

# Qulliq Energy Corporation



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Qulliq Energy Corporation  
Société d'énergie Qulliq  
Qulliq Alruyaktuqtunik Ikumatjutiit

## Application for Major Project Permits

**GENSET REPLACEMENTS FOR  
BAKER LAKE, RANKIN INLET AND IQALUIT**

**September 2024**



## 1 **Executive Summary**

2 Qulliq Energy Corporation (QEC) hereby applies to the Minister Responsible for Qulliq  
3 Energy Corporation pursuant to section 18.1 of the *Qulliq Energy Corporation Act*,  
4 R.S.N.W.T. 1988, c.N-2 for project permits for genset replacements in Baker Lake, Rankin  
5 Inlet and Iqaluit. The proposed genset replacements will address reliability and capacity  
6 issues in the communities related to the need to meet QEC's capacity planning criteria,  
7 address units that are at or beyond their useful life and resolve reliability issues related to  
8 the unavailability of spare or replacement parts.

9 QEC's estimated cost to complete the four genset replacement projects is \$33.9 million.  
10 This would result in an estimated 1.58 cents/kWh increase in revenue requirement by the  
11 time the projects are fully in service. The projects will have no impact on rates until the time  
12 of QEC's first General Rate Application following the project in-service date. Project  
13 budgets have been prepared based on recent tendering experience with similar projects.

14 Genset replacement projects typically take two years to complete based on the need to  
15 order equipment and schedule construction. The projects are anticipated to be completed  
16 by 2025/26 and 2026/27 fiscal years respectively.



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## 1.0 Application

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 major project permits for genset replacements in Baker Lake, Rankin Inlet and Iqaluit. QEC is requesting permission to proceed with these projects. Details in support of the requested project permits 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. QEC uses a required firm capacity (RFC) planning formula for its diesel plants such that 110% of the forecast peak load can be met with the largest single unit out of service, subject to engineering judgement. This planning criterion is consistent with that used by the Northwest Territories Power Corporation for its isolated single-generation communities.<sup>1</sup>

Genset replacements can be required for a number of reasons, including:

1. The community does not have sufficient installed capacity to meet the RFC formula.
2. The genset has reached the end of its expected life either in age or hours of service.
3. Maintenance issues have arisen that compromise the reliability of the unit.
4. Spare or replacement parts are no longer available.

QEC is applying for major project permits to replace gensets in three communities: Baker Lake, Rankin Inlet and Iqaluit. The locations of these communities is shown in Figure 2.1.

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<sup>1</sup> A Vision for the NWT Power System Plan (2013), NT Energy, p. 24. Available: [https://www.ntpc.com/sites/default/files/2021-02/psp-december-10\\_2013.pdf](https://www.ntpc.com/sites/default/files/2021-02/psp-december-10_2013.pdf) Accessed, September 20, 2024



1 **Figure 2.1 – Genset Replacement Community Locations**



2  
 3 **2.1 Baker Lake**

4 **2.1.1 Project Background**

5 Baker Lake is located in the Kivalliq Region of Nunavut. The population of the community  
 6 was 2,061 in the 2021 census.<sup>2</sup> Access to the community is primarily by air at the Baker  
 7 Lake airport or by sealift. Table 2.1 summarizes the current genset line-up installed in the  
 8 community. There is currently no emergency generator located in the community.

<sup>2</sup> Statistics Canada. 2021 Census of Canada. Available: <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=9810000201#data> Accessed, September 20, 2024.



1

**Table 2.1: Baker Lake Genset Line-up**

Unit Number	Brand and Model	Capacity (kW)	Year Installed	Operating Hours
G1	Cat D 3516 B	1100	2017	26,879
G2	Cat D 3512 B	850	2005	71,069
G3	Cat D 3516 B	1050	2005	85,419
G4	Cat D 3508 B	550	2011	46,393

2

3 On July 15, 2024, QEC submitted a MPP to the Minister Responsible for Qulliq Energy  
 4 Corporation requesting that the project permit be granted expeditiously without providing  
 5 all the information typically included in a project permit application and without seeking  
 6 advice from the Utility Rate Review Council.

7 This project was initially approved in the 2021-22 fiscal year to replace genset G4 (550  
 8 kW) with a new 1,100 kW unit. The upgrade ensures an adequate, safe, and reliable  
 9 power supply to address Baker Lake’s future energy needs. The current lineup of gensets  
 10 will not be able to meet the firm’s installed capacity requirements due to the community’s  
 11 potential increase in load in keeping with the NU3000 housing plan and other customer  
 12 growth. The NU3000 housing plan is scheduled to construct 180 public housing units in  
 13 Baker Lake by 2030.

14 The project was approved by the Board and FMB in 2022 with a budget of \$4.985 million,  
 15 which is below the threshold of \$5 million required for a Major Project Permit application  
 16 (MPPA).

17 A contract to supply a CAT 3516B, 1100 kW, was signed with Toromont in May 2023.  
 18 The generator is to be delivered to the site in the summer/fall of 2025.

19 Most recently, QEC received bids for installing and commissioning the genset, bringing