Canadian Geothermal Energy Association (CanGEA)
Pre-Budget 2017 Submission to the Parliamentary Standing Committee on Finance
August 5th 2016

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Executive Summary

The Canadian Geothermal Energy Association (CanGEA) is the collective voice of Canada's geothermal industry with a focus on the development of power generation and direct use of heat from geothermal resources. Our association represents 150+ members with the goal of unlocking Canada's tremendous geothermal potential.

We champion geothermal development because it will benefit Canadian individuals, businesses and communities by allowing each to prosper through access to low cost renewable energy (heat and power). Canada has a strategic advantage for the development of geothermal because we are already world leaders in sub-surface resource development and our numerous remote communities would see disproportionally large benefits from increased sustainable baseload energy access and economic opportunities.

The Challenges

1. Renewable heat is not yet effectively supported federally as a climate change mitigation tool.

2. Geothermal development, despite its potential benefits to Canada, has not occurred because it is not currently de-risked as other resource exploration/prospecting industries are; namely oil, gas, mining, and wind power.

3. Geothermal, and its benefits, are not well understood in Canada.

Solutions

1. **Properly recognize geothermal as a heat resource so that Canadian industry can mitigate climate change in innovative and job creating ways.**

2. **Allow geothermal exploration and development assured access to the Canadian Renewable Conservation Expense (CRCE) so projects can be built.**

3. **Support CanGEA, in our continuing public and industry outreach and education initiatives as well as the geothermal industry as a whole through strategic investment.**

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Geothermal Primer

Geothermal is a pan-Canadian clean and renewable source of power and heat derived from deep, (3 - 5 km) underground heat reservoirs.

There are 4 main types of geothermal resources in Canada (figure 1) that each use different technology and have unique costs: Volcanic/Magmatic(1), Hot Wet Rocks(2), Sedimentary(3), Enhanced Geothermal Systems(4). GroundSource Heat Pumps/Geoexchange are commonly referred to as shallow "geothermal" and are represented by the Geoexchange Coalition.

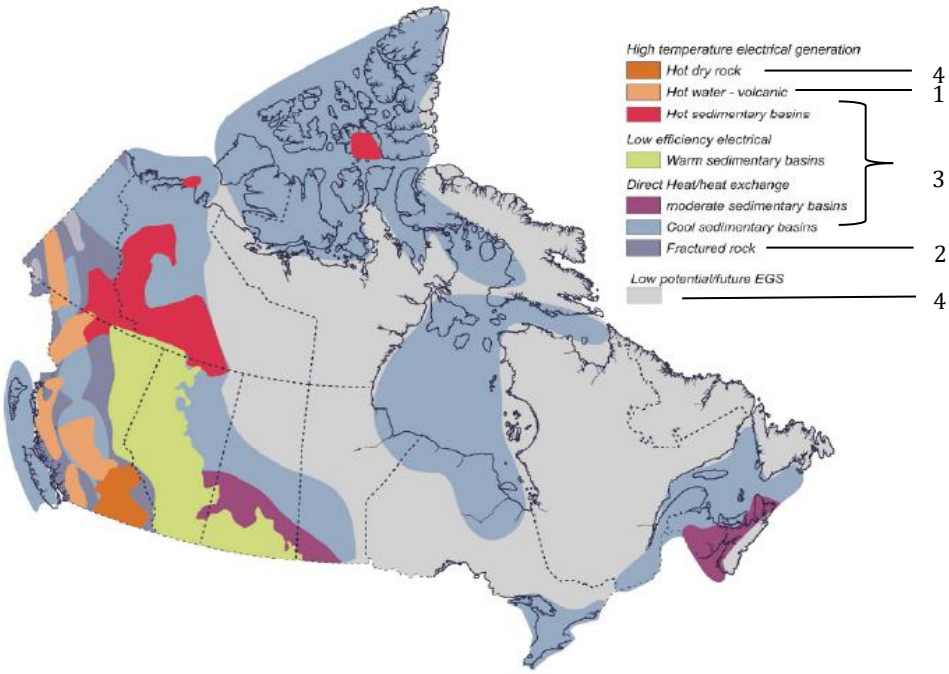

Figure 1. Canadian Geothermal Resource Map[1].

