Overview, Status, and Future of the Fort Nelson CCS Project

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Overview

The Plains CO2 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 (CO2) emissions produced by SET’s Fort Nelson Gas Plant (FNGP). The FNGP is located near the town of Fort Nelson in northwestern British Columbia, Canada. The gas stream produced by the FNGP will include up to 5% hydrogen sulfide (H2S) and a small amount of methane (CH4) and, as such, is referred to as a “sour” CO2. The sour CO2 gas stream would be injected into a deep saline carbonate formation.

The Fort Nelson demonstration 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 per year) storage of sour CO2 in a deep saline formation. The role of the MVA work performed included all subsurface, technical risks resulting from the geologic storage of CO2.

Status

To date, a variety of site characterization, modeling, risk assessment, MVA planning, regulatory permitting, and public outreach activities have been conducted. Collection of baseline data for shallow groundwater characteristics has been initiated. A comprehensive suite of existing well data, 2-D and 3-D seismic survey, and core testing results have been acquired and used to create static geologic models. The static geologic models have supported dynamic modeling, including history matching and the development of predictive simulations for selected injection scenarios. Results thus far suggest that the geology and hydrogeology in the vicinity of the FNGP are amenable to long term geologic storage of CO2. The output from the characterization and modeling exercises has provided the basis for two iterations of a comprehensive risk assessment of the geologic risks associated with the Fort Nelson CCS project. The combined results of the characterization, modeling, and risk assessment activities provide a basis for MVA planning and will ultimately support the selection of a site-specific injection strategy. Key permitting application documents have been developed for submission to British Columbia regulatory authorities. A poster and fact sheet have been developed to provide supporting materials for public outreach efforts.

Future

Future plans call for drilling an additional exploration well and collecting new 3-D seismic data. This will be followed by further refinement of the static model and new dynamic simulations, which will support the selection of a final injection strategy. Once a final injection strategy has been defined, the risk assessment will once again be updated, which will, in turn, be used to guide a specific MVA strategy. The updated MVA plan will include 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, with the greatest potential for success throughout the project’s lifetime.

Characterization

The site characterization program is a fundamental component of the Fort Nelson CCS Project and fulfills the needs of both the Fort Nelson Final Geologic Model (FNFNM) and the Fort Nelson Final Geology Model (FNGM). The FNFNM is a deep saline reservoir model, which is used to support the selection of injection wells, injection strategies, and monitoring plans. The FNGM is a deep saline reservoir model, which is used to support the selection of injection wells, injection strategies, and monitoring plans. The FNGM is used to support the selection of injection wells, injection strategies, and monitoring plans.

Modeling

The modeling work is focused on understanding the potential for success throughout the project’s lifetime. Strategies remain fit for purpose and cost-effective, with the greatest potential for success throughout the project’s lifetime.

A CO2 density of 415 kg/m3 was used to calculate the storage mass (average CO2 density in the reservoir).

Summary

Table: Storage Mass

<table>
<thead>
<tr>
<th>Formation</th>
<th>Pore Volume, m3</th>
<th>Storage Mass, metric tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keg River</td>
<td>22,200,000,000</td>
<td>92,100,000</td>
</tr>
<tr>
<td>Sulphur Point</td>
<td>2,920,000,000</td>
<td>12,100,000</td>
</tr>
<tr>
<td><strong>Summary</strong></td>
<td>29,460,000,000</td>
<td>122,200,000</td>
</tr>
</tbody>
</table>

Legend:

- A = Acceptable
- C = Combined
- D = Difficult
- N = Not Applicable
- I = Ignored
- £ = Eliminated
- £¢97 = Not Considered

References

Acknowledgement

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