British Columbia Utilities Commission
Indigenous Utilities Regulation Inquiry

Final Argument Submission

Canadian Geothermal Energy Association (CanGEA)

Submitted October 4, 2019

Canadian Geothermal Energy Association
P.O. Box 1462 St. M, Calgary, Alberta, T2P 2L6, Canada
info@cangea.ca

Table of Contents

Canadian Geothermal Energy Association
P.O. Box 1462 St. M, Calgary, Alberta, T2P 2L6, Canada
info@cangea.ca

1. About CanGEA

CanGEA's mission is to accelerate Canadian exploration and development of geothermal resources in order to provide secure, clean, and sustainable energy to Canada's heat and electricity markets. CanGEA works to advance policies and regulations that enable the transition of Canadians towards the use of geothermal energy for electricity and heat, as applicable.

The Canadian Geothermal Energy Association (CanGEA) is the collective voice of Canada's geothermal energy industry. As a non-profit industry association, we represent the interests of our member companies with the primary goal of unlocking Canada's tremendous geothermal energy potential. Geothermal energy can provide competitively priced, renewable, around-the-clock energy to the Canadian market and is part of the solution to growing concerns about securing sustainable and cost-effective energy sources. CanGEA promotes the industry and the potential of geothermal energy in Canada through outreach events, research, policy work and representing Canadian interests internationally. Conducting research and providing valuable reports is an important method for CanGEA to promote the industry and the potential of geothermal energy. CanGEA acts as the conduit between industry and government to ensure that there is a supportive ecosystem for development across Canada. CanGEA participates in engagements with all levels of government, including federal departments and committees, provincial/territorial governments and utility commissions, municipal governments, and First Nations.

2. Summary of Submission

In the context of the BCUC Indigenous Utilities Regulation Inquiry, we are advancing our work as an industry association by supporting Indigenous ownership of geothermal energy systems. Indigenous ownership and use of geothermal energy systems facilitates environmental, economic, social, cultural and health benefits for traditional territories and beyond. The following points provide a summary of our suggestions to the Commission:

- Supporting the development of Indigenous Utilities in BC should be a top priority for the BC government. Support could come through partnerships, or by providing funding for Indigenous projects. Further, CanGEA suggests that procurement policies for electricity and heat could support Indigenous-led businesses. It is the government's, and by extension the BCUC's role to ensure that the regulatory context is designed in a way that maximizes the socio-economic benefits for Indigenous communities and promotes Indigenous participation in any manner – from full ownership and operation to limited ownership (<50%).
- CanGEA recommends that the Commission urge the BC Government to reconsider the creation of a Well Classification for Thermal Gradient Wells under the GRA built to the standards of Geotechnical Wells licenced under the Water Sustainability Act and grandfather the existing permit and lease holders under the old regulatory regime. Ameliorating the geothermal regulatory process would enable the development of BC's geothermal resources and by extension, pave the way for Indigenous-owned geothermal utilities.
- Overall, since the use of cascaded geothermal energy designs have such universally positive effect, it is CanGEA's submission that the BCUC must ensure that any regulatory

framework that governs geothermal Indigenous Utilities allows for the economic development of cascaded geothermal systems. To do so, the regulatory framework must be tested and formalized so as to provide a sufficient degree of certainty to the project proponents.

- It is CanGEA's submission that the BCUC should recommend to the government that all greenfield energy projects should, on the merits of the project, have the opportunity to earn and sell carbon credits, irrespective of energy type.
- It is CanGEA's position that Indigenous Utilities could provide a viable solution to BC Hydro's locational grid reliability challenges while increasing available energy/capacity. It is CanGEA's suggestion that the BCUC consider recommending that BC Hydro actively seek out First Nations projects or partner with First Nations on new utilities projects in areas that lack energy security.
- CanGEA submits that baseload and dispatchable electrical capacity should be financially recognized in British Columbia, as is done in the State of California.
- It is CanGEA's suggestion that the BC government encourage the offering of a capacity call for firm, clean, and First Nations owned energy in areas that are affected by a lack of reliable grid-supplied clean electricity.

3. Background on Geothermal

3.1 Canadian Geothermal Energy Basics

Geothermal energy is a mature technology capable of producing heat and electricity and is widely used around the world. The global installed geothermal electrical capacity is 13.5 GW, while the global installed geothermal capacity for direct heat is 20.6 GW (equivalent electric power).[1]

The United States currently leads global geothermal electricity production with approximately 3.6 GW of installed capacity,[2] in addition to 21 installed district-heating systems.[3] The U.S. Department of Energy (DOE) published a report in May 2019 titled, *GeoVision: Harnessing the Heat Beneath Our Feet*. In this report, rigorous technical analysis was conducted to evaluate future geothermal deployment opportunities across the U.S. Its models indicate that with technology improvements, geothermal power generation could increase to 60 GW of installed capacity by 2050, with district-heating installations increasing to 17,500 in the same period.[4]

[1] Limberger, Jon et al., "Geothermal energy in deep aquifers: A global assessment of the resource base for direct heat utilization" pg. 962, Renewable and Sustainable Energy Reviews 82 (2018) 961-975.
[2] ThinkGeoEnergy, "The Top 10 Geothermal Countries 2018 – based on installed generation capacity (MWe)," 2018, http://www.thinkgeoenergy.com/the-top-10-geothermal-countries-2018-based-on-installed-generation-capacity-mwe/.
[3] Snyder, Diana et al., "Update on Geothermal Direct-Use Installations in the United States," *National Renewable Energy Laboratory* (February 2017): pg. 2, Produced for the 42nd Workshop on Geothermal Reservoir Engineering, https://pangea.stanford.edu/ERE/pdf/IGAstandard/SGW/2017/Snyder.pdf, accessed Sept 27, 2019.
[4] U.S. Department of Energy, "GeoVision: Harnessing the Heat Beneath Our Feet, May 2019, pg. ix, https://www.energy.gov/sites/prod/files/2019/06/f63/0-GeoVision-ExecSummary-v2-opt_0.pdf, accessed Sept 27, 2019.

Geothermal energy is a renewable resource, with one of its most significant advantages being that it is a baseload and dispatchable form of energy.[5] Unlike other renewables that depend on external factors like weather to produce electricity, the Earth constantly produces heat, allowing for the continuous production of electricity and/or heat.

At the core of geothermal energy production is the basic operation of a liquid being converted to vapour, which then spins a turbine, thereby producing electricity. Traditional geothermal plants make use of volcanic heat, which is capable of flashing water to steam upon contact; these are considered high-grade resources and can be found in locations such as Iceland and Hawaii. Figure 1 below, illustrates the types of geothermal resources that can be found in Canada.

