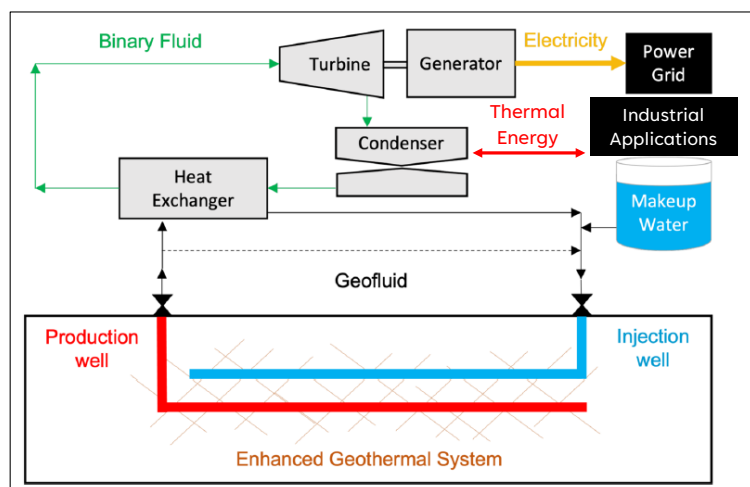


Design and Optimization of Enhanced Geothermal Systems in Alberta

Deep geothermal energy is a potential source of clean, reliable, utility-scale energy from Alberta's Precambrian basement geology, with temperatures of 200+ Celsius. Enhanced Geothermal System (EGS) technology circulates a working fluid down one or more horizontal injection wells, through a thermal reservoir created by hydraulic fracturing, and up one or more production wells where the extracted heat can be recovered for use. This project assesses opportunities, risks and potential technical solutions. This project is intended to lay the groundwork for Alberta's first EGS pilot.



RECIPIENT:
**Modern West
Advisory Inc.**



PARTNERS:
**Emissions Reduction
Alberta, ResFrac Corp.,
Southwest Research
Institute, Sproule,
University of Alberta,**



TOTAL BUDGET:
\$606,129



AI FUNDING:
\$248,796



PROJECT DATES:
**NOV 2024 -
JUN 2025**



PROJECT TRL:
**Start: 6
End: 7**

APPLICATION

EGS facilities have the potential to supply clean, reliable, utility-scale heat or electricity to the energy system or directly to energy consumers. EGS with CO₂ as a working fluid may offer some benefits compared to a water-based system. EGS paired with direct air capture (DAC) of CO₂ can reduce DAC net emissions by supplying clean and reliable electricity and heat for DAC operations.

PROJECT GOALS

The Project seeks to evaluate several optimization opportunities for developing EGS, including:

- Through partner collaborations, leverage hydrocarbon and geoscience expertise in Alberta to select preferred locations, assess risks, and mitigate costs.
- Evaluate the use of carbon dioxide (CO₂) as a working fluid. Assess potential advantages over a water-based system, including higher energy extraction rate, sequestration of CO₂ below ground, less corrosion and scaling, and lower cost, more efficient turbines.
- Evaluate potential synergies with CO₂ direct air capture, which can use waste heat from geothermal facilities.

BENEFITS TO ALBERTA

- Increase supply of clean, reliable and affordable electricity and heat by offering a potentially competitive alternative to natural gas with carbon capture and sequestration. EGS shows promise as one of the most economic options for clean, reliable electricity.
- Potential for Alberta to become a leader in developing EGS for both domestic and export markets, given the province's existing energy sector supply chains, technologies and highly skilled work force.
- Improve economics and greenhouse gas emissions profile for direct air capture of CO₂ and other CO₂ capture and sequestration facilities.
- Higher density of energy production per square meter of land, compared to renewable wind and solar facilities.
- Support transition of work force from conventional to low emitting energy production.
- Diversification of Alberta's clean energy economy.



**2 New
Products/Services**



100+ Future Jobs



**100 kt to 1 Mt/yr Future
GHGs Reduced**

CURRENT STATUS

MAY 2025

In Progress. The first milestone has been completed, resulting in preliminary models and results. Identified three regions with high potential based on geology, suitable surface infrastructure and proximity to large CO₂ emitters. Identified key challenges for EGS development to overcome under Alberta's geological conditions. Completed a preliminary comparison of performance and net energy recovery using CO₂ versus water-based working fluid.