

## Evaluation of the Geothermal Energy Potential at Cambridge Bay and Resolute Bay

Qulliq Energy Corporation (QEC), formerly the Nunavut Power Corporation, is a 100% Government of Nunavut (NU) owned corporation that is the sole provider of electrical power in the Territory. The QEC currently provides power to the 25 communities in NU by operating (25) stand-alone diesel power plants in each, which means that it is dependent upon fossil fuels. However, the QEC is actively searching for new and renewable energy resources.

Geothermal energy uses heat from within the Earth to produce heat and electricity with a much lower environmental impact than methods that burn hydrocarbons. Close to volcanoes, the subsurface water can be hot enough to efficiently produce electricity. In other locations the temperatures are lower, and it is most efficient to use the energy directly for heating for other applications. Subsurface temperatures in Northern Canada are high enough to make the direct use of heat to be a practical source of energy, but research is needed to determine how to best develop this type of energy resource. Information about the type of rock and water present underground is essential to guide geothermal energy development but is generally not available in NU.

The University of Alberta is leading a major geothermal energy project that is active in many parts of Canada. The project has an emphasis on finding creating ways to supply energy needs of northern communities.

The proposed research will use geophysical measurements to look under the surface to a depth of 2 km around the communities of Cambridge Bay and Resolute Bay. These measurements will determine (1) the type of rock present, (2) the thickness of the frozen layer and (3) the amount and type of groundwater. Two geophysical exploration techniques will be used. The first is called magnetotellurics (MT) and uses a specialized radio receiver that measures natural radio signals coming from the atmosphere. Sensors attached to the instruments are buried in shallow holes dug with hand tools to a depth of 30 cm. The instrument is left to record data for 12-24 hours. The second technique measures the strength of gravity at each location and determines the thickness of rock layers. Measurements with both techniques will be made at a grid of points around each community.

The studies at Cambridge Bay and Resolute Bay will be made by a group of 4-5 people who will work for 10-14 days. The research team will be led by Martyn Unsworth, a professor of geophysics at the University of Alberta. The team will be looking for ways to engage with the community and explain how the work in 2023 will help the development of geothermal energy in Nunavut. Work at Cambridge Bay is planned for 2 weeks in July 2023 and at Resolute Bay for 2 weeks in August 2023. At least one member of the group will be a member of the local community who will be employed to help with installation of instruments and as a wildlife monitor. The field group will not establish a camp and will be based in the communities.

All measurement locations will be reached with vehicles and on foot. Figures 1 and 2 illustrate the areas in which the measurement will be taken.



