

Qulliq Energy Corporation



ᑭᓄᑦᓕᓄᓄᑦ ᐅᓕᓄᑦᓄᑦᓄᑦᓄᑦ ᓄᓄᑦᓄᑦ
Qulliq Energy Corporation
Société d'énergie Qulliq
Qulliq Alruyaktuqtunik Ikumatjutiit

Application for Major Project Permit

IGLOOLIK NEW POWER PLANT

February 2021



Executive Summary

The Qulliq Energy Corporation (QEC) hereby applies to the Minister Responsible for Qulliq Energy Corporation pursuant to section 18.1 of the Qulliq Energy Corporation Act, R.S.N.W.T. 1988, c.N-2 for a project permit respecting the new Igloolik Power Plant Project.

The project will have no impact on rates until the time of QEC's first General Rate Application following the project in-service date, which is expected no earlier than the 2025/26 fiscal year.

Igloolik is a community with increasing demand for electricity, reflecting its growing population. The existing Igloolik power plant is an aged plant which was constructed in 1974. Presently, the power plant has 1,520 kW installed firm capacity (IFC) which is less than the community's required firm capacity (RFC) forecast of 1,649 kW in 2030. It is not technically feasible to expand the existing power plant due to lack of space and poor building infrastructure condition. This situation requires a solution to ensure QEC can continue providing safe, reliable power to the community.

Proceeding with the proposed Project will maintain safe and reliable electricity supply in the community at the lowest cost over the life of the facility. As well the Corporation expects reductions in fuel consumption with the installation of the new engines.

The key benefits of constructing the new Power Plant in Igloolik include:

- Ensuring sufficient installed capacity to meet QEC's required firm capacity criterion.
- Resolving power reliability and stability concerns by replacement/upgrading of equipment and systems at the end of their useful service life.
- Resolving safety and operation concerns by addressing the current structural issues.
- Addressing environmental requirements of fuel storage system according to applicable codes and standards.
- The new plant will be capable of integration with renewable energy sources.

QEC's estimated cost to complete the Project is \$35.745 million. This project has been identified to receive funding from the Arctic Energy Fund (AEF) Program for a contribution of 75% of eligible expenses, and as such QEC's customers would only have to pay for approximately 25% of the total project cost.



Table of Contents

1.0	Application	1
2.0	Background	1
3.0	Existing Facility	2
3.1	Introduction.....	2
3.2	Condition.....	4
4.0	Future Growth	4
4.1	Population Forecast.....	4
4.2	Load Forecast.....	5
5.0	Assessment of Project Options	6
6.0	Impact of the Project on Ratepayers	9
7.0	Grounds in Support of the Application.....	11
8.0	Project Timeline	11

List of Tables

Table 1 - Igloolik Power Plant Genset Line-up.....	3
Table 2 - Igloolik Population Projections.....	4
Table 3 - Igloolik Actual Load and Load Forecast.....	5
Table 4 - Existing and Proposed Genset Line-up.....	8
Table 5 - Project Contribution (\$000).....	9
Table 6 - Igloolik New Power Plant Estimated Rate Impact.....	10
Table 7 - Proposed Igloolik Power Plant Project Schedule.....	12

List of Figures

Figure 1 - Location of Proposed New Plant: Option Two.....	2
Figure 2 - Igloolik.....	3



1.0 Application

The Qulliq Energy Corporation (QEC) hereby applies to the Minister Responsible for Qulliq Energy Corporation pursuant to Section 18.1 of the Qulliq Energy Corporation Act, R.S.N.W.T. 1988, cN-2 for a major project permit for the Igloolik Power Plant Project. QEC is requesting permission to proceed with this project. Details in support of the requested project permit are set out below.

2.0 Background

QEC is committed to planning and developing cost effective and efficient ways to ensure that energy supply remains safe, reliable and stable.

The Igloolik Power Plant was constructed in 1974. The plant's installed capacity is inadequate to meet the community's current capacity requirements. The capacity of the existing plant cannot be increased due to the lack of space and poor condition of the facility.

Now 47 years old, the Igloolik facility is due for replacement for multiple reasons, including the need to replace aging equipment and compliance with current safety and environmental regulations.

