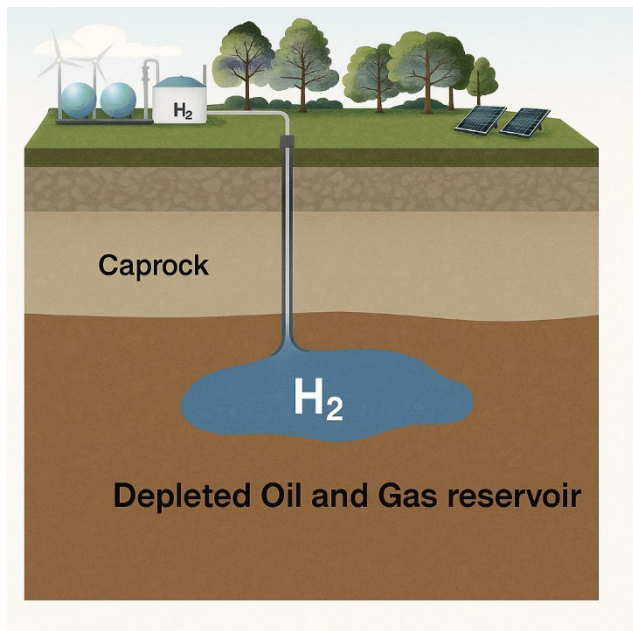


Developing strategies for enhanced underground hydrogen storage (UHS)

Hydrogen is an appealing substitute for hydrocarbon fuels because it can contribute to different parts of Alberta's energy value chain. However, supply/demand mismatches require the exploitation of underground reservoirs (e.g. depleted natural gas reservoirs) that can store hydrogen seasonally. Given Alberta's abundance of such reservoirs, our objective is to perform a geological scan to identify reservoirs that are especially well-suited for storage. Having done so, we will run simulations to estimate hydrogen plume evolution through multiple injection/withdrawal cycles. We will also make laboratory measurements of hydrogen leakage through representative caprock. We will thereby inform key questions related to storage security/recoverability.



RECIPIENT:

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PARTNERS:

**Centre for Energy and
Mineral Processing
(UofA)**



TOTAL BUDGET:

\$241,534



AI FUNDING:

\$120,767



PROJECT DATES:

**APR 2025 –
MAR 2028**



PROJECT TRL:

**Start: 3
End: 5**

APPLICATION

Hydrogen's importance derives from its many uses, from a transportation fuel to a chemical feedstock. Within Canada, Alberta boasts the greatest potential to develop its hydrogen economy due to its extensive oil and gas expertise/infrastructure. The province is therefore poised to host or inform many of the ~100 hydrogen projects planned nationwide. First, however, effective solutions must be developed for underground hydrogen storage. Our principal application area is UHS in the depleted gas reservoir context.



ALBERTA INNOVATES CLEAN ENERGY

CLEAN TECHNOLOGY

CARBON CAPTURE, UTILIZATION AND STORAGE (CCUS) & HYDROGEN

PROJECT GOALS

- Use publicly-available geological data to identify those depleted natural gas reservoirs that show special promise as vehicles for underground hydrogen storage (UHS).
- Sharpen the corresponding national geological survey, published in 2020, by restricting focus to depleted natural gas reservoirs within Alberta.
- Run numerical simulations to model hydrogen flow through especially favorable candidate formations.
- Perform laboratory experiments to characterize hydrogen leakage rates through representative caprock.

BENEFITS TO ALBERTA

Expanded UHS opportunities benefit Alberta in two complementary ways.

- Alberta industry already consumes large volumes of hydrogen; secure storage offers a buffer against supply disruptions.
- Alberta's Hydrogen Roadmap forecasts aggressive expansion into economy-diversifying markets, i.e. gas utility systems, transportation, power generation, and exports. In each case, the capacity to store hydrogen cheaply and safely is an essential prerequisite for business investment.

Because North America does not currently possess any depleted reservoir storage facilities for hydrogen, even a pilot-stage project could represent a business development opportunity that is a vehicle for investment and job creation.



**2 Students
Trained**



1 Project Job



10 Future Jobs



**20 t/yr Future GHGs
Reduced**

CURRENT STATUS

MAY 2025

Although the project has been active for less than 1-month, good progress has already been made: the geological survey that is central to our project's success is underway and a scoring criteria for candidate depleted reservoirs has been identified. Moreover, experimental planning and equipment procurement is underway. We look forward to commencing laboratory data collection later this summer and to using said data in guiding our geological survey.