Each region of Canada has different geothermal opportunities (figure 2) but each can benefit from access to renewable heat and/or power.

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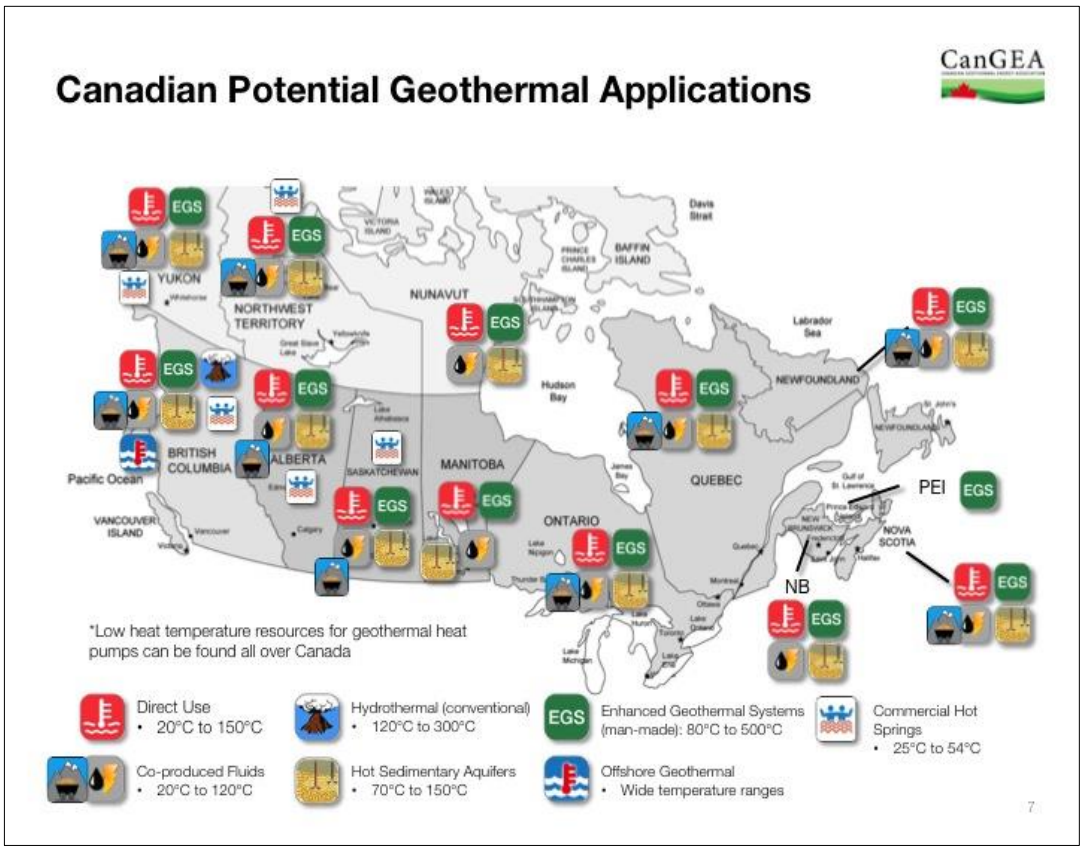

Figure 2. This graphic has grouped Volcanic/Magmatic(1) & Hot Wet Rocks(2) into the Hydrothermal category.

Because there are different types of geothermal, much like there are different types of fossil fuels, Canadian public and policy makers have, at times, misunderstood this renewable energy. The misunderstanding has created barriers to development and a widespread sentiment that geothermal doesn't work in Canada – or it would have been developed already. CanGEA's submission aims to clarify the reasons for, and offer remedies to, geothermal's slow start.

Despite having no geothermal power facilities in Canada, North America is still the largest continental producer of geothermal electricity thanks to the US and Mexico. **The geothermal resources in all three countries are similar in distribution and quality but development of geothermal to the south has occurred because of greater government, industry and public understanding of the benefits that geothermal provides.**

The finance committee should know that 82 countries around the world use geothermal because it:

- Is the most affordable renewable energy with a per-kWh cost ½ of hydroelectric or wind[2].

