



## Deliverable D2.3

### Market Study Visit Canada

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## 1. Introduction

In 2019, a GeoEnergy Europe market outlook report country screening process, identified Canada as an “emerging Market with limited project development to date”; the principal reason for the lagging investment in Canada’s geothermal business has been widely attributed to the availability of cheap gas. However, since the initial review, there has been significant progress with limited private investment taking place, based on favourable government policy sentiments supporting the green agenda. Deep geothermal opportunities offer attractive prospectivity, particularly in parts of British Columbia, Alberta, and Saskatchewan, under the right market conditions with focus on value creation which considers geothermal exploitation on a standalone, hybrid production with options for associated brine mineral extraction and carbon sequestration. To this end, the main objectives of this market survey visit were focused on the deep Canadian Geothermal Sector, with significant attention to the overall objectives of the GEE2 project. The events featured presentations by EU companies seeking partnerships with Canadian counterparts to develop deep geothermal energy. The visit addressed the key requirements of the clusters and SMEs as outlined in the objectives of the GEE2 project including:

- Presentation of tailored strengths of the member companies to target Canadian market.
- Enhancement of business development and capacity building activities through engagement.
- Supporting transition to the green economy, utilising existing skillsets in subsurface geoscience.
- Developing new sustainable services, drawing knowledge from more traditional subsurface activities.
- Supporting the expansion of employment in niche scientific and engineering related disciplines.
- Sustainable application of subsurface knowledge, supporting the harnessing of geothermal energy.

Notwithstanding the nascent status of the geothermal industry, Canada has sufficient expertise and knowhow gained in the oil and gas industry to accelerate the Canadian energy landscape to incorporate geothermal, mineral extraction and carbon sequestration in the overall energy mix. It also has the human resources and experience to support the global acceleration of the geothermal industry in Europe and worldwide, and in doing so, driving down the costs of drilling through improved efficiencies. Europe on the other hand has a long and distinguished track record in the harnessing of geothermal energy, including resource discovery, development, and plant performance optimisation at significant scale. The opportunities for synergies between Canada and its European counterparts are clearly in evidence.

## 2. Preparatory Work

Preparatory work for the market visit followed on from the output of virtual market visit held on Wednesday, 26 May 2021, when partners of the GEO-ENERGY EUROPE metacluster met with representatives of the Canadian geothermal sector to exchange thoughts about the prospects of future cooperation between European and Canadian companies involved in the geothermal sector around the development of international projects. Canada has significant potential for geothermal power production, relatively close to major urban centres in the west of the country close to the border with the USA. However, these have not been developed to date, principally due to the plentiful availability of cheap gas. Europe, on the other hand, has long tapped into its geothermal resources with a focus on heating and cooling, developing a world leading expertise in deep geothermal energy projects.

On Wednesday, May 4<sup>th</sup> 2022, the “Energy Efficiency, Water Management & Waste Management – Canada Cleantech Market Opportunities” webinar was organised with EU Techbridge project in collaboration with [Gedeth Consulting](#), a consulting firm specialized in international business development, and [GEO-ENERGY EUROPE](#), an European project that brings together the European know-how, technologies and experience in geo-energy, with an emphasis on the EU SMEs’ offer. The goal and main focus were to obtain guidance from Gedeth on the Canadian market and more specifically on the basic instruments to start building a new business overseas. This included an overview of the Comprehensive Economic and Trade Agreement between the European Union and Canada (CETA).

After consulting with the Geological Survey of Canada, it was considered that the Prospectors and Developers Association of Canada (PDAC) might not be the best venue for geothermal as it is very much mineral focused. However, considering the overall objectives of GEE2, particularly those in relation to technology transfer, and the wider context of the just energy transition, it was considered that PDAC was a valid target convention for those clusters expressing interest in attending the Canadian Market Visit. As it transpired, the technology transfer opportunities, particularly from the mining sector best served the objective supporting transition to the green economy, utilising existing skillsets in subsurface geoscience.

The rescheduling of PDAC from its normal early March slot to June did present certain difficulties in that it coincided with Geodays 2022 in Europe, the International Conference on Geothermic and Geothermal Energy in Montréal, closely followed by GeoConvention. Indeed, the latter was recently reported as the biggest event in Canada, held in Calgary every year, with more focus for people working on deeper high temperature systems.

A schedule of the associated competing June events is given below.

[GeoTHERM \(geotherm-offenburg.de\)](#), June 2-3 2022 - Offenburg, Germany

[The Global Energy Show - North America’s Leading Energy Event](#), June 7-9 – Calgary, Canada.

[Journées de la Géothermie 2022 - AFPG](#), June 9-10, 2022 - Aix-les-Bains, France

[Geodays 2022](#), June 14 -15 - Palais Beaumont, Pau

[Prospectors & Developers Association of Canada](#), June 13-15 June.

[International Conference on Geothermic and Geothermal Energy](#), June 16-17- Montreal, Canada.

[Geoconvention 2022](#), June 20-22 Calgary, Canada.

A “save the date” invitation to the GEE2 PDAC geothermal seminar in Toronto attracted limited initial response and led to the decision to extend the scope of the market visit to include attendance at the Global Energy Show in Calgary (Programme in annex 1), just ahead of PDAC.

Prior to the visit, Geocience Ireland (GI) attended an informative seminar hosted by Dublin Chamber on the 29<sup>th</sup> March. This included presentations by the Ireland Alberta Trade association and Invest Alberta. At the forefront of Canada’s energy transition, it was learned that Alberta was committed to completely offsetting carbon dioxide emissions by 2050 and is leading projects on geothermal, wind, solar, battery storage and carbon capture. Following up on these discussions, it was established that the main deep geothermal projects, underway are in the region were DEEP, Razor, Alberta No. 1, Clark Lake, and the Mount Meager Project. In addition, the Eavor demonstration facility provided an innovative and attractive technology offering that potentially has global application. It was also determined, early in the planning process, that there is a clear distinction between geothermal and shallow geo-exchange systems in Canada. For this reason, given the deep geothermal market study focus, the scope of the market visit centred on to the above five deep geothermal opportunities in addition to the Eavor deep geoexchange demonstration.

