



## **REQUEST FOR PROPOSAL**

**Title:** Economic Viability of Geothermal Resources in British Columbia

**Date Issued:** Monday, November 24, 2014

**Solicitation Closes:** 12:00 noon Pacific Time, Thursday, December 11, 2014

**Enquiries to:** Christa Pellett  
Project Manager, Geoscience BC

**Email:** [pellett@geosciencebc.com](mailto:pellett@geosciencebc.com)

## **THE ORGANIZATION**

Geoscience BC is an independent, not for profit, geoscience organization with a mandate to attract new mineral and oil and gas investment to British Columbia through geoscience. Geoscience BC works in partnership with industry, academia, government, First Nations, and communities to fund innovative applied geoscience projects.

## **INTRODUCTION**

Geothermal energy is the natural heat energy contained within the Earth. For centuries natural hot springs have been used by people for industrial and therapeutic purposes. Today geothermal energy is used to generate electricity in more than 70 countries with a total installed capacity of more than 12,000 MW ([GEA Annual U.S. & Global Geothermal Power Production Report, April 2014](#)).

## **OBJECTIVES**

The objective of the study will be to ultimately deliver an assessment of the economic viability of geothermal energy in the Province of British Columbia for electrical power generation. The electrical power generation component will initially review sites previously studied ([Western Renewable Energy Zones, Phase 1: QRA Identification Technical Report, 2009](#)), the Clarke Lake Gas Field ([Walsh, 2013](#)), and areas identified through Provincial referrals for geothermal energy. A *Geothermal Development Decision Matrix* (see accompanying xls file) will then be completed for each of the 18 sites. Those sites deemed capable of geothermal electrical development should then be assessed for their economic potential utilizing the Williams et al. (2008) USGS geothermal assessment methodology ([USGS Open-File Report 2008-1296](#)), or another suitable volumetric methodology, to estimate energy generation potential. The study should clearly take into account confidence levels in the input data, during the volumetric geothermal assessment and explain how this problem was addressed. An economic analysis of each site, for which it is determined enough data is available, will then be completed using the Geothermal Electricity Technology Evaluation Model (GETEM) developed by the National Renewable Energy Lab (NREL), or another appropriate model, to determine the levelized cost of energy.

Two major themes are planned, the data compilation and the technical and economic assessment of those areas deemed favourable.

### **A) Data Compilation**

The most current compilation of data used to assess geothermal potential for British Columbia was published in the early 1990's by the National Geothermal Program.

In general, previous studies have focused on high-temperature geothermal electrical generation, and low-temperature geothermal applications have not been fully evaluated. A favourability map ([Kimball, 2010](#)) was produced to identify areas with greatest potential for development based on additional factors, focusing on the exploration of resources for electricity generation.

The compilation required for this RFP would re-evaluate these earlier works while focusing on compiling data specific to potential geothermal electrical generation. It should be noted that a concurrent Targeted Geoscience for Direct-Use RFP will be run and that will also require much of the same data compilation. As such, there are synergies between the two projects.

## **B) Favourability Table and Economic Evaluation**

The data compiled will be used to fill the *geothermal development decision matrix*. Those areas that fall out of the exercise as *favourable* will be evaluated for economic potential

For each favourable site, energy generation will be estimated using a volumetric methodology developed by Williams et al. 2008 ([USGS Open-File Report 2008-1296](#)), or another suitable methodology. Regardless of which methodology is used for the determination of energy potential, the study should attempt to categorize confidence levels of not only the input data but the final MW capacity estimate for each site. Afterwards, the levelized cost of power should be calculated using a Geothermal Electricity Technology Evaluation Model (GETEM, Office of Energy Efficiency & Renewable Energy, <http://energy.gov/eere/geothermal/downloads/getem-geothermal-electricity-technology-evaluation-model-0>), or any other suitable model.

The project should be summarized including all data compilation, assumptions, methodology and results.

## **TECHNICAL SPECIFICATIONS AND DETAILS**

This Request for Proposals (RFP) is focused on Data Compilation, Favourability Assessment and Economic Evaluation of geothermal resources in British Columbia.