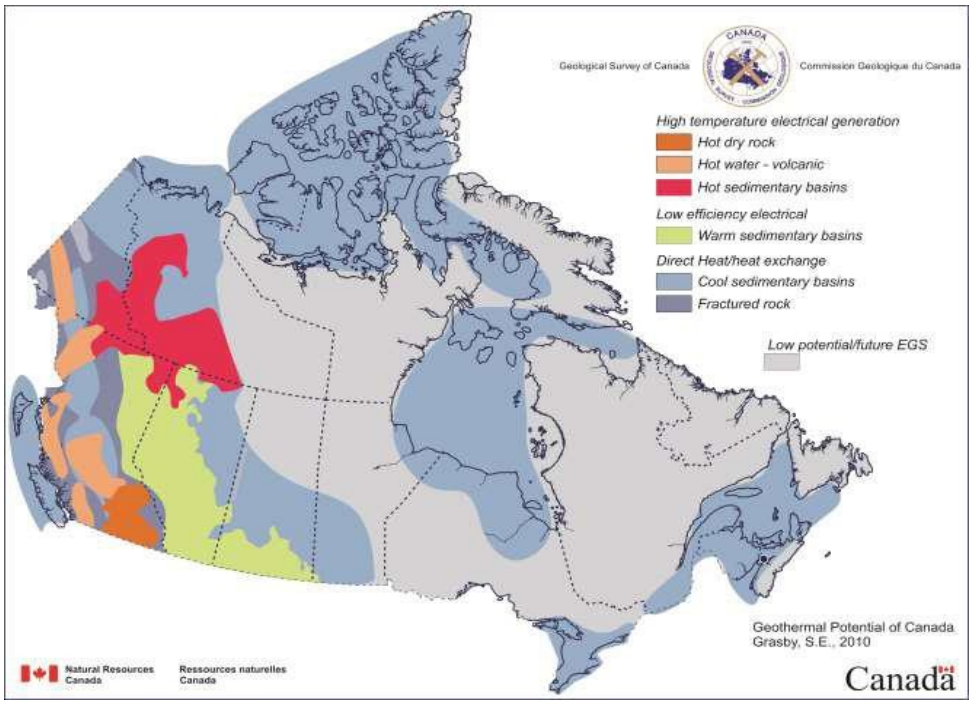

Figure 1: Geothermal Resource Types in Canada

3.2 Geothermal Resources in British Columbia

As seen in Figure 3, above, British Columbia has four main types of geothermal resources: Hot Sedimentary Aquifers (HSA – also referred to as Warm/Hot Sedimentary Basins), Volcanic, Hot Wet Rock (HWR – also referred to as Fault-controlled), and Hot Dry Rock (HDR – which require engineered geothermal systems).

3.2.1 Fault-controlled and Volcanic Systems

Fault-controlled geothermal systems occur in areas where convection of subsurface waters results

[5] NRCan, *About Renewable Energy – Geothermal*, https://www.nrcan.gc.ca/energy/renewable-electricity/7295#geo, accessed June 19, 2018.

from tectonic (crustal movement) or volcanic activity. Meteoric waters (rain waters) descend through fractures and permeable pathways to depths where they become heated, and in cases become mixed with fluids from deep in the Earth, to then travel back up naturally via fractured pathways to the Earth's surface and occasionally form thermal springs.

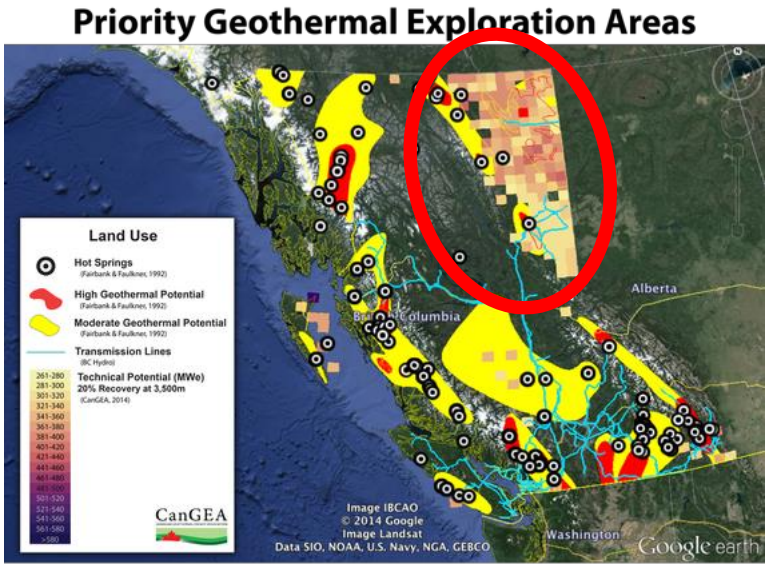

Figure 2: Priority geothermal exploration areas in BC

3.2.2 Hot Sedimentary Aquifer (HSA) Systems

Hot Sedimentary Aquifers (HSA) are deep, porous, and highly permeable layers of rock saturated with fluids (aquifers) that are heated naturally. For this type of geothermal system, a well is used to bring the heated fluid to the Earth's surface where it can be used for electricity generation or heating. The cooled water is then pumped back into the subsurface.

Though HSA resources are considered lower grade in comparison to volcanic/fault-controlled resources, they still have large potential and there are many possible applications for electricity generation and heating. The Western Canada Sedimentary Basin in the northeast portion of BC, highlighted in Figure 2, above, is the most prospective region for the development of HSA geothermal resources, due to its geological characteristics and knowledge from historic oil and gas exploration. However, the geothermal potential of HSAs within other sedimentary basins in BC, such as the Bowser and Nechako basins, remains uncertain.

3.3 Types of Geothermal Applications

The applications of geothermal energy fall into two classes:

1. **Direct Use of Geothermal Heat (30°C – 150°C)**
2. **Geothermal Electricity**

3.3.1 Direct Use Geothermal

Direct use of geothermal heat implies that geothermal energy is used for heating and other industrial or commercial processes. Direct use operations often involve drilling to a certain depth and bringing geothermal fluids to the surface to extract the heat. After the heat is extracted, the lower temperature liquid is returned to the earth via an injection well so that it can be reheated and utilized again. Industrial uses include heating greenhouses, aquaculture, pulp and paper manufacturing, and many other applications that require moderate heating. In some areas, hot springs will reach the surface naturally and the hot waters can be put to use without drilling.

Within the category of direct use, there are two sub-categories: industrial heat and direct heat. Industrial geothermal heat utilizes the heat from geothermal fluids, typically above 60°C.

Applications that fall under this category include ethanol and biofuel production, refrigeration and ice making, lumber drying, cement and aggregate drying and other industrial processes.

