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**Written Submission for the Standing Committee on Finance's
Pre-Budget Consultations 2020**

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Canadian Geothermal Energy Association (CanGEA)

Recommendation 1: That the Government of Canada provide funding in the amount of \$250,000 for CanGEA to scale up its geothermal energy literacy pilot into a Pan-Canadian initiative.

Recommendation 2: That the Government of Canada create a 2-stage geothermal risk reduction program to help mobilize risk capital towards exploratory and production geothermal well drilling.

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 harnessing Canada's vast and diverse geothermal energy potential.

Per-capita energy use in Canada is higher than elsewhere in North America and with Canada being a northern country, the need for clean sources of heat and electricity is growing. As a result, traditional renewables such as hydro, wind and solar have seen industry growth in Canada. Conversely, the geothermal energy industry has seen little growth, despite Canada having significant and accessible resources. The result is an underdeveloped industry that could benefit from the recommendations put forward in this document.

Geothermal energy can provide clean heat and reliable baseload electricity where resources are available. A 2012 Geological Survey of Canada report concluded that the available high-grade geothermal resources in Canada are considerable and a key constraint to development is related to the costs and risks associated with exploration drilling. CanGEA believes that with the right support from the federal government, Canada's nascent geothermal industry can thrive.

The Liberal government's recent declaration that Canada is in a national climate emergency is significant. From wildfires in the West, to melting permafrost in the North, to flooding in the East; we are beginning to see real effects of climate change from coast to coast to coast. To mitigate climate change, Canada must transition to a lower-carbon economy, requiring a diverse mix of low-carbon sources of energy. CanGEA submits that in regions with geothermal potential and in Canada's north, geothermal heat and electricity will be crucial to Canada meeting its greenhouse gas (GHG) emission targets.

In anticipation of the 2020 Federal Budget, CanGEA is putting forward 2 recommendations for the Standing Committee on Finance's Pre-Budget Consultation with the goal of improving the ecosystem for geothermal energy development in Canada.

Recommendation 1: That the Government of Canada provide funding in the amount of \$250,000 for CanGEA to scale up its geothermal energy literacy pilot into a Pan-Canadian initiative.

Takeaway: Energy literacy is key to advancing renewable energy projects, like geothermal, which will be crucial to Canada meeting its GHG emissions targets and to attract investment and create jobs in Canada's clean technology sector.

CanGEA recommends that the Federal Government provide funding in the amount of \$250,000 for CanGEA to scale up its geothermal energy literacy educational initiative. With the Government of Canada's demonstrated commitment to increasing renewable energy generation and the *Pan-Canadian Framework on Clean Growth and Climate Change*, Canada is on a path to a greener

future. Advancement on this path relies on the building of low-carbon energy projects, which will reduce GHGs, create jobs and attract further investment to Canada's clean technology sector.

Geothermal energy technologies are mature and utilized in 86 countries around the world. According to the US Department of Energy, geothermal energy projects produce 4 jobs/MegaWatt (MW) in the construction phase and maintain 1.7 jobs/MW throughout the project's lifecycle. Moreover, geothermal energy has been shown to have the highest degree of skill transferability with the oil and gas industry, which suggests that Canada's burgeoning geothermal industry represents an opportunity to harness existing skilled labourers within Canada. Lastly, geothermal energy projects produce zero GHG emissions and have long project lifecycles, creating a long-term sustainable stream of revenue and jobs.

Currently, Canada does not produce any geothermal electricity and has very few cases of projects that utilize geothermal heat. This contributes to the low level of understanding government and the public have of this energy type. A recent report by the Generation Energy Council found that one of the necessary tools to increase the use of renewable fuels in the energy transition is public confidence. The first step towards bolstering public confidence is building a baseline understanding of renewables that are not well-known or tacitly understood, such as geothermal energy. To build this baseline of understanding, information must be readily available on public forums. This is simply not the case currently.

As a case in point, Natural Resources Canada's (NRCan) landing page for renewable energy does not feature geothermal energy alongside other renewables, see Figure 1 below.