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- Is a baseload generator of electricity and heat with an average capacity factor of 92% compared to 25% for solar[2].
- Creates 11X more jobs than hydroelectricity and 17X more jobs than natural gas plants[3].
- Supplies heat to whole communities via district energy thereby offsetting thousands of tonnes of Greenhouse Gas emissions from furnaces[4].
- Increases food security for remote/northern communities by enabling otherwise impossible greenhouse agriculture in cold weather conditions as Iceland has demonstrated[5,6].
- Allows for commercial aquaponic fish farms that do not harm native fresh or saltwater fish species[6].
- Synergizes with established subsurface talent and infrastructure that would allow oil patch workers to return to work developing natural resources[7].
- Minimizes the area required for industry or drowned for dams because geothermal has the smallest project footprint for equivalent generation requiring 1.1% of the area needed for solar photovoltaic and 3.4% of the area used by a wind farm[8].
- Can deploy gigawatts of power and heat in less than 4 years[9].
- Creates significant employment in the tourism industry[10].
- Provides access to strategic lithium resources[11].

Furthermore, geothermal meets the Prime Minister's ministerial mandate goals to Jim Carr, Carolyn Bennet, Navdeep Singh Bains, Stéphane Dion, Chrystia Freeland, Catherine McKenna, Amarjeet Sohi and Bill Morneau[12].

Geothermal development in Canada would be aided by two factors - resource availability and resource accessibility, both of which derive from Canada's geology and synergy with the mining and upstream hydrocarbon sectors. Because the exploration and development of geothermal use techniques and technologies that are nearly identical to the hydrocarbon and mining industries, geothermal is the best way to redeploy un(der)employed Canadian subsurface geoscience expertise and associated services toward the sustainable energy future. For example, Chevron is the world's largest geothermal power developer.

The following agencies have each publicly stated that geothermal is a job creating, green energy solution for Canada:

- DeSmog Canada
- Alberta Oil Magazine
- Daily Oil Bulletin
- David Suzuki Foundation
- Greenpeace
- ATB Financial

Social license for geothermal has been achieved with a broad consensus between environmental protection groups and resource extraction proponents.

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Recommendation 1:	Support Canadian Renewable Heat.

1a:

By correcting the definition of geothermal from a power resource to a heat resource the entire geothermal industry will be boosted by being able to better develop and sell its energy. A geothermal project, due to thermodynamic constraints, can only use ~10% of the heat resource for power production. The other ~90% of the heat resource is not currently supported for sale.

As an example of the current misrepresentation of geothermal, the Accelerated Capital Cost Allowance (ACCA) technical class guide 43.2 states that a geothermal energy system is for power production, which means that drilling for heat (the actual resource) is not supported by the CRCE. This would be like telling a natural gas company that they have to use their product for power, instead of letting industry find productive uses for the resource.

Supporting geothermal heat is also a good job creation strategy because heat is where most geothermal job creation occurs, 4:1 compared to only power production[3].

1b:

To achieve a sustainable future, renewable heat must be a major component of the economy. The potential benefits from geothermal heat are myriad and could serve all Canadians because our geothermal resources are diverse in character and distribution across the country (Figures 1 & 2).