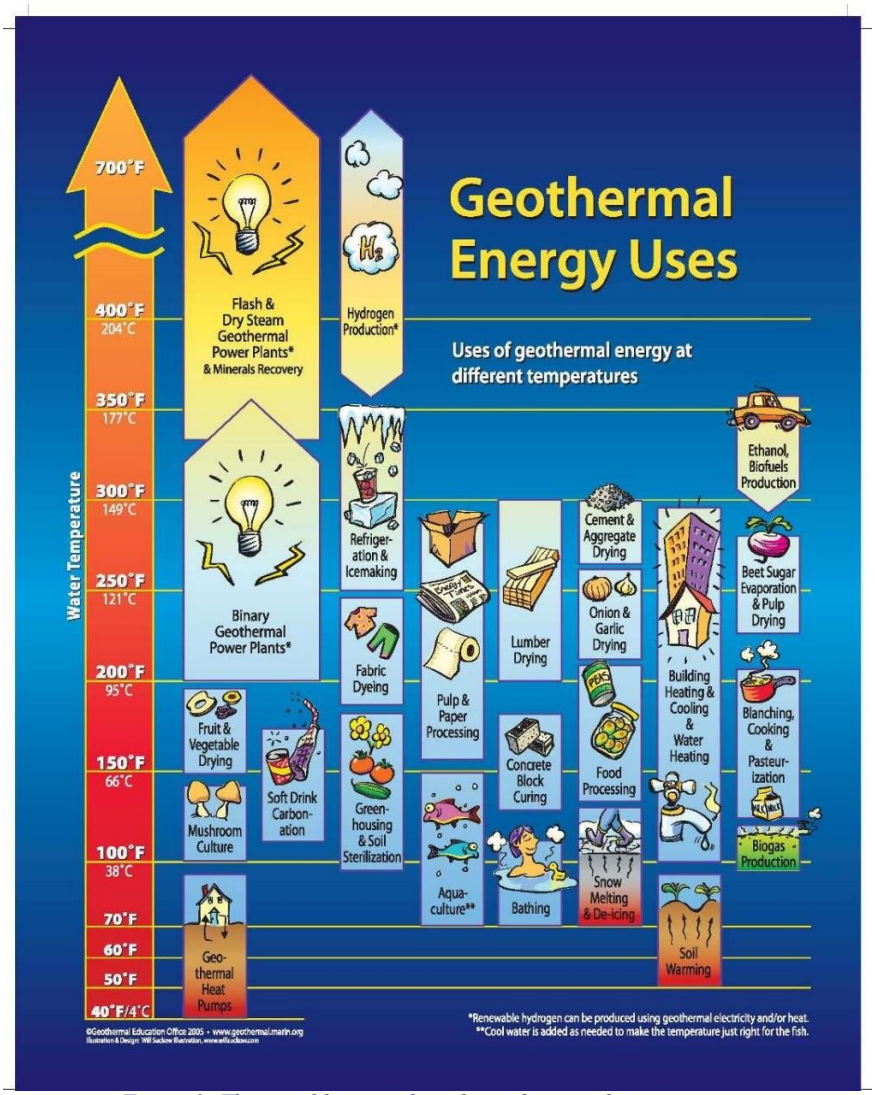

Figure 3: The possible uses of geothermal energy by temperature

There are many possible applications of direct heat including water (pre) heating, aquaculture, bathing, snow melting and de-icing, and even industrial cooling (refrigeration) as can be seen in Figure 3, above.[6] An important note is that the heat from geothermal fluids can be cascaded, meaning that a resource can be used multiple times for different purposes until the temperature has been lowered to a point where it is no longer useful, thereby utilizing as much heat from the geothermal resource as possible.

3.3.2 Geothermal Electricity

The most likely application for geothermal electricity in BC is through a binary geothermal plant. A binary geothermal plant utilizes the heat of geothermal water, which is transferred via a heat exchanger to a second (binary) liquid in an adjacent loop. The binary fluid then boils to vapour, which in turn spins the turbine, thereby creating electricity. Binary plants generally use lower temperature resources (38°C -149°C) as they make use of a binary liquid with a lower boiling point, such as butane.[7] A common application with binary plants is small modular units with a 0.25-3 MWe capacity range that can be stacked in sequence to create larger scale projects.

A geothermal plant costs more up-front than a fossil fuel-based electricity generation plant due to the risks and costs associated with confirming the resource's viability. In comparison to larger geothermal plants, small plants cost more per kilowatt of electricity (kWe). It is also important to consider the operations and maintenance costs associated with running a geothermal plant, costs can vary depending on the price of electricity in the jurisdiction. In general, the cooler the resource and the smaller installed capacity of a plant, the more expensive the project per kWe produced.[8] Though smaller projects cost more, it is important to note that a relatively small geothermal electricity plant could be profitable if the plant is accompanied by a direct use heat application such as aquaculture, a greenhouse, or other types of facilities that require heat.[9]

3.4 Projects in British Columbia (BC)

CanGEA members currently have two projects under development in British Columbia, one of which is majority owned by a First Nation. A third project is being undertaken by the Fort Nelson First Nation.

3.4.1 Kitselas Geothermal Inc. – Lakelse Project – Geothermal Heat and Electricity (CanGEA member)

Kitselas Geothermal Inc. (KGI) is a joint venture between Borealis GeoPower (BGP) and majority owner, Kitselas Development Corporation. KGI's Lakelse geothermal project is located near Terrace, BC. The Terrace area is near the end of an ~800 km long 287 kV transmission line, and as a result, it experiences frequent electricity outages, placing it among the top 10 brownout areas

[6] Ground Zero Energy, "Geothermal Energy Uses," accessed July 15, 2019, http://www.groundzerosoftware.net/Geo-energy-uses.
[7] Battocletti, Liz, "Geothermal Small Business Workbook," *Bob Lawrence & Associates, Inc.*, (May 2003): pg. 37, Produced for the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Geothermal Technologies Program under Contract No. DE-FG03- 01SF22365.
[8] *Ibid*, 38.
[9] *Ibid, 39.*

in the Province, see Figure 5 for reference. BC Hydro transmission and high voltage distribution lines run above many parts of the project area and it is currently assumed that the project's interconnection will be within 300 meters of BC Hydro facilities.

The Terrace area is also located in the same airshed as the district of Kitimat. Projected GHG emissions from the LNG industry will have significant impact on air quality in the Terrace area.

The project is planned to be executed in three Phases. The first Phase will involve the development of a small geothermal-heated business park (geoheat park), then Phase 2 will involve ramping up the geoheat park with up to 20 times the amount of heat produced in Phase 1. Finally, Phase 3 aims to produce electricity that can be fed into the grid or provided directly to a nearby LNG project. A byproduct of the produced geothermal brines may be valuable metals and minerals currently dissolved in the fluid. They envision some form of mining as a separate but parallel Phase of the project.