QEC intends to engage in a multiyear project to build a new power plant in Igloolik, Nunavut. The project will include the installation of 4 new fuel-efficient gensets with total capacity of 3,450 Kw, two 90,000-litre double wall horizontal fuel tanks. A 400-meter fuel pipeline (partially underground) will be constructed to connect to the Petroleum Products Division's (PPD) system. The plant will generate much less noise and exhaust gases, due to the availability of equipment like industrial scrubbers and hospital grade silencers which will substantially reduce sound and air pollution. The new plant will have a life cycle of over 40 years, and will be capable of integrating renewable energy sources.

QEC met with the Igloolik Hamlet Council on August 11, 2020. At this time, QEC presented three proposed location options for the new power plant and outlined the pros and cons of each location. Following these discussions, on August 21, 2020 the Hamlet issued a letter to QEC indicating the acceptance of the proposed "Option 2" location. This location is approximately 400 meters north of the PPD tank farm and immediately east of an existing road.



Figure 1 - Location of Proposed New Plant: Option Two



QEC has already performed Geotechnical and Environmental studies and survey of the Option Two lot, and completed archeological research. QEC anticipates receiving Nunavut Impact Review Board (NIRB) approval by June 2021. Land approval for the proposed site has also been obtained from the Hamlet.

3.0 Existing Facility

3.1 Introduction

Igloolik is a community in Foxe Basin, located in the Qikiqtaaluk Region north of the Arctic Circle, between the Canadian mainland and Baffin Island. Figure 2 provides a map indicating the location of Igloolik.



Figure 2 - Igloolik¹



Access to the community is limited to air and sea traffic travel only. The community fuel resupply is carried out annually in the summer/fall via fuel supply tanker. Some of the largest electricity loads in the community include the Hamlet Office & Community Centre, one school, Health Centre, Northern Store and Co-Op stores.

QEC and its predecessors, the Northwest Territories Power Corporation (NTPC) and the Northern Canada Power Corporation (NCPC), have operated the diesel generating plant in Igloolik since the plant was constructed in 1974. Table 1 summarizes the current Genset line-up of the plant.

Table 1 - Igloolik Power Plant Genset Line-up

Unit	Make	Model	kW Rating	Year Installed	Engine Hours (Jan 2021)	Engine Life Hours
G1	Detroit	12V4000G73	850	2013	25142	100000
G2	Caterpillar	D3508	480	1993	96950	100000
G3	Caterpillar	D3512	720	1995	118985	100000
G4	Detroit	Series 60	320	2006	45815	72000
Total Installed Capacity			2,370			
Installed Firm Capacity			1,520			

Installed Firm Capacity= Plant capacity with the largest unit out of service

¹ Source: CBC (cbc.ca)



3.2 Condition

The facility is 47 years old and has exceeded its 40-year design life. The overall condition of the facility is poor. The current plant has a number of technical and engineering deficiencies, including:

- 1) **Aging Infrastructure**: The facility is 47 years old. The building and ancillary equipment are old and have begun to deteriorate.
- 2) **Genset Replacement**: G3 has exceeded its engine life hours while G2 is approaching its retirement usage limit and soon will be due for replacement.
- 3) **Safety Issues**: The facility is a very old plant and is at a higher risk of equipment failure. The existing switchgear is not Arc Flash resistant nor can it be modified due to age. This increases the fire and safety risk of the facility.
- 4) **Environmental Requirements**: The existing plant has a tank that is single-walled, which is not code compliant as per present codes. In addition, the tank is housed in a berm, which requires decanting each year. The melt water that accumulates in the steel berm gradually erodes and degrades the berm floor.
- 5) **Capacity**: The existing plant does not meet QEC's required firm capacity (RFC) criterion. The Igloolik existing plant's previous years load and load forecast is provided in Table 3. Based on the load forecast, the community is already projected to RFC deficit by 2022/23 reaching a shortfall of 8% by 2029/30.

4.0 Future Growth

QEC recognizes the need for a long term approach to prioritize and maximize the benefit of capital expenditures while providing safe and reliable electricity service.

4.1 Population Forecast

The population of Igloolik is estimated to reach 1949 in 2021 according to the Nunavut Bureau of Statistics. Table 2 summarizes population projections for Igloolik through 2036.

Table 2 - Igloolik Population Projections

YEAR	PROJECTED POPULATION
2021	1949
2026	2098
2031	2260
2036	2431

Source: Nunavut Bureau of Statistics



4.2 Load Forecast

Table 3 summarizes the load forecast for Igloolik. The plant is projected to experience RFC shortfall by 2022/23, which is expected to increase by 2029/30. With the proposed plant capacity QEC will be able to meet community's power demand and provide reliable and safe electricity in the community for the foreseeable future.

