

Geothermal in Alberta – The Holistic View. An Eco-Industrial Cluster Centered on Alberta No. 1

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Summary

Alberta No. 1 is a geothermal project located south of the City of Grande Prairie in the Municipal District of Greenview. The project was officially announced in August of 2019 and since then has been making steady progress in understanding the subsurface of Alberta and its suitability for geothermal energy extraction (Hickson et al. 2020). Although the Province has widespread resources of 40°C and higher at depths much less than 4 km, resource temperatures higher than 110°C at less than 4.5 km depth are more limited. The western and northern regions of the Province are most prospective. For this reason, combined with the cooperation and support received from the Municipal District of Greenview, the project chose a site south of the Wapiti River near the Hamlet of Grovedale.

In addition to favourable geology for high temperatures (~120°C@4000m; Huang et al. 2021) and high flow rates, the area is located near the Grovedale light industrial park and the Greenview Industrial Gateway, 20 km farther south. Both industrial settings provide opportunity for heat offtake industrial uses and sale of green renewal power.

Theory / Method / Workflow

After identifying a region where it was possible to co locate industrial users within a 10 to 15 km radius, coupled with proximity to transmission, work began on the well prognosis and drilling program. A vertical well drilled in the target zones of 177.8 mm (7in) in diameter is planned with a TD of 3,800m. The well will likely be drilled slightly deeper to sample and test the basement rocks for their suitability as a geothermal reservoir and for testing their potential for carbon sequestration, however, it is anticipated that production and sequestration will come from the deep strata of mixed carbonates and sandstones above the basement. Units such as the Leduc, Slave Point., Watt Mountain., Gilwood, Muskeg, and Granite Wash formations are anticipated to flow substantial quantities of fluids.

Novel Development Concept

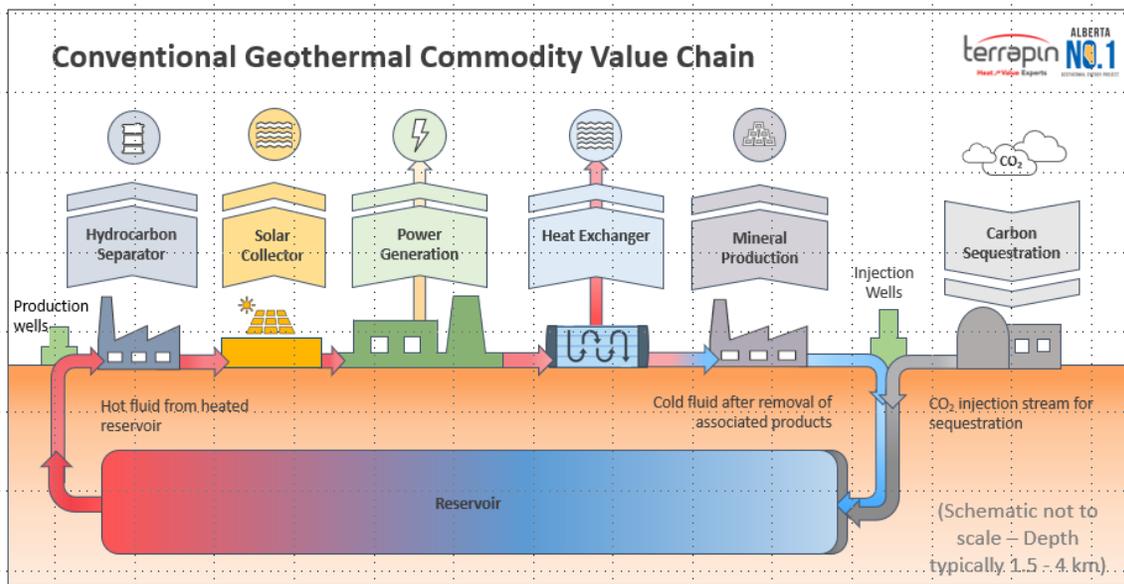
Geothermal energy extraction in the context of Alberta's deregulated power market and low-cost natural gas needs a commercial boost. Fortunately, this boost has come in the form of carbon credits, providing geothermal projects with three cash flow streams – heat, power, and carbon credits. However, with conventional geothermal energy production, the hot fluids provide other potential extractive opportunities. For those holding the hydrocarbon rights, any co-produced PNGs can be extracted and provided back to the rights holders with compensation for the CAPEX invested to drill the wells. The same is true of the metallic and industrial minerals. With significant emphasis being placed on Lithium extraction from oil field brines, if a geothermal project were situated in an area where higher Li values were found, negotiating with companies focused on direct extraction for Li from brines may prove a favourable avenue for commercial investigation. Perhaps the greatest synergies can be established between blue hydrogen producers and

geothermal companies. In addition to providing hydrogen generating companies with renewable, base load (firm) power, Alberta No. 1 is investigating the feasibility of co-injection of CO₂.

Co-location of these various facilities and industries creates even greater synergies as the industrial cluster will be a concentrated force to reduce greenhouse gas emissions and create a more sustainable eco-industrial complex. If feasible, CO₂ sequestration combined with geothermal production, would make geothermal energy extraction not just the greenest of the green renewable energy sources, but also make projects carbon negative, thereby supporting other extractive industries in the quest for Carbon Zero by 2050.

The holistic view

Depending on local geological conditions, an integrated industrial cluster (resource park) is possible.



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References

Catherine Hickson, Katie Huang, Darrell Cotterill, Will Gosnold and Dick Benoit, A Relook at Canada's Western Canada Sedimentary Basin for Power Generation and Direct-Use Energy Production, In Geothermal Resources Council, Transactions, Volume 44, 2020, Reno, Nevada, October 18-21, 2020

Katherine Y. Huang, Catherine J. Hickson and Yannick Champollion, Preliminary results of a Temperature Log Using a Deep Disposal Well in the Western Canada Sedimentary Basin, GeoConvention 2021