3.4.2 Borealis GeoPower – Canoe Reach Project – Geothermal Heat and Electricity (CanGEA member)

BGP's Canoe Reach geothermal project is located near Valemount. The Valemount area is at the end of a 300 km long 138 kV radial transmission line, and as a result, it experiences frequent electricity outages, see Figure 5 for reference. The Canoe Reach project is following a similar phased approach as the Lakelse project in Terrace. Phase 1 initially aimed to build a small-scale electricity project, however, development of Phase 2, a geoheat park, took priority over Phase 1. Phase 3 would expand the heat and electricity projects to match the resource potential with local energy market demand. Metal and mineral extraction may also be a part of the project. BGP is working closely with the Village of Valemount and local businesses on the project.

BGP looks forward to dialogue with the BC government on the potential for renewable heat and electricity from this project site due to its strategic location within the Provincial grid, proximity to the large, new load developing from the TransMountain pipeline expansion project, and the negative emissions impact that current wood burning for heat is having on the region.

The BC Ministry of Environment and Climate Change Strategy recently released a Central Interior Air Zone Report (2015-2017). The report found that on an annual and daily concentration basis, Valemount had the highest concentration of $PM_{2.5}$ pollution in the Central Interior Air Zone (CIAZ). $PM_{2.5}$ are particles up to 2.5 micrometres in diameter that are harmful to human health and can lead to shortness of breath, cardiovascular and respiratory diseases as well as birth defects. The reduction of $PM_{2.5}$ has been a top air quality priority across the Central Interior Air Zone over the past several years. It is worth noting that the numbers in the report were affected by wildfire smoke. [10] With Valemount being home to an active geothermal project, there is a prime opportunity for the community to utilize local, clean and renewable heat and electricity to help mitigate its air quality situation.

[10] BC Ministry of Environment and Climate Change Strategy, *Central Interior Air Zone Report (2015-2017)*, accessed July 15, 2019, https://www2.gov.bc.ca/assets/gov/environment/air-land- water/air/reports-pub/air-zone-reports/2015-2017/central_interior_air_zone_report_2015- 2017.pdf.

3.4.3 Deh Tai Limited Partnership – Fort Nelson Geothermal Assessment

Deh Tai Limited Partnership is the economic development company of Fort Nelson First Nation. In August 2019, Deh Tai received $1,000,000 in funding from Natural Resources Canada's Clean Energy for Rural and Remote Communities (CERRC) program in order to assess the resource potential of several renewable energy technologies.[11] This assessment includes a potential geothermal electricity generation project, which involves Saulteau First Nations' participation. The CERRC program is designed to support "a responsible and strategic transition away from diesel dependency."[12]

A report was released by Geoscience BC in September 2019 titled *Clarke Lake Geothermal Pre-Feasibility Study*, assessing two potential sites close to the Clarke Lake Gas Field south of Fort Nelson.[13] The assessment includes an outline of "potential costs and revenues as well as technology recommendations and permitting requirements as a first step to understanding economic viability."

Fort Nelson Chief Sharleen Gale said the following regarding the *Clarke Lake Geothermal Pre-Feasibility Study: "*Fort Nelson First Nation is grateful for the studies by Geoscience BC that have highlighted geothermal resource opportunities immediately adjacent to our home community and located in our territory where our people have lived for thousands of years… We are grateful for this unique opportunity to pursue clean, renewable energy that can provide us with food security, energy independence and diverse economic opportunities in our territory…"

4. Federal Government Considerations

The federal Liberal government (2015-2019) has made Reconciliation one of their utmost priorities, as can be seen through various initiatives undertaken since 2015. One of the more recent efforts was led by the Federal Standing Committee on Natural Resources (RNNR) in their study titled, "International Best Practices for Indigenous Engagement in Major Energy Projects: Building Partnerships on the Path to Reconciliation." The purpose of the study was to examine how Canadian governments can best engage with and include Indigenous peoples in the development and operation of energy projects within the country. [14]

The study made 5 recommendations as to how Canadian governments can best work with Indigenous peoples and communities in energy projects in an effort to promote long-term socio-economic benefits to the communities. The most notable recommendation was Recommendation

---

[11] Government of Canada News Release, *Canada Supports Clean, Renewable Energy Technologies in British Columbia*, Aug 23, 2019, https://www.canada.ca/en/natural-resources-canada/news/2019/08/canada-supports-clean-renewable-energy-technologies-in-british-columbia.html.
[12] *Ibid.*
[13] Geoscience BC News Release, *Study Outlines Feasibility of Using New Natural Gas Wells for Geothermal Heat and Power*, Sept 19, 2019, http://www.geosciencebc.com/study-outlines-feasibility-of-using-new-natural-gas-wells-for-geothermal-heat-and-power/.
[14] Standing Committee on Natural Resources, "International Best Practices for Indigenous Engagement in Major Energy Projects: Building Partnerships on the Path to Reconciliation," June 17, 2019, https://www.ourcommons.ca/Content/Committee/421/RNNR/Reports/RP10575903/rnnrrp13/rnn rrp13-e.pdf.

1, which was to "Create Sustainable Opportunities for Indigenous Peoples," by:

A. Providing educational and professional development opportunities to support a competitive Indigenous workforce, including higher education scholarships and skills training;

B. Establishing procurement policies that support Indigenous-led businesses, goods and services, similar to Australia's Indigenous Procurement Policy;[15]

C. Supporting the development of community-owned and operated utilities through public-private partnerships and regional cooperatives;

D. Investing in transportation and communication infrastructure in remote and rural areas, where needed, in a manner that balances out environmental and socioeconomic considerations, according to local priorities; and

E. Promoting the development of Indigenous heritage trust funds to ensure that the benefits of non-renewable energy resources extend to future generations.[16]

Recommendation 1 from the RNNR report provides a clear message that Indigenous participation in energy projects represents a significant opportunity for Reconciliation as well as an opportunity for Indigenous communities to develop long-term, sustainable socio-economic benefits for their communities. Moreover, *Recommendation 1C* was that governments should partner or work with communities to develop Indigenous-owned or partial-owned utilities in an effort to create sustainable opportunities for Indigenous peoples.

New Zealand Māori trusts serve as useful examples as to how Indigenous groups and communities can benefit from the ownership or partial ownership of geothermal utilities. The evolution of New Zealand's regulatory regime is also demonstrative of how prudent government action can resolve regulatory issues that hinder development. The inclusion of Māori values in New Zealand's resource management laws has led to several successful geothermal utility Māori trust and government partnerships, which in turn has led to increased self-sufficiency, economic stimulus, jobs and other opportunities for the trusts and their members.

