



GEO THERMAL PLANT IN ICELAND

Gaining Steam: A Regulatory and Policy Framework for Geothermal Energy Development in Alberta

Executive Summary

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The Environmental Law Centre (ELC) has been seeking strong and effective environmental laws since it was founded in 1982. The ELC is dedicated to providing credible, comprehensive, and objective legal information regarding natural resources, energy and environmental law, policy, and regulation in the Province of Alberta. The ELC's mission is to educate and champion for strong laws and rights so all Albertans can enjoy clean water, clean air, and a healthy environment. Our vision is a society where laws secure an environment that sustains current and future generations.

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INTRODUCTION

Geothermal energy is heat energy generated and stored in the earth. It can be found in shallow ground, or in water and rock located many kilometres below the surface. Depending upon the nature of the particular resource, geothermal resources can be used in geo-exchange systems, direct heat systems, or power plant developments.

Geothermal resources are a significant potential source of energy in Canada where in-place geothermal power exceeds Canada's current electrical consumption by one million times.¹ While it is likely that only a fraction of Canada's and Alberta's potential can actually be developed (due to current limitations of technology, and the location of some resources outside areas served by high-capacity transmission lines and at some distance from load centres),² geothermal resources remain a significant potential source of energy. Alberta's existing oil and gas infrastructure may allow for a convergence of energy production and heating opportunities. The Canadian Geothermal Energy Association has estimated that Alberta has the potential of roughly 500 wells for power generation, 7,202 wells for industrial heat and over 53,000 wells for direct heat.³

Even though only a fraction of Canada's and Alberta's in-place geothermal resources may be developable, geothermal resources can still play an

¹ S.E. Grabby et al., *Geothermal Energy Resource Potential of Canada*, Geological Survey of Canada, Open File 6914 (revised) (2012) Natural Resources Canada doi: 10.4095/291488.

² *Ibid.*

³ See Canadian Geothermal Energy Association, *Alberta Well Filtering Study Overview, Wellhead Analysis, Methodology and Dashboards*, online: <https://www.cangea.ca/reportanddashboards.html>.

important role in the transition to a low carbon energy future. It has been estimated that installing 1,000 heat generating systems across Alberta, each drawing 100 degree Celsius from deep wells in the deep Canadian sedimentary basin, could save about 30 megatonnes of carbon dioxide (MT CO₂) per year by replacing gas heating with geothermal heating.⁴ For reference, the oil sands industry generates about 34.7 MT CO₂ per year.⁵ Remote communities in particular could benefit from geothermal resource development which would reduce dependency on diesel fuel transports.⁶

In order to realize its potential as a relatively clean energy source, an effective legislative and policy framework to support the development of geothermal resources is essential. However, Alberta does not currently have a comprehensive legislative and policy framework for the exploration, development, and use of geothermal resources.

A regulatory framework for geothermal energy development must address several basic legal issues:

- Clearly defining geothermal resources;
- Clarifying ownership of the geothermal resource, along with a tenure (in the case of Crown ownership) and access process;
- Establish a licensing regime enabling exploration and development of geothermal resources;

⁴ Simon Weides, *Exploration of geothermal resources in the Alberta Basin, Canada* (2014) PhD Dissertation Thesis, University of Berlin at 104.

⁵ *Ibid.* at 104.

⁶ *Ibid.*

- Provisions addressing environmental regulatory matters such as environmental assessment, and abandonment and reclamation requirements.

We recommend that geothermal resources be defined as a unique resource. Further, the definition should encompass all geothermal resources that can be used for geo-exchange, direct heat, or electrical applications.