Table 3 - Igloolik Actual Load and Load Forecast

	Fiscal Year	Generation MWh	Peak Load kW	Change %	RFC kW	Existing Plant IFC kW	RFC Surplus
Actual	2013	6,183	1215		1337	1520	12%
	2014	6,410	1306	7%	1437	1520	5%
	2015	6,608	1302	0%	1432	1520	6%
	2016	6,587	1209	-7%	1330	1520	13%
	2017	6,771	1247	3%	1372	1520	10%
	2018	6,671	1353	9%	1488	1520	2%
	2019	6,915	1398	3%	1538	1520	-1%
	2020	6,875	1329	-5%	1462	1520	4%
Forecast	2021	6,901	1331	0%	1464	1520	4%
	2022	7,032	1370	3%	1507	1520	1%
	2023	7,093	1398	2%	1538	1520	-1%
	2024	7,167	1405	0%	1545	1520	-2%
	2025	7,258	1414	1%	1555	1520	-2%
	2026	7,335	1431	1%	1574	1520	-4%
	2027	7,418	1451	1%	1596	1520	-5%
	2028	7,504	1469	1%	1615	1520	-6%
	2029	7,588	1483	1%	1631	1520	-7%
	2030	7,675	1499	1%	1649	1520	-8%

RFC=Required Firm Capacity = 110% of Peak Load

IFC=Installed Firm Capacity= Capacity with the largest unit out of service

Table 4 illustrates plant capacity and RFC requirements with the proposed Project.



Table 4 - Igloolik RFC Surplus Projection with Project

	Fiscal Year	Generation MWh	Peak Load kW	Change %	RFC kW	Existing/ New Plant IFC kW	RFC Surplus
Actual	2013	6,183	1,215		1337	1520	12%
	2014	6,410	1,306	7%	1437	1520	5%
	2015	6,608	1,302	0%	1432	1520	6%
	2016	6,587	1,209	-7%	1330	1520	13%
	2017	6,771	1,247	3%	1372	1520	10%
	2018	6,671	1,353	9%	1488	1520	2%
	2019	6,915	1,398	3%	1538	1520	-1%
	2020	6,875	1,329	-5%	1462	1520	4%
Forecast	2021	6,901	1,331	0%	1464	1520	4%
	2022	7,032	1,370	3%	1507	1520	1%
	2023	7,093	1,398	2%	1538	1520	-1%
	2024	7,167	1,405	0%	1545	1520	-2%
	2025	7,258	1,414	1%	1555	1520	-2%
	2026	7,335	1,431	1%	1574	2350	33%
	2027	7,418	1,451	1%	1596	2350	32%
	2028	7,504	1,469	1%	1615	2350	31%
	2029	7,588	1,483	1%	1631	2350	31%
	2030	7,675	1,499	1%	1649	2350	30%

RFC=Required Firm Capacity = 110% of Peak Load

IFC=Installed Firm Capacity= Capacity with the largest unit out of service

5.0 Assessment of Project Options

QEC recognizes the need for a long-term approach to prioritize and maximize the benefit of capital expenditures while providing safe and reliable electricity service.

The existing plant deficiencies mean the “Do Nothing” option is not a viable option. Operating assets beyond their service life also places a larger burden on QEC’s maintenance and operations personnel by trying to maintain and operate assets that should be replaced.

QEC investigated the following options as potential solutions to address the deficiencies at the existing plant.



Option 1 – Major Plant Upgrade

This option includes upgrading and replacement of major components and systems within the existing facility, including the gensets.

However, this option is not technically feasible for the following reasons:

- The plant has deteriorated due to age and is beyond upgrading;
- The footprint of the existing plant is too small to accommodate the required new gensets;
- The existing plant site does not have sufficient land space to accommodate a plant expansion.

Based on these considerations, Option 1 is not a viable option.

Option 2 – Construct a New Plant at a New Location

This option involves the construction of a new power plant at a suitable location in the community.