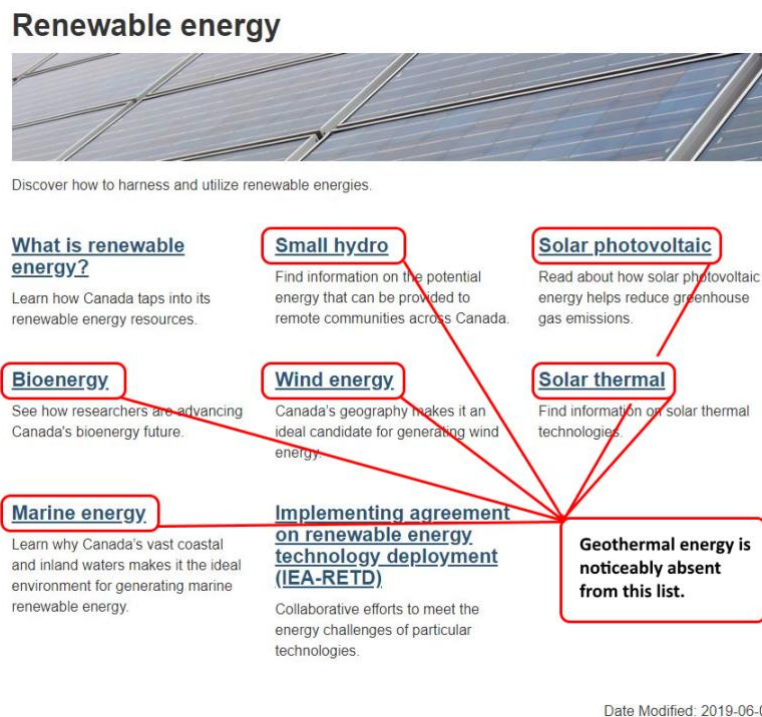


Figure 1 – Natural Resource Canada's Landing Page for Renewable Energy
<https://www.nrcan.gc.ca/our-natural-resources/energy-sources-distribution/renewable-energy/7293>

As Figure 1 reveals, geothermal energy is absent from NRCan’s renewable energy landing page, despite all other renewables being featured. It is worth noting that there is a similar issue on the Government of Canada’s renewable energy landing page. As one aspect of our geothermal energy literacy initiative, CanGEA will work with governments across Canada to ensure that information pertaining to geothermal energy is accurate and easily accessible. In addition to working with government, CanGEA will scale up its geothermal energy literacy series, piloted last year.

In 2018, CanGEA delivered a geothermal energy literacy workshop series to 5 communities in Alberta. Workshop attendees rated the workshop 4.4/5 on average and in total, the 5 workshops reached over 1,000 individuals. CanGEA would like to scale up its geothermal energy literacy pilot into a pan-Canadian initiative, with an early-stage focus on Western and Northern Canada. CanGEA recognizes that an informed and knowledgeable populace, including local governments, is key to gaining the social license to move energy projects forward and creating jobs, reducing GHGs and attracting investment.

CanGEA has already identified target locations with geothermal resource potential and obtained support letters from local governments and other local groups. CanGEA has prepared a project plan regarding the nature of the energy literacy series.

CanGEA recommends that the Government of Canada provide funding in the amount of \$250,000 for CanGEA to scale up its geothermal energy literacy pilot into a pan-Canadian initiative.

Recommendation 2: That the Government of Canada create a 2-stage geothermal risk reduction program to help mobilize risk capital towards exploratory and production geothermal well drilling.

Takeaway: Geothermal drilling risk reduction programs have been successfully implemented in several countries, helping to mobilize risk capital towards geothermal exploratory and production drilling. In addition to promoting increased drilling activities, a 2-stage geothermal risk reduction program will also create jobs for Canada’s existing oil and gas labour force.

