IQALUIT HYDROELECTRIC PROJECT

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Renewable Energy in Nunavut

Nunavut does not currently generate energy from local renewable sources. To date, the territory depends exclusively on imported fossil fuels for diesel plant power generation. As the sole utility in the territory, Qulliq Energy Corporation (QEC) has 25 stand-alone power plants that operates on diesel fuel to produce electricity for each of the 25 Nunavut communities. Each year, approximately 55 million liters of diesel fuel is purchased for approximately $54 million dollars. The fuel is shipped in bulk during the short summer season and stored in tank facilities in each community. Fuel is then used to power generator sets that convert energy into electricity for QEC's customers.

QEC currently has 13 of 25 power plants operating beyond their useful life span and the aging power plants require upgrades and replacements. QEC's operating cash flow is sufficient to enable the corporation to pay ongoing operating expenses, but it is not sufficient to fund the replacement of the older power plants. QEC currently borrows funds for capital expenditures to rebuild its power plants.

The corporation has made diesel power plant rebuilds a priority, however, it is restricted by borrowing capacities and availability of resources. Major capital overhauls to QEC's aging power plant infrastructure and equipment are necessary to ensure that Nunavummiut are provided with safe and reliable energy. While the construction and installation costs of new diesel power plants are lower than the construction and installation costs of renewable energy power, they require significant long term costs in regard to fuel purchases. The cost of diesel fuel is the largest item in QEC's current budget.

The corporation continuously looks for opportunities to reduce the territory's reliance on diesel fuel and works to provide Nunavut with a more sustainable energy supply that generates power through harnessing renewable energy sources. Compared to diesel power plants, most of the costs associated with renewable energy development occur during the construction phase. Once the capital costs have been paid, the cost of a renewable energy facility is limited to maintenance as there are minimal costs associated with the generation of power. As for diesel power plants, there are the significant costs for fuel and maintenance once the capital costs are paid.

In efforts to create a more affordable and sustainable electricity supply for its customers, QEC is pursuing renewable energy systems to help power the territory like the development of an Iqaluit hydroelectric power plant.

Iqaluit Hydroelectric Project

The Iqaluit Hydroelectric Project was initiated in 2005 as a long-term energy plan to supply a sustainable, affordable and reliable source of energy in Nunavut's capital. The proposed project was driven by the ratepayers' request to pursue alternative energy in order to stabilize electricity rates.

Two sites, Jaynes Inlet and Armshow South, have been selected as the most cost effective and viable solutions after comprehensive research. At the two sites, the construction of dams will create reservoirs of water that allow control of the water flow. A hydroelectric plant will generate the energy into electricity for QEC's Iqaluit customers. The two selected sites have the capacity to produce electricity year-round in Arctic conditions if water reservoirs are maintained at operational levels. Systems similar to the Iqaluit Hydroelectric Project have operated successfully in northern jurisdictions such as the NWT, Yukon and Alaska.

Rather than proposing one large renewable energy project that will produce much more power than the projected demand in Iqaluit, the implementation of the Iqaluit Hydroelectric Project will work in two phases. The Jaynes Inlet site is expected to meet Iqaluit's current energy requirements and the Armshow South site will be developed when the demand has increased to the point of needing additional capacity. The phased approach is more achievable in regard to electricity demand and project costs.

Jaynes Inlet is a 12.5 megawatt (MW) storage project located 60 kilometers southwest of Iqaluit. Electricity from the site will be delivered to Iqaluit by an 84 km long transmission line.

Armshow South is a 7.3 megawatt (MW) storage project similar to that of Jaynes Inlet. It will tie into the same transmission line constructed for the Jaynes Inlet facility.

Benefits

There is a compelling case for investing in the Iqaluit Hydroelectric project based on the substantial and wide-spread benefits the project will bring to Nunavummiut. The project is a long-term energy plan to provide lasting financial, environmental and social benefits to the territory and would reduce the cost of living and doing business in Iqaluit. The general impact of any hydro power generating facility produces, and contributes to, physical and social infrastructure development, employment, training and education, business opportunities and cultural supports.

The cost of electricity in Nunavut is already the highest in Canada. In certain areas of Nunavut electricity rates are exceeding a dollar per kilowatt hour. The cost of fuel currently required to power the territory contributes to these high rates. With the implementation of a hydroelectric energy facility, residents and business owners can expect that electricity costs would become lower.

A hydroelectric power plant in Iqaluit could reduce the corporation's overall annual fuel consumption by nearly a third. Of the 55 million liters of fuel QEC requires annually, Iqaluit alone consumes about 15 million liters of diesel. The development of Jaynes Inlet has the ability to displace 21 million liters of fuel and Armshow South would displace a further 12 million liters. Therefore as Iqaluit's power needs increase, it would offset any additional fuel requirements. In turn, this will also reduce the cost of producing energy in Nunavut relative to diesel power generation and provide a meaningful reduction to the territory's greenhouse gas emissions.

A hydro-electric facility can also be expected to last up to 100 years before major refurbishment compared to a normal 40 year life span for power plant infrastructure currently used in Nunavut. Hydro generators are also considerably cheaper to maintain than their diesel counterparts.

