Advancing Containment, Conformance and Injectivity Technologies for Effective Geological Storage

Ben Rostron[1] and Rick Chalaturnyk[2]

BACKGROUND

AQUISTORE PROJECT

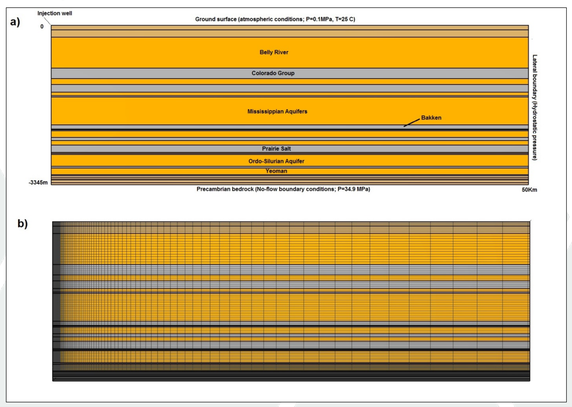
The Aquistore research project is part of SaskPower's Boundary Dam Integrated Carbon Capture and Storage Demonstration Project. Between 2200-3200 tonnes CO_2/day are captured from a ~150Mw coal-fired power generation station.

Aquistore is designed to take the slipstream CO_2 from the capture plant and store it ~ 3400 metres underground using a newly-drilled injection well.

SHORT-TERM OBJECTIVES

To support our research efforts to advance our understanding of containment, conformance and injectivity associated with the geological storage of CO_2 our short terms objectives are:

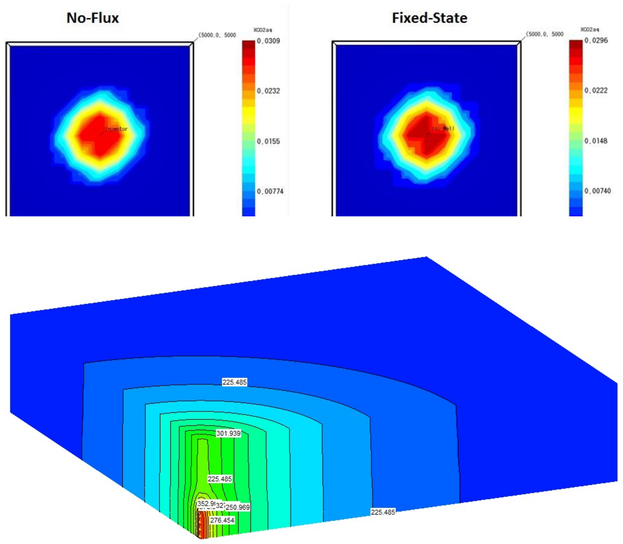
- Construct a single-phase groundwater model (e.g., MODFLOW or SUTRA) of a larger (100 x 100 km) domain than current models to investigate higher injection rates in the existing well and the addition of one or more additional injection wells



PROJECT OVERVIEW

Canada is a world-leader in CCS with two operating projects: Shell-Quest in Alberta; and Boundary Dam in Saskatchewan. Together these projects currently capture more than 2 Mtpa of CO_2. At Boundary Dam, most of the captured CO_2 is sold for use in the Weyburn CO_2-EOR project with the remainder also injected into the Basal Cambrian storage complex as part of the Aquistore Project. There is an immediate opportunity to expand both of these projects that could lead to significant CO_2 reductions (i.e., Mtpa) in a short time (ie <5 years). At Boundary Dam, the operator (SaskPower) faces an imminent decision whether to add carbon capture capacity to its upcoming retrofits on Boundary Dam 4 and 5 power station units. That decision depends in large part on the capacity of the Basal Cambrian storage formation to store increased amounts of CO_2. Thus our longer-term objectives include:

- Assessing whether additional injection wells could be placed within existing storage complexes without impacting the subsurface storage complex and confining layers;
- For subsurface conditions represented by Aquistore and Quest, what is the maximum increase that could be handled by existing wells?
- What would the subsurface pressure plume be if existing wells were increased to their maximum injection capacity?
- Would the brine migration laterally, and vertically, have any significant impact on other uses of the pore space, including shallow freshwater aquifers?
- Where would the best place be to drill additional injection wells at the Aquistore site?
- How could we optimize the number of injection wells?



THEME OVERVIEW

CARBON CAPTURE, UTILIZATION, & STORAGE

Hydrocarbons will continue to serve as an essential energy source while the world transitions to a lower-carbon energy economy, but can we prevent the use of those fuels from contributing to the accumulation of CO2 in the atmosphere? Existing technologies can capture carbon, but these methods can be costly and energy-intensive. Extracting energy without burning fuels, improving CO2 capture efficiencies if they are burned, and finding effective ways to store or reuse captured carbon may be essential to ensuring it does not enter the atmosphere.

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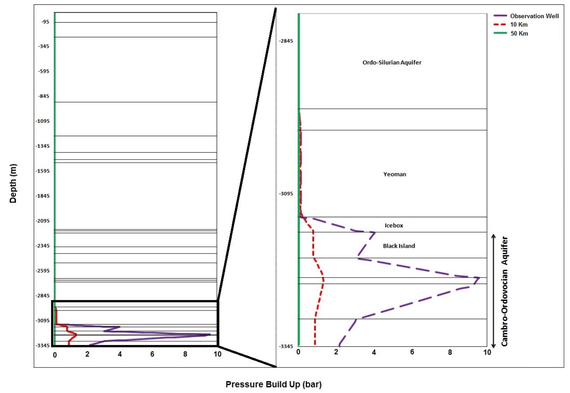
EXPECTED OUTCOMES

Projects like Aquistore and Quest are critical to effective and safe implementation of CO_2 geological storage because they are providing early, at scale results of full scale CO_2 injection. Leveraging measurement and monitoring data collected from these world-class projects allows us to pursue research on the processes that lead to permanent storage of CO_2 and its economic injection (containment, conformance and injectivity).

We plan to work with the operators of the Aquistore and Quest projects by conducting numerical simulations to understand how to increase CO_2 injection at these sites.

It is expected that timely application of directed research demonstrating additional storage capacity, and storage security under increased injection have the potential to tip a decision in favor of increased CCS as an effective strategy with the portfolio of options for mitigating greenhouse gas emissions



EXTERNAL PARTNERS

PETROLEUM TECHNOLOGY RESEARCH CENTRE,
Regina, Saskatchewan

Aquistore®

ptrc
Petroleum Technology Research Centre

[1]Department of Earth & Atmospheric Sciences, University of Alberta, Edmonton, Alberta
[2]Department of Civil & Environmental Engineering, University of Alberta, Edmonton, Alberta

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