A typical exploration campaign and initial test drilling program of 3-5 geothermal wells costs between \$20-\$30 million. While modest in comparison to the total cost of developing a geothermal project, the inability to raise funds for exploration and initial drilling can delay and stall geothermal projects before resources are even confirmed. Raising the necessary risk capital can be particularly challenging for private-sector geothermal developers, since exploration drilling is typically funded with owner equity. Therefore, the real or perceived geothermal resource risk has become a common barrier to advancing geothermal development globally.

Stage 1: Cost-Shared Exploratory Drilling Program

A government cost-shared exploration drilling program creates additional liquidity in risk capital that is often scarce and/or costly to access. A cost-shared drilling program involves the government covering a portion of the cost of an exploratory well, thereby providing an incentive to developers to drill more exploratory wells. An added measure could be a repayment scheme, where the developer refunds all or a portion of the government’s cost-share for successful exploration wells when the project becomes profitable.

Case Study: The United States and Japan’s Successful Cost-Shared Drilling Programs

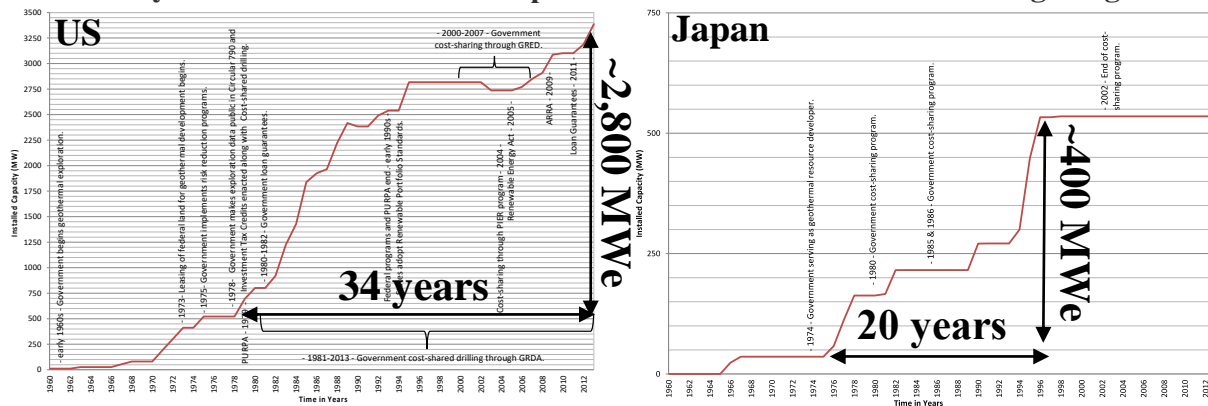


Figure 2: Installed Geothermal Electricity Capacity Vs. Time in United States and Japan

The United States (US) experienced positive growth in geothermal developments as a result of a cost-shared drilling program and is currently considering another round of cost-shared drilling. Over the 34 years the US cost-shared drilling program was active, >2,800 MW of geothermal electricity was added to US grids. It is worth noting that other support programs were also active during this time.

Japan also offered a geothermal exploratory cost-shared drilling program for geothermal developers from 1975-1995. Over the 20 years that the program was active, >400 MW of geothermal electrical capacity was installed.

Cost-shared exploratory drilling regimes have been used successfully in several countries with nascent geothermal development programs with few drilled wells. The development of a cost-shared drilling program could promote further exploratory efforts throughout Canada. Case-in-point, the Qulliq Energy Corporation, Nunavut’s power authority, is currently seeking support to drill exploratory wells to investigate their geothermal resource potential.

Stage 2: Geothermal Resource Risk Insurance Regime

Following exploratory drilling and confirmation of the geothermal resource, developers must drill larger diameter production wells, which transport large quantities of hot geothermal fluid to the surface. Due to the larger diameter of production wells, they are more costly and there is still risk

of drilling an underperforming well, which can lead to project failure, especially in countries with younger and less developed industries. One internationally-tested mechanism to reduce risk is the implementation of a geothermal resource risk insurance program.

