ALBERTA INNOVATES

# ENERGY, AEROSPACE, DEFENCE & ADVANCED MATERIALS

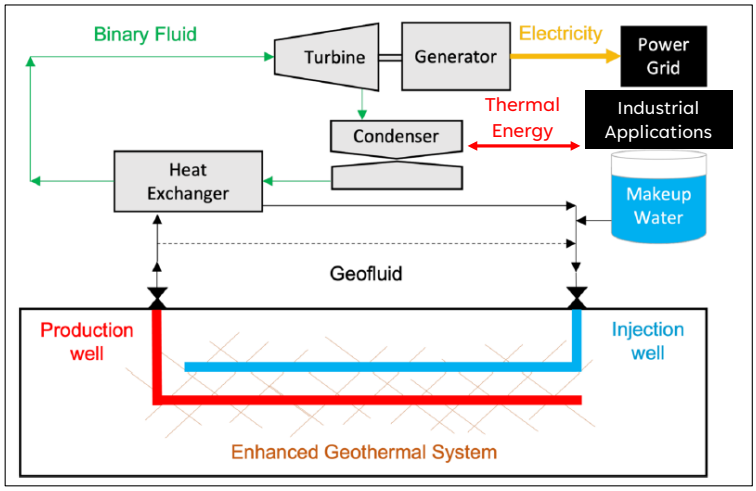
ENERGY

ELECTRICITY

FUNDING DETAILS

## 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 fracking, and up one or more production wells where the extracted heat can be recovered for use. This project assessed opportunities, risks and potential technical solutions. This project was 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 - AUG 2025**

**PROJECT TRL:**

**Start: 6**

**End: 7**

## APPLICATION

EGS facilities have the potential to supply clean, reliable, utility-scale heat or electricity. EGS paired with direct air capture (DAC) of $CO_2$ can reduce DAC net emissions by supplying clean and reliable electricity and heat for DAC operations.

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## PROJECT GOALS

The Project sought 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 ($CO_2$) as a working fluid. Assess potential advantages over a water-based system, including higher energy extraction rate, sequestration of $CO_2$ below ground, less corrosion and scaling, and lower cost and more efficient turbines.
- Evaluate potential synergies with $CO_2$ 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 $CO_2$ and other $CO_2$ 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' clean energy economy.

**1 New Product/Service**

**100+ Future Jobs**

**0.8 Mt/yr Future GHGs Reduced by 2030**

**CURRENT STATUS**

**OCT 2025**

Completed. Based on modelling, design optimization, expected subsurface parameters, and energy pricing forecasts, EGS in Alberta appears economically and technically feasible in selected locations (confidential), although with a higher levelized cost than a shallower facility at Cape Station, Utah. $CO_2$ as a working fluid does not appear optimal. The University of Alberta completed a seismicity risk assessment and mitigation study (public). Local exploration and geophysical testing will be critical to site selection and detailed design. The Final Report will be made public after March 31, 2026.