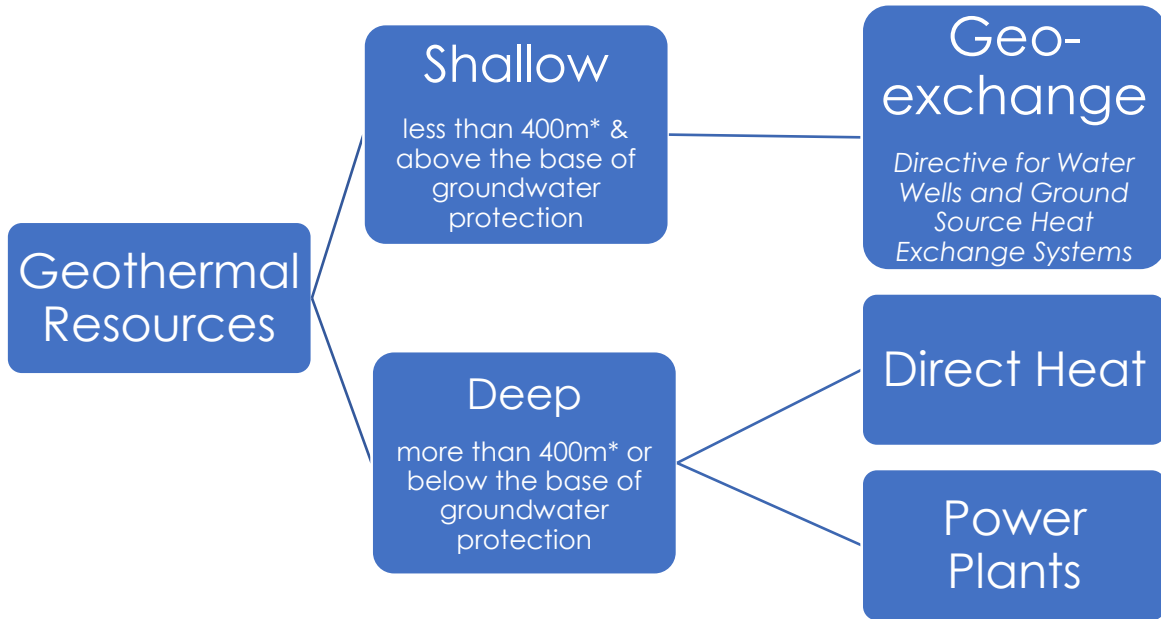
Further, we recommend that ownership of all geothermal resources be vested, by legislative declaration, in the Crown. For the purposes of tenure, a distinction should be made between shallow and deep geothermal resources. Shallow geothermal resources are those which are less than 400m deep and are above the base of groundwater protection. These resources may be used by the surface landowner in geo-exchange applications without need to obtain tenure (although other regulatory requirements may be in place).

For deep geothermal resources (400m or deeper⁷ or below the base of groundwater protection⁸), tenure must be obtained via a geothermal specific regulation under the *Mines and Minerals Act* (or stand-alone legislation). Similarly, the licensing of deep geothermal exploration and development activities should be addressed with a geothermal specific regulation under the *Mines and Minerals Act* (or, alternatively, stand-alone legislation). In terms of surface access for deep geothermal resources, this would be handled by the

⁷ The 400m cut-off is based the depth historically used in Europe to distinguish between shallow and deep geothermal resources. See the Geothermal Communities e-learning materials - *Geothermal Systems and Technologies* at page 48 (available at <https://geothermalcommunities.eu/elearning/repository>).

⁸ The base of groundwater protection elevations in Alberta available at www1.aer.ca/ProductCatalogue/378.html which provides the BGWP for every legal subdivision in Alberta except for mountainous regions and NE quarter of Alberta.

Public Lands Act in the case of public lands and the *Surface Rights Act* in the case of private lands.



In Alberta, with its significant oil and gas industry, the potential overlap and synergy of the geothermal resource industry and the oil and gas industry is particularly relevant. There is possibility for the co-production of geothermal resources with oil and gas wells, as well as the use and re-working of abandoned wells and other existing infrastructure. These overlaps raise particular legal issues – such as subsurface conflicts and liability - that need to be addressed by a geothermal regulatory regime.

Aside from an effective regulatory regime, supporting policy is needed to encourage development of Alberta's geothermal resources. Countries with successful geothermal industries have typically employed policy tools to address the risks associated with geothermal development, at least in the early stages of development. Similar approaches should be adopted to foster Alberta's nascent geothermal industry.

The Path to Geothermal Resource Development: Eliminating Legislative & Policy Barriers

Alberta's lack of a comprehensive, effective regulatory and policy framework hinders the development of our geothermal resources. The uncertainty created by unresolved legal issues and undefined regulatory processes is a significant barrier which must be overcome to clear the path to geothermal resource development. This path is made easier with the adoption of stable, predictable policy support programs which address the financial and technological risks associated with development of geothermal resources. Not surprisingly, addressing legislative and policy barriers and clearing the path forward is a significant task. As such, the background information and discussion for clearing the path to geothermal resource development is provided in several modules:

- [Module 1: Geothermal Energy and Alberta's Current Regulatory Landscape](#)
- [Module 2: The Missing Pieces in Alberta's Regulatory Landscape and a Path Forward for Geothermal Energy Development](#)
- [Module 3: Policy Support Mechanisms for Geothermal Energy Development in Alberta](#)
- [Module 4: Regulation of Geothermal Energy in Other Jurisdictions](#)

Our legislative and policy recommendations - which are designed to clear the path to geothermal resource development - are briefly outlined below.