Current Status

To date, all work on Iqaluit's hydro development is at the preliminary feasibility study stage. In 2005, studies were conducted for site identification and ranking on 13 rivers within a 100 km radius of Iqaluit. A short list of five potential project sites were identified as promising hydroelectric developments. Public consultations took place to gather more information from land users, hunters, cabin owners, and other key stakeholders on the social and economic lives of the impacted communities.

Between 2006 and 2008, further comprehensive studies on engineering, environmental baselines, Inuit knowledge and financial analysis were also conducted to narrow down preferential hydro sites. QEC also sought out professional assistance to peer review the pre-feasibility studies and advise on engineering and financial analysis. At that time, QEC established a hydro committee made up of local stakeholder groups mandated to review the available data and identify a preferred site for development.

In 2008, Jaynes Inlet and Armshow South were selected as the front runners for potential project sites as together they represent effective solutions to Iqaluit's long-term energy requirements: lowest cost; meets current and future electricity needs; and minimal environmental impacts.

In 2014, the Iqaluit Hydroelectric project was put on hold due to the large capital investment required to proceed with the project which is beyond QEC's funding and borrowing ability.

Financial Analysis

Approximately $10 million was spent to cover the costs of preliminary baseline studies and research for the hydroelectric development and was funded through QEC's internal capital plan. A 2013 capital estimate quoted the price of constructing the first phase of the hydro development at Jaynes Inlet to be $211.5 million and the second phase at Armshow South to be $144.5 million. These estimated project costs are subject to inflation and timing of actual construction.

In 2016, the Auditor General raised a concern that the $10 million carried by QEC for the Iqaluit Hydroelectric Project work-in-process no longer meets the criteria for being a capital work-in-process account. The Auditor General recommended that the work-in-process account needs to be written down as an expense. The Financial Administration Act requires an Act of Write-off for any write-down greater than $20,000. These costs have now been expensed against current income, as the project is no longer active and did not met the accounting definition of an asset.

While the $10 million has been written off of QEC's books, the cost of this work is not lost. The efforts of bringing hydroelectricity to Iqaluit will continue and this preliminary work will be a valuable asset in moving the initiative forward.

Overview of Expenditures

Large scale renewable energy projects, like the Iqaluit Hydroelectric Project, require multitude of comprehensive assessments before they can be considered viable for power generation. Much of the expenses already incurred by QEC focuses on preliminary feasibility work required to carefully determine the viability of hydroelectric facilities in the territory's capital. The following chart summarizes the amount QEC has expended on the Iqaluit Hydroelectric Project by fiscal year.

Project Expenses by Fiscal Year

2005-2006	$146,348.16
2006-2007	$1,036,412.07
2007-2008	$1,656,561.48
2008-2009	$2,867,155.05
2009-2010	$1,661,754.41
2010-2011	$584,452.62
2011-2012	$107,691.93
2012-2013	$401,740.44
2013-2014	$1,035,802.78
2014-2015	$291,506.84
2015-2016	$251,317.66
	$10,040,743.44

Many of QEC's expenses for this project lie in the planning and preparatory stage of renewable energy development. The following chart summarizes how much QEC has financed for project activities thus far.

Project Expenses (broken down by expense category, cost and activities)

Expense Category	Cost	Activities
Payroll Payroll (overtime)	731,921.55 21,790.76	Project manager, project coordinator, site staff, and bear monitors
Materials	158,946.73	Camp supplies, office supplies, gas, helicopter fuel, monitoring equipment, land use permits, water licenses, camp construction materials, satellite phone and usage fees
Freight	32,419.42	Shipping of materials
Travel & Lodging Meals & Incidentals	184,700.69 6,557.82	Helicopter pilot rotation, community consultations, hydroelectric facility visit in Nuuk Greenland
Vehicle & Equipment Rental	2,076,143.14	Helicopter rental, boat rental
Equipment Misc. Costs	58,894.68	Portable habitat shelters, emergency kits
Contractor Labour Contractor Materials Contractor Travel & Lodging Contractor Meals & Incidentals	4,872,858.82 60,320.25 246,425.75 24,054.83	Translation services, advertising, socio-economic perceptions survey, Inuit knowledge study, aquatic (marine) and environmental impact/baseline studies, feasibility studies, rate impact analysis, report preparation, hydrology studies, project development plan, community consultation
Capital Overhead Allocation	1,565,709.00	Project administration cost
Total	**$ 10,040,743.44**	

Over half of the project costs were consumed by contracting specialists to conduct the preliminary feasibility research needed to kick start the hydro project. This includes site visits, desktop and field studies, data collection, environmental and socio-economic assessments and other relevant research to fully comprehend the feasibility of the project and the implications of its establishment.

Many of the associated costs for lodging and transporting contractors were due to the location of the potential hydro facilities. The hydro developments are not accessible by road, therefore air and water transportation services were required to transport contractors to and from the site. Rental helicopters and boats, as well as all-terrain vehicles, were used for this purpose.