An important takeaway from the Māori trusts is that even though only one of the trusts has significant ownership in their geothermal ventures (75%), all of the trusts had benefitted (or were expecting to benefit) significantly from the projects on their land. The benefits varied from employment opportunities to revenues that enabled the trusts to offer various grants to their members, however, in each case it is clear that the trusts benefitted significantly.

Considering the recent federal RNNR committee report, the BC government's own goals for Reconciliation, and the example of Māori trust involvement in geothermal utilities, it is clear that the development of Indigenous-owned or partial-owned utilities is in the best interest of all governments throughout Canada. **Supporting the development of Indigenous Utilities in BC should be a top priority for the BC government. Support could come through partnerships,**

[15] Australian Government, "Australia's Indigenous Procurement Policy" accessed July 11, 2019, https://www.pmc.gov.au/Indigenous-affairs/economic-development/Indigenous-procurement- policy-ipp.
[16] Standing Committee on Natural Resources, "International Best Practices for Indigenous Engagement in Major Energy Projects."

or by providing funding for Indigenous projects. Further, CanGEA suggests that procurement policies for electricity and heat could support Indigenous-led businesses. It is the government's, and by extension the BCUC's role to ensure that the regulatory context is designed in a way that maximizes the socio-economic benefits for Indigenous communities and promotes Indigenous participation in any manner – from full ownership and operation to limited ownership (<50%).

5. Case Study: New Zealand Geothermal Regulatory Framework

As New Zealand enjoys one of the more mature geothermal industries in the world and is a common law based legal jurisdiction, their geothermal regulatory framework was largely adopted by BC in the *Geothermal Resources Act*.[17] Prior to discussing the BC geothermal regulatory framework, there are three salient issues with New Zealand's current regulatory framework that are worth highlighting.

First, it was the Government of New Zealand that conducted initial geothermal investigations by drilling wells.[18] For example, in the mid-1980s, the Crown drilled four deep exploration wells in the Ngatamariki geothermal field, de-risking the area for subsequent private sector exploration and production. Given that the initial de-risking of the resource area had been undertaken by government, their understanding of the resource type(s) and technical capacity via direct experience made them well-positioned to regulate their geothermal resources.

Recently, federal and provincial governments have undertaken geothermal de-risking activities in two areas of BC: the Clarke Lake Natural Gas Field near Fort Nelson and Mount Meager, located in the Garibaldi Volcanic Belt. It is our understanding that no geothermal permit or title exists for the Clarke Lake Natural Gas Field. CanGEA is concerned that provincially-funded geothermal investigation to date does not appear to have a clear project selection process.

It is CanGEA's suggestion that the Provincial government, and arms-length bodies of the BC government, such as Geoscience BC, take the following actions in order to support the growth of BC's geothermal industry and Indigenous Utilties: a) establish formalized project selection criteria to accelerate project de-risking funding, b) make the criteria transparent, c) design the criteria to prioritize Ministry of Energy, Mines, and Petroleum Resources (MEMPR) geothermal resource permits/leases, and d) to the fullest extent possible, design the criteria in order to support Indigenous Utilities, pursuant to comments made in this submission.

It is also CanGEA's position that because the BC government has had marginal involvement in geothermal exploration to date, this may have contributed to overly stringent regulation resultant from little knowledge of the risks posed by harnessing the full breadth of the Province's geothermal resource types.

---

[17] RSBC 1996, c 171

[18] Kortright, Noel, Luketina, Katherine and Robson, Bridgette, "Geothermal Policy and Implementation, the New Zealand Example," *IGA Academy*, World Geothermal Congress 2015, April 2015, pg. 90.

Two other salient issues are worth highlighting from the New Zealand case. First, "[s]ome of the powers do not rest with the appropriate authority."[19] Second, New Zealand experienced a problem whereby "wholesale adoption of the petroleum regulations to the less hazardous geothermal industry" resulted in a scenario where "the costs of implementing the framework applied to petroleum operations [were] higher in relation to the benefits. The geothermal industry drilling regime is similar to the petroleum industries, as emphasized by the many [American Petroleum Institute] standards that are used in practice and referenced in the [New Zealand code of practice for deep geothermal wells] but is less hazardous."[20]

The first point is salient in that the author recognizes that the development of NZ's geothermal resources has been slow due to regulatory powers not being assigned to the most effective and efficient authority. This is something that CanGEA believes is the case with the BC Oil and Gas Commission regulating the early stages of development of the vast proportion of BC's geothermal energy resources. The second point is important as it speaks to the difficulty of adopting petroleum regulations for geothermal energy, which according to the author, results in the costs outweighing the benefits. **It is CanGEA's position this regulatory difficulty is not endemic to New Zealand; and the same scenario is playing out in the BC geothermal industry.**

6. BC's Geothermal Energy Regulatory Framework

The BC Geothermal Resources Act (GRA) defines a geothermal resource as "the natural heat of the earth and all substances that derive an added value from it".[21] This includes steam, water, water vapour and all substances dissolved in the steam, water or water vapour obtained from a well.[22] A notable feature is that the Act specifically excludes water that at the surface has a temperature less than 80°C and hydrocarbons.[23] Through the GRA, the Province owns all geothermal resources in British Columbia. When geothermal fluids are greater than 80°C at the wellhead, the project is not subject to regulation by the BCUC, but instead is regulated by the BC Oil and Gas Commission. When geothermal fluids are less than 80°C at the wellhead, then the project is treated as a Thermal Energy System and is therefore subject to regulation by the BCUC.

In comparison to other regulatory frameworks, the BC geothermal resource and regulatory context is unique. The majority of resources within the Province are not HSA (hot sedimentary aquifer) resources, unlike other Canadian provinces (e.g. Saskatchewan and Nova Scotia). Yet, the BC regulatory framework is tailor-made for HSA resources. The majority of the geothermal projects in BC are targeting fault-controlled geothermal resources greater than or equal to 80°C, which means that they are subject to regulation by the BC Oil and Gas Commission (BCOGC).

---

[19] Ellis, Donna, Vernon, Wayne and Lord, Sam, "Challenges of New Zealand Geothermal Legislation," *Proceedings World Geothermal Congress 2015*, April 2015, pg. 6, https://pangea.stanford.edu/ERE/db/WGC/papers/WGC/2015/03005.pdf.
[20] *Ibid*, bottom of page 6.
[21] RSBC 1996, c 171, s 1(1).
[22] *Ibid.*
[23] *Ibid.*

6.1 BC's Geothermal Regulatory History

Until 2015, the responsibility for regulation of exploration activities and administration and tenure management under the *GRA* was held by the British Columbia Ministry of Energy and Mines (MEM).[24] In November of 2015, the MEM initiated a stakeholder consultation regarding transferring the regulatory authority for geothermal drilling and geophysical activities to the BC Oil and Gas Commission (BCOGC).[25] Approximately 1.5 years after the consultation, on March 31, 2017, the BCOGC became the regulator for geothermal resources - from preliminary exploration and well authorizations, through to well abandonment or closure.[26] Therefore, the BCOGC is the regulator for geothermal energy resources or resources greater than or equal to 80°C at the surface.

