Application of Canadian Standards Association Guidelines for Geologic Storage of CO_2 Toward the Development of a Monitoring, Verification, and Accounting Plan for a Potential CCS Project at Fort Nelson, British Columbia, Canada

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Abstract

The Plains CO_2 Reduction (PCOR) Partnership, led by the Energy & Environmental Research Center (EERC), and Spectra Energy Transmission (SET) are investigating the feasibility of a carbon capture and storage (CCS) project to mitigate carbon dioxide (CO_2) emissions produced by SET's Fort Nelson Gas Plant (FNGP). The FNGP is located near the town of Fort Nelson in northeastern British Columbia, Canada. The gas stream produced by the FNGP will include up to 5% hydrogen sulfide (H_2S) and a small amount of methane (CH_4) and, as such, is referred to as a "sour" CO_2 stream. If a CCS project for the FNGP is determined to be feasible, the sour CO_2 gas stream would be injected into a deep saline carbonate formation.

The Fort Nelson project provides a unique opportunity to develop a set of cost-effective, risk-based monitoring, verification, and accounting (MVA) protocols for large-scale (>1 million metric tons a year) storage of sour CO_2 in a deep saline formation. The role of the PCOR Partnership is to provide the project with reservoir modeling and simulation, risk assessment of subsurface technical risks, and an MVA plan to address these risks. The PCOR Partnership applies a philosophy that combines geologic characterization, modeling, risk assessment, and MVA strategies into an iterative process to produce superior-quality results during the project feasibility and development periods. Elements of any of these activities are crucial for understanding or developing the other activities (Gorecki and others, 2012).

In June 2012, the Canadian Standards Association (CSA) released a standard for geological storage a standard of CO_2 entitled "Standard CSA Z741 Geological Storage of Carbon Dioxide." The standard was developed by the CSA's Technical Committee on Geological Storage of Carbon Dioxide, which is a joint Canada–U.S. Technical Committee. This committee included 38 individuals with a broad range of experience in government, academia, and the oil and gas industry. In Canada, the consensus among CCS stakeholders is that the CSA standard for geological storage of CO_2 will be used for different purposes. This standard, by itself, does not have the force of law unless it is officially adopted by a regulatory authority. However, it is possible that the CSA standard, in total or in part, could be adopted or referred to by regulatory authorities. One potential

scenario is that provincial regulators may officially incorporate the CSA standard, as a whole or in part, into their standard regulatory process. There are also other scenarios by which nongovernment stakeholders could use the CSA standard as a benchmark by which CCS projects can be judged both within and outside of the legal system, even in jurisdictions that do not officially adopt the standards. With this in mind, and because the CSA draft standard is the most detailed and thorough standard of its kind developed by a North American organization, a draft MVA plan for a potential Fort Nelson CCS project was developed by the PCOR Partnership in such a manner so as to be compliant with the CSA standard.

Since 2009, SET and the PCOR Partnership have made substantial efforts to collect baseline characterization data on potential injection target formations and sealing formations in the Fort Nelson area. Those data have been used to create static petrophysical models of potential CO_2 storage reservoirs and to conduct dynamic simulation modeling of potential injection scenarios. The baseline characterization data and initial modeling results were in turn used to conduct a risk assessment of potential Fort Nelson CCS project scenarios. While a final injection strategy has not yet been determined for the FNGP, a draft MVA plan has been developed using assumptions that are based on those previous characterization, modeling, and risk assessment efforts. The risk-based draft MVA plan covers the surface, near-surface, and deep subsurface environments in the area of the FNGP. The draft MVA plan includes specific technologies, spatial locations of measurements, monitoring schedule, and baseline data necessary to address critical project risk and regulatory requirements and identify any deviations from expected conditions in a timely manner. Although specific techniques and procedures may change as the project proceeds, the project's integrated philosophy of geologic characterization, modeling, and risk assessment will ensure that MVA strategies remain fit for purpose and cost-effective and have the greatest potential for success throughout the project's lifetime. The key elements of the proposed draft Fort Nelson MVA plan have been considered and presented in the context of how they individually and/or collectively address the guidelines enumerated in the CSA standard for geologic storage of CO_2.

References

Gorecki, C.D., Sorensen, J.A., Klapperich, R.J., Botnen, L.S., Steadman, E.N., and Harju, J.A., 2012, A risk-based monitoring plan for the Fort Nelson feasibility project: Paper CMTC 151349 presented at the 2012 Carbon Management Technology Conference, Orlando, Florida, USA, February 7–9 2012, 14 pp.

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