In such a scheme, initial resource due diligence is carried out by the insurer, in this case, the Government of Canada (GoC), then the developer and insurer jointly create a success criterion for the well in question. Based on the likelihood of payouts, a premium is then selected, which must be paid up-front by the developer to participate in the insurance program. Following drilling, the production is assessed. If the results deem a well to be underperforming or are outside the predetermined success criteria, the GoC would compensate the developer for a portion of their losses.

Case Study: France's National Geothermal Risk Guarantee System

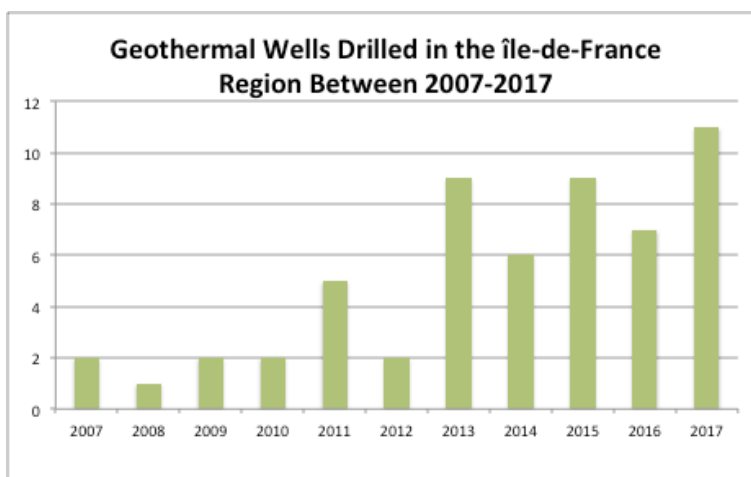


Figure 3: Geothermal Wells Drilled in the Île-de-France Region between 2009 and 2017
http://www.geothermie-perspectives.fr/sites/default/files/afpg_2015_etude_de_marche_2015_batok.pdf, pg.18.

The French geothermal risk guarantee system offers financing to cover geological risk and is based on two complementary mechanisms, short-term risk (STR) and long-term risk, where this case study will focus on the STR program. The STR program covers geological risk in the event of total or partial failure of the first drilling operation of a geothermal project. Success measures are based on flow rate and temperature, which are useful to gauge a project's potential feasibility and profitability. Eligibility for the STR program requires the project to be accepted by a Technical Committee and for the developer to pay a premium up-front. France's STR program has contributed to a significant increase in the number of geothermal wells drilled per year in the Île-de-France region, as seen in Figure 3.

The Netherlands have also implemented a similar type of geothermal insurance scheme, which led to a significant increase in the number of drilled geothermal wells per year (Figure 4) as well as the number of geothermal installations (Figure 5). Considering the success of such insurance schemes, CanGEA recommends that the GoC develop a geothermal resource insurance scheme as the second stage of the drilling risk reduction program.

