



the **ENERGY** lab

PROJECT FACTS

Carbon Sequestration

Plains CO₂ Reduction Partnership— Validation Phase

Background

The U.S. Department of Energy (DOE) has selected seven partnerships, through its Regional Carbon Sequestration Partnership (RCSP) initiative, to determine the best approaches for capturing and permanently storing carbon dioxide (CO₂), a greenhouse gas (GHG) which can contribute to global climate change. The RCSPs are made up of state and local agencies, coal, oil and gas, and other private companies, electric utilities, universities, and nonprofit organizations. These partnerships form the core of a nationwide network helping to establish the most suitable technologies, regulations, and infrastructure needs for carbon sequestration. The partnerships include more than 350 organizations, spanning 43 states and four Canadian provinces. The RCSPs are developing the framework needed to validate and deploy carbon sequestration technologies. The RCSPs will determine which of the numerous sequestration approaches are best suited for their specific regions of the country and identify regulatory and infrastructure requirements that will be needed should policy and economics indicate that sequestration be deployed on a wide scale. The RCSP initiative is implemented in three phases, which includes the Characterization Phase, Validation Phase, and Development Phase. In September 2003, the Characterization Phase began with the seven partnerships working to determine the locations of CO₂ sources and to assess suitable locations for CO₂ storage. The Validation Phase of the RCSP effort (2005–2009) is focused on evaluating promising CO₂ sequestration opportunities through a series of small scale field tests in the seven partnership regions. Development Phase (2008–2018) activities are proceeding and will continue the validation process to determine that CO₂ capture, transportation, injection, and storage can be achieved safely, permanently, and economically at a large scale. These tests will promote understanding of injectivity, capacity, and containment of CO₂ in the various geologic formations identified by the partnerships. Results and assessments from these efforts will assist commercialization efforts for future sequestration projects in North America.

Description

The Plains CO₂ Reduction (PCOR) Partnership is a diverse group of public and private sector stakeholders working together to explore the technical and economic feasibility of capturing and storing CO₂ emissions from stationary sources in the central interior of North America. The PCOR Partnership is one of seven RCSPs funded by DOE and a broad range of project sponsors. It is led by the Energy & Environmental Research Center (EERC) at the University of North Dakota. The PCOR

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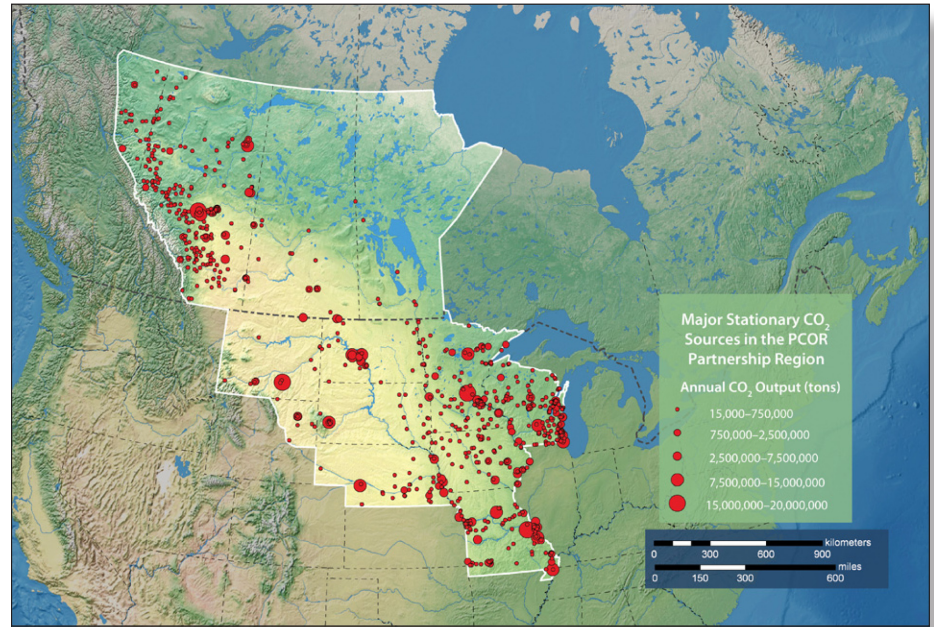
Customer Service: 1-800-553-7681



