

Canadian Policy Opportunities for the Geothermal Energy Industry (August 2024)

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ABSTRACT

Geothermal energy, despite its availability, has been largely untapped in Canada thus far. The industry has struggled to gain traction due to a lack of foundational support and strategic policy frameworks. This paper explores the existing federal and provincial policy landscapes to identify gaps and propose actionable recommendations to stimulate the geothermal sector. With strategic policy support and targeted investments, Canada has the potential to unleash its geothermal resources.

At the federal level, the promising Clean Technology Investment Tax Credit (ITC), now inclusive of geothermal heat and electricity, provides up to a 30% refundable tax credit. Further policy opportunities for the federal government to play its part to lay the foundation of the industry may include Heat Price Swapping Agreements (HPSAs) and establishing a clear framework for geothermal carbon offset projects and Carbon Contracts for Difference (CCFD). Further, a risk mitigation drilling fund would support geothermal developers by compensating unsuccessful projects and recycling funds from successful ones, thereby reducing financial risks and encouraging private sector investment.

In Alberta, targeted projects to fuel-switch industrial processes to geothermal heat can significantly reduce emissions while developing new energy sources. These demonstrations would prove the economic and technical feasibility of geothermal energy. Similar to existing incentives for petrochemicals and carbon capture, a dedicated geothermal incentive program would attract investment and accelerate industry development. On the regulatory side, extending surface access rights, addressing urban drilling regulations, ensuring exclusive rights to pore space, and considering electricity market reforms are areas for further policy reforms to catalyze the geothermal energy industry.

In British Columbia, introducing geothermal tax incentives similar to established mining and heat pump tax credits can attract investment and reduce the financial burden on developers. Introducing a geothermal portfolio standard in the CleanBC Industry Fund and as part of BC Hydro's Integrated Resource Plan can facilitate the development of geothermal heating and electricity systems. Encouraging geothermal offset projects through the Fuel Switch Offset Protocol, reconsidering well classifications, exempting waste heat from regulation, and streamlining the permitting process can further remove barriers and expedite geothermal project development in the province.

Introduction

Canada represents a virtually new frontier for geothermal energy development with significant market and moderate resource potential. In our view, geothermal development has stalled because there has been an over-focus on electrification, as in the mid-2010s federal funding targeted electricity-generation, thus overlooking the foundations of the industry— direct-use of geothermal heat. Provinces on the other hand, have simply had other priorities, or have not been sufficiently educated or persuaded to recognize the potential and benefits of geothermal energy; however, this is beginning to change – as indicated by recent announcements such as the Alberta Drilling Accelerator.

The entire supply chain stands to benefit from industry-enabling legislation and regulations including developers, drillers, financiers, scientists and consultants, supply and service providers etc. Policy work has the potential to save millions (\$) and save years on geothermal energy projects, enabling more projects to commence and finish, creating more sure and swift returns for developers and financiers. With a world-class energy sector and professionals to match, tapping into and commercializing geothermal resources in Canada could unfold rapidly with the right investments and policy shifts.

This paper will review the existing frameworks at the federal level, Alberta, and in British Columbia (BC) to recommend policy proposals from the perspective of geothermal energy stakeholders. There may be opportunities in other provinces as well, though this paper emphasizes Alberta and BC given that the bulk of geothermal industry stakeholders currently are developing projects and exploring potential projects in these two provinces, given the availability of Canada’s highest quality resources in relation to market opportunities.

1. Federal

In Canada, geothermal permitting, leasing, project approvals and tenure is primarily handled at the provincial level, not the federal level. At the federal level, policy opportunities relate primarily to financial incentives and risk mitigation, as geothermal projects are not likely to be affected by proposed federal regulatory legislation, such as the Impact Assessment Act, which was initially struck down by the Supreme Court for encroaching on provincial jurisdiction (Killoran et al., 2023). Natural Resources Canada, a federal agency, funds various programs related to natural resource development, and under the current government, prioritizes clean resources, technologies, and emissions-reducing projects.

1.1 Investment Tax Credits (ITCs)

The Clean Technology ITC

The 2022 Fall Economic Statement introduced the initial details of the Clean Technology ITC. Mentioned eligible clean technology equipment included systems relating to storage, heat pumps, nuclear, and solar—notably absent was geothermal energy. Immediately, CanGEA began a campaign to ensure geothermal energy systems would be included in legislative drafts of the Clean Technology ITC. After a series of half-a-dozen meetings with both sides of the aisle and dozens more communications beginning in late 2022, in the Spring of 2023, Environment Minister Guilbeault announced the expanded eligibility of the Clean Technology ITC to include geothermal energy systems, as is also contained in Budget 2023.

The Clean Technology ITC is a refundable tax credit of up to 30% of investments in eligible property acquired on or after March 28, 2023. Eligible equipment includes, “(v)*equipment used exclusively for the purpose of generating electrical energy or heat energy, or a combination of electrical energy and heat energy, solely from geothermal energy, that is described in subparagraph (d)(vii) of Class 43.1 in Schedule II to the Income Tax Regulations, but excluding any equipment that is part of a system that extracts fossil fuel for sale*” (Parliament of Canada, 2023). If labour requirements (prevailing wage and apprenticeship conditions) are not satisfied, the tax credit rate would drop by 10 percentage points.

This ITC was introduced in the House of Commons on November 30, 2023, as part of a broader package (C-59) to implement provisions of the Fall Economic Statement and as of summer 2024, is available to claim in an updated Schedule 31 ITC form for corporations.

