

The Plains CO₂ Reduction Partnership: Demonstrating Carbon Dioxide Storage in the United States and Canada

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Abstract

The Plains CO₂ Reduction (PCOR) Partnership is one of seven regional partnerships awarded in 2003 by the U.S. Department of Energy's National Energy Technology Laboratory to determine the best approaches to geologic storage and apply technologies to safely and permanently demonstrate the storage of carbon dioxide (CO₂). The PCOR Partnership region covers an area of over 1.4 million square miles in the central interior of North America and includes all or part of nine U.S. states and four Canadian provinces.

As part of the PCOR Partnership effort, a number of industrial partners have joined the program to undertake commercial-scale CO₂ storage projects, regional characterization efforts, and large-scale CO₂ storage project feasibility studies. Currently in the eighth year of the demonstration phase, the PCOR Partnership is testing the validity of different characterization, modeling and simulation, risk assessment, and monitoring techniques and technologies to advance the science of CO₂ storage in geologic formations. Completed efforts to date include a best practices manual for a feasibility study surrounding the potential to inject over 2 million tonnes of CO₂ a year near Spectra Energy's Fort Nelson Gas-Processing Plant [1, 2]; the completion of an updated regional technology implementation plan surrounding Apache Canada's Zama acid gas enhanced oil recovery (EOR) and CO₂ storage project [3]; and a binational effort between the United States and Canada to characterize the lowermost saline system (basal Cambrian) in the Williston and Alberta Basins [4]. In addition to the completed efforts, there are several ongoing efforts, including injection at the Bell Creek project and planned injection (scheduled to begin in 2015) at the Aquistore project.

The PCOR Partnership is collaborating with Petroleum Technology Research Centre (PTRC) in site characterization; risk assessment; public outreach; and monitoring, verification, and accounting (MVA) activities at the Aquistore project. The Aquistore project is a carbon capture, utilization, and storage (CCUS) project situated near the town of Estevan, Saskatchewan, Canada, and the U.S.–Canada border. This project is managed by PTRC and will serve as buffer storage of CO₂ from the SaskPower Boundary Dam CCUS project, the world's first commercial-scale postcombustion CCUS project from a coal-fired electric generating facility. In early 2015, CO₂ captured from SaskPower's Boundary Dam power facility will be transported to the Aquistore site and injected into the Deadwood Formation for long-term CO₂ storage [5, 6].

At Bell Creek, the PCOR Partnership is working with Denbury to study CO₂ storage associated with commercial CO₂ EOR at the Bell Creek oil field. The Bell Creek oil field covers approximately 22,000 acres (89 square kilometers), contains over 450 wells, and has produced over 130 million barrels of oil since its discovery in 1967. Denbury is injecting approximately 50 million cubic feet (1.4 million cubic meters) of CO₂ a day, sourced from from the ConocoPhillips-operated Lost Cabin Gas Plant and the ExxonMobil Shute Creek Gas Plant in LaBarge, Wyoming. The CO₂ is being transported to the Bell Creek oil field via the 232-mile (373-kilometer)-long Greencore pipeline and injected into an oil-bearing sandstone reservoir in the Lower Cretaceous Muddy Formation at a depth of approximately 4500 feet (1372 meters) for the purpose of CO₂ EOR. Denbury is carrying out the injection and production operations, while the EERC is providing support for site characterization, modeling and simulation work, integrated risk assessment, and aid in the MVA of the injected CO₂ [7, 8]. Injection operations began in the Bell Creek Field in May 2013 and as of the end of August 2014, 1,247,174 tonnes of CO₂ had been injected.

The PCOR Partnership also continues to provide widespread carbon capture and storage outreach and education, aid in regulatory development, and collaboratively undertake regional characterization efforts [9]. Paramount to the PCOR Partnership efforts is knowledge-sharing focused on concepts and techniques that have proven effective for the implementation of large-scale CO₂ injection projects. Discussion will focus on lessons learned and strategies that were



successful in the feasibility, design, and/or implementation phases of projects with PCOR Partnership Program involvement.

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