Regulatory Regime

Alberta's regulatory regime for geothermal resources must provide a definition of geothermal resources, ownership of geothermal resources, and a comprehensive licensing regime.

- Geothermal resources should be defined as a unique resource which falls into the purview of the *Mines and Minerals Act*. The definition should encompass all geothermal resources that can be used for direct heat or for electrical production. The definition should not be tied to a particular temperature or to a particular technology; rather, it should focus on the resource as a form of energy.
- Ownership of geothermal resources should be vested in the Crown via legislation.
- As a Crown resource, an appropriate tenure regime for geothermal resources (that is, a process to obtain rights to extract geothermal resources) is required. It is recommended that a new regulation – called the *Geothermal Resources Tenure Regulation* - pursuant to the *Mines and Minerals Act* be made to specifically address tenure of geothermal resources.
- While both shallow and deep geothermal resources should be vested in the Crown, a distinction should be made for tenure in the proposed *Geothermal Resources Tenure Regulation*.
 - Shallow geothermal resources are those which are less than 400m deep and are above the base of groundwater protection. These resources should be allowed to be used by the surface landowner in geo-exchange applications without need to obtain tenure.

- Deep geothermal resources tenure would be obtained via a hybrid staking approach which would allow geothermal rights to be applied for and granted under ministerial discretion. In addition, the Minister should have the authority to post rights and accept bids.
- Prior to granting tenure to geothermal resources, there should be screening for environmental concerns such as impacts on species at risk, water resources, habitat and so forth.
- Prior to extensive disposition of rights to geothermal resources, the government should articulate an approach to addressing potential conflicts with other subsurface interests.
- While there would be no need to obtain tenure for shallow geo-exchange applications, this does not mean that such activities would be exempt from regulation.
 - There is currently existing regulation (under the *Water Act*) around geo-exchange systems that are completed above the base of groundwater protection (with the exception of horizontal closed-loop systems).
 - Given the typically small scale and the lack of need to access special geological conditions (i.e. do not require deep well construction), there is likely existing capacity to regulate these systems via building codes, municipal building requirements, and environmental laws of general application.
 - Additional guidelines and directives for appropriate design and installation may be appropriate (especially for more dense neighbourhood scale or district heat applications).

The licensing regime would be regulated with a stand-alone regulation - the *Geothermal Resource and Energy Regulation* - promulgated pursuant to the *Mines and Minerals Act* and implemented by the Alberta Energy Regulator (AER). This regulation would apply to deep geothermal resources.

- In the case of geothermal resources located under private lands, a developer would be required to enter lease negotiations with the landowner or seek access pursuant to the *Surface Rights Act* (in the same way as other energy activities).
- The *Geothermal Resource and Energy Regulation* would address the licensing of geothermal exploration and development/extraction activities.
 - Provide key definitions associated with the various stages of exploration, development, and production (for example: well, facilities, operator, project, power plant).
 - Set out the purposes of the regulation including protection and minimization of damage to the environment, useable ground waters, geothermal resources, life, health, property, and other subsurface interests. In addition, one purpose should include maximum long-term efficiency of the resource by ensuring extraction rates do not exceed natural recharge rates.
 - Empower the AER to make rules for a comprehensive licensing regime including fees, notices, and technical requirements.
 - Establish license and approval requirements. There should be a requirement for exploration licenses issued for a term of 1 year which can be renewed as long as prescribed conditions are met. In addition, there should be a requirement for well drilling and facilities approvals issued for 20-year terms which can be renewed if

prescribed conditions are met. The AER should be enabled to impose conditions on licenses and approvals, and both should be subject to suspension or cancellation if specific license or approval conditions are not met.

- Provide authority to seek security before geothermal resource activities commence.
 - Set out requirements set for the different stages of geothermal resource development: exploration, well drilling, field development, power plant operations, and closure/reclamation.
 - Set out requirements for record-keeping, monitoring and reporting. In some cases, the regulator may determine that immediate filing and release of certain data is required as a matter of public safety (as is the case with the *AER's Directive 059: Well Drilling and Completion Data Filing Requirements*).
 - Consider opportunities to increase access to exploration data, including the potential for making data public after a prescribed time.
 - Set out offences and penalties.
- Activities associated with deep geothermal resources fall into the purview of the *Environmental Protection and Enhancement Act* (EPEA) and the *Water Act*, as such, it is recommended:
 - That the possibility of a directive or code of practice be explored for deep geothermal developments (subject to environmental screening occurring at the tenure-granting stage). In particular, direct heat applications or geothermal power plants that qualify as micro-generators are likely candidates for a directive or code of

practice that could be used to streamline approval or license requirements under the *Water Act*.