CCUS Investment Tax Credit Parity and Hydrocarbon Co-production:

Our industry may receive up to 30% via the Clean Technology ITC, whereas the CCUS Investment Tax Credit provides up to 60%. We are grateful for geothermal energy’s eligibility under the Clean Technology ITC, though 60% would of course be preferred over 30%.

Hydrocarbon Co-production:

Furthermore, the ITC legislation specifies that— *“equipment used for geothermal energy projects that will co-produce oil, gas or other fossil fuels would not be eligible for the [Clean Technology Investment Tax] credit.”* Geothermal projects that may co-produce hydrocarbons will still reduce net emissions and should not be excluded from the Clean Technology ITC.

Conclusion

Although there are still ways to improve the Clean Technology ITC for geothermal energy, such as raising the percentage points to match CCUS and accommodating for hydrocarbon co-production, we commend the Government for their forward-thinking approach to our energy future and would encourage energy developers across Canada, and abroad, to consider adding Canadian geothermal projects to their portfolio, considering this new incentive to develop geothermal energy.

1.2 Renewable Heating Portfolio Standard (RHPS) and Heat Price Swapping Agreements (HPSAs)

Although the Federal Government in Canada cannot mandate a Renewable Portfolio Standard (RPS) for public utilities (which would fall into provincial jurisdiction), they can mandate a RPS for federal agencies. RPS mandates in the U.S., such as Executive Order 13514 and 13693, have led to the power purchase agreements (PPAs) of geothermal energy by federal departments, such as by the Department of Defense (DoD).

Although PPAs are well established and proven effective, the geothermal industry is not yet at the maturity level in Canada to generate electricity in a competitive market – thus PPAs would need to be adjusted to pay premiums for baseload renewable energy. A more necessary (and novel) policy market mechanism at this time would be the idea of Heat Price Swapping Agreements (HPSAs), given that direct-use of geothermal heat is the low hanging fruit of the industry, and will

serve as its foundation. Heat cannot be dispatched onto a grid, and it loses energy rapidly if it is transported across even small distances; therefore, at the federal level in Canada, to enable government buildings and/or agencies to purchase geothermal heat, the government could implement a HPSA Program to meet the targets of a Renewable Heating Portfolio Standard (RHPS).

The Government of Canada is the single largest building owner in Canada (Efficiency Canada, 2024). Under the HPSA Program, a government building customer would swap the price they pay for heat (natural gas) with a customer located near a geothermal heat resource. The government customer would continue to receive their existing heating source but pays the price for geothermal heat. Meanwhile, the customer near the geothermal resource would receive geothermal heat but pay the usual price of the government customer's conventional heat. By purchasing geothermal heat in place of natural gas, carbon emissions would be reduced, local air quality would improve, and energy security would be enhanced.

The Canadian Gas Association (CGA) has likewise proposed procurement of renewable natural gas (RNG) for the heating of the federal buildings, which calls for a 5% and 25% blend of RNG by 2025 and 2030 respectively (Canadian Gas Association, 2021). However, opting for geothermal heating instead would enable the Federal Government to eliminate virtually all GHG emissions from these buildings rather than only by 110,000 tonnes/year by switching to RNG. This will help to reduce the Government of Canada's 11.2 million GJ/yr of natural gas reliance, either directly or through renewable heat credits, which is equivalent to taking 124,500 homes/year from fossil fuels (Canadian Geothermal Energy Association, 2021).

The cost of RNG quoted at \$18/GJ by the CGA is a premium over the current natural gas rate. Once established, geothermal heat prices are extremely economic, competitive, virtually immune to commodity price fluctuations, and would likely be much lower than the price of RNG. Locking in geothermal heat at a fair price over a long-fixed period would not only help the federal government reduce GHG emissions but would secure a sustainable rate for these buildings. Additionally, while a geothermal power facility would create approximately 17 times as many full-time jobs as a comparable natural gas facility, CanGEA (2014) posits that would be a comparable ratio to a geothermal heating system versus a natural gas burning system.

An HPSA Program could lead to a cascading effect of geothermal heating sites across Canada, as waste heat from an initial industrial customer can then feed into nearby district heating infrastructure. As the Federal Government invests in building greater geothermal heating infrastructure, further growth within other communities through greater knowledge capacity will be enabled. Moreover, the infrastructure created for geothermal projects has a long-life cycle and is extremely resilient relative to conventional combustion heating infrastructure, enhancing energy security.

A white paper may be necessary to explore the feasibility of the HPSA Program. The paper would determine the capability and outcomes of acquiring geothermal heat for hundreds of Government of Canada federal buildings. As well, the project will develop a deeper understanding of the implications of an RHPS policy in Canada and how creating a renewable heating credit trading system would assist the Federal Government in the procurement of geothermal heating for their federal buildings and to meet GHG reduction goals. The HPSA Program would promote a stable foundation for the geothermal industry and establish its infrastructure and supply chains.

1.3 A Clear Framework for Geothermal Carbon Offset Projects and Geothermal Carbon Contracts for Difference (CCFD)

The proposed federal regulations to cap emissions in the oil and gas sector present a substantial opportunity for the geothermal energy industry. Establishing a clear framework for geothermal carbon offset projects can maximize this opportunity, ensuring that the benefits persist regardless of political changes. This framework should include Carbon Contracts for Difference (CCFD) specific to geothermal projects, providing the financial certainty necessary for long-term investments.

Additionally, the framework should facilitate credit trading among emitters and enable collaboration on offset and emission-reducing projects, including projects that would switch from combustion fuels to direct-use geothermal heat. Emitters contributing to emission-reducing projects offsite should still receive credits for these reductions, even if their own emissions are not directly decreased. This approach encourages investments in emissions reductions wherever they can be most effectively achieved, promoting national solutions over localized ones, and recognizing contributions to broader emissions reduction goals.

