

Integrated monitoring systems at the PTRC's Aquistore field laboratory: More than just a CO₂ storage project

Erik H. Nickel¹, Kyle Worth¹, Rick Chalaturnyk², Kevin Dodds³, Chris Hawkes⁴, Ben Rostron², James Sorensen⁵, Don White⁶

1: Petroleum Technology Research Centre

2: University of Alberta

3: Australian National Low-emissions Coal R&D

4: University of Saskatchewan

5: Energy and Environment Research Center

6: Geological Survey of Canada

Abstract

The Petroleum Technology Research Centre's Aquistore project is measuring and monitoring CO₂ being injected from an anthropogenic source into a deep saline geological formation through two heavily instrumented wells – one for injection and the other for monitoring. The source of CO₂ is SaskPower's Boundary Dam 3 unit, a coal fired power plant with post combustion CO₂ capture. CO₂ is being injected into the basal Cambrian Deadwood formation, and the lower Ordovician Winnipeg Sand (Black Island beds). Together, these form an interbedded stacked sandstone reservoir approximately 200m thick at a depth of up to 3400m.

The Aquistore project as whole is more than just a CO₂ storage study; it is a field laboratory investigating many forms of monitoring suitable for other industry-related activities such as enhanced oil production, advanced seismic data gathering or production optimization. At surface, the area is monitored by tilt metres, a permanent passive seismic array and permanent seismic source. There are also GPS monitors, InSar reflectors, gravity metres and a program of soil gas monitoring. At depth, in the observation and injection wells, there are downhole temperature and pressure gauges, a formation fluid sampling system, and fibre optic lines that carry temperature, pressure and distributed acoustic signal (DAS) data.

As more CO₂ is injected into the reservoir, the monitoring systems are active and giving indications of the shape and size of the injected plume as it grows. While this is an important result, the use of down-hole DAS fibre for seismic imaging and its comparison to traditional downhole seismic geophone arrays has been of great interest to sponsors and the scientific community.