- We recommend that consideration be given to exempting geothermal power plants smaller than 1 megawatt from the environmental assessment process under EPEA.
- The possibility of registration along with a code of practice be explored, particularly for those direct heat applications or geothermal power plants that qualify as micro-generators, as a means to streamline EPEA requirements (in terms of design standards, operations and reclamation requirements).

It should be noted that in order to grant authority over regulation of geothermal resources to the AER, some consequential amendments to the *Responsible Energy Development Act* will be required.

The Geothermal – Oil and Gas Interface

Currently, a variety of regulatory tools are enabled by the *Oil and Gas Conservation Act* (OGCA) to address subsurface conflicts. The ELC recommends that the proposed *Geothermal Resource and Energy Regulation* provide similar tools or enable use of the *Oil and Gas Conservation Act* tools for resolving subsurface issues that may arise with geothermal development and other subsurface interests. In order to minimize potential conflict, it may be appropriate to legislate minimum setbacks for geothermal wells from existing oil and gas wells and water wells. Further, there should be clear articulation of the approach to be adopted in the case where geothermal activities might negatively impact the extraction of oil or gas resources or other minerals (or vice versa).

Liability associated with co-production of geothermal resources with oil and gas operations or re-working oil and gas wells should be clarified.

- In the case of co-production, given the geothermal aspect of the operations is an adjunct to the oil and gas operations, statutory liability should fall in accordance with existing provisions under the OGCA and EPEA. It is recommended that clarity be provided by regulation on apportionment of liability in cases where geothermal operations are undertaken by a party other than the oil and gas operator.
- In the case of re-working an oil and gas well into a geothermal well, the complex liability issues likely require additional legislative refinement. This should include implementation of a pre-transfer inspection and assessment process to provide a snapshot of existing condition of the well, subsurface and surface prior to transfer for re-working purposes. Issues detected during this process should be addressed by requiring resolution of the issues or, in some cases, it may be appropriate to require payment of security.

While the OGCA has provisions for reworking wells, given the context of the Act (which is the production of oil and gas, and storage and disposal of substances), it likely doesn't envision reworking for geothermal energy purposes. This should be addressed by including a provision allowing the issuance of permits and approvals to rework oil and gas wells for geothermal energy purposes in the proposed *Geothermal Energy and Resource Regulation*. Furthermore, the AER or Orphan Well Association could undertake programs to encourage “adoption” of orphan wells for reworking into geothermal wells.

Policy Considerations

Other jurisdictions have demonstrated success with using policy instruments to support a nascent geothermal industry and these are recommended for Alberta. There are a variety of policy instruments available, broad recommendations include:

- In the initial development of the geothermal industry, it is likely appropriate to not impose a royalty in order to encourage development. However, the authority to impose royalties should exist as royalties may become appropriate in later stages of industry development.
- The *Renewable Electricity Act* should be maintained as it establishes a legislated target for developing electrical capacity from renewable resources. The Act could be enhanced by placing specific requirements on individual utilities, as well as enabling a market for trading Renewable Portfolio Standards (RPS) credits.
- Policies and programs must be put into place in order to actually achieve the target established by the *Renewable Electricity Act*. These policies and programs could be similar to or a recommencement of the Renewable Electricity Program previously used in Alberta, or could be a Feed-in-Tariff (FIT) program.
- Aside from establishing robust RPS and FIT programs, development of geothermal resources likely requires financial incentives. These can be:
 - Loans which are backed by the government or are directly provided by government to geothermal developers.
 - Insurance which absorbs the economic setbacks associated with drilling failures. For instance, the Icelandic government provides

loans which convert into grants when an attempt to develop a new field fails.

- Early stage fiscal incentives such as easing import duties on machinery and equipment; reduced licence fees; and tax incentives.
- Direct government support such as grants and cost sharing. Participation in such direct support programs should be conditional upon data sharing requirements.

Although some policy tools are designed to transfer risk to the public purse, which is contrary to the polluter pays principle, there are other social objectives to be considered (such as increased renewable energy sources). The appropriate level of risk (that is, the level of support) will be a matter of assessing the various policy goals of the program. The precise mix of policy tools – including appropriate timing and level – requires economic analysis which goes beyond the scope of this project. We note that there is precedent for government financial support for new resources in Alberta as similar approaches were adopted in the early days of oil-sands development.