The Federal Government should establish a comprehensive framework that would accommodate geothermal energy Carbon Contracts for Difference (CCFD). Although some individual CCFD deals have been signed with specific companies in other industries (Department of Finance Canada, 2023), there is no broad framework in place. CCFDs guarantee the future price of carbon, offering financial stability for geothermal energy investments. Without a robust CCFD framework, the future of large-scale geothermal projects could be jeopardized if political support wanes after the upcoming federal election. Establishing this framework would provide certainty and encourage sustained investment in geothermal projects, securing their role in Canada's clean energy future.

1.4 Geothermal Exploration Risk Mitigation Drilling Fund

Heat customers with existing assets who are interested in switching to geothermal heat face significant financial and technical risks in making the transition. Developers aiming to sell electricity also confront drilling risks and the potential challenges of not finding quality resources at economic costs or lacking sufficient capital to develop resources that are cooler or more difficult to access. A risk mitigation insurance program, where unsuccessful projects are compensated and successful ones pay back premiums to the program, would minimize risks for both the government and the private sector. This government-backed initiative would encourage private sector participation by providing a safety net for developers, reducing the financial risks associated with geothermal projects.

A revolving risk mitigation drilling fund would be immensely beneficial for the geothermal industry. Access to this fund would likely be competitive, with bids evaluated based on project feasibility and potential impact. Initial funding allotments would be awarded to kick-start projects, with subsequent disbursements provided on a milestone basis. This phased approach ensures that funds are allocated efficiently, and projects are monitored for progress and viability.

Successful developers would repay the investment, effectively recycling the funds back into the program. Conversely, unsuccessful developers would be forgiven and have no obligation to repay, thereby minimizing financial risks for both developers and the government. Thus, the program

provides grants (forgiven loans) as well as loans that are eventually repaid. This model ensures that successful projects offset the costs of unsuccessful ones, maintaining a balanced and effective risk management strategy, and ensuring the sustainability of the fund and continuous support for new projects.

Key features of the proposed risk mitigation program:

- Projects would compete for initial funding based on their feasibility and potential impact.
- Initial allotments to start projects, with subsequent disbursements contingent on meeting specific milestones.
- Successful developers repay the loans, recycling funds back into the program for future projects.
- Unsuccessful developers are forgiven, reducing financial risks for all parties involved.
- The program supports all geothermal technologies, both for electricity generation and direct-use heat applications, excluding ground source heat pumps.

This structured and balanced approach to risk mitigation and funding would significantly reduce the barriers to entry for geothermal projects. The program could also be replicated and proposed at the provincial level.

2. Alberta

Alberta represents a virtually new frontier for geothermal energy development with significant market and moderate resource potential. Hydrothermal resources are immediately accessible for relatively low-risk development with already existing and mature technologies, not necessarily for power generation, but more readily for direct-use, which will in turn access and collect critical data from deep aquifers, de-risking them for later electricity generation.

With more than 600,000 oil and gas wells already drilled in Alberta, we have enough data to determine that approximately 4,000 of them may be geothermally interesting (CanGEA, 2023). Critical to achieving the emissions reduction and energy resilience goals of Alberta, is the utilization of every readily available energy resource. It is geothermal heat that is readily and immediately available, and this heat happens to be baseload, abundant, renewable, and low-emitting.

With a world class energy sector and professionals to match, tapping into and commercializing geothermal resources in Alberta could come to fruition rapidly with the right strategy, investments, and policy developments.

2.1 Fiscal: Industrial Fuel-switching to Direct-use of Geothermal Heat Demonstration Projects

There is a great fit between the heat demand of Alberta's industries (large final emitters) and Alberta's geothermal potential to supply— a few projects are already in the early stages of development, such as the Canfor Geothermal Wood Kilns Project near Whitecourt and the Latitude 53 Project near Hinton. The development of our geothermal energy resources for direct-use of heat

could reduce emissions by about $\frac{2}{3}$ in our heavy industry sectors, or 18.9 MT/year (Borealis Geothermal, 2023). In addition, land impacts are extremely minimal and do not disrupt natural water cycles or ecosystems. The ideal geothermal temperatures needed to satisfy the demand for heat in industrial processes such as food processing, pulp and paper manufacturing, vegetable dehydration, dairy and sugar processing, aquaculture, and greenhouses etc. exist in Alberta. Processes such as these cannot be fully or efficiently electrified, thus renewable thermal energy is the only way to sustainably decarbonize these energy intensive essential industries. Crucially, many of these operations are already proximate to accessible geothermal resources. There is an additional economic opportunity to harness the cascading or waste geothermal heat from these industrial customers to feed into municipalities for district heating.

To stress the efficiency of direct-use, the direct transfer of geothermal heat avoids the inefficiencies and energy losses associated with generating and transmitting electricity and then converting electricity into heat. Furthermore, geothermal resources maintain a nearly constant temperature throughout the year, providing a reliable and stable heat supply that is not subject to weather variations nor requires combustion. Geothermal installations are also characterized by their long operational lifespan, typically ranging from 25 to 50 years, with minimal degradation in performance. Finally, maintenance and operational costs are low – virtually unmatched in the subsurface energy industry.

Critical to the rapid development and commercialization of geothermal direct-use is the existing technical and drilling expertise, infrastructure, and supply chains that exist in Alberta's world class energy workforce. These jobs are highly transferrable to the geothermal industry and would require little-to-no retraining. More broadly speaking, a developed geothermal industry could create tens of thousands of jobs including temporary and construction jobs (Borealis Geothermal, 2023). Additionally, it would protect 73,000 existing heavy industry jobs that may be threatened by federal emissions reduction strategies (Borealis Geothermal, 2023).