### 3. Training Session

The training session was organised by GEODEPP on the 10<sup>th</sup> May, between 2:00pm and 3:00pm (CET), online. The organisation of this training session followed the same pattern as the previous one in Chile: overview of the Canadian geothermal market, presentation of the collaborative tool developed by CAPES, SME coach and presentation of the planned market visit. The final agenda was as follows:

14:00 CET	<b>Introduction :</b> <ul style="list-style-type: none"><li>• Overview of Geoenergy Europe project (Project Coordinator – Geological Survey Ireland)</li><li>• Presentation of capacity building activities (GEODEEP)</li></ul>
14:15 CET	<b>Presentation of Canadian Country Fiche (Expert on Canadian market- GEODEEP)</b> <ul style="list-style-type: none"><li>• global structure of the energy market</li><li>• geothermal market (regulation and risk mitigation scheme if existing, market barriers, structure of the competition, key stakeholders)</li></ul> <b>Presentation of GEE Collaborative tool (CAPES)</b>
15:45	<b>Coaching of our SMEs (Halfway / GEODEEP)</b> <ul style="list-style-type: none"><li>• Key aspects when working with Canadian geothermal companies</li><li>• Identification of specified know-how developed by our SMEs to fit to market country specificities</li><li>• If needed, identification of proper expertise / competencies to develop outside the consortium, to reach key target markets?</li></ul>
16:45	<b>Roundtable with participants - Q&amp;A session</b> <ul style="list-style-type: none"><li>• Share experience</li><li>• SME's expectations in coherence with training contents ?</li></ul> <b>Presentation of Canada Market visit (<u>13<sup>th</sup> of June in Toronto</u>) (Geoscience Ireland)</b>

A market visit briefing session was also arranged for the Irish Ambassador in Ottawa, this session took place on the 9<sup>th</sup> of June to garner support for the GEE2 project and to explain the content of the Market Visit in Calgary and Toronto. The Deputy Head of Mission attended the GEE2 Seminar in Toronto on 13<sup>th</sup> June.

## Training Session - Canada

### Presentation of the market Visit



GEO-ENERGY  
EUROPE

1. British Columbia & Yukon – power generation possible from steam or volcanic hot rocks. However problems due to reduced porosity and permeability.
2. Alberta, B.C. & Saskatchewan - power from sedimentary rocks in the west with adequate depth, porosity, permeability and population.
3. Yukon & North-West Territories - limited suitable areas, sparse population. Potential for enhanced geothermal systems and SedHeat, under evaluation.
4. Enhanced Geothermal System (EGS) feasibility studies required due to low temperature and limited porosity and permeability. (< 500lt/sec) . Requires more research support.

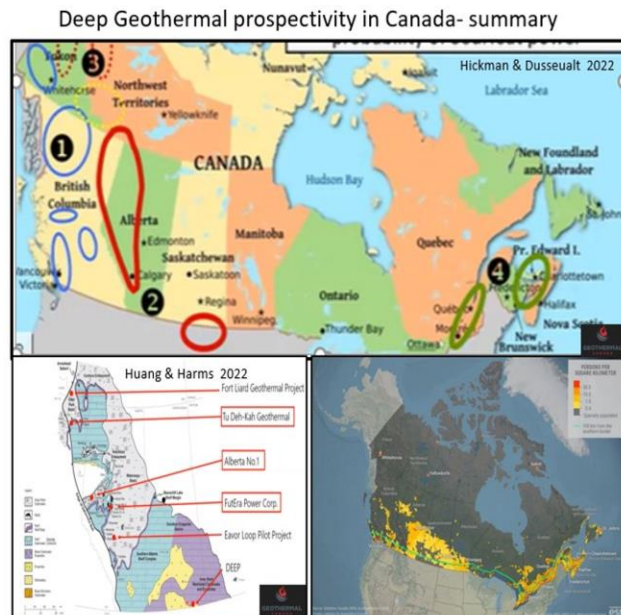


Figure 1: Slide from the presentation pack of the training session focused on the Market Visit planning on deep geothermal prospectivity in Canada.

## 4. Market Visit

### 4.1 Overview of service offerings of clusters, SMEs Business support and research agencies

The Market Visit was divided into two sessions. The first session allowed the clusters, SMEs and research associates to outline their specific interest in business development opportunities between Canada and like-minded European counterparts with specific reference to the deep geothermal opportunities highlighted during the visit. The second session concentrated mainly on addressing the more specific technical goals of GEE2. The running order with contributors, targets and themes is given below.

A visit to the Eavor demonstration facility, north of Calgary was included, after interest was expressed from the German and Italian clusters. This visit took place on the 6<sup>th</sup> June, followed by scheduled meetings at the Global Energy Show and thereafter, PDAC. The initial 'save the date' for the Toronto Market seminar was the 12<sup>th</sup> of June, just ahead of the PDAC but this was subsequently changed to the afternoon of the 13<sup>th</sup> to accommodate interested visiting stakeholders.

The second part of Market Visit took place on the afternoon of 13<sup>th</sup> at the Executive Cosmopolitan Hotel, in Toronto. The agenda is below.

#### Agenda & Running Order for GeoEnergy Europe Seminar – Toronto, Monday, 13<sup>th</sup> June 2022

Time	Item	Contributor	GEE2 Targets and Objective Themes.
14.00-14.15	Cluster 1	GEE2 metacluster	Outline of key aims and objectives of the GEE2 project:
14.15-14.30	Cluster 2	Cluster of Applied Earth Sciences (CAPES)	Overview of CAPES state of the art services & solutions
14.30-14.40	Cluster 3	Jesder	Overview of JESDER state of the art services & solutions
14.40- 14.55	SME 1	IdroGeo	Engineering and Geological consultancy services
14.55- 15.10	SME 2	Steam	Engineering, Environmental and Geological consultancy services
15.10-15.25	SME 3	Mincon	Mincon-overview of geothermal interests
15.25-15.30	Research Member	iCrag	
15.30-15.45	Business 1	Alberta Energy	Deep Geothermal – Policy Business Environment Update
Coffee Break	30 mins		Networking
16.15-16.30	GEE2 Canada Strategy	Geoscience Ireland	Overview of Geoscience Ireland coordination of GEE2 Canada programme.
16.30- 16.45	Objective 1	Geoscience Ireland	Sustainable application of subsurface knowledge, engineering supporting the harnessing of geothermal energy.
16.45- 17.00	Objective 2	CGG Electromagnetics	Supporting transition to the green economy, utilising existing skillsets in subsurface geoscience. -
17.00-17.15	Objective 3	Quantec	Developing new sustainable services, drawing knowledge from more traditional subsurface activities.
17.15- 17.25	Business 2	Enterprise Ireland	Enhancement of business development and capacity building activities through engagement
17.25- 17.35	Close	Wrap up & Close	All objectives summary of progress and follow up actions.