The plant would be a four-engine generation facility designed for a 40-year life and would incorporate new technology to improve reliability, efficiency, operation, and safety. The plant would meet current operational, safety and environmental regulations. The new construction will include fuel storage consisting of two 90,000-liter double wall horizontal fuel tanks and appropriate pumping facilities, concrete pad for transformers storage, pole racks, berms for used oil, required upgrade of existing distribution system to connect to the new facility, space for Transient Unit, and a Quonset Garage. The new plant will also have space for two Sea Cans for storage, a waste disposal area, and a fence. The project scope also includes required existing distribution system upgrade to connect the new facility.

The plant would generate less noise and air pollution, due to the remote location and installation of equipment, including industrial scrubbers and hospital grade silencers. The new plant would be capable of integrating renewable energy sources.

The proposed generating capacity of the new plant is approximately 3,450 kW. A power plant of this capacity will meet Igloolik's peak load projections for 40 years. Table 5 indicates the genset ratings of the existing plant and proposed new plant.



Table 5 - Existing and Proposed Genset Line-up

Existing Units	Existing Rating (KW)	Proposed Units	Proposed Rating (KW)
G1	850	G1	1100
G2	480	G2	950
G3	720	G3	850
G4	320	G4	550
Total Installed Capacity	2370		3450
IFC	1520	IFC	2350

IFC=Installed Firm Capacity= Capacity with the largest unit out of service

Based on the manufacturing of the engines the expected installed capacity of the new plant is 3450 kW. QEC dispatch programming is set at 80% of capacity of engines online to ensure reliability and good fuel economy.

The installed firm capacity (IFC) of the plant will be 2350 kW. At the target load of approximately 80% of the capacity to maximize the fuel efficiency, the adjusted firm capacity of the plant will be approximately 1,880 kW.

The RFC requirement for the community is projected at approximately 1,574 kW by 2025/26. Option 2 proposes a firm capacity taking into consideration the following:

1. Igloolik is a growing community in Nunavut.
2. The plant is being built for long-term use.

Anticipated benefits from the new plant include the following:

- Resolving power reliability and stability concerns by replacement/upgrading of equipment and systems at the end of their useful service life; and
- Resolving safety and operation concerns by addressing the current structural issues.



The total preliminary cost estimate for Option 2 is \$35.745 million. This cost is a preliminary D-class estimate with accuracy of +/- 25%. The cost is subject to refinement during the project design.

This project has been identified to receive funding from the Arctic Energy Fund (AEF) Program for a contribution of 75% of eligible expenses. Ineligible AEF expenses are estimated to be approximately \$1.385 million (including land acquisition and in-house administration cost). As such, the net cost of the new plant for QEC's customers is estimated at \$9.975 million as detailed in Table 6.

Table 6 - Project Contribution (\$000)

Description	2022/23	2023/24	2024/25	2025/26	Total
Plant Replacement	1,010	4,191	14,109	16,435	35,745
AEF Ineligible Expenses	259	162	328	636	1,385
AEF Contribution - 75%	563	3,022	10,336	11,849	25,770
QEC Contribution - 25%	188	1,007	3,445	3,950	8,590
Total	1,010	4,191	14,109	16,435	35,745
Total QEC Contribution	447	1,169	3,773	4,586	9,975

After examining the options, QEC considers the most feasible and cost effective option is to pursue the construction of a new plant. QEC will maintain and operate the existing facility until the new plant is operational.

Prior to demolition of the old power plant all major components will be reviewed during asset disposal process to evaluate age, reliability and feasibility to re-purpose any or all of these major components.

QEC proposes to design the Igloolik Plant with the ability to integrate potential renewable energy sources in the future.

6.0 Impact of the Project on Ratepayers

QEC conducted an analysis of the impact of the Project on ratepayers in the community of Igloolik. It should be noted that the project will have no impact on rates until the time of QEC's General Rate Application following the project coming in-service, which is expected no earlier than the 2025/26 fiscal year.

QEC conducted the rate impact analysis based on the current system of community-based rates, as well as an alternative territorial rate design option. Under the current system, rate impacts to communities needing new power plants are high. These rate increases could be mitigated by rate options including moving to a territory-wide rate, or if community based



rates were to continue, by not reflecting the full impact of the new capital addition in rates for the community (such that the revenue to cost coverage ratio for the community would be below unity and other communities would be required to have revenue to cost coverage ratios above unity).

The rate impact analysis is based on QEC’s estimated cost for this project of \$9.975 million, after the AEF contribution. While the Project is expected to improve fuel efficiency compared to the existing genset, QEC performed a conservative rate impact analysis which does not include expected fuel savings benefit of the Project.