Although the risk of accessing the geothermal resource is low, potential industrial customers of direct-use (large final emitters) are wary of the risks associated with retrofitting/replacing their combustion systems with geothermal energy systems. Heat customers with existing assets that are interested in switching to geothermal heat have to somehow justify the financial and technical risks of making the switch. A risk mitigation insurance program where unsuccessful projects are compensated, and successful ones pay back premiums to the program would minimize risk for both the government and the public sector. The private sector would also be emboldened by government sponsorship of the initiative.

2.2 Fiscal: Geothermal Incentive Program

Following the establishment of the foundation of the industry with direct-use pioneer projects, to further catch the eye of investors, fruition of a 12% geothermal incentive program akin to the Alberta Petrochemicals Incentive Program and the Alberta Carbon Capture Incentive Program, as directed in the mandate letter to the Energy and Minerals Minister to catalyze the industry will

rapidly scale the industry to the next level of maturity. Broadened eligibility to include geothermal-hydrocarbon co-production would partially compensate for the omission of such projects from the Federal Clean Technology ITC.

2.3 Fiscal: Expanded Scope of the Alberta Drilling Accelerator (ADA) to Include Subsurface Data Collection

The ADA represents a massive public policy win and opportunity for the geothermal industry, given that the “geothermal component” of the accelerator has been given priority order. However, the current focus of the ADA is to advance and accelerate drilling technology, as per the geothermal policy mandate from the Alberta Emissions Reduction and Energy Development Plan. As a result, the scope of the project includes only limited reservoir testing (e.g. wireline logging to determine the lithology, fluid and porosity of the strata from the base of the surface casing to total well depth, as mandated by the regulations); completions are not considered as part of the initiative.

After the geothermal drilling component, later stages of the ADA would assess the integration of other drilling techniques for industries such as CCUS, helium, and rare earth minerals. In Alberta, these emerging industries are generally interested in targeting a similar pore space – deep basal sediments in the Western Canada Sedimentary Basin. Unfortunately, there is a dearth of information associated with these deep basal sediments because most information of Alberta’s subsurface comes from decades of data collected from oil and gas reservoirs that are found in shallower formations. Further understanding of the characteristics of these poorly tested reservoirs would be extremely helpful for advancing emerging subsurface industries, including geothermal.

While advances in drilling are important components for accelerating the aforementioned industries, there is an opportunity to leverage the ADA initiative and include funding support for reservoir testing. Drilling through the basal sediments could test both basal sediments and the basement itself, collecting critical data for emerging subsurface industries in the province, including geothermal. It is in the interest of the geothermal industry to socialize this opportunity with stakeholders, the public, and the Governments of Canada and Alberta, to ensure that the ADA is fully leveraged and expanded to catalyze evolving subsurface industries within the province.

The reservoir testing aspect of the ADA could include:

- Core samples and permeability/porosity measurements.
- Drill Stem Tests (DST), H₂S measurements, water samples.
- Wireline logs (including standard gamma ray, resistivity, sonic, and neutron/density logs as well as detailed temperature measurements).
- Injection/production tests (when possible).
- Diagnostic Fracture Injection Test (DFIT) to determine formation pressure, permeability, and fracture closure pressure.

To get the most value out of the data collected during the testing program it is imperative that locations of high geothermal/lithium/helium/CCUS potential are targeted as test drilling locations by the ADA. Furthermore, the selected drilling contractor must be equipped to properly execute the testing program.

2.4 Regulatory: Surface Access Rights

The Surface Rights Act allows oil and gas developers to appeal to access land in cases where developers and landowners cannot reach an agreement. Section 2.3 of AER Directive 089 expressly excludes geothermal from the same right-of-entry mechanisms under the Surface Rights Act. Given that most geothermal development is likely to occur on private land, this creates a significant barrier to geothermal resource development, as landowners can simply refuse access and geothermal has no recourse, presenting complexities, costs, and risks for geothermal developers and investors that do not exist in other provinces—namely BC and Saskatchewan which do provide equitable surface access rights to geothermal.

In Alberta, there exists political sensitivities with respect to landowner rights; as such, a reasonable compromise to protect landowners may entail a public interest test by restricting geothermal surface rights to locations that matter—aligning with provincial objectives to responsibly develop resources and cut red tape. For a geothermal project to be eligible for surface access, criteria may be set such as a minimum emissions reduction threshold, job creation and retention, and demonstration of good faith efforts to fairly compensate and negotiate with landowners.

2.5 Regulatory: Urban Drilling in the Presence of sour gas (H₂S)

In collaboration with the private sector, regulator, and the relevant ministries, it is critical we find a safe regulatory solution to enable geothermal drilling in the presence of sour gas (H₂S) near communities. Current H₂S regulations (Directive 56) require drilling to be distant from population centres. This might not be a problem for hydrocarbons, but for geothermal, it makes sense to be near the heat customer. There are also other rules pertaining to rigs, drilling mud, backup equipment, and training that may be unnecessarily stringent for our industry. The actual hazard presented by drilling through H₂S reservoirs, on the way to sweet geothermal reservoirs, has largely been managed without incident for decades now. This necessitates changing the regulations to reflect geothermal drilling and production.

2.6 Regulatory: Exclusive Rights to Pore Space

Pertaining to pore space hierarchy, it is critical that where geothermal and other subsurface rights coexist, geothermal projects are ensured to commence first with exclusive pore space rights, to access the resource before it is sterilized by other subsurface developments. This will significantly increase investor confidence in geothermal projects.