<b>Attendees participating in Toronto seminar</b>	<b>Stakeholder affiliation</b>
Cluster partners that attended (2).	<a href="#">Geoscience Ireland</a> , <a href="#">CAPES</a>
SME's that attended from GEE2 (3)	<a href="#">STEAM</a> , <a href="#">IdroGeo</a> , <a href="#">CGG Electromagnetics</a>
SME's that attended from the target country (3)	<a href="#">Quantec Geoscience</a> , <a href="#">White Arrow Technical Services LLC</a> , <a href="#">Mincon</a>
Research Institutions from Ireland (1)	<a href="#">iCRAG</a> ; <a href="#">University College Dublin</a>
Research Institutions from target country (1)	<a href="#">University of Waterloo; Ontario</a>
Embassy officials & Government support bodies from GEE2-E.U. (2)	<a href="#">Enterprise Ireland</a> , <a href="#">Embassy of Ireland, Ottawa</a> .

## 4.2 Legal framework and business Incentives

[Invest Alberta](#) and [Energy Alberta](#) were particularly helpful in providing guidance and updates in relation to legislation and the regulatory frameworks in Alberta. Current industry initiatives include the development of the National Geothermal Innovation Roadmap (GIR), the Canadian National Geothermal Database, provincial/territorial geothermal favourability maps, and various lobbying efforts on the part of the Canadian Geothermal Industry Association to build provincial and federal policy support for the geothermal industry.

[CanGEA](#) (the Canadian Geothermal association) also successfully advocated introducing tax breaks for geothermal projects. Under Schedule II of Canada's Income Tax Act, if certain types of renewable energy and conservation equipment are included under Class 43.1, it then allows for a 30% accelerated capital cost allowance rate. Formerly, geothermal equipment was not included under Class 43.1.

The Alberta government has cited increased interest in geothermal development as a reason for the establishment of a dedicated geothermal framework<sup>1</sup>, along with the potential for geothermal resources development to create jobs while lowering greenhouse gas emissions. Bill 36 Geothermal Resource Development Act received proclamation on December 8, 2021. New regulations and amendments to support the implementation of Bill 36<sup>2</sup>, also received Order in Council approvals.

Other Acts and Regulations related to geothermal regulation are listed below:

- [Environmental Protection and Enhancement Act 385/2021](#)
- [Responsible Energy Development Act 386/2021](#)
- [Geothermal Resource Development Act - Proclamation 375/2021](#)
- [Geothermal Resource Development Act 376/2021](#)
- [Mines and Minerals Act 377/2021](#)
- [Responsible Energy Development Act 387/2021](#)

<sup>1</sup> [Click here](#) for a copy of the regulations and amendments

<sup>2</sup> [Click here](#) to view Bill 36

Elsewhere in Canada, Deep geothermal was mentioned in an Act for the first time in Quebecian history under clause 43<sup>3</sup>, which is positive and could lead to pilot projects. The clause suggests that pilot deep geothermal projects should be approved by the minister, but it makes no mention of how to do so or of who is the resource's owner. To distinguish between shallow and deep geothermal systems, the phrase does not specify the depth of a deep geothermal resource. (Environmental groundwater protection regulations regulate shallow systems.) Without changes, it is uncertain how much money resource development firms would put into Quebec's deep geothermal projects. Companies are unlikely to spend millions on deep drilling if they are uncertain about their ability to obtain a license to exploit the resource. In British Columbia, similar issues are in play relating to the offtake of electricity to the grid as no provisions for such, currently exists for geothermal resources.

#### **4.3 Overview of target opportunities**

Both deep geothermal and geoexchange systems are potentially helpful to reducing greenhouse gas emissions, as well as reducing operating costs in time. High upfront costs of exploration drilling and power plant construction with a slow return on investment, a lack of policy and regulation for geothermal products, and a maze of provincial power monopolies and permitting systems are some of the main obstacles to the development of Canada's geothermal industry. However, this market visit reports that supporters of Canada's emerging geothermal industry have been successful in their efforts to undo the outdated energy grid legislation, as several geothermal projects are currently under way in British Columbia, Alberta, and Saskatchewan that can swiftly and effectively start Canada's use of this clean energy resource.

Conventional development of geothermal resources requires drilling deep, high-temperature wells that can be both expensive and risky. Drilling costs can be 50% or more of the cost of development of a conventional geothermal field, and exploration drilling, and testing can take considerable time, delaying return on investment.

There are three conventional geothermal power projects under development, all of which are among the first in Canada: The Tu Deh-Kah project in northern British Columbia, Alberta No. 1 near Greensview, and the DEEP project in south-eastern Saskatchewan. All three have access to 120°C brine through wells that range in depth from two to four kilometres. More crucially, all of them place a high priority on food security, with an expectation they will be able to demonstrate the practicality of employing geothermal energy for greenhouses. There is a possibility for lowering capital costs by taking advantage of pre-existing wells, their well temperature and proximity to roads, habitation and an industrial park that might be appropriate for establishment of greenhouses or composting facilities. There is a keen interest in using the waste heat for other purposes, including increasing the regions food security and potential for agricultural exports, heating hectares of greenhouses, lithium extraction and carbon sequestration.

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<sup>3</sup> [Link for the Act](#)

In summary, with geothermal, the opportunities do not stop at clean electricity production. Geothermal can also be useful for energy-intensive heating purposes, such as: fruit and vegetable drying, greenhouses, soil warming and sterilization, aquaculture, lumber drying, pulp and paper processing. Other possible applications are hot springs pools, water heating (bathhouses, saunas), heating recreation centres, building heating and cooling, heating for industrial processes and de-icing roads and sidewalks.

