

## The Evolution of the Quest CCS MMV Plan: 2011 to 2020

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### Summary

This paper gives an overview of the Measurement, Monitoring and Verification (MMV) Plan for the Quest Carbon Capture and Storage (CCS) Operation. Quest is the world's first large-scale commercial application of CCS at an oil sands operation, and it is now capturing more than one million tonnes of CO<sub>2</sub> per year from the Scotford Upgrader. The (MMV) program for Quest is comprehensive, with a variety of technologies being used to monitor the atmosphere, hydrosphere, biosphere and geosphere.

### MMV – Measurement, Monitoring and Verification for CCS Projects in Alberta

A government approved Measurement, Monitoring and Verification Plan is a requirement for the geological storage of CO<sub>2</sub> in Alberta. The two key objectives of the MMV program are to demonstrate containment and conformance of the injected CO<sub>2</sub>. MMV also supports the emissions accounting and the transfer of long-term liabilities associated with geological sequestration.

The Quest MMV Plans are risk-based, site specific and adaptive by design (as per the guidelines published by DNV (2010), and the conformance and containment monitoring technologies are fit-for-purpose to address the risk assessment.

### The adaptivity of the Quest MMV Plan

The Quest CCS operation is in its 6<sup>th</sup> year of operation. The MMV Plan is updated every 3 years and most recently updated in 2020.

#### Pre-Injection Phase

The initial MMV Plan was submitted in 2011 and focused heavily on the site characterization and acquisition of baseline monitoring data. The lessons learned from the Weyburn-Midale CO<sub>2</sub> monitoring and storage project were front of mind for many stakeholders during the development of the early MMV Plans.

#### Injection Phase

With additional years of operational experience and learnings, the Quest MMV plan has been adapted as new information has been gained from reservoir and well performance, site-specific technical feasibility assessments and monitoring performance and results. Each MMV Plan cycle includes an updated risk assessment for storage and an assessment of the monitoring technologies required to maintain a life-cycle approach to MMV activities.

In particular, the 2020 MMV Plan is specific as to which risks are addressed through the MMV Plan to demonstrate conformance, containment and verification of the sequestered CO<sub>2</sub> – and which risks are managed outside of the MMV and Closure Plans and identified as project or operational threats. All threats are carried in the Project risk register and assessed at minimum

on the MMV and Closure Plan update cycles to understand if the risks have changed significantly enough to be addressed by a modification to the MMV or Closure Plans.

### **Closure Phase**

The closure period is the period following the cessation of injection operations. Closure criteria are continually being developed and an MMV Plan is required in order to commence closure activities in order to demonstrate sustained compliance with the required performance criteria for closure. During the closure period, the decommissioning of the injection wells and reclamation the surface will occur, in accordance with the regulatory requirements in place at the time.

### **Post-Closure Phase**

Following the completion of site closure activities Quest will be eligible to apply for a Site Closure Certificate and submit a Post-Closure MMV Plan to the Crown. The post-closure period will then begin with the issue of a Site Closure Certificate that will transfer the long-term liability to the Crown in accordance with the Mines and Minerals Act.

The Government of Alberta maintains a post-closure stewardship fund (PCSF) intended to support any MMV activities that may be required after the site is abandoned and reclaimed.

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