2.7 Regulatory: Update Directive 060 to Mandate the Utilization of Geothermal Waste Heat

Alberta's AER Directive 060: *Upstream Petroleum Industry Flaring, Incinerating, and Venting* provides guidelines and requirements for the flaring, incinerating, and venting of gas in Alberta's upstream petroleum industry. The directive requires industry to harness flare gas, implementing practices to reduce flaring and venting volumes through conservation, utilization, and minimizing gas releases. Operators must monitor flaring, incinerating, and venting activities and report data to the AER, enabling effective oversight and enforcement of regulations. An additional provision of the directive to mandate the utilization of geothermal waste heat from oil and gas operations could be developed.

Co-produced wastewater from oil and gas operations is sometimes hot enough to be used for power generation in binary geothermal power plants. If able to be produced, this electricity can be used to decarbonize the oil and gas operation and/or provide clean energy to the grid. More significantly, co-produced wastewater from oil and gas operations is nearly always hot enough for direct-use heating. In theory, co-produced water with temperatures as low as 40°C could be used to economically heat a greenhouse. District energy systems used for space heating and commercial activities are viable options for communities and entrepreneurs in the areas surrounding oil and gas operations.

Many oil and gas wells may produce approximately less than 10% hydrocarbons and greater than 90% water –co-produced (Kemp, 2014). Co-produced water, at a minimum temperature and volumetric threshold, should be mandated to be used for economic and environmental benefit in much the same way that the AER Directive 060 has mandated the utilization of flare gas. A co-produced water analogue to AER Directive 060 would result in the maximization of the utility of the drilled well and the associated land disturbance. Furthermore, the implementation of a co-produced water analogue to AER Directive 060 will reduce the costs and risks associated with geothermal energy development by using already existing infrastructure such as roads, well pads, and electrical connections, thereby encouraging the growth of Alberta’s nascent geothermal industry.

2.8 Regulatory: Electricity Market Reform

Alberta is known for its longstanding energy-only market, in which electricity generators are only paid for the power they provide to the market. As a longer-term objective to scale up the electricity market share of geothermal sources by assuring developers of a profitable price for geothermal electricity that is well worth the risk, it would be necessary to make common sense reforms to the Alberta electricity market.

In response to rising strains on the grid, Alberta’s Premier has been calling for the need for reliable sources of baseload power, openly criticizing the unreliability of Alberta’s intermittent renewable resources. In late 2023, a grid alert came in the wake of a “deep freeze,” in which increased demand took most of the blame for the shortage. A later alert on April 5, 2024, cannot be blamed solely on increased demand, rather, intermittent resources were generating at very low capacities and many gas generators were not running that morning (Doering, 2024). It has also become increasingly discussed that providers may be shutting down generation to inflate and manipulate the price. Perhaps an overhaul of Alberta’s energy market is past due.

The government has touted its commitment to “*protecting Alberta’s grid and ensuring our province continues to generate reliable baseload power both now and in the future.*” It is becoming increasingly apparent that market measures are needed to lay the groundwork for the public and private sectors to work together to unleash baseload geothermal megawatts onto Alberta’s grid. Such measures may be a capacity market that pays for both energy and the baseload capacity (availability) of geothermal, as AESO recommended in a 2016 report. Another option would be for Alberta to encourage geothermal power by creating a public utility that pays a premium for baseload dispatchable power, similar to a first-of-its-kind Clean Transition Tariff (CTT) that Google and a Nevada public utility introduced to enable private sector giant customers to pay a higher rate for clean baseload power.

3. British Columbia

The Province of British Columbia boasts some of the highest quality geothermal resources available in Canada. British Columbia has the resource, market, and political conditions to follow the pathway to geothermal development set by states such as California, as there are notable parallels. Although GHG reduction policies set by the BC government are encouraging the search for clean power sources, permitting red tape, regulatory disparities, and lack of up-front targeted capital, are inhibiting the initial takeoff of geothermal energy projects within the province.

3.1 Fiscal: Tax Incentives

Parity with existing mining tax credits.

The BC Government has established the 20% Mining Flow-Through Share (MFTS) tax credit, and a 20-30% the B.C. Mining Exploration Tax Credit (METC), to encourage investment in critical resources. Eligible expenses may include prospecting, geological surveys, and drilling. Given BC's clean electricity and GHG reduction goals, a similar Geothermal Energy Tax Credit for electricity generation and direct-use would be in line with provincial objectives.

Carbon Tax Credits for Geothermal Offset Projects

To build out the foundations of the geothermal industry, it is logical to go after the low hanging fruit—namely hydrothermal resources for direct-use applications—and tailor initial incentive policies around this opportunity. Geoscience BC's 2016 report titled *Direct-Use Geothermal Resources in British Columbia* featured a tax incentive proposal called the Carbon Tax Credits for Direct-Use Geothermal Investments. Incentivizing the use of geothermal would equate to reduced electricity and natural gas demand, which is exactly what the province is looking for.

The Fuel Switch Offset Protocol (FSOP) in British Columbia, established in 2018, enables offset projects that reduce emissions through energy conservation, energy efficiency, and switching to lower-carbon fuels. The FSOP is currently under review to assess its alignment with the Greenhouse Gas Industrial Reporting and Control Act (GGIRCA) and ensure it continues to deliver real, quantifiable, verifiable, permanent, and incremental emissions reductions. Given the potential of geothermal energy to significantly reduce greenhouse gas emissions, it is an opportune time to advocate for its inclusion and consideration in the revised FSOP, to ensure that geothermal development is encouraged as an offset project option for developers and emitters seeking to meet GHG reduction mandates. Additionally, consideration and flexibility of geothermal as offset projects in connection to BC's developing new Output-based Pricing System and Net-zero New Industry policies would be helpful to raise awareness of the geothermal opportunity in connection with these various GHG reduction policies and initiatives in BC.