U.S. DEPARTMENT OF
ENERGY

PARTNERS

Abengoa Bioenergy New Technology, Inc.
Air Products and Chemicals, Inc.
Alberta Department of Energy
Alberta Innovates - Technology Futures
ALLETE
Ameren Corporation
American Coalition for Clean Coal
Electricity
American Lignite Energy (ALE)
Apache Canada Ltd.
Baker Hughes Oilfield Operations, Inc.
Basin Electric Power Cooperative
Biorecro AB
Blue Source, LLC
BNI Coal, Ltd.
British Columbia Ministry of Energy,
Mines, and Petroleum Resources
Carbozyme, Inc.
Dakota Gasification Company
Ducks Unlimited, Inc.
Eagle Operating, Inc.
Eastern Iowa Community College District
Enbridge Inc.
Encore Acquisition Company
Energy & Environmental Research Center
(University of North Dakota)
Energy Resources Conservation Board/
Alberta Geological Survey
Environment Canada
Excelsior Energy Inc.
Great Northern Project Development, LP
Great River Energy
Hess Corporation
Huntsman Corporation
Indian Land Tenure Foundation
Interstate Oil and Gas Compact
Commission (IOGCC)
Iowa Department of Natural Resources -
Geological Survey
Lignite Energy Council
Manitoba Geological Survey
Marathon Oil Company
MEG Energy Corporation
Melzer Consulting
Minnesota Power
Minnkota Power Cooperative, Inc.
Missouri Department of Natural
Resources
Missouri River Energy Services
Montana Department of Environmental
Quality
Montana-Dakota Utilities Company
National Commission on Energy Policy
Natural Resources Canada
Nebraska Public Power District
Nextant, Inc.



Major Stationary CO₂ Sources in the PCOR Partnership Region.

Partnership region generates about 12 percent of the total U.S. CO₂ emissions from major stationary sources. It has abundant geologic sink opportunities that can be used for storing CO₂. During the PCOR Partnership Characterization Phase (2003–2005), key reservoir characterization data were gathered for over 1,900 oil fields in the oil-producing states and provinces of the region. Three saline formations that cover large portions of the region were also evaluated, and several more were identified for evaluation in the Validation Phase (2005–2009). The region's major coal fields have also been evaluated for CO₂ sequestration potential. CO₂ storage estimates within the region's major oil and gas, saline, and unmineable coal formations are estimated at 29 billion metric tons (3.2 billion tons), 106 billion metric tons (116 billion tons) 7.3 billion metric tons (8 billion tons) respectively.

The PCOR Partnership region also contains many opportunities for terrestrial sequestration of CO₂. Terrestrial sinks include agricultural lands (e.g., croplands, grasslands, and rangelands), forestlands, wetlands, and peat bogs. Forested areas within the PCOR Partnership region total more than 302 million acres, agricultural lands (both farmland and rangeland) total more than 402 million acres, the Prairie Pothole Region (PPR) includes 30.9 million acres of wetlands, and the region contains more than 106 million acres of peat bogs. While the amount of carbon that can be sequestered in this manner is species or location-dependent, gross estimates of sequestration capacity can be made by applying known sequestration rates to the available acreages.