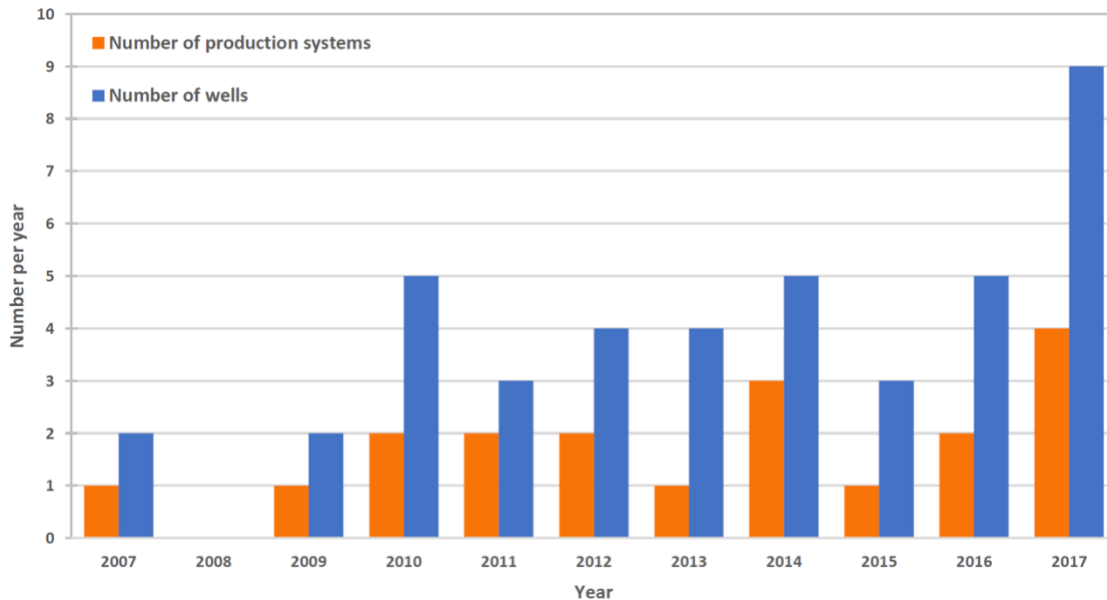


Figure 4: Number of Wells Drilled and Production Systems Installed Per Year in the Netherlands
<https://www.nlog.nl/en/geothermal-energy-overview>

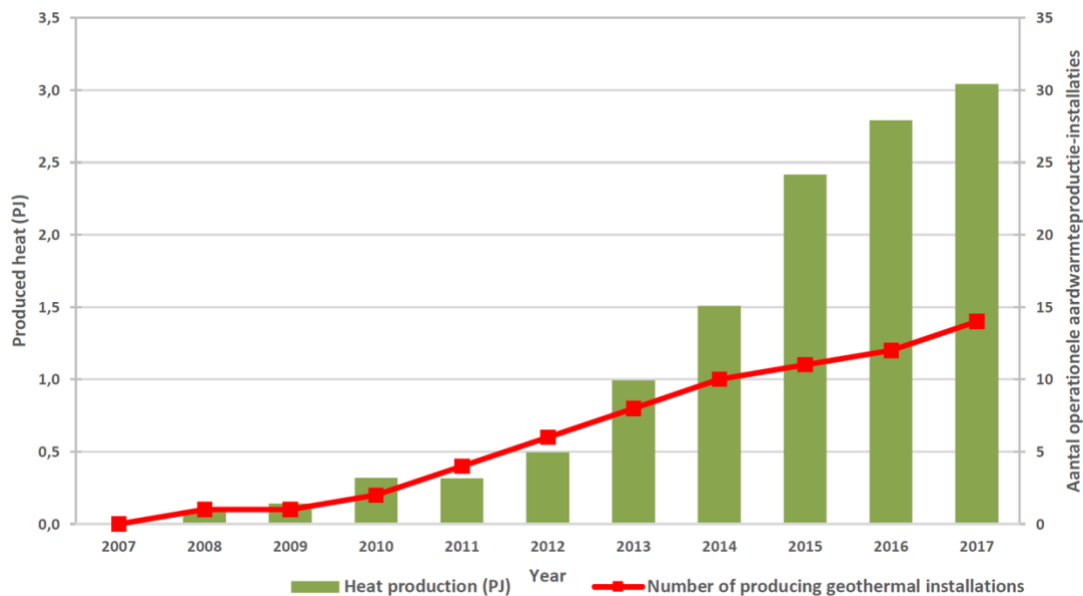


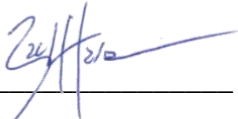
Figure 5: Annual Production of Geothermal Energy and Number of Producing Geothermal Installations in the Netherlands
<https://www.nlog.nl/en/geothermal-energy-overview>

CanGEA recommends that the GoC create a 2-stage geothermal drilling risk reduction program to help mobilize risk capital towards exploratory and production geothermal well drilling. CanGEA would be pleased to assist in assembling the Technical Committee necessary for the program’s creation.

Conclusion:

CanGEA welcomes the opportunity to appear before the Committee to further elaborate on how our suggestions will promote further geothermal developments in Canada, thereby aiding in the transition to a lower-carbon economy.

Sincerely,



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