Considering the production of geothermal electricity requires higher temperatures, flow rates and in general, drilling to deeper depths, the rationale behind the assignment of the BCOGC as the regulator for geothermal resources was likely due to their experience in the oil and gas sector and managing the risks associated with exploiting oil and gas resources.

In the 2015 *Geothermal Resources Act - Consequential Amendments and Supporting Regulations Consultation Paper*, the BC Government recognized their significant geothermal energy potential that "could generate firm renewable electricity."[27] Moreover, the Government also stated its commitment to supporting geothermal energy development in the Province by "streamlining the regulatory framework for development."[28] **Having recognized the intent of the amendments and the consultation process, CanGEA submits that the 2017 amendments did not result in the intended effect.**

6.2 BC's Geothermal Regulatory Effectiveness

CanGEA would like to raise our concern with the BCOGC being the regulatory body for all activities associated with exploring for and producing geothermal resources or possible geothermal resources. CanGEA believes that the BCOGC does not currently possess the relevant technical capacity or interpretive flexibility for the early stages of development of the vast proportion of BC's geothermal energy resources. It is believed that relatively deep, large diameter, high volume flowing wells, i.e. production and injection wells, are the specialty of the BCOGC, as well as all aspects of the [Hot Sedimentary Aquifers (HSA)] geothermal resources. Note: HSA projects do not require the early development stages of fault-controlled/volcanic resources, as the HSA resources have already been largely delineated by the oil and gas industry.

---

[24] BC Ministry of Energy and Mines, "*Geothermal Resources Act* – Consequential Amendments and Supporting Regulations Consultation Paper," *Electricity and Alternative Energy Division*, accessed August 19, 2019, https://www.cangea.ca/uploads/3/0/9/7/30973335/consulation_paper_october_2015_final.pdf.
[25] *Ibid*.
[26] British Columbia Oil & Gas Commission, "Geothermal Energy," accessed August 19, 2019, https://www.bcogc.ca/public- zone/geothermal-energy
[27] BC Ministry of Energy and Mines, "*Geothermal Resources Act* – Consequential Amendments and Supporting Regulations Consultation Paper," pg. 2, https://www.cangea.ca/uploads/3/0/9/7/30973335/consulation_paper_october_2015_final.pdf.
[28] *Ibid.*

Considering that the majority of geothermal energy projects in BC are located in areas with fault controlled or volcanic geothermal resources, it seems illogical that the early phases of exploration/development would be regulated by the BCOGC and assessed as being as hazardous as oil and gas wells. The administrative expense and time for approvals, reviews and permits are currently costly and burdensome, open to the interpretation of inexperienced regulators for the activities performed, and can lead to, or has led to, project delays or potential project failure.

CanGEA appreciates the consultation opportunity provided by the BC MEM/OGC, however, as previously stated, we do not believe that the goal of streamlining the geothermal regulatory process was achieved. **As such, CanGEA recommends that the Commission urge the BC Government to reconsider the creation of a Well Classification for Thermal Gradient Wells under the GRA built to the standards of Geotechnical Wells licenced under the Water Sustainability Act and grandfather the existing permit and lease holders under the old regulatory regime.**

As per the *Consultation Paper*, the MEM/OGC had intended to create a well classification for Thermal Gradient Wells under the GRA that would have allowed for the exploratory wells to be licenced similar to Geotechnical Wells under the Water Sustainability Act. The result would have been a much less burdensome regulatory process for developers to obtain geothermal exploratory drilling licences. CanGEA submits that the OGC's decision to not develop a well classification for Thermal Gradient Wells has seriously hampered the ability of geothermal developers in BC to perform the exploratory activities necessary to advance their projects.

CanGEA recognizes the document was not meant to provide any assurances as to whether the content of the consultation document will be implemented, however, given the document's stated intentions to support the industry, CanGEA had remained hopeful that the best interests for the industry would prevail and, indeed, our members believed they received the well classification proposal outlined by the MEM/OGC in good faith. The resulting amendments to the *GRA* that were implemented on March 31, 2017 did not include the new proposed class of wells, which has resulted in difficulties securing permits for drilling exploratory wells, substantially increased project development costs, and slowed project growth amongst our members.

Ameliorating the geothermal regulatory process would enable the development of BC's geothermal resources and by extension, pave the way for Indigenous-owned geothermal utilities.

7. Cascaded (or "Waste Heat") Geothermal Applications

It is CanGEA's opinion that heat as a <u>by-product</u> of a geothermal electricity project should not be regulated by the BCUC and/or granted an exemption. As illustrated in Figure 4, below, an individual geothermal energy application often uses only a portion of the available energy. As such, a portion of the energy remains and is able to be used in other applications (i.e. cascading energy use). It is this by-product heat, also known as 'waste heat', that should not be regulated.

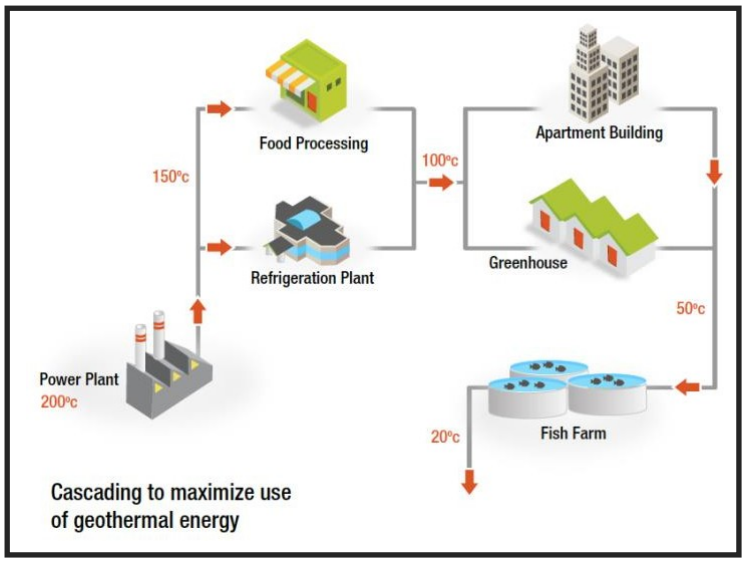

Figure 4: Cascading of geothermal energy

The reasoning for not regulating heat is multi-faceted. First, BC's *Clean Energy Act* states the following regarding the Province's energy objectives:

> "to reduce waste by encouraging the use of waste heat, biogas and biomass;"[29]

CanGEA believes that any regulation that is not absolutely required would discourage the development of heat applications that utilize by-product heat. If a project proponent determines that regulatory burdens make a by-product heat application uneconomic or prohibitively onerous, the heat project will not come to fruition.