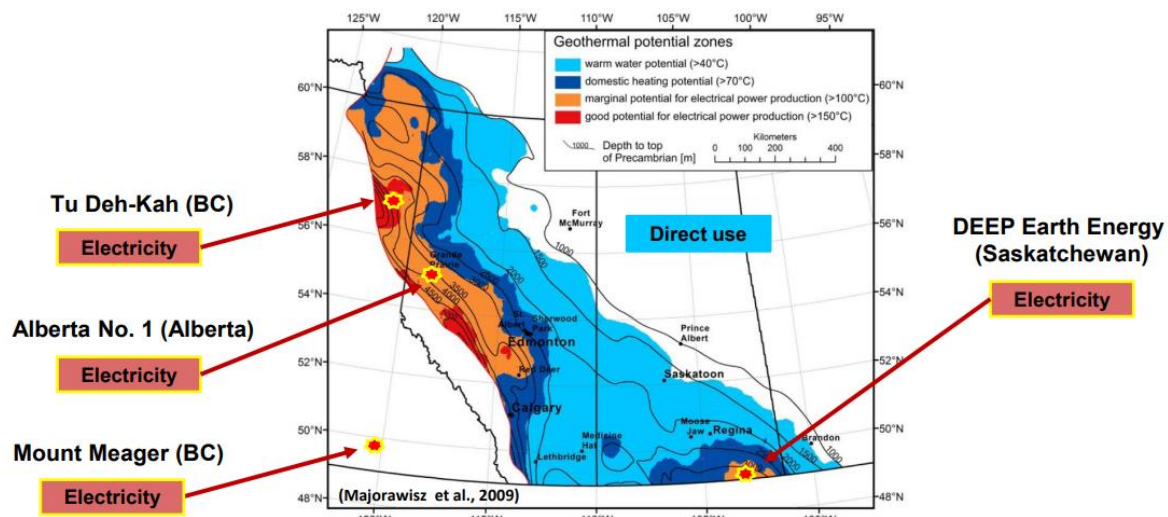


Figure 2: Electricity and Direct use opportunities in Canadian sedimentary basins\*

Adapted from Terrapin/ Alberta No 1 presentation to Global Energy Show, June 2022. -“Geothermal Energy- The full value chain in a decarbonising world”

In British Columbia, the [Tu Deh-Kah](#) Geothermal project aims to provide 7 to 15 megawatts of power. Previously known as the Clarke Lake Project, this initiative is led by the Fort Nelson First Nation community.

While electricity can be easily transported thousands of kilometres away via wires, heat will dissipate as it travels. For a greenhouse to use the heat from a suspended well, they would need to be located within a 10 km radius. “Part of our filter for this review is looking at the individual location of the well, drawing a 10-km circle around it and seeing what’s there.”.

Based on the source of geothermal energy being tapped, reservoir attributes of importance may also include fault mapping and detection. [Mount Meager](#) in British Columbia, for example, is a possible geothermal project that has been mapped and discovered using seismic and potential field data to generate geothermal energy from fractured volcanic rocks. They integrated passive seismic recordings with deep magnetic and electric field measurements in this effort to enhance the image of underlying faults and its link to a heat source in a magma chamber. As the problem is to generate enough heat and/or power from complicated subsurface conditions, geophysical information and analysis can help to increase efficiency in tapping into the best sources. Work in the Pemberton-area volcano over the last two years has been led by the research scientists at the [Geological Survey of Canada](#) and included Geoscience BC and seven colleges and universities. Its main goal was to

reduce exploration risk into the renewable energy source by collecting more knowledge about what's happening beneath Meager's surface. Recently the project is looking at a strategy for development and the engagement with Lil'wat First Nation. Drilling could start late in 2022.

### Relevance to Geo-Energy Europe

In Saskatchewan, [DEEP Earth Energy Production Corp](#) (DEEP) have drilled six wells to date in the Canadian side of the Williston basin and signed a 25-year Power Purchase Agreement (PPA) for 5 MW with SaskPower and negotiations are ongoing for an enhanced PPA. The \$50 million facility received over \$28m funding from the federal government. They have completed feasibility engineering studies and plan to have the first 35-megawatt facility commissioning in early 2025. Four of these 35-megawatt facilities are being planned for a total of 140-megawatts of geothermal base load power. One of the four planned facilities would be enough to power 35,000 households. As for the secondary heat, one option would be to sell heat to that end user such as a greenhouse complex or aquaculture, discounted to the price of natural gas, with no carbon tax, providing a clean sustainable renewable energy supply. The DEEP opportunity is of particular interest as it highlights the value of drawing on the very considerable local drilling expertise. From an integrated geoscience perspective, the deep opportunity is well understood in terms of resource estimates and presents an opportunity for hybrid development of gas and geothermal brines, including a provision for lithium extraction and carbon capture as discussed in other target countries such as Chile and Kenya.

The market visit included meetings with a Calgary based Completion Solutions Cluster of companies who provided the completions solutions for among other, the DEEP wells. Seamount and its cluster associates leverage almost 200 years' experience in the energy industry focused on project development, execution, optimization, and operations across many basins globally and provides a thorough technical knowledge base across all disciplines from surface to subsurface and conception to execution.

Conventional development of geothermal resources requires drilling deep, high-temperature wells that can be both expensive and risky. Opportunities exist to cost-effectively produce from medium to high temperature sedimentary rock formations, reuse already drilled oil and gas wells and either convert them to geothermal wells or co-produce heat and hydrocarbons. The first use case is to identify late-stage oil or gas wells and convert fully to geothermal production or use dry wells that did not contain economic hydrocarbons but produced significant amounts of water. Second, one can potentially co-produce hydrocarbons and heat from wells earlier in their hydrocarbon lifecycle when enough water is already being produced. Geothermal well development requires unique skills, and over 40% of the project cost can be for drilling the well.