3.2 Fiscal: Funding Parity

Carve-out for geothermal energy in the Clean BC Industry Fund.

Currently, as standalone greenfield projects, geothermal energy projects do not fall under any eligibility stream of CleanBC funding, unless a geothermal developer partners with a large emitter. An additional stream to fund greenfield clean energy projects, including geothermal, would enable fuel-switching away from emitting fuels, thus contributing to the goals and purpose of CleanBC programs. For example, geothermally heated greenhouse projects, whether new projects or retrofit

projects, should be included as an eligible project type under the CleanBC Building Innovation (CBBI) Fund. Also, a geothermal portfolio standard could be paired with the Fund whereby a portion of funding would be dedicated to a minimum threshold of geothermal heat as the carbon offset mechanism.

Direct public investments into geothermal district heating.

BC has recently announced an investment of up to \$151 million toward the Federal Oil to Heat Pump Affordability (OHPA) program. Additionally, The CleanBC Better Homes program provides incentives for homeowners to install a heat pump for cooling and air filtration. Geothermal heat can also be used directly to heat and cool municipal districts even more efficiently than heat pumps or natural gas, and thus should receive equivalent public investment or eligibility under existing heat pump funding streams. District heating systems could also provide the infrastructure needed to hook up geothermal stoves – which could be paired or consolidated with the existing Community Wood Smoke Reduction Program.

3.3 Regulatory: Reconsider Geothermal Well Classifications

Currently, the Geothermal Resources Act serves to regulate all activities associated with the exploration for and production of geothermal resources above 80 °C. While the Geothermal Resources Act lends itself well to regulating Hot Sedimentary Aquifers (HSA) geothermal resources, it is not optimized to regulate the development of fault controlled geothermal resources that require exploration – the vast proportion of BC’s geothermal resource portfolio. Geothermal well classifications should be reconsidered under the Geothermal Resources Act. In particular, the BC Government should reconsider the creation of a well classification for ‘Thermal Gradient Wells’ for fault-controlled resources under the Geothermal Resources Act, built to the standards of Geotechnical Wells licensed under the Water Sustainability Act.

3.4 Regulatory: Exempt Waste Heat from BCUC Regulation

We recommend that heat as a by-product not be regulated by the BC Utilities Commission and/or be granted an exemption from regulation. As illustrated in Figure 2, below, an individual geothermal energy application often uses only a portion of the available energy. As such, a portion of the energy remains and can be used in other applications (i.e. cascading energy use) such as greenhousing, aquaculture and crop drying. It is this by-product heat, also known as ‘waste heat,’ that should not be regulated. This recommendation would increase investor confidence and aligns with one of BC’s clean energy objectives, “to reduce waste by encouraging the use of waste heat,” as stated in the Clean Energy Act.

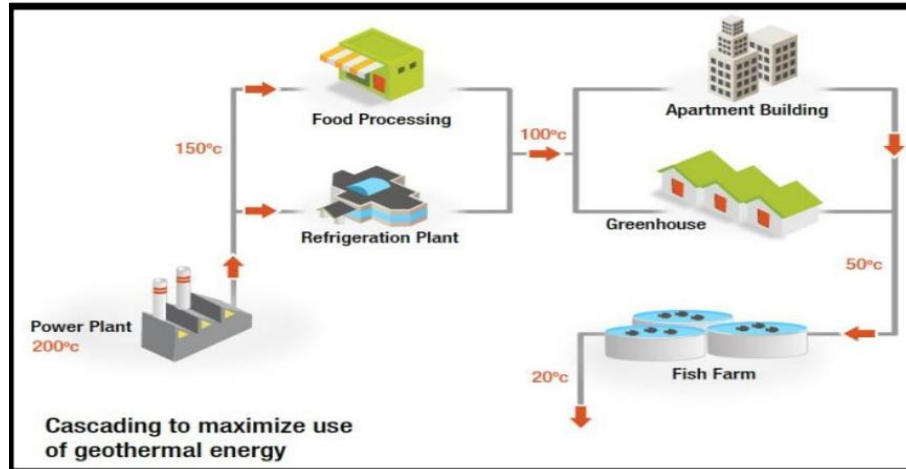


Figure 1: An example of cascaded energy use

3.5 Regulatory: Streamlined Geothermal Permitting

There are a series of measures that could be observed to smooth out the geothermal permitting process in BC.

1. Increasing the number of available geothermal permits to encourage more players to enter the market, sparking competition and innovation. BC is falling behind Alberta in this regard, as BC has only issued one permit to Alberta's 32 in the same time period, as measured by the Canadian Geothermal Energy Association (CanGEA).
2. A redesigned and simplified geothermal-specific permit application portal. Currently, geothermal developers have to apply through a non-tailored application management system, which is arduous and unintuitive. The portal could be redeveloped to be more user-friendly and tailored to the unique needs and characteristics of geothermal energy projects, as Alberta has done, making it less time-consuming and more cost-effective for new and existing geothermal energy providers.
3. That BC budget greater resources to the Energy Policy and Regulation Branch to enable increased staff to accelerate geothermal permit and lease processing.

Cost Recovery

In the United States, proposed federal permitting reform legislation has been complemented with cost-recovery provisions, namely in H.B. 7422 and S. 4753. In the United States, legislative cost recovery provisions would authorize the Bureau of Land Management to charge developers for the cost of streamlined permit processing to ensure the agency possesses the staffing resources needed to complete reviews.