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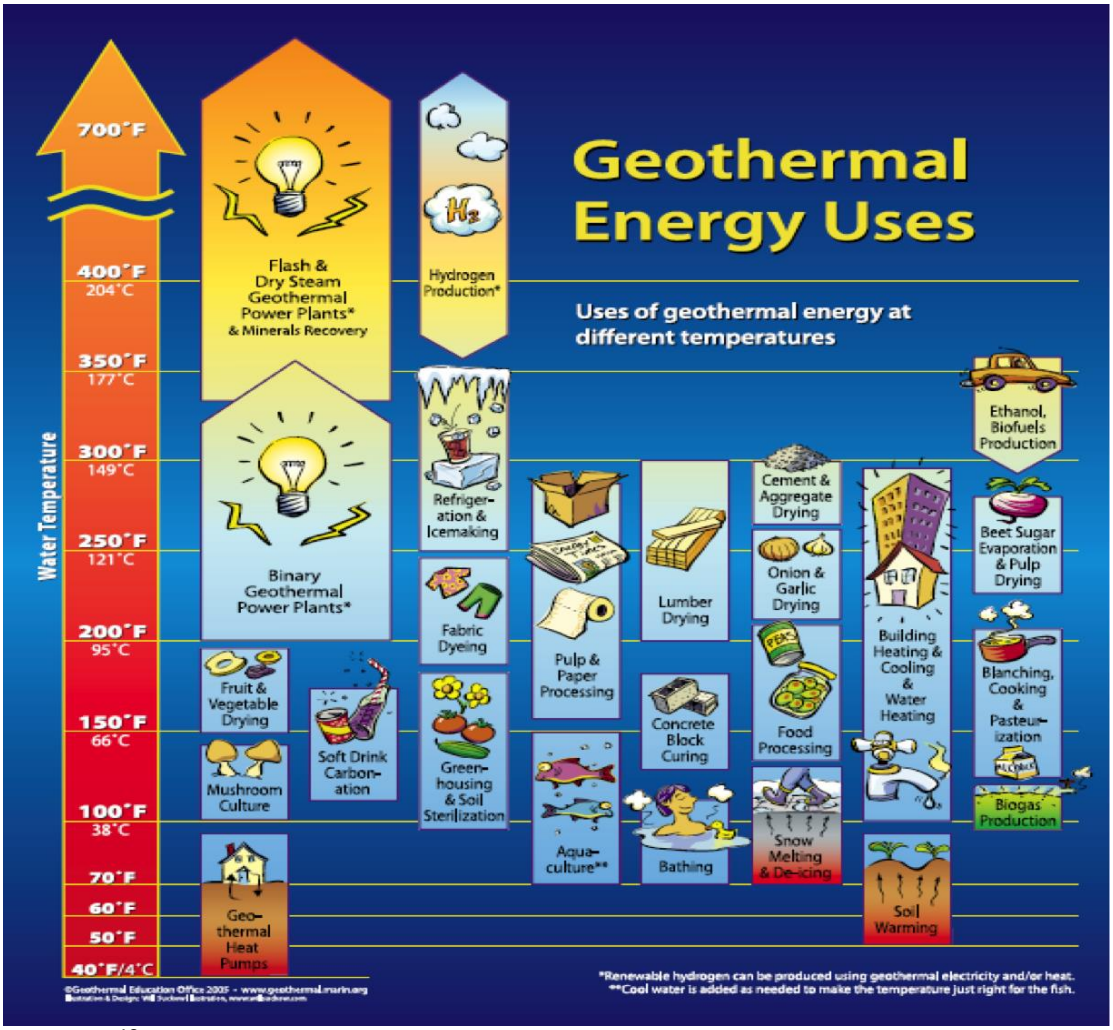

Figure 3[13] Strikingly shows how geothermal heat can empower and diversify an economy.

The largest Geo-Park in Iceland has created 650 jobs using many of the heat industries shown above. In 2015, Kirchweidach Germany created over 150 jobs in a single geo-greenhouse operation. The Valemount, BC Geo-Park (http://borealisgeopower.com/geoparks/) looks to create ~100 heat jobs and the Temple Gardens Mineral Spa, in MooseJaw, SK has created 200 jobs from a single geothermal warm well.

CanGEA recommends that the Federal government **include renewable heat, and power from renewable heat, from geothermal and other renewable energies in the Canada Infrastructure Bank, Green Bond, and Low Carbon Economy Trust programs.**

- Creating loan guarantees and $/GJ incentives as part of the support for renewable heat projects would signal to industry that the Canadian government

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is willing to think beyond the electrical outlet for ways to achieve climate change and economic diversification targets.