[Seamount Geothermal](#) is a multi-discipline Geothermal Project Development and Advisory Services Consultancy based in Calgary. [Frontier Project Solutions](#), is a well delivery consultancy company also based in Calgary. Between the two companies there is a

considerable experience in all aspects of project integration and delivery in all surface and subsurface disciplines. Seamount enables the effective development of geothermal resources to reduce emissions and reduce power costs at the same time. Over 35 years drilling, completions, testing, and workover experience covering design and execution across various well types including High Pressure High Temperature, Geothermal, Thermal (Steam Assisted) Oilsands, Unconventional Gas, and Lithium in several global onshore and offshore basins. Notably, the companies are responsible for drilling the first horizontal geothermal wells in Canada for the Deep project.

Representing the Canada Calgary based cluster of SMEs on the Market visit were:

- Completions Geoscience, a company, integrating geology with geomechanics to optimise engineering and investment decisions.
- Seamount Geothermal managing Partner with over 30 years' experience including: facilities engineering and execution for energy projects for geothermal power, thermal oil recovery, conventional oil, gas, power, new technology, and lithium in domestic and international. Seamount facilities design, process engineer, over 18 years of experience in a broad range of energy facilities for producers in Canada and other international locations.
- GeoGen Technologies Inc founder and professional engineer committed to providing new solutions for the energy transition and building a team to bridge the gap between old energy and new. Focused on technology adoption within the oil and gas industry to deliver a viable geothermal well conversion for oil and gas wells using "old wells for new energy".

From the GEE2 metacluster the following SMEs were present at the Market Visit:

[IdroGeo srl](#) is an engineering and consulting company from the GEE2 Cosvig-DTE<sup>2</sup>V cluster in Italy. IdroGeo implements integrated projects with professionals and expert researchers in the field and in drilling for energy production using medium and high enthalpy systems, low environmental impact and binary ORC cycle systems.

[Geoscience Ireland](#) technical lead for GEE2 project was present during the whole market visit.

#### **4.4 Co-production opportunities.**

Two projects [FutEra](#) and the company [Razor](#) have successfully developed a geothermal/natural gas hybrid power station and are now in the building phase of the infrastructure in Swan Hills, Alberta. The aim is to provide lower carbon energy and leveraging oil and gas activities. As part of its ongoing conventional oil and gas production and waterflood activities, Razor generates and injects significant quantities of hot water, a renewable kind of geothermal energy, daily. This hot water allows FutEra to gather geothermal heat energy and create power with zero Greenhouse Gas (GHG) emissions.

Because the Project is co-produced, no new surface land footprint is required because it makes use of existing assets such as processing infrastructure, producing wells, a produced water reinjection system, and an operational gathering and distribution system.

Geothermal electricity is baseload and eliminates the intermittent issue that other renewable energy sources have. The FutEra Project stands out as an example of innovative and effective co-produced geothermal energy generation. Razor and FutEra continue to demonstrate the synergies and collaboration required to establish a sort of transition energy and set the bar for how traditional oil and gas firms may grow into 'energy and technology' enterprises required for the future of Alberta's energy complex.

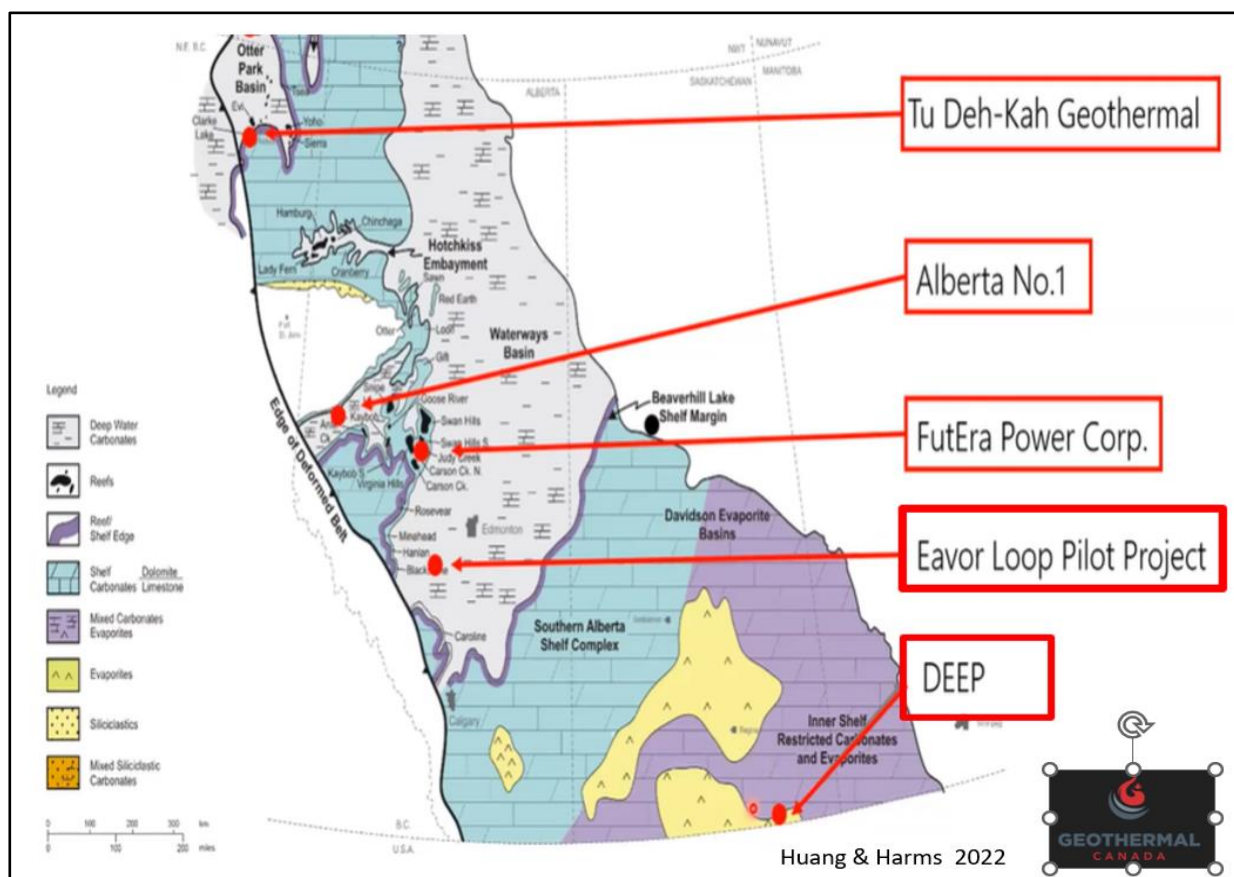


Figure 3: Location of geothermal projects in Canada.