Further to compromising the Province's objective to reduce waste, regulating 'waste heat' poses several other concerns. First, by-product heat applications could turn an uneconomic geothermal development into an economically viable one. Simply put, without the added revenue derived from waste heat heating applications, many geothermal developments may never see the light of day. Second, in British Columbia, the use of geothermal energy for heat is arguably more socially, economically, and environmentally beneficial than only placing geothermal electricity on the provincial grid. This is owing to the grid's existing clean nature, while heat continues to be sourced primarily from fossil fuels.

CanGEA would also refer to pages 9 and 10 of the KGI Submission to this inquiry (Exhibit C6-3). KGI argues that the competitive forces in the heat market act in a way such that the market alone serves to effectively regulate rates for heat, and therefore the BCUC doesn't need to take a role in regulating heat prices for consumers.

[29] SBC 2010, c 22, s 2(j).

> "The BCUC has noted that competitive forces are in the interests of the customer, and where they exist, rate regulation is light or unnecessary. However, in monopolistic or near monopolistic contexts, rate regulation is often required so that market suppliers don't take undue advantage.
>
> Against this backdrop, we suggest it's important to distinguish between heat and electricity, as the markets are very different with respect to their competitive context.
>
> The heat market is highly competitive. On a direct basis, despite the regulation of some participants, notably natural gas distributors and occasional strata or one-off heat projects, the market is open to competition from alternate forms of supply. At any one time, an energy buyer will have the choice of selecting from one or more supply types (electricity, natural gas – pipeline, natural gas – CNG, propane, fuel oil, diesel, solar, and/or wood) from any number of sellers.
>
> Further, this price competition is not a function of scale (or size). For all heat providers, economically efficient equipment exists at the lowest scale. During the preparation of this submission, as articulated by a colleague, the barriers to entry for a wood stove or baseboard heating are quite low when wood is plentiful and electricity is already on site."

Without regulatory intervention, geothermal energy is a low-cost energy source that can be used for nearly any residential, commercial, or industrial process requiring heat. Such resources spur economic growth and are especially suited to rural areas, municipalities, Indigenous communities, and entrepreneurs. For example, natural gas is not available in the Village of Valemount; instead, propane is trucked into the area and used for heating, along with wood. Heating could be instead provided by geothermal energy. In this context, Valemount is analogous to many rural and remote First Nations communities. Greenhouses, fish farms, timber kilns, and hatcheries are just some examples of the types of businesses that could operate in areas that were previously deemed uneconomic. Geothermal heat applications also create jobs in order to build and maintain heating infrastructure, and the economic growth created by the heat results in job creation as well. For First Nations communities that are seeking economic independence, employment and economic growth opportunities, heat applications of geothermal energy are arguably even more valuable than electricity.

The use of geothermal heat as a by-product reduces GHG emissions and improves air quality. When geothermal energy is used in heating applications, it is capable of displacing a significant amount of fossil fuel consumption and wood combustion. For example, for every TJ of natural gas that is left unburned due to geothermal energy substitution, approximately 50 tonnes CO_2e of GHG emissions are saved.[30] As previously mentioned, Valemount had the highest concentration of $PM_{2.5}$ pollution in the Central Interior Air Zone. $PM_{2.5}$ are particles up to 2.5 micrometres in diameter that are harmful to human health and can lead to shortness of breath, cardiovascular and respiratory diseases as well as birth defects. Despite air quality concerns, Valemount's residents are making the choice to burn additional wood in light of rising electricity prices due to the termination of the

[30] Environment Canada Low Carbon Economy Challenge GHG template - Natural Gas -Res. Comm. - BC

BC Hydro E-plus program.[31] If the existing geothermal project in Valemount was encouraged to use its by-product heat to warm homes and businesses, air quality in the valley would improve.

Overall, since the use of cascaded geothermal energy designs have such universally positive effect, it is CanGEA's submission that the BCUC must ensure that any regulatory framework that governs geothermal Indigenous Utilities allows for the economic development of cascaded geothermal systems. To do so, the regulatory framework must be tested and formalized so as to provide a sufficient degree of certainty, as well as cost and time effectiveness, to the project proponents.

8. Carbon Credits

At present, greenfield geothermal energy projects do not qualify for GHG offset units. In order for a geothermal electricity (or heat) generation project to be eligible as an offset project in BC, it has to be reducing emissions from a) its own baseline (e.g. brownfield) or b) removing emissions from the atmosphere (e.g. carbon capture). Greenfield projects are not eligible for carbon credits because they do not have a pre-existing facility, or baseline data.

CanGEA recognizes that quantifying emissions reductions from greenfield projects requires careful consideration in determining the criteria for developing baseline scenarios, however it is CanGEA's submission that greenfield Indigenous Utilities, geothermal or not, should be granted the ability to create, retain, and sell carbon credits. The receipt of carbon credits is not only a means of economic stimulus for an Indigenous Utility, but it is a way of encouraging that Indigenous Utilities are clean.

Further, it is CanGEA's opinion that quantifying emissions reductions from greenfield electricity projects is more variable than quantifying emissions reductions from greenfield heat projects. Whereas an electricity project may replace electricity generated by a variety of grid sources, a heat project will generally only replace heat from a discrete source in any given year. For example, a heat project might provide heat to a business that would ordinarily use 100% natural gas or 100% propane for its heating needs. Businesses contract with suppliers for their energy used for heating purposes, and this energy supply is metered in one way or another. This makes the quantification of emissions reduction easier, as there are verifiable records of the baseline scenario.

It is CanGEA's submission that the BCUC should recommend to the government that all greenfield energy projects should, on the merits of the project, have the opportunity to earn and sell carbon credits, irrespective of Indigenous ownership and energy type.

9. The Role of BC Hydro

As British Columbia's crown owned electric utility, BC Hydro is inextricably linked with any Indigenous Utilities that wish to provide electricity to the public-at-large. Doing so would offer that Indigenous Utility a revenue generating opportunity, and may provide opportunity for the

[31] Andru McCracken, "BC Hydro scraps E-Plus program, forces more wood burning" (July 4, 2019), *The Rocky Mountain Goat*, pg 3, online: <https://www.therockymountaingoat.com/2019/07/bc-hydro-scraps-e-plus-program-forces-more-wood-burning/>.