In BC, the equivalent agency is the BC Energy Regulator (BCER), and we likewise propose a compromise of a balanced legislative package to streamline permit processing inclusive of a cost recovery provision to bolster the staffing capabilities of the Regulator. Staff who process geothermal applications should have a minimum technical knowledge of the industry necessary to understand the nuances and risks (or lack thereof) of an application. It may also be necessary for

the Regulator to create or reform training materials necessary to bolster staff knowledge of geothermal energy and streamline application processing.

We would like to see cost recovery as a temporary measure until both the Regulator and applicants have established a repeatable process with clear expectations and consistently streamlined outcomes. The key to any cost recovery is the determination of what is a reasonable cost. For instance, lawyers splitting hairs for the sake of it may be great for their billable hours but may not be fully recoverable or efficient. In other instances, it may be advisable for the Regulator to bring in consultants from developer companies. These personnel may advise on regulatory design – but not on specific project approvals—to avoid a conflict of interest.

Cost-recovery could also be launched in Alberta to likewise bolster the permitting capacity of the Alberta Energy Regulator.

3.6 Regulatory: A Geothermal-Procurement Standard

When Regulators identify new technologies, or generation sources that will improve service quality, e.g., improvements of reliability and cleanliness, the Regulator can order utilities to acquire certain types of energy or install certain technologies (BCUC, 2019). BC Hydro is already directed to seek out approximately 3,000 GWh/year of additional clean energy as early as late fall 2028 (BC Hydro, 2024). Although it would be unreasonable to mandate a public utility to purchase geothermal power from generators that is not yet available, setting a minimum standard or goal for geothermal power acquisition as part of BC Hydro’s Integrated Resource Plan would compel the BCER to accelerate permit approvals and the Minister to create incentives for energy developers to add geothermal projects to their portfolios.

3.7 Regulatory: Periodic Legislated Reviews of Geothermal-related Legislation

From the perspective of members of the Canadian Geothermal Energy Association (CanGEA), there are series of potential legislative reforms in the BC Geothermal Resources Act that would improve the development landscape for geothermal energy projects, either for direct-use or power generation. Furthermore, as the industry develops, qualms and issues which have not yet arisen are nearly certain to arise. It is critical that legislation be flexible to the needs of the evolving industry. For example, BC’s Environmental Assessment Act (EAA) requires a mandatory review and industry stakeholder engagement every four years. It would be in the interest of the geothermal industry that the Geothermal Resources Act (and Alberta’s Geothermal Resource Development Act) also be subject to periodic mandatory review and industry consultation.

A few areas for potential review in the BC EAA are outlined below:

Timeline Certainty:

Currently, it is unclear when developers can expect a decision to be made on their permit applications. Timeline certainty is needed to reduce cost, risk, and investor uncertainty in geothermal projects in the province of BC. Lack of deadlines for the BC Energy Regulator (BCER) to finalize assessments represents a gap in the Geothermal Resources Act.

Decision Appeals:

Section 5(1) of the Act states, “*The minister may issue or refuse to issue a permit, whether or not the requirements of this Act have been complied with, and the refusal is final.*” CanGEA proposes that an appeal mechanism instead be put in place, which represents a protection of public rights and interest.

Grounds for Refusal:

Section 12(1) states, “*Subject to the regulations, the regulator may issue, subject to conditions, restrictions and stipulations considered necessary or desirable, or may refuse to issue, a well authorization.*” It would reduce uncertainty for industry and investors for the Legislator and/or Regulator to clarify grounds and criteria for refusing a well authorization.

Parity Under the Related Reviewable Project Regulation

Under the act, geothermal projects may trigger an assessment if more than 75 litres/second of groundwater is to be extracted by a project for longer than one year, it may be subject to an assessment, as per the Reviewable Project Regulation. Whereas oil and gas operations which extract water are not subject to review. Our industry seeks parity on this issue with the oil and gas industry.

Conclusion

Geothermal energy holds immense potential for transforming Canada's energy landscape, providing a stable, renewable, and low-emission source of power and heat. However, the industry has faced significant challenges due to policy gaps and lack of targeted support. By addressing these challenges through strategic policy and legislative reforms at both federal and provincial levels, Canada can unlock the full potential of its geothermal resources.

Federally, introducing clear frameworks for carbon offset projects, enhancing tax credits, and establishing supportive market mechanisms such as Carbon Contracts for Difference (CCFD) can provide the necessary financial stability and incentives for geothermal development. Additionally, a risk mitigation drilling fund would reduce the financial and technical risks for developers, encouraging more investments in geothermal projects.

In Alberta, the opportunity lies in leveraging existing resources and expertise to develop direct-use geothermal heat projects. Fiscal incentives, such as a dedicated geothermal incentive program and demonstration projects, can stimulate initial development. Regulatory reforms, including granting surface access rights and addressing urban drilling regulations, are essential to create a favourable environment for geothermal exploration and production.

British Columbia, with its high-quality geothermal resources, requires targeted fiscal incentives and funding parity to attract investments. Regulatory adjustments, such as encouraging geothermal offset projects, reconsidering well classifications, and streamlining the permitting process, can remove barriers and accelerate the deployment of geothermal technologies.