### **A) Data Compilation**

The data compilation for the electrical generation component of the study will be focused on the 18 areas described in **Table 1** (next page). Whereas, data compilation for a separate geothermal direct-use study (a direct-use specific RFP will be issued subsequent to this one) which will look at direct-use opportunities near load, or potential load, in the Province. This RFP will consist of analysing the following thematic information compiled from existing data sets, and any additional data sets needed to fill the *Geothermal Development Decision Matrix*:

#### 1. Permeability

- Active fault locations
- Seismic hypocenters

#### 2. Fluids

- Aqueous chemistry
- Thermal springs (5°C or above)

#### 3. Thermal contributions

- Volcanic vents
- Intrusive bodies

#### 4. Well data (heat flow data)

- Well head locations
- Bottom hole temperatures
- Geothermal gradients
- Temperature at depth predictions

#### 5. Economic Elements

- Distance to relevant Infrastructure,
- Population density
- Economic factors such as industrial activity

**TABLE 1**

<b>Geothermal Prospect Area</b>	<b>Data Source</b>	<b>GWH</b>	<b>MW</b>	<b>X</b>	<b>Y</b>
<b>North East British Columbia - Western Canadian Sedimentary Basin</b>					
Liard River	GeothermEx estimates for WREZ		16	-126.1006	59.4263
Clarke Lake	<a href="#">Walsh, 2013</a>		34	-122.4606	58.7177
Hudson's Hope	GeothermEx estimates for WREZ		16	-122.1060	56.0007
<b>North West British Columbia - Stikine Volcanic Belt</b>					
Mt. Edziza / Iskut / Mess Creek	GeothermEx estimates for WREZ ( <a href="#">MEM Referral</a> )		90	-130.7478	57.7710
Hoodoo Mountain/ Sphaler Creek	GeothermEx estimates for WREZ ( <a href="#">MEM Referral</a> )		45	-131.3099	57.0489
<b>Mid-Coast British Columbia Anahim Volcanic Belt</b>					
King Island	GeothermEx estimates for WREZ		16	-127.3334	52.4831
Mt. Silverthrone/Knight Inlet	GeothermEx estimates for WREZ project ( <a href="#">MEM Referral</a> )		45	-125.65	51.3026
Clearwater Volcanic Field	GeothermEx estimates for WREZ		16	-120.1666	52.07232
Lakelse Lake	GeothermEx estimates for WREZ ( <a href="#">MEM Referral</a> )		16	-128.5267	54.3755
<b>Eastern British Columbia - Rocky Mountain Trench</b>					
Canoe Creek / Valemont	GeothermEx estimates for WREZ ( <a href="#">MEM Referral</a> )		16	-119.1186	52.70836
<b>South Coast - Garibaldi/Pemberton Volcanic Belts</b>					
Mt. Garibaldi	Geothermal Data from the RETI project ( <a href="#">MEM Referral</a> )	354.78	45	-123.237	49.8815
Mt. Cayley	Geothermal Data from the RETI project ( <a href="#">MEM Referral</a> )	354.78	45	-123.707	50.3959
Meager Creek / Pebble Creek	Geothermal Data from the RETI project ( <a href="#">MEM Referral</a> )	709.56	90	-123.774	50.9176
Harrison Hot Springs/Sloquet Creek	Geothermal Data from the RETI project ( <a href="#">MEM Referral</a> )	112.12	16	-122.011	49.6471
<b>South Interior - Columbia Basin</b>					
Upper Arrow	Geothermal Data from the RETI project	112.12	16	-118.266	50.805
Lower Arrow Lake	GeothermEx estimates for WREZ		16	-118.0784	49.73819
Okanagan	Geothermal Data from the RETI project	112.12	16	-119.943	49.6679
Kootenay	Geothermal Data from the RETI project	112.12	16	-116.995	49.9371

## **B) Data Presentation and Standards:**

Geospatial products will be prepared in an ArcGIS interoperable data format with coordinates recorded as latitude and longitude, and as UTM eastings and northings in the NAD83 datum. Project proponents are requested to coordinate with the data custodian, at Geoscience BC, to determine suitability prior to publishing to Geoscience BC's GIS.

## **C) Deliverable Items**

Unless otherwise specified, digital data and summary maps of key results.

The following items will be delivered to Geoscience BC, Suite 440 – 890 West Pender Street, Vancouver, BC, Canada, V6C 1J9:

1. Monthly progress reports
2. Regular meetings with Geoscience BC's Geothermal Technical Advisory Committee.
3. Digital Data
  - i. Completed *Geothermal Development Decision Matrix*
  - ii. For those sites deemed *favourable* from the matrix, the electric power generation potential (derived from a Volumetric Method).
  - iii. For those sites deemed *favourable* from the matrix, an economic model which determines the levelized cost of power.
4. A Report summarizing the assumptions, uncertainties, methodology, and results. Two (2) print copies and one digital copy in PDF format, which must include the following:
  - i. A report number supplied by Geoscience BC;
  - ii. The name and address of the contractor, the phone and fax numbers of the company and the date of the survey;
  - iii. A table of contents;
  - iv. Details of data compilation and references; and
  - v. A summary of specific problems encountered during compilation and solutions developed.

