THE FORT NELSON CARBON CAPTURE AND STORAGE PROJECT – A PROGRAM FOR LARGE-SCALE GEOLOGIC STORAGE OF CO_2 FROM A NATURAL GAS-PROCESSING PLANT IN BRITISH COLUMBIA, CANADA

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Nearly 1600 facilities around the world remove impurities such as carbon dioxide (CO_2) from producers' raw sour natural gas, and the Fort Nelson gas-processing plant in northeastern British Columbia, Canada, owned and operated by Spectra Energy, is among the largest. For this reason, Spectra Energy and the Plains CO_2 Reduction (PCOR) Partnership are working together in a collaborative venture involving government, industry, technical experts, and researchers to demonstrate the concept of carbon capture and storage (CCS) to manage the CO_2 emissions of a large natural gas-processing facility. Over the course of the Fort Nelson CCS project, the conceptual design envisions injecting 1.3 to 2 Mt per year of sour CO_2 into a saline formation situated at approximately 2.2 to 2.3 km deep. The movement and fate of the sour CO_2 in the subsurface is to be monitored to ensure the safe and effective operation of geologic storage sites for CO_2 in this region and provide a reference for other large-scale CCS projects in deep saline formations. Over the next decade, the demonstration will store 13 to 20 Mt of CO_2 that would have otherwise entered the atmosphere.

The sour CO_2 stream (95% CO_2, 5% H_2S) from Spectra Energy's Fort Nelson gas-processing facility, located near Fort Nelson, British Columbia, Canada, is capture ready. In the current plan, the final phase of the capturing phase would call for the sour CO_2 to be compressed to a supercritical state and then be transported via pipeline approximately 20 km to a site where it would be injected to a depth of over 2200 meters for permanent storage in brine-saturated carbonate rocks of the Devonian-age Beaverhill Lake Group and/or Elk Point Group. The Fort Nelson CCS project also has the potential to generate 9 MW of green power from waste heat recovery, a zero net fuel requirement above business-as-usual sour gas processing that allows for a significant reduction in CO_2 emissions in the region.

In addition to the fact that Spectra Energy's Fort Nelson CCS project would significantly reduce CO_2 emissions in accordance with the desires of British Columbia and Canada, the Fort Nelson CCS project serves as a project for research and demonstration programs being funded by Natural Resources Canada, the United States Department of Energy (DOE), and the province of British Columbia. In particular, the baseline characterization, monitoring, and risk assessment components of the Fort Nelson CCS project are being conducted as part of the DOE-funded PCOR Partnership's Phase III program. The primary objective of the Fort Nelson demonstration is to verify and validate the concept of utilizing North America's large number of saline formations for large-scale injection of anthropogenic CO_2 for permanent storage. Specific goals include:

- Cost-effective risk management, simulation, and monitoring, verification, and accounting (MVA) strategies for large-scale CO_2 storage in deep saline formations.

- Testing and refinement of reservoir modeling intended to predict and estimate CO_2 injectivity (the potential for placing CO_2 into the reservoir) and confirm the practical CO_2 storage capacity for this site, areal extent and mobility of the supercritical CO_2 plume in the reservoir, and improved methodologies to ensure that site characterization and MVA results better support risk management objectives and modeling efforts.

- Testing strategies to predict the effects of CO_2 on the integrity of overlying sealing formations, including the testing and modeling of key geomechanical and geochemical parameters.

The injection site was chosen in 2008, and the drilling for the initial test well (which will also likely serve as either an injection well or a monitoring well) and shallow groundwater-monitoring wells was completed in the spring of 2009. Injection is planned to begin in 2013, and Spectra Energy intends to continue injection of sour CO_2 over the remaining operational lifetime of the Fort Nelson gas-processing plant which, for several decades will be processing nonconventional gas reserves from the Horn River shale basin. An MVA plan will be implemented to manage the CCS scheme's performance in accordance with regulations and monitor the underground sequestration of the injected CO_2 in conjunction with project simulation models.