REFERENCES

- AESO. "Alberta's Wholesale Electricity Market Transition Recommendation." 2016.
- BC Energy, Mines and Low Carbon Innovation. "Expanded Heat Pump Program Helps British Columbians Save on Home-Energy Costs." 2014. <https://news.gov.bc.ca/releases/2024EMLI0023-000739>.
- BC Environment and Climate Change Strategy. "Greenhouse Gas Industrial Reporting and Control Act Bulletin 028." 2023. <https://www2.gov.bc.ca/assets/gov/environment/climate-change/ind/reporting-emissions/2023/ggirca-bulletin-028.pdf>.
- BC Hydro. "2024 Call for Power." 2024. https://www.bchydro.com/work-with-us/selling-clean-energy/2024-call-for-power.html?utm_source=direct&utm_medium=redirect&utm_content=2024callforpower
- BCUC. "British Columbia Utilities Commission – Indigenous Utilities Regulation Inquiry – Project No. 1598998 Scott Hempling – Utility Regulation Report" 2019. https://docs.bcuc.com/documents/proceedings/2019/doc_54078_a-8-hempling-utility-regulation-report.pdf
- Borealis Geothermal. "HOT Portfolio." 2023.
- Canadian Gas Association. "CGA By the Numbers: The Renewable Natural Gas Opportunity in Federal Buildings." 2021. https://www.cga.ca/wp-content/uploads/2021/09/CGA-By-the-Numbers_The-Renewable-Natural-Gas-Opportunity-in-Federal-Buildings-1.pdf.
- Canadian Geothermal Energy Association. "Geothermal Energy: The Renewable and Cost-Effective Alternative to Site C." 2014, pp. 6-7, 26.
- Canadian Geothermal Energy Association. "Greening of Federal Buildings through Geothermal Heat." 2021.
- Canadian Geothermal Energy Association. "British Columbia Budget Consultation 2021 Submission." 2020. <https://www.leg.bc.ca/content/CommitteeDocuments/41st-parliament/5th-session/fgs/submissions/1036-11250.pdf>.
- Coso Operating Company. "Project Information." Retrieved in 2024. <https://cosoenergy.com/who-we-are/>.
- Department of Finance Canada. "Budget 2024: Fairness for Every Generation." 2024. <https://budget.canada.ca/2024/home-accueil-en.html>.
- Department of Finance Canada. "Deputy Prime Minister Welcomes the Canada Growth Fund's First Carbon Contract for Difference." 2023. <https://www.canada.ca/en/department-finance/news/2023/12/deputy-prime-minister-welcomes-the-canada-growth-funds-first-carbon-contract-for-difference.html>.
- Department of Finance Canada. "Fall Economic Statement 2022." 2022. <https://www.budget.canada.ca/fes-eea/2022/report-rapport/FES-EEA-2022-en.pdf>.
- Doering, Jason. "Apr 5, 2024 Alberta Supply Shortfall Event – The Facts." 2024. <https://jasondoering.substack.com/p/apr-5-2024-alberta-supply-shortfall>.

- Efficiency Canada. "Advancing Mandatory Building Performance Standards in Canada: A Call for Federal Leadership." 2024, p. 5. <https://www.energycanada.org/wp-content/uploads/2024/01/Advancing-Mandatory-Building-Performance-Standards-in-Canada-%E2%80%94-Policy-Brief.pdf>.
- Emissions Reduction Alberta. "Geothermal Lumber Drying Kilns." Accessed 2024. <https://www.eralberta.ca/projects/details/geothermal-lumber-drying-kilns/>.
- Geoscience BC. "Direct-Use Geothermal Resources in British Columbia." 2016. https://cdn.geosciencebc.com/project_data/GBCReport2016-07/GBC%20Report2016-07_SectionA_Summary.pdf.
- Government of Alberta. "Making Alberta a Geothermal Energy Leader." 2024. <https://www.alberta.ca/release.cfm?xID=90261DBAEA3AF-CE21-DFF5-D6DD88B135AD45E2>.
- Government of BC, King's Printer. "Clean Energy Act." Accessed 2024. https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/10022_01.
- Government of Canada. "T2 Corporation – Income Tax Guide – Chapter 7: Page 8 of the T2 Return." Accessed June 2024. https://www.canada.ca/en/revenue-agency/services/forms-publications/publications/t4012/t2-corporation-income-tax-guide-chapter-7-page-8-t2-return.html#P3284_246737.
- Kemp, John. "Water is the Biggest Output of U.S. Oil and Gas Wells." Reuters, 2014. <https://www.reuters.com/article/idUSKCN0J223O/>.
- Killoran, Maureen, Duncanson, Sander, Sutherland, Sean, and Noga, Brodie. "Supreme Court of Canada Finds the Federal Impact Assessment Act Unconstitutional." 2023. Osler. <https://www.osler.com/en/insights/updates/supreme-court-of-canada-finds-the-federal-impact-assessment-act-unconstitutional/#:~:>.
- Parliament of Canada. "C-59: An Act to Implement Certain Provisions of the Fall Economic Statement Tabled in Parliament on November 21, 2023 and Certain Provisions of the Budget Tabled in Parliament on March 28, 2023." 2023. <https://www.parl.ca/LegisInfo/en/bill/44-1/C-59>.
- Province of Alberta. Alberta King's Printer. "Surface Rights Act." Accessed 2024. https://kings-printer.alberta.ca/1266.cfm?page=S24.cfm&leg_type=Acts&isbncln=9780779847662.
- Sightline Climate. "Google's New Tariff for Clean Firm Power." 2024. <https://www.ctvc.co/googles-new-tariff-for-clean-firm-power-201/?ref=ctvc-by-sightline-climate-newsletter>.
- Smith, Danielle. Office of the Premier. "Mandate Letter - Energy and Minerals." 2023. <https://open.alberta.ca/dataset/bf7f9a42-a807-49b3-8ba3-451ae3bc2d2f/resource/c87b60b4-217e-4d60-98be-1bbd2f538353/download/em-mandate-letter-energy-and-minerals.pdf>.
- Smith, Danielle. 2024. <https://x.com/ABDanielleSmith/status/1776283193408409659>