Final deliverables must be received by Geoscience BC no later than April 30, 2015.

## **CONTENT OF PROPOSAL**

The proposal **should** contain:

1. A summary of the proponent's relevant past project work, including any previous projects completed for Geoscience BC.
2. A timeline for the project, including an undertaking to start the project in a timely manner with monthly reporting of the status of the project.
3. A price for the project in Canadian dollars. This will be an all-inclusive price, including all personnel, administrative, compilation and final reporting costs.
4. A commitment to work with Geoscience BC on community outreach and engagement activities in local communities in the vicinity of the project.

The submission of standard business development or promotional materials published corporate profiles, annual reports, standard marketing or sales brochures and other like materials is discouraged.

Each Proponent is solely responsible for conducting their own independent research, due diligence, and any other work or investigation, and seeking any independent advice necessary for the preparation of

the Proposal. Nothing in this RFP is intended to relieve the Proponents from forming their own opinions and conclusions with respect to the matters addressed in this RFP.

**CONFIRMATION OF INTEREST**

Each Proponent who intends to submit a Proposal in response to this RFP shall confirm its intention and provide a single point of contact, phone number, fax number and e-mail address to Christa Pellett at Geoscience BC.

Contact: Christa Pellett  
E-Mail: *pellett@geosciencebc.com*

**SUBMISSION OF PROPOSALS**

Proposals will be accepted in the form of an electronic submission in PDF format to [pellett@geosciencebc.com](mailto:pellett@geosciencebc.com) by the time and date indicated on page 1 of this RFP document. Proposals submitted in response to this RFP will not be returned, and will be kept confidential. Original Proposals submitted after this deadline will not be accepted. Each Proponent shall be responsible for the timely delivery of its Original Proposal. All components of a proposal must be received by the submission deadline.

GBC may extend the Submission Deadline by issuing an Addendum prior to the Submission Deadline. Proponents who have confirmed their intention to submit a Proposal will be advised directly of any extension to the Submission Deadline.

**ENQUIRIES / TIME EXTENSION TO THE RFP CLOSING DATE**

All enquiries and other communications related to this RFP throughout the solicitation period shall be directed in writing only, by email, to Christa Pellett.

To ensure the equality of information among Proponents, answers to enquiries which are relevant to the quality of the proposals will be communicated to all proponents who have confirmed their interest in submitting a proposal. Such enquiries must be received at least two (2) working days before the submission deadline. A request for a time extension to the RFP submission deadline WILL NOT be considered.

**VALIDITY OF PROPOSAL**

Any cost estimates associated with the proposals must remain valid for acceptance for a period of not less than ninety (90) days after the submission deadline of the RFP. After the RFP closing date, no amendments to the proposal will be accepted. However, during the evaluation the Technical Authority may require clarification from or conduct interviews with the Proponents.

**AMENDMENT OF PROPOSAL**

A Proponent may amend its Proposal prior to the Submission Deadline by withdrawing its original Proposal and submitting a revised Proposal.

GBC may, in its sole discretion, seek clarification of any matter in a Proposal in any manner it considers appropriate including investigating the abilities and experience of a Proponent, seeking information from other parties about a Proponent, requiring Proponents to submit supplementary documentation and seeking a Proponent’s acknowledgement of GBC’s interpretation of the Proponent’s Proposal.

### **APPLICABLE LAWS**

Any contracts subsequently negotiated and awarded with respect to this RFP shall be interpreted and governed, and the relations between the Parties determined, by the laws in force in the province of British Columbia and the parties attorn to the jurisdiction of the British Columbia courts.

### **RIGHTS OF GEOSCIENCE BC**

Geoscience BC reserves the right to:

- a) Reject any or all proposals received in response to this RFP
- b) Enter into negotiations with one or more Bidders on any or all aspects of its proposal;
- c) Accept any proposal in whole or in part;
- d) Cancel and/or reissue this requirement at any time;
- e) Award one or more contracts;
- f) Verify any or all information provided with respect to this requirement;
- g) Award contracts without competition for follow-on-work if any, to the successful Proponent for this requirement;
- h) Reduce or increase the overall RFP scope by up to 20%.

