in the Williston Basin	5/16/2005
19	Additional Formation Outlines for the Williston Basin	7/29/2005
20	Sequestration Potential of the Newcastle and Inyan Kara Aquifer Systems	7/29/2005
21	Geologic Sequestration Potential of the PCOR Partnership Region	8/30/2005
22	Sequestration Potential of the Williston Basin Coals	6/30/2005
23	The Contribution of Soils to Carbon Sequestration	6/15/2005
24	Terrestrial Carbon Sequestration Potential in Southwest North Dakota	7/15/2005
25	Economics and Policy of Carbon Sequestration in Agricultural Soils: A Review of Recent Literature	7/8/2005
26	Wetland Carbon Sinks in the Glaciated North American Prairie	8/8/2005



Project Deliverables

Deliverable	Description	Status – Date of Completion
27	Deployment Issues Related to Geologic Terrestrial CO ₂ Sequestration in the PCOR Partnership Region	5/30/2005
28	The PCOR Partnership Decision Support System	Completed
29	Identifying CO ₂ Sequestration Opportunities	Completed
30	Identification of CO ₂ Sequestration Strategies for the PCOR Partnership Region	9/1/2005
31	The PCOR Partnership Decision Support System	Ongoing
32	Final Report with Regional Action Plans	9/30/2005
33	Quarterly Report 1	Completed
34	Quarterly Report 2	Completed
35	Quarterly Report 3	Completed
36	Quarterly Report 4	Completed
37	Quarterly Report 5	Completed
38	Quarterly Report 6	4/28/2005
39	Quarterly Report 7	7/28/2005



Next Steps

Task 1 Management and Reporting

- *Continue overall project management and reporting.*
- *Seek additional partnership opportunities where appropriate.*
- *Develop detailed schedule for completion of products.*

Task 2 Technology Deployment

- *Complete development of MM&V strategies for potential geologic and terrestrial sequestration options in the PCOR Partnership region.*
- *Finalize updates to topical report related to Task 2 activities (includes obtaining external review).*



Next Steps (cont.)

Task 3 Public Outreach

- *Continue participation in RCSP Outreach Working Group conference calls.*
- *Print DVDs, complete DVD jackets and package DVDs, preview DVDs to partners, prepare press release for public DVD broadcast on Prairie Public Television on May 12, 2005.*
- *Complete education contact list, education forum list, curriculum packet, list of candidate outreach opportunities.*
- *Complete recruitment for focus group meetings in Williston, North Dakota, in mid-April 2005, hold focus groups, and complete report for focus group activity.*
- *Finalize newspaper articles and contact newspapers with target of late April 2005.*



Next Steps (cont.)

Task 4 Sources, Sinks, and Infrastructure

- *Incorporate sink-related databases for Alberta into GIS Web site.*
- *Develop sequestration potential estimates for key geological sinks in Alberta.*
- *Obtain or calculate source-related chemical characterization data for gas-processing plants in the region.*
- *Obtain infrastructure databases and map files.*
- *Incorporate information regarding capture and separation technologies into a format compatible with final report.*
- *Summarize baseline data from HREC plots.*
- *Prepare conceptual design of economic analysis model for terrestrial sequestration.*



Next Steps (cont.)

Task 5 Modeling

- *Complete preliminary economics for important regional strategies to rank them relative to each other.*
- *Prepare a topical report describing the matching/screening protocol, the results of the beta check, and the final regional results.*

Information Management Systems

- *Input Alberta data.*
- *Develop terrestrial database and Web site.*



Upcoming Issues

Task 1 Management and Reporting

- None

Task 2 Technology Deployment

- *Ensuring that the updated version of the topical report pertaining to deployment issues is reviewed by appropriate external advisors.*

Task 3 Public Outreach

- *Ensuring scheduling and coordination among public opinion focus groups, newspaper article publication, and video air times on public television.*



Upcoming Issues (cont.)

Task 4 Sources, Sinks, and Infrastructure

- *Sources of pipeline data and maps – commercial vendors and government agencies have different restrictions that must be dealt with – data from government agencies would be best, but may need formal request to come from DOE.*

Task 5 Modeling

- *None*

Information Management Systems

- *None*

