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Non-technical Summary

1.1 Project Title: Evaluation of the Deep Geothermal Potential of Baker Lake, Nunavut, Canada

1.2 Lead Researchers and Affiliation: Pr. Jasmin Raymond, Dr. Mafalda Miranda, Ysaline Bacon

1.3 Research Questions: We aim to assess the deep geothermal potential of Baker Lake at the request of the Qulliq Energy Corporation (QEC). Our goal is to complement Respec's geothermal exploration project for QEC by addressing the following questions: Can the geothermal resources beneath Baker Lake meet the community's heating and electricity needs? Are the deep geothermal resources in Baker Lake obtainable at a competitive cost? To answer these questions, we plan to conduct fieldwork, laboratory analyses, numerical modelling, and life-cycle cost analysis. These cost-effective tools will provide a preliminary assessment of Baker Lake's deep geothermal potential.

1.4 Research Objectives: This project aims to assess Baker Lake's geothermal potential by identifying key parameters that need more information to mitigate future risks. Objectives include studying local geology, characterizing thermophysical properties of rocks, evaluating geothermal potential, developing numerical models, and analysing life-cycle costs. The results could support geothermal development in the north and contribute to a thermo-hydro-mechanical properties database. The goal is to promote sustainable energy independence while respecting the environmental and social values of the Baker Lake community.

1.5 Where, When, and Duration of Field Research: Field research is scheduled for the summer of 2024 (between June 1, 2024, to September 30, 2024) and will be conducted within a limited area (less than 10 km) surrounding the Baker Lake community. The fieldwork is expected to span over three weeks.

1.6 Methods for Fieldwork: Research methods include fracture studies, geological mapping, and surface rock sample collection. Fracture data will be gathered through linear scanline and rectangular window sampling methods. Linear scanline involves measuring attributes of fractures intersecting a tape laid on an outcrop. Rectangular window sampling uses a rectangle placed on an outcrop to measure selected fracture attributes within the area. Surface rock samples will be collected using a geological hammer.

1.7 Environmental, Wildlife, and Societal Impacts: With no drilling planned, we expect minimal environmental and societal impacts from our research. Our field activities will be conducted quietly and with utmost respect for the environment. Despite the research's proximity to the community, no impacts on wildlife are expected. Regarding social impact, Baker Lake has already experienced Respec's work in December 2022, which involved engaging in dialogue with residents. Based on this, we anticipate a positive community response. Additionally, we'll conduct follow-up activities with the Qulliq Energy Corporation (QEC). This collaboration is crucial, as QEC could potentially use our findings, in partnership with the community, to advance geothermal resource development if desired by the community. This proactive approach underscores our commitment to transparent communication, community engagement, and potential collaboration for the benefit of Baker Lake and its residents.

1.8 Data Storage and Management: The results obtained from the 2024 fieldwork will remain within our institution until their public release in spring 2025, in the English language.

1.9 Involvement of Nunavut Residents: The Baker Lake community will be actively engaged in the research by sharing their expectations and limits. Their preferences for heating and energy sources will contribute to building a realistic model for assessing the potential and feasibility of installing a geothermal heating system within the community.

1.10 Communication of Research Results in Nunavut: Research findings will be shared with Baker Lake through a non-technical report. We maintain open communication with our team and invite future collaboration. This project aligns with environmentally responsible practices, meeting the community's specific needs for a sustainable energy solution while preserving local values.

►Δ&ΠΔ: Résumé non technique

1.1 Titre du Projet : Évaluation du Potentiel Géothermique Profond du Lac Baker, Nunavut, Canada

1.2 Chercheurs Principaux et Affiliation : Pr. Jasmin Raymond, Dr. Mafalda Miranda, Ysaline Bacon

1.3 Questions de Recherche : Notre objectif est d'évaluer le potentiel géothermique profond du Lac Baker à la demande de la Qulliq Energy Corporation (QEC). Nous visons à compléter le projet d'exploration géothermique de Respec pour la QEC en abordant les questions suivantes :

- Les ressources géothermiques sous le Lac Baker peuvent-elles répondre aux besoins de chauffage et d'électricité de la communauté ?
- Les ressources géothermiques profondes du Lac Baker sont-elles accessibles à un coût compétitif ?