The [Alberta No.1](#) opportunity was presented at the Global Energy Show in Calgary. Together with [Terrapin Geothermics](#), the company is actively pursuing greenhouse farmers who could be interested in co-locating with their 10-megawatt plant that could potentially provide thermal energy for tens of acres of greenhouses. Food security is an important factor in northern Alberta. The plan would include thermal energy is extracted from the fluid to produce power through an Organic Rankine Cycle (ORC) system to generate clean electricity. After the ORC, the still hot fluid goes through a heat exchanger to extract heat for district and/or industrial heating. Once the energy is extracted, the brine is reinjected into the earth to be reheated and used again. In Alberta's sedimentary basins, there are large areas where a thermal resource is available of high enough temperature to efficiently generate electricity. Alberta's cold climate makes power generation with ORC units like those



provided by [Exergy International](#) (Italian company) more efficient and the resource is sufficient to produce power and provide thermal energy for projects such as district heating and massive greenhouse installations. Milan based Exergy, exports and implements its technology worldwide with a particular focus on high growth potential markets. Exergy is the developer and manufacturer of Organic Rankine Cycle (ORC) systems utilizing the innovative Radial Outflow Turbine (ROT). Thanks to the simpler design and specific configuration of the ROT technology the ORC geothermal plants can offer several advantages with up to 7 stages on a single disk turbine to achieve state of the art efficiency with extreme flexibility for changing geothermal fluid conditions, in terms of flow, temperatures and constituents.

#### **4.5 Hot Spring Geothermal Resources**

A PDAC meeting offered additional opportunities for insights into hot Spring geothermal resources in the Rockies. The thermal spas of Banff, to the west of Calgary are well known. Further west in the town of Revelstoke an interesting study of the untapped power of hot springs was gratefully shared by a geophysicist who specializes in geothermal resource location, who has studied geothermal systems in British Columbia based out of [Simon Fraser University](#). She offers an insightful overview in an article she wrote for a local paper in the Revelstoke Mountaineer. Revelstoke is a town in interior British Columbia. It addresses the local geothermal regime in that area and does an economic break down of GHP systems for individual homes, using locals with installed heat pumps as interviewees. The article can be found [here](#). Similar uses of hot springs are found in the Tuscany region of Italy and hence, of interest to visiting SME's from the GEE2 Cosvig-DTE2V cluster in Italy.

#### **4.6 Eavor-Lite Demonstration Facility – A deep geoexchange project**

During the market visit, a field trip to the [Eavor-Lite demonstration](#) facility, north of Calgary Alberta, took place on the 6<sup>th</sup> of June. This is described by [Eavor](#) as the world's first scalable clean dispatchable energy facility. The trip was led Eavor Chief Business Development Officer and Chief Process Engineer and key subject matter expert at Eavor. The visit addressed a key GEE2 objective relating to the investigation of the sustainable application of subsurface knowledge and engineering, which is supporting the harnessing of deep geothermal energy. Attendees from the GEE2 project were: Geoscience Ireland, GSI and IdroGeo from the Cosvig-DTE2V cluster in Italy. A debriefing session was held afterwards at the Eavor offices in Calgary with the Chief Finance Officer and Geoscience Manager addressing additional geoscience and commercial queries.

This is a Closed-Loop system where no supporting aquifer is required using circulation by a thermosiphon principle, precluding the requirement for a parasitic pump load. There is no GHG/CO<sub>2</sub> release and no water production. This methodology exploits horizontal drilling revolution in North America and is drilled with standard equipment; with multilateral sections completed without casing. The heat transfer is by conduction, creating a heat exchanger within up to 100 km of wellbore. This closed loop system has attracted international interest in Italy, Germany and the USA

Eavor is working hard at internationalising this energy facility to other global locations including Europe.

It is of particular interest to GEE2 cluster members, namely Cosvig-DTE2V member IdroGeo that is involved in the preparations for the installation of such a facility at Pantelleria Island, Italy.

In Germany, GEE2 Cluster Leader Celle Drilling is involved in a planned project at Geretsreid in Bavaria for which the permit for the power plant has been recently issued. Enx owns the drilling site, Eavor supplies the technology. The turbines will be supplied under contract by the Italian company Turboden. The Eavor Loop approach allows the predetermination of expected performance of the plant and the turbine technology can also be priorly dimensioned. This concept envisages laying a total of four heat loops in the ground which will require additional drilling. According to Eavor, the geothermal power plant in Gelting will convert the subsidized geothermal energy into electrical energy for up to 5000 households feeding part of the geothermal energy directly into a district heating network later. The maximum output of the power plant is to be 8.2 megawatts with onstream production in 2024 and full capacity in 2026 potentially saving about 44,000 tons of CO<sub>2</sub> per year.



## 5. Lessons Learnt

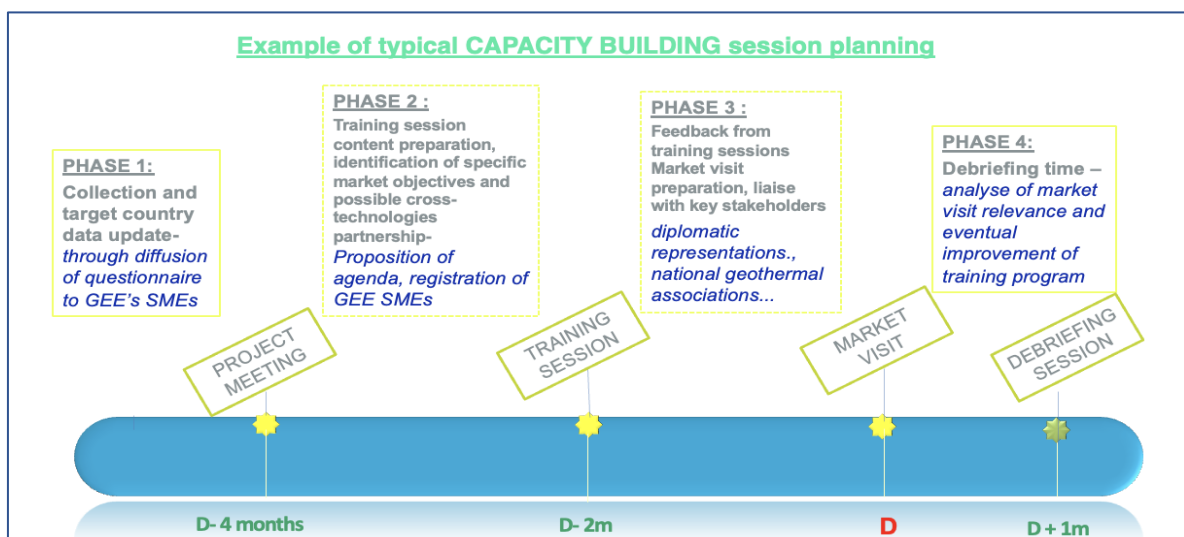
Planning of the market visit to coincide with the (PDAC) presented several challenges, not least the number of competing conferences scheduled for June and the ongoing travel and visa restrictions in effect at that time that prevented cluster member JESDER from travelling to Canada.