- The Eco-Energy for Heat Incentive program should be expanded to include renewable heat sources that have been so far excluded such as geothermal. Only passive solar heating was allowed to claim the 25% capital rebate, up to $400,000/project.

Recommendation 2:	Support Geothermal Exploration & Development

One of the major reasons geothermal has not been well developed in Canada is that the exploration of the resource has not been de-risked as compared to other industries that need resource prospecting; namely oil, gas, mining, and wind power. **By supporting geothermal programs to the same level that other industries have received, the geothermal industry would begin within the year.**

An effective geothermal exploration and development support program would include:

- The core hole and slim hole exploration wells are CRCE eligible expenses given that
  - the exploration will take more than one fiscal year,
  - the generation of electricity is not guaranteed and,
  - the wells could be used for profitable heat production.
- production wells may require a test turbine.
- transmission is an eligible expense.

Recommendation 3:	Support Geothermal Literacy, Scientific Exploration & Industry Development

3.a

So that we may expand our current "powEARTHful" outreach, education and market development initiatives CanGEA asks that the Federal government provide financial assistance of $300,000 over 3 years to CanGEA These three activities will facilitate the development of geothermal in Canada by identifying targets for development, educating the public and policy makers about project benefits and showing businesses the opportunities of investing in geothermal.

3.b

Scientific exploration is the foundation of innovation and CanGEA recommends that the Geologic Survey of Canada (GSC) receive funding and a mandate to develop a publicly accessible Geothermal Data System, Resource Assessment and Classification System. The more that Canadians know about Canadian resources, the more innovative we can be with our shared resource. CanGEA has taken on this role and completed maps for Alberta, British Columbian and Yukon, but it is more suitably a role for the GSC to take over and expand upon.

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3.c

For Canada to develop its geothermal industry, the government should give geothermal the same start-up support previously awarded to the wind and solar electricity industries. The wind industry under the Wind Power Production Incentive received $334 million which was directly responsible for the creation of 924 MW of clean electricity. The Renewable Power Production Incentive was allotted $97 million and the Eco-Energy for Renewable Power Program (EERP) has paid out $1.4 billion to renewable power producers in Canada. No geothermal project was able to benefit from the latter 2 programs because:

- The programs did not recognize the value of direct use heat which
  - Significantly limited the ability to integrate commercial heat opportunities into geothermal power projects in order to make them more economic.
  - Did not allow developers to finance their projects because the sub-surface resource exploration federal de-risking programs do not properly recognize geothermal as a heat source that must be prospected.
- Geothermal projects would only be funded on a "case by case" basis which stymied development as compared to other renewable generators which were able to calculate project economics with investor confidence.
- Most Provinces/Territories did not offer geothermal tenure rights at the time.

CanGEA is working towards correcting the last point but the geothermal industry needs the federal government's help to fix the first two.

CanGEA requests that the federal government either create a Geothermal Power and Heat Production Incentive or restart the EERP with revisions so that geothermal is not disadvantaged. For either program to see maximum use and benefit, CanGEA recommends that the new program(s) should:

- Offer upfront cash grants equivalent to the net present value (NPV) of the $/MWh payment schedule (as the USA does) which will de-risk upfront exploration/drilling.
- Develop geothermal capacity factors with industry input so that developers can fully prepare an economic analysis for investors.
- **Make direct use of heat a centre point; the government has helped renewable electricity in the past, it is time to help geothermal renewable heat and power.**

Conclusion

Thank you for considering our submission to this 2017 pre-budget consultation. CanGEA believes that our recommendations will:

- Quickly create a new Canadian green energy industry
- Create thousands of direct jobs for oil & gas experts to develop emissionless heat and power.
- Create tens of thousands of indirect and induced jobs that will:
  - Generate opportunities for Canada's burgeoning knowledge economy and innovative entrepreneurs

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- Produce local prosperity across Canada, especially remote communities through low cost energy access
- Increase Northern sovereignty and Northern food security through low cost greenhouse agriculture

Geothermal is heat, power, jobs, local food and economic diversification and the federal government can start a Canada wide industry within a year.

Sincerely,

Alex Kent
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