Pour répondre à ces questions, nous prévoyons de mener des travaux sur le terrain, des analyses en laboratoire, une modélisation numérique et une analyse des coûts du cycle de vie. Ces outils économiques fourniront une évaluation préliminaire du potentiel géothermique profond du Lac Baker.

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Project transportation types

Transportation Type	Activity	Length of Use
Air	air travel between Quebec and Baker Lake	
Land	Vehicle rental to travel within the designated research area outlined on the map via accessible roads.	

Project accomodation types

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Given the absence of camps and our accommodation in a hotel, the waste production associated with our presence in Nunavut is minimal and has little impact on the natural environment. We will implement stringent practices to minimize our ecological footprint, in compliance with the regulations in place in Baker Lake, ensuring that all generated waste is properly disposed of. In the field, we employ non-invasive exploration methods such as the use of hammers and crack counting, thus avoiding the generation of unnecessary waste, and will be conducted on area free of vegetation. Furthermore, all the equipment we utilize is designed to be reusable, and it will be carefully transported back to the laboratory after our fieldwork. This approach ensures sustainable waste management, minimizing our environmental impact and preserving the integrity of local ecosystems within the framework of our geothermal exploration in Nunavut.

Additional Information

SECTION A1: Project Info

SECTION A2: Allweather Road

SECTION A3: Winter Road

SECTION B1: Project Info

SECTION B2: Exploration Activity

SECTION B3: Geosciences

SECTION B4: Drilling

SECTION B5: Stripping

SECTION B6: Underground Activity

SECTION B7: Waste Rock

SECTION B8: Stockpiles

SECTION B9: Mine Development

SECTION B10: Geology

SECTION B11: Mine

SECTION B12: Mill

SECTION C1: Pits

SECTION D1: Facility

SECTION D2: Facility Construction

SECTION D3: Facility Operation

SECTION D4: Vessel Use

SECTION E1: Offshore Survey

SECTION E2: Nearshore Survey

SECTION E3: Vessel Use

SECTION F1: Site Cleanup

SECTION G1: Well Authorization

SECTION G2: Onland Exploration

SECTION G3: Offshore Exploration

SECTION G4: Rig

SECTION H1: Vessel Use

SECTION H2: Disposal At Sea

SECTION I1: Municipal Development

[illegible]

Our research area is situated in a tundra region characterized by long, extremely cold winters and short, cool summers. Winter temperatures average between -21 and -25°C, while summers are typically cool and rainy. The absence of trees contributes to its designation as having a polar climate. Transportation is facilitated by Baker Lake Airport and a 110 km (68 mi) gravel road called Mine Road, providing vital access to the region. The bedrock of the area mainly consists of Archean gneiss, shaping the physical landscape. Roads are accessible by car, which is crucial for the connectivity of the region. It's important to note that our research will have minimal impact on the physical environment, apart from the collection of small hand-sized samples with a geological hammer on the outcrops, which will not affect vegetation. We will strictly adhere to accessible roads during our fieldwork.

[illegible]

The municipality of Baker Lake is home to a diverse range of wildlife species, including caribou, muskoxen, Arctic hares, wolves, wolverines, sik-siks, and geese. Our research will take place in the vicinity of the community, so we do not anticipate encountering these species, if such encounters do occur, leave and not disturb them.

[illegible]

The residents of Baker Lake primarily depend on local grids powered by diesel generators for electricity, while oil furnaces are used for space heating. Despite subsidies, this reliance leads to considerable expenses. The local economy is closely tied to the Meadowbank gold mine, operated by Agnico Eagle Mines Limited, serving as a key source of employment and economic activity in the area. During our research, we will engage local services such as hotels, food, and car rentals, contributing positively to the socio-economic environment of the community.

Miscellaneous Project Information

N/A

[illegible]

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Cumulative Effects

N/A

Impacts

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2	polyline	road
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12	point	our hotel - Nunamiut Lodge