Table 7 summarizes the estimated incremental revenue requirement increase due to the project of \$0.892 million. The estimated rate increase under the community-based rates is 12.87 cents/kWh, which is very high at 20.9% increase over the current domestic rate of 61.70 cents/kWh in Igloolik. However, under a territorial rate design scenario the estimated average rate increase is 0.46 cents/kWh, or 0.7% over the current domestic rate of 61.70 cents/kWh.

Table 7 - Igloolik New Power Plant Estimated Rate Impact

<u>Project Characteristics</u>	
Net Capital Cost (\$ 000)	9,975
Amortization Period (year)	40
GRA Approved Return on Ratebase	6.45%
<u>Revenue Requirement Impacts</u>	
Amortization Expense (\$ 000)	249
Return on Ratebase (\$ 000)	643
sub-total: Revenue Requirement Increase (\$ 000)	892
Total Revenue Requirement Impact (\$ 000)	892
Igloolik 2025/26 Forecast Sales (MWh)	6,931
Average Community-Based Rate Increase (c/kWh)	12.87
Territorial 2025/26 Forecast Sales (MWh)	195,491
Average Territorial Rate Increase (c/kWh)	0.46

It is important to note this analysis has been provided for illustrative purposes only. Actual rate impacts will depend on the overall revenue requirements and rate designs approved in subsequent General Rate Applications.



7.0 Grounds in Support of the Application

The implementation of the proposed Project is very important to QEC's customers and the public. The implementation of the project will address the following primary concerns:

- **Power Reliability and Stability**

The current plant will not meet QEC's required firm capacity criterion in the coming years. As the Igloolik power plant continues to age and systems become more outdated, it will become more difficult to maintain the facility and plant reliability will become an issue. Power is an essential service in the North and perhaps more so for remote communities. Without reliable equipment, QEC's customers are at risk of system failure. A new power plant equipped with new fuel-efficient gensets and plant automation will increase fuel efficiency and overall plant reliability.

- **Safety Concerns**

Construction of a new power plant will allow QEC to address the existing deficiencies with the current power plant related to the safety concerns. In particular, the existing switchgear is not Arc resistant and cannot be modified, which increases fire risk of the facility.

- **Environmental Requirements**

The existing fuel storage system is single walled and therefore does not comply with the current codes and regulations of Environment Canada. The proposed project will address these environmental requirements.

The new plant will be capable of integrating renewable energy sources, such as wind turbines or solar panels should the opportunities arise in the future. This will help reduce greenhouse gas emissions to the atmosphere and reduce the cost of energy in the end.

8.0 Project Timeline

The geotechnical and Phase I&II environmental assessments were performed in January 2021. The archeological assessment is anticipated for completion by June 2021.

The new power plant design will commence in the second quarter of 2022/23, with specifications and tenders to allow for ordering of materials and construction contracts beginning in the second quarter of 2023/24. Site grading works will begin during July - September of 2024 and materials will be delivered during sealift 2024. Construction would begin second quarter of 2024/25 and be completed in 2025/26. Table 8 illustrates the proposed project schedule for reference purposes.



Table 8 - Proposed Igloolik Power Plant Project Schedule

Task Table	2020-2021				2021-2022				2022-2023				2023 - 2024				2024 - 2025				2025 - 2026			
	1 ST QT	2 ND QT	3 RD QT	4 TH QT	1 ST QT	2 ND QT	3 RD QT	4 TH QT	1 ST QT	2 ND QT	3 RD QT	4 TH QT	1 ST QT	2 ND QT	3 RD QT	4 TH QT	1 ST QT	2 ND QT	3 RD QT	4 TH QT	1 ST QT	2 ND QT	3 RD QT	4 TH QT
Finalize List of Proposed Sites	■																							
Geo-Tech Study and Recommendations		■	■	■																				
Site Selection Approval				■	■																			
Develop Business Case and Cost Estimate (Class 'D')				■	■																			
WPP Regulatory Process and Approval				■	■	■																		
FMB Approval						■	■																	
Tendering Stage							■	■	■															
ProjectDetail Design								■	■	■	■													
Construction contract Tender and Award													■	■	■									
Construction																								
Substantial Completion																								■
Project Handover																								■
Project Close Out																								■