### **INFORMATION PROVIDED BY GEOSCIENCE BC**

No representation or warranty, expressed or implied, is made and no responsibility of any kind is accepted by GBC, or its advisors, employees, consultants or agents, for the completeness or accuracy of any information contained in the RFP Documents or that is provided during the RFP process or contract negotiation process, or under a contract that may be entered into, if any.

### **CHANGES TO THE RFP DOCUMENTS**

GBC may, prior to the Submission Deadline, without liability, cost or penalty, alter the Submission Deadline and amend or supplement the RFP Documents by Addenda only. No other communications of any kind whatsoever will modify the RFP Documents.

### **COSTS OF PROPOSAL**

The Proponent shall bear all costs and expenses with respect to the preparation and submission of its Proposal and any other activity pertaining to its Proposal, including its participation in the RFP process and contract negotiation, if any. GBC shall not be liable to pay any such costs/expenses regardless of the conduct or the outcome of the RFP process.

### **CONFIDENTIALITY**

GBC and its partners will take all reasonable precautions to maintain the confidentiality of the information submitted by the Proponents, subject to any disclosure required by law. GBC reserves the right, however, to disclose the Proposal to employees, servants, agents, advisors and consultants of GBC and its partners and affiliates for the purpose of assisting GBC in evaluating the Proposal. The employees, servants, agents, advisors and consultants of GBC and its partners and affiliates will not be liable for any damages resulting from any disclosure before, during or after the issuance of this RFP and the submission of a Proposal.

Proponents will take all reasonable precautions to maintain the confidentiality of any information provided by GBC, subject to any disclosure required by law. Proponents reserve the right, however, to disclose the Proposal to employees, the servants, agents, advisors and consultants of the Proponent and its affiliates for the purpose of assisting the Proponent in preparing the Proposal.

### **NO PUBLIC STATEMENTS**

Recipients of and Proponents to this RFP shall not issue any public statement or news release pertaining to this RFP without the prior written consent of GBC.

### **ABSENCE OF CONTRACTUAL OBLIGATIONS DURING RFP PROCESS**

- (a) GBC shall have no obligation to enter into a contract with a Proponent in respect of the provision of Services that are the subject of this RFP. GBC shall only have obligations to a Proponent if it decides to execute a written agreement with a Proponent and such obligations shall be in accordance with the terms and conditions of that agreement as finalized between GBC and the Proponent.
  
- (b) GBC may, in its sole discretion, for any reason and at any time, take any action in respect of the Proposals it receives including:
  - (i) Entering into further discussions or clarification meetings with one or more of the Proponents;
  - (ii) Entering into any contract or contract negotiations with one or more of the Proponents;
  - (iii) Inviting any of the Proponents to participate in another competitive process to carry out the Services;
  - (iv) Requesting one or more of the Proponents to supplement and resubmit their Proposal;
  - (v) Accepting or rejecting any Proposal;
  - (vi) Annulling this RFP process and rejecting all Proposals; or
  - (vii) Annulling this RFP process and commencing a new process;

at any time without incurring any liability to any Proponent and without any obligation to inform Proponents of the reasons for GBC's actions. Nothing in this subsection or elsewhere in the RFP Documents shall impact or affect the validity of (a) and (b).

### **FURTHER INFORMATION, CLARIFICATION AND CONTACT INFORMATION**

Requests for further information, clarification or for any other purpose related to this RFP are to be made by e-mail to:

**Christa Pellett**  
**E-Mail: [pellett@geosciencebc.com](mailto:pellett@geosciencebc.com)**

- (a) Proponents are responsible for seeking any clarification that they require well in advance (at least 2 working days) of the Submission Deadline. GBC shall not be responsible for any misunderstanding of the RFP Documents.
  
- (b) For all purposes related to this RFP, Proponents shall not contact or attempt to contact:
  - (i) Any GBC officer, employee, subcontractor, agent, representative, consultant or volunteer with respect to this RFP, **other than the GBC contact set out in subsection (a) above; and**
  - (ii) Any other prospective Proponent except for the purpose of discussing the possibility of submitting a Proposal as a Joint Venture.



**METHOD OF SELECTION**

GBC shall, in its sole discretion, use any evaluation criteria (whether subjective or objective), it deems suitable to evaluate the Proposals. In the event that GBC selects a Proponent for the provision of the Services, GBC will notify each Proponent in writing, and GBC's method of selecting the Proponents will remain confidential to GBC.

**AGREEMENTS**

GBC will confirm the business arrangement in the form of a Project Agreement to be drafted after selection of the successful Proponent(s).