The Plains CO_2 Reduction (PCOR) Partnership's Activities in the Williston Basin

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Abstract

The Plains CO_2 Reduction (PCOR) Partnership is one of the Regional CO_2 Sequestration Partnerships (RCSPs) established by the U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL). Over 85 partners from industry, government, and nongovernment organizations contribute time, resources, and expertise to the PCOR Partnership. The PCOR Partnership covers an area of over 1.4 million square miles in the central interior of North America, including all or part of nine states and four Canadian provinces. The PCOR Partnership region is a well-studied area, particularly with respect to the Williston Basin.

The Williston Basin is a reasonably large sedimentary basin located in eastern Montana, western North and South Dakota, and southern Saskatchewan. The Williston Basin has significant potential as a geological sink for sequestering CO_2. Geological sinks that may be suitable for long-term sequestration of CO_2 include both active and depleted petroleum reservoirs, deep saline formations, and coal seams, all of which are abundant in the Williston Basin. The PCOR Partnership is currently planning to carry out three tests in the Williston Basin with respect to CO_2 sequestration.

The first test (currently being conducted in Phase II of the project) will be a field validation test in deep, unminable lignite seams in Burke County, North Dakota, to investigate the potential for coalbed methane production.

In the summer of 2007, five wells were drilled, logged, and cemented. Approximately 30 feet of core, ten of which was the primary coal seam of interest, was retrieved from the center well and has been evaluated for gas content from core, rock mineralogy, vitrinite reflectance, maceral composition, methane and carbon dioxide isotherms, and lithology description. Analysis of all data collected in the field is ongoing. Once the results from this analysis have been thoughtfully interpreted, field-scale experiments will be conducted. Additionally, as data from the field tests become available, the geologic model will be updated with new inputs. Once this model is validated, it will be used to further create the CO_2 simulation model. This will help to finalize the CO_2 flood design. Injection for this field validation test will most likely commence in the

summer of 2008. At that time, a monitoring, mitigation, and verification plan will be implemented to monitor CO_2 fate.

The second test (to be conducted during Phase II of the project) will be a field validation test in a deep carbonate reservoir in the Williston Basin approximately 2 miles from the earth's surface, thus being the deepest CO_2-based enhanced oil recovery (EOR) project in North America. Since the beginning of Phase I of the project (September 2005), the PCOR Partnership has focused a large effort toward characterizing the Williston Basin's oil fields for geologic and engineering data. A site is currently being chosen based upon this information. Once a specific site location is chosen, a CO_2 injection plan will be developed. It is anticipated that CO_2 injection will begin in late 2008.

The third test (to be conducted during Phase III of the project) will be a field demonstration test. This demonstration will inject CO_2 into a saline formation in the Williston Basin for the dual purpose of sequestration and EOR. The demonstration will transport between 500,000 and 1,000,000 tons a year of CO_2 from Basin Electric Power Cooperative's Antelope Valley Station (an existing conventional coal-fired power plant in central North Dakota) and inject the CO_2 into an oil reservoir located in western North Dakota or eastern Montana. The power plant will be retrofitted with a system that can capture CO_2 from its flue gas stream. The slipstream will be processed to separate and capture the CO_2, dehydrated, compressed to supercritical conditions, combined with supercritical CO_2 from the Great Plains Synfuels Plant, and transported via pipeline to the sequestration site that is anticipated to be approximately 150 miles away. While a specific oil field has not yet been chosen to be the host site for the Williston Basin large-volume CO_2 injection test, it is anticipated that the selection will take place in the early stages of Phase III.

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Ed Steadman is a Senior Research Advisor at the Energy & Environmental Research Center (EERC), where he is responsible for development, marketing, management, and dissemination of commercially oriented research and development of programs focused on the environmental effects of power and natural resource production. He currently serves as the Program Manager for the Plains CO_2 Reduction (PCOR) Partnership, one of seven regional partnerships funded by the U.S. Department of Energy's National Energy Technology Laboratory Regional Carbon Sequestration Partnership Program, to assess the technical and economic feasibility of capturing and storing (sequestering) CO_2 emissions from stationary sources in the northern Great Plains and adjacent area. Mr. Steadman's principal area of expertise is carbon sequestration. He holds an M.A. in Geology from the University of North Dakota and a B.S. in Geology from the University of Pennsylvania–Edinboro.