Primary Project Goal

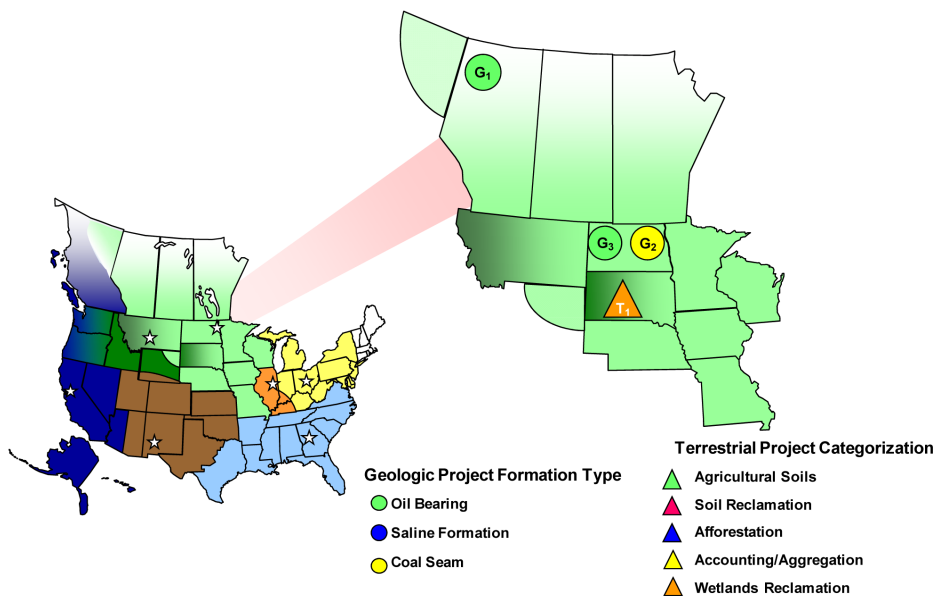
The overall goal of the PCOR Partnership Validation Phase is to develop a core of local technical expertise and experience to facilitate future CO₂ sequestration efforts in both subsurface and terrestrial settings in the plains region, thus providing results and assessments from these efforts to assist commercialization efforts for future sequestration projects in North America.

Objectives

- Continue to assess regional carbon sequestration opportunities.
- Develop and implement field tests; three geologic, and one terrestrial.
- Evaluate the feasibility of selected commercial-scale carbon sequestration technologies.
- Assess storage capacity, CO₂ permanence, economics, risk, public acceptance, and societal and monetary benefits.
- Provide outreach and education for CO₂ sequestration stakeholders and the general public.

Already completed are field validation tests that demonstrated four sequestration scenarios of significant scale and designed to verify the proposed concepts. The PCOR Partnership Characterization Phase results have indicated enormous potential for sequestration in strata suitable for enhanced oil recovery (EOR). EOR projects are especially compelling as field validation tests since the PCOR Partnership's regional opportunity is large, and the economics are favorable. The information generated on sink capacities and permanence; monitoring, verification, and accounting (MVA); CO₂ transport; economics; risk; public acceptance; and societal benefits that resulted from the sequestration/EOR tests, made them ideal activities.

Field Projects



PCOR Partnership Validation Phase Field Tests

PARTNERS (cont.)

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 Pipeline Authority
 North Dakota State University
 Otter Tail Power Company
 Oxand Risk & Project Management
 Solutions
 Petroleum Technology Research Centre
 Petroleum Technology Transfer Council
 Prairie Public Broadcasting
 Ramgen Power Systems, Inc.
 RPS Energy
 Sasjatgewan Ministry of Energy and
 Resources
 Saskatchewan Industry and Resources
 SaskPower
 Schlumberger
 Shell Canada Energy
 Spectra Energy
 Strategic West Energy Ltd.
 Suncor Energy Inc.
 TAQA North Ltd.
 U. S. Department of Energy
 U. S. Geological Survey Northern Prairie
 Wildlife Research Center
 University of Alberta
 University of North Dakota
 Weatherford Advanced Geotechnology
 Western Governors' Association
 Westmoreland Coal Company
 Williston Basin Interstate Pipeline
 Company
 Wisconsin Department of Agriculture,
 Trade, and Consumer Protection
 Xcel Energy

COST

Total Project Value

\$29,236,394

DOE/Non-DOE Share

\$16,452,858 / \$12,783,536