The revised compressed schedule did not attract the desired number of SMEs because of conflicting business commitments elsewhere. It was decided to have a longer market visit due to the spread opportunities with visits to Calgary, Ottawa and Toronto as well as a field visit to the Eavor demonstration facility near Rocky Mountain House, Alberta.

Hence; more time is needed for organising and promoting the market visit. Earlier engagement with the SMEs would be particularly helpful in the matchmaking process, to ensure that the specific interests are better understood and communicated.

## 6. Final Considerations

The match making process normally adapted for such market visits was impacted by COVID-19 social and travel restrictions for much of the GEE2 duration. The GEOCOLAB tool should prove more effective for future visits when the schedule is less compressed and the metacluster SMEs are more familiar with it for it is user-friendly, easy-to-use. The database contains only publicly available data collected from the internet. The access is restricted to the members of GEO-ENERGY EUROPE – external access can be granted for partner seeking, but further development is needed, it is designed to easily find partners within GEE members for geothermal projects by using simple free word searches.



The use of the Trade commissioners [match making tool](#) proved effective for the Global Energy Show visit and this event proved to be highly valuable in terms of networking and content, ahead of the market survey seminar in Toronto on the 13<sup>th</sup> June. The online tool enabled delegates to book business appointments other attendees based on their profiles

and allocated a physical meeting place and time at the Canadian Trade Commission conference area.

Overall, the market visit was a success with positive feedback from both Canadian and European SMEs.

There was significant interest in the Eavor closed loop technology, and Italian SME IdroGeo is consulting on a project proposing to use this technology in the Pantelleria, an Italian island commune 100 kilometres southwest of Sicily and 60 km east of the Tunisian coast.

Cluster leader Celle drilling are also involved in the Geretsreid project in Bavaria.

## **7. Annex 1 - GLOBAL ENERGY SHOW AGENDA**

### **DAY 1: Tuesday June 7**

8:30 Welcome to the Global Energy Show

8:45: How Indigenous Communities Can Help Drive Economic Growth in Canada's Energy Industry and Play a Leading Role in the Energy Transition. Former Minister of Justice and Attorney General of Canada

9:15 – 10:15 10 Questions with An Industry Visionary *CEO, Cenovus*

10:15 – 10:30: Keynote Address, Minister of State for Petroleum Resources, Nigeria

### **10:30 – 11:00: Exhibition Opens and Coffee Break**

11:00 – 11:30: Geothermal: An Age-Old Resource for the New Energy Era

*Senior Vice President of Innovation & New Energy, Weatherford*

11:30 – 12:00 Colombia's Energy Transition and Doing Business in Colombia, *President, ANH*

### **Lunch**

12:00 – 1:00 Keynote Luncheon: Alberta's Vision for the Future of Energy – The Global Preferred Source for Clean, Secure and Responsibly Produced Natural Gas and Related Products *Premier of Alberta*

1:00 – 1:30 Networking, Show Floor VIP Tours

1:30 – 2:30 Panel: Financing the Transition

*Panel introduced by Director of Partnerships, Energy Future Labs*

**Moderator:** *Chief Sustainability Officer & Senior Vice-President, Stakeholder Engagement, Cenovus CEO, Indigena, Capital Managing Director, BMO Capital Markets Principal, Elemental Energy Founder, Canative Energy*

2:30 – 3:00: Ghana's Energy Future *Minister of Energy, Ghana*

### **3:00 – 3:30: Coffee Break and Visit Exhibition**

3:30 – 4:00: Sustainable Utilization of Natural Resources – The Icelandic Example *Minister of Higher Education, Science and Innovation, Iceland*

4:00 – 5:00: The Producer Perspective: Navigating Through Uncertain Hydrogen Supply and Demand Needs

- Green, blue, pink hydrogen....carbon intensity is all that matters

- Achieving net-zero through innovation
- Barriers and opportunities in different forms of hydrogen production
- Developing the hydrogen economy by leveraging regional resources and achieving scale
- Opportunities for Canada to lead in low-carbon hydrogen production globally

*Moderator: Energy Systems Architect, The Transition Accelerator CEO, Omni Technologies President and CEO, HTEC*

5:00 – 6:30 Networking Drinks Reception

## **DAY 2: Wednesday, June 8**

8:00 Welcome Remarks from the Host

8:00 – 8:15: How the War in Europe has become the Catalyst for a Long-Term Surge in Renewables Investments and a Short-Term Boost in Upstream Investments

*Senior Vice President of Analysis, Rystad Energy*

8:15 – 9:15 North American Energy Security

*President and CEO, Canadian Global Affairs Institute Minister of Energy, Government of Alberta President, Canadian Natural Gas Pipelines, TC Energy Founder and Chief Oil Analyst, Energy Aspects Vice President, North American Crude Oil Markets, IHS Markit*

9:15 – 10:00 Executive Interview: Perspectives on the Next Era of American Energy Policy

*Former Energy Secretary, US Department of Energy & former Governor of Texas*

10:00 – 10:30 Fireside Chat: More than Lip Service: Sustainability as a Competitive Advantage

*Country Chair Canada and GM Renewables & Energy Solutions Canada, Shell*

## **10:30 – 11:00 Coffee Break and Visit Exhibition**

11:00 – 12:00 Panel: Zeroing Out: Is Net Zero by 2050 Possible?

