PLAINS CO_2 REDUCTION (PCOR) PARTNERSHIP (PHASE III) FORT NELSON DEMONSTRATION SITE GEOCHEMICAL WORK INITIATED – MILESTONE M18

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Prepared for:

Mr. Darin Damiani

U.S. Department of Energy
National Energy Technology Laboratory
3610 Collins Ferry Road
PO Box 880
Morgantown, WV 26507-0880

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Prepared by:

James A. Sorensen
Edward N. Steadman

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

David J. Moffatt

Spectra Energy Transmission
425 1st Street SW, Suite 2600
Fifth Avenue Place, East Tower
Calgary, AB T2P 3L8
CANADA

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PLAINS CO_2 REDUCTION (PCOR) PARTNERSHIP (PHASE III)
FORT NELSON DEMONSTRATION SITE GEOCHEMICAL WORK INITIATED – MILESTONE M18

The Plains CO_2 Reduction (PCOR) Partnership is working with Spectra Energy Transmission to determine the effect of the large-scale injection of carbon dioxide (CO_2)-rich acid gas into a deep brine-saturated carbonate formation for the purpose of simultaneous acid gas disposal and sequestration of CO_2. A technical team that includes Spectra Energy, the Energy & Environmental Research Center (EERC), and others will conduct a variety of activities to determine the baseline geological characteristics of the injection site and surrounding areas. Spectra Energy will carry out the injection process, while the EERC will conduct CO_2 monitoring, mitigation, and verification (MMV) activities at the site. The Fort Nelson demonstration project will be a unique opportunity to develop a set of cost-effective MMV protocols for large-scale (>1 million tons per year) CO_2 sequestration in a brine-saturated formation.

The field demonstration test conducted in the Fort Nelson area of British Columbia will evaluate the potential for geological sequestration of CO_2 as part of a gas stream that also includes high concentrations of H_2S into a brine-saturated carbonate formation. The results of the Fort Nelson activities will provide insight regarding the impact of high concentrations of H_2S (13.5%) on sink integrity (i.e., seal degradation), MMV, and successful sequestration within a carbonate reservoir. The acid gas will be obtained from the Fort Nelson gas-processing plant and injected into a brine-saturated reservoir in a Devonian-age carbonate formation at a depth of approximately 6900 to 7200 feet (2100 to 2190 meters). The Fort Nelson Gas Plant is owned and operated by Spectra Energy Transmission. The plant currently generates about 1.4 million tons of acid gas consisting of approximately 13.5% H_2S and 85.5% CO_2. This amounts to a total of about 1.2 million tons/year of CO_2 and 200,000 tons/year of H_2S. The activities at Fort Nelson will sequester an estimated 1.2 million tons of CO_2 annually.

FORT NELSON DEMONSTRATION SITE GEOCHEMICAL WORK PLAN

In an effort to significantly reduce CO_2 emissions from their natural gas-processing operations in northeastern British Columbia, Spectra Energy Transmission, in a coordinated effort with the PCOR Partnership Phase III demonstration program, is taking steps to initiate the first carbon capture and storage (CCS) project in North America to inject over 1 million tons/year of CO_2 into a saline reservoir in North America. The source and sink for this CCS project are both located near Fort Nelson, British Columbia, and the project is, therefore, referred to as the Fort Nelson CCS project. Understanding the geochemical properties of the study area and the potential geochemical changes that may occur as a result of the injection activities is a critical component of the program. As part of the Fort Nelson CCS project, laboratory and field-based activities will be conducted that are focused on determining 1) the baseline geochemical properties of target injection formation and overlying seals and aquifer systems and 2) the potential effects of supercritical CO_2 and H_2S on both reservoir rocks and sealing rocks. Laboratory tests will be conducted on core samples of the target injection formation and key

sealing formations under reservoir conditions to assess the geochemical reactions anticipated to occur between the injected gas and the rocks and fluids of the reservoir and seal. Mineral compositions will be obtained using x-ray diffraction, x-ray fluorescence, and scanning electron microscopy techniques. Eventually, laboratory tests will be conducted on core samples of the target injection formation and key sealing formations under reservoir conditions to assess the geochemical reactions anticipated to occur between the injected gas and the rocks and fluids of the reservoir and seal. Mineral compositions will be obtained using x-ray diffraction, x-ray fluorescence, and scanning electron microscopy techniques. Samples of fluids from key formations in the selected oil field will be collected and analyzed for major and minor constituents. Laboratory results will be used to refine geochemical models which will be integrated with CO_2 fate predictive modeling efforts. The results of these activities will be presented in a Geochemical Final Report for the Fort Nelson Site (D41). Geochemical modeling will include the following:

- The interaction between the injected CO_2, the reservoir fluids, and the rocks will be modeled to determine the amount of CO_2 that will be stored through dissolution and mineral precipitation.

- Geochemical modeling will be used to assess the long-term fate of CO_2 in the subsurface.

FORT NELSON DEMONSTRATION SITE GEOCHEMICAL WORK INITIATED

A variety of activities focused on geochemical characterization and modeling were initiated in the second quarter of Phase III – Year 1. These activities include the following:

- Laboratory tests on rock and mineral samples that are relevant to the target injection formation and key sealing formations under reservoir conditions were initiated in February 2008 to assess the geochemical reactions anticipated to occur between the injected gas and the actual rocks and fluids of the reservoir and seal. Mineral compositions of the rock and mineral samples obtained before and after exposure to supercritical acid gas using x-ray diffraction, x-ray fluorescence, and scanning electron microscopy techniques will be determined. Similar tests will be conducted on core samples of the actual target injection formation and overlying seal which will be collected during the drilling of the exploratory well in the summer of 2008.

- Efforts to identify and evaluate geochemical modeling software packages were initiated in January 2008. Most of the initial efforts have focused on determining the capabilities of the PHREEQC software package with respect to CO_2-related geochemical modeling. Other modeling programs will be examined, and those which are most appropriate will be utilized for geochemical modeling activities.

- Salinity maps for the key aquifer systems in the Fort Nelson area, including the systems within which injection is most likely to occur (the Devonian Elk Point Group and Beaver Hill Lake Group) have been obtained from Spectra Energy Transmission.

Additional maps of key geochemical properties will be developed as more geochemical data become available. It is anticipated that the drilling of the exploratory well in the summer of 2008 and the collection of formation water samples from other wells in the Fort Nelson area over the course of the baseline characterization phase will yield a significant amount of new geochemical data.