Indigenous community to become economically independent. In CanGEA's information requests to BC Hydro, we asked:

a) whether they offered capacity building opportunities to First Nations who are interested in developing their own projects, and
b) whether partnering with or offering capacity building opportunities to First Nations would either contribute to fostering the development of First Nations communities, or help them enhance grid reliability in targeted areas of the transmission system with existing issues.

CanGEA would like to address BC Hydro's response to our information request.

In their responses, BC Hydro expressly stated that BC Hydro is in a surplus position and does not have an expected need for new energy resources. It is CanGEA's opinion that while BC Hydro is in a surplus overall energy position, they do not have the capacity to effectively distribute their surplus energy to those who need it. As shown in Figure 5, below, it is clear that there are still areas of the Province that lack a reliable grid transmission system. **It is CanGEA's position that Indigenous Utilities could provide a viable solution to BC Hydro's locational grid reliability challenges while increasing available energy/capacity.**

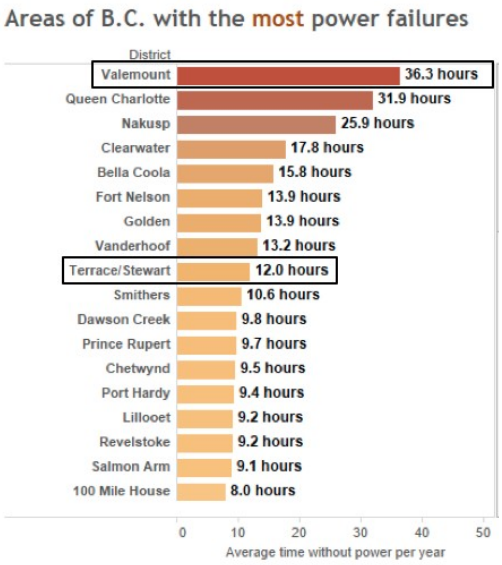

Figure 5: Geothermal projects under development in two of the least reliable electricity markets in BC.

BC Hydro stated that they have participated in direct discussions with First Nations that are advancing clean energy proposals. While CanGEA appreciates that this is the case, it is our understanding that BC Hydro is not proactively engaging with First Nations in areas where they see a need for energy infrastructure improvements. **It is CanGEA's opinion that the BCUC should consider recommending that BC Hydro actively seek out First Nations projects or partner with First Nations on new utilities projects in areas that lack energy security.** If BC Hydro actively encouraged projects with First Nations in areas where there are frequent electricity outages (or an insufficient amount of clean BC Hydro electricity to supply regional loads), BC Hydro could provide energy security to the areas of the Province that need it while also reducing

the Province's carbon footprint by a significant amount and improving air quality in at-risk airsheds. As shown in Figure 5, the geothermal projects under development in Valemount and Terrace coincide with areas that have some of the least reliable electricity supply in the Province. For First Nations, these partnerships and/or projects could provide economic security and vast social benefits, while for non-First Nations communities the reliable clean energy may lead to economic growth and health benefits as well.

10. Capacity Pricing

Jurisdictions worldwide recognize the benefit to their electricity grids of incorporating energy sources that have either baseload capacity or are dispatchable. The advantages accruing from such characteristics are referred to as ancillary services. Neither wind, solar, nor run of river hydro possesses both of these characteristics. In contrast, geothermal electricity is baseload and dispatchable. A further benefit of geothermal electricity production is that in colder climates, like Canada, there is the ability to generate more electricity output in the winter months. This matches well with the "winter peaking" electrical grid that exists within BC.

CanGEA submits that baseload and dispatchable electrical capacity should be financially recognized in British Columbia, as is done in the State of California. By providing dependable capacity, geothermal electricity has the potential to shape, firm and help integrate intermittent and other renewable sources such as wind, solar and run of river hydro onto the grid. This financial recognition should be available to Indigenous Utilities in order to maximize revenues from their geothermal electricity projects.

11. Capacity Call for Firm, Clean, and First Nations Owned Energy

First and foremost, CanGEA submits that regulations should be designed in a way that promote the development of Indigenous-owned utilities and the facilitation of environmental, economic, social, cultural and health benefits for traditional territories, and beyond. Secondly, dependable capacity in the form of ancillary services should be recognized.

It is CanGEA's final suggestion that the provincial government encourage the offering of a capacity call for firm, clean, and First Nations owned energy in areas that are affected by a lack of reliable grid-supplied clean electricity.

In the Pembina Institute's letter of comment (Exhibit D-3-1), they stated that:

> "The regulation of utilities in B.C., including any regulation of Indigenous utilities, needs to evolve to reflect a broader definition of the public interest that includes considerations beyond the cost of service, safety and reliability. Issues that should be considered by regulatory bodies include, in our view:
>
> - A commitment to advancing Reconciliation with Indigenous Peoples and upholding the principles of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), which the B.C. government intends to adopt into legislation.

- Environmental costs, including air quality impacts, impacts from diesel spills, and economic costs from climate change.
- Other socioeconomic factors including health impacts and local economic impacts."

CanGEA respectfully and wholeheartedly agrees with Pembina's opinion on this topic.

Offering a capacity call for firm, clean, and First Nations owned energy in areas that are affected by a lack of reliable grid-supplied electricity would address the issues that Pembina brings forth in their statement. Doing so would represent a commitment to advancing Reconciliation with Indigenous Peoples. Doing so would allow First Nations to benefit from the lands, territories, and resources that they have traditionally owned, occupied or otherwise used.

Offering this capacity call would displace fossil fuel and firewood combustion, thereby reducing GHG emissions and ameliorating local air quality.

Offering this capacity call would provide First Nations, communities, and entire regions with newfound energy security, allowing for sustained economic growth. It would foster healthy and vibrant communities by creating new stable jobs.

Offering this capacity call would reward proponents whose utilities are fully beneficial environmentally, economically, and socially.

12. Conclusion

CanGEA's mission is to accelerate Canadian exploration and development of geothermal resources in order to provide secure, clean, and sustainable energy to Canada's heat and electricity markets. CanGEA works to advance policies and regulations that enable the transition of Canadians towards the use of geothermal energy for electricity and heat, as applicable. In the context of the BCUC Indigenous Utilities Regulation Inquiry, we are advancing our work as an industry association by supporting Indigenous ownership of geothermal energy systems. Indigenous ownership and use of geothermal energy systems facilitates social, economic, and environmental benefits for traditional territories and beyond.

We thank the Commission for the opportunity to participate in this Inquiry. We are prepared to be of use in the promotion of British Columbia's Reconciliation, climate, and economic development goals and we truly hope that our participation in this Inquiry was helpful for the Commission in determining the future regulation of Indigenous Utilities.

CanGEA is available to answer more questions on this very important topic, if requested.