*Moderator: University of Calgary Chief Sustainability Officer, Suncor President & CEO, Capital Power Executive Director, Regulatory Affairs & External Relations, Enhance Energy William Smith, EVP Engineering, Terrestrial Energy*

## **12:00 – 2:00 Lunch**

Lunch Panel: Oil Sands Pathway to Net Zero

Moderated National/Financial Post

*Chief Sustainability Officer & Senior Vice-President, Stakeholder Engagement, Cenovus*

*Chief Sustainability Officer, Suncor Safety, Risk Management and Innovation, Canadian Natural Resources*

*Vice President Commercial & Corporate Development, Imperial Oil*

2:00 – 2:30 Fireside Chat: A Focus on Hydrogen

*Chair & CEO, ATCO*

2:30 – 3:00 Fireside Chat: Fuelling the Energy Transition with Parkland Fuel Corporation

*Senior Vice President Refining, Supply, Trading, HSE, Parkland Corporation*

### **3:00 – 3:30 Coffee Break and Visit Exhibition**

3:30 – 4:30 Panel Discussion: The Circular Carbon Economy: Building on Momentum In CCUS

The circular carbon economy has taken centre stage as a whole system solution to manage carbon emissions. What are the emerging technologies and how are innovators capitalizing on this emerging business opportunity?

Sponsored by the Government of Saskatchewan

*Moderator: CEO, COSIA*

*Minster of Energy and Resources, Government of Saskatchewan*

*COO, Emissions Reduction Alberta*

*President and CEO, International CCS Knowledge Centre Adlai Majer, Director, New Energy, Whitecap Resources Inc.*

### **DAY 3: Thursday, June 9**

8:00 – 8:15 Welcome Remarks

*Associate Minister of Natural Gas and Electricity, Government of Alberta (TBC)*

8:15 – 8:30 Renewable Propane: A Transition to a Net Zero Emissions Future

*Vice-President, Government Relations, West, Canadian Propane Association*

8:30 – 9:30 Small Modular Reactors: An essential part of Canada's drive to Net Zero

*Moderator: Director of Regulatory and Environmental Affairs, Canadian Nuclear Association*

*Lead of the Next Gen Initiative, Bruce Power Chief Nuclear Engineer, New Brunswick Power*

*Senior Advisor, Business Development, Ontario Power Generation Iain Harry, Senior Business Advisor in Generation Asset Planning, SaskPower*

9:30 – 10:30 Panel: Have Renewables Come of Age?

*Moderator: President Saskatchewan Research Council Jeanine Vany, VP Geoscience, Eavor Technologies Inc. CEO, Steeper Energy Co-Founder, BluMaple Capital President, Westinghouse Canada*

10:30 – 11:00 Coffee Break and Visit Exhibition

11:00 – 12:00 Panel Discussion: Shaking Up the Utilities Sector: Evolving Business Models & Consumer Demand

*Moderator: Global Industry Director, Industrial & Critical Infrastructure, CISCO President, Electricity, ATCO CEO, First Nation Power Authority Director, Business Development, Electricity Canada CEO, Greengate*

**12:00 – 1:30 Ukraine Lunch Panel**

1:30 – 2:30: The Robots Are Coming - The Collision of Tech x Energy?

Sponsored by: *geoLOGIC President & CEO, geologic CEO, Carbon AI CEO & Co-Founder, Avatar Innovations Inc. CEO, Veerum*

## 8. Annex 2 - Canada Market alert – Training Session and Market Visit Seminar

GEE-2 Project Canadian market tour and information meeting, JESDER

The GEO-ENERGY EUROPE meta-cluster [promotes the internationalization](#) of European small and medium companies. To boost the international outreach, the meta-cluster has created partnerships with structuring clusters in target markets, notably in Canada, Chile, and Kenya. In line with this, partners of the project are offering SME's the opportunity to attend training sessions dedicated to those market countries. Each training session will be followed by a market visit organised in the country.

Within the scope of the target countries of the GEE-2 Project, of which Turkey's Geothermal Power Plant Investors Association (JESDER) is a stakeholder, a country market trip will be made to Canada on 13 June 2022. Before the said trip, an online information meeting will be held at 15:00 on Tuesday, May 10, for all participating companies-SMEs and project managers.

### **Canadian Training session – Tuesday 10th of May 2022 – 2:00pm – 3:30pm (CET):**

- Canadian geothermal market: global structure of the energy market, geothermal market (regulation, support schemes and risk mitigation schemes if existing, market barriers...)
- Collaborative tool developed by GEE's partner (CAPES)
- Coaching of our SMEs: key aspects when working with Canadian geothermal companies, identification of specific know-how developed by GEE's SMEs to fit the market...
- Roundtable, share experience, SME's expectations and identification of eventual barrier to enter Canadian market
- Preparation of the market visit

If you're interested in attending the Training session, please register before 7th of May via [this link](#).

### **Canadian Market visit – Monday 13th of June in Toronto**

GEOSCIENCE IRELAND, on behalf of GEO-ENERGY EUROPE, is planning some in-country engagements as part of its upcoming GEE2 Canada market visit in June 2022. The program includes co-hosting a short Seminar with Enterprise Ireland, during PDAC, in Toronto on the 13th of June at 14.00. This seminar is for participants interested in the Canadian Geothermal Sector, with insights into the overall objectives of the GEE2 project. The event will feature presentations by EU companies seeking partnerships with Canadian counterparts to develop geothermal energy.

The following is a summary of the key aims and objectives of the GEE2 project:

- Presentation of tailored strengths of the member companies to target the Canadian market.
- Enhancement of business development and capacity building activities through engagement.

- Supporting transition to the green economy, utilising existing skillsets in subsurface geoscience.
- Developing new sustainable services, drawing knowledge from more traditional subsurface activities.
- Supporting the expansion of employment in niche scientific and engineering related disciplines.
- Sustainable application of subsurface knowledge, supporting the harnessing of geothermal energy

Source: Email correspondence via our Turkish language platform [JeothermalHaberler](#)

Full alert online: [here](#).