Contractors and QEC staff were required to stay on site for long periods of time. Because a lot of the work was conducted out on the land, shelters such as huts and tents were purchased to provide protection to contractors, staff and equipment at the hydro development study sites.

Existing QEC staff filled the roles of project manager and project coordinator. QEC also employed additional staff to assist contractors with the preliminary work of the project. Their salary compensation was allocated to the hydro development expenses.

Other costs for the project consisted of project materials and equipment, shipping, permits and licenses, camp and office supplies, fuel and technology, and community consultations.

Capital overhead allocation accounts for interest charges and indirect project administrative services provided by QEC staff. These services consist of activities such as processing project related documentation (billing, travel arrangements, contracting, etc.).

Contributions

Two funding contributions were received for the Iqaluit Hydroelectric Project from federal and territorial governments totaling $2.1 million. The Canadian Northern Economic Development Agency (CanNor) approved funding support in the amount of $110,000 in 2013 for QEC's Hydrology Analysis Project as per the signed agreement. In 2009, the Government of Nunavut contributed $2 million to the Jaynes Inlet and Armshow South hydro developments. The funding was used on expenses associated with the preliminary feasibility studies conducted at the two potential hydroelectric sites.

Contributor	Amount	Year
CanNor	110,000	2013
Government of Nunavut	2,000,000	2009
Total External Funding	**2,110,000**	

Funding

QEC does not generate an adequate revenue surplus to fund construction of a hydroelectric facility on its own and the current capital spending is required to maintain the existing diesel power infrastructure. QEC is at the point of needing replacements for 13 of 25 power plants. Power plant rebuilds have become a top priority for QEC in order to provide Nunavummiut with a safe, reliable and affordable energy supply. QEC has prioritized which community power plants that require replacing.

The corporation obtains funds to pay for capital expenditures, such as power plant rebuilds, and is restricted to how much it can borrow at any given time. Financing the $10 million preliminary feasibility

studies for Iqaluit's hydro facilities was possible because of QEC's borrowing capacity from the GN. QEC's borrowing limit would not cover the costs associated with proceeding with the hydro project.

Increasing customer rates to finance the hydroelectric project is also not a viable option for financing the Iqaluit Hydroelectric Project. Nunavut's ratepayers are already burdened with electricity costs much higher than the costs customers pay in other provinces and territories in Canada. Charging customers more for the power they receive could have significant financial implications for Nunavummiut.

A number of other financing options have been considered such as territorial funding, federal financial assistance and private sector investments. QEC has lobbied and pursued partnership opportunities to fund the large capital investment needed to advance this project, however, attempts to secure funding arrangements were unsuccessful.

Government of Nunavut

The GN operates under a limited debt cap granted by the Government of Canada. QEC has been allocated $200 million of that debt as a loan guarantee in order to replace existing infrastructural needs. Currently QEC nor the GN has access to adequate financial resources, and as such, prevents the territory from financing the cost of the project on its own. An increase in the current Government of Nunavut debt cap granted by the Government of Canada through a loan guarantee could provide Nunavut with enough allowable debt to finance the Iqaluit Hydroelectric Project.

Federal

Direct investment from the Government of Canada would allow QEC to proceed with the project, without breaching the Government of Nunavut's existing debt cap. QEC is also currently seeking opportunities for funding within the Government of Canada's federal budget that would allow the corporation to further pursue renewable energy projects.

Private Investment

Many multimillion dollar companies and corporations have been taking steps toward investing in socially responsible initiatives such as renewable energy projects. As the Iqaluit Hydroelectric Project is expected to reduce the cost of living and doing business in Iqaluit, private investors would benefit from the economic, social and environmental impacts of large renewable energy initiatives within the territory.

Moving the Project Forward

The Iqaluit Hydroelectric Project will provide significant economic and environmental benefits to the territory and will supply clean, sustainable, and affordable energy to Nunavummiut. This project is also in alignment with the Government of Canada's clean energy developments and demonstrates national and regional significance, economic and financial merit, and its ability to considerably reduce greenhouse gas emissions.

Even though the potential hydro development is proven to provide lasting benefits to the territory, the Iqaluit Hydroelectric Project is currently on hold. There are two fundamental circumstances required to re-start the project and move the development forward.

Project financing

As of 2013, the total cost of the project is estimated at approximately $356 million to construct both hydro development sites. Financing for the hydroelectric developments is the bottom line necessity in progressing the project forward. While a variety of potential funding avenues have been identified, the funding for the project will likely require a combination of private financing and/or direct investment from the federal and territorial governments. Attempts to secure federal funding and public sector arrangements were unsuccessful thus far.

Final feasibility studies

A final feasibility study to determine the impact the project will have on aquatic life and the surrounding environment is the last step to confirm whether or not the project should proceed as planned. The final feasibility studies are estimated to cost an additional $6.6 million to complete the next permitting phase.

Large scale projects, such as the proposed Iqaluit Hydroelectric Project, require great care and consideration in planning and preparation as well as multiple solutions for the development and commissioning of infrastructure. Conducting final feasibility studies and securing financing is key in moving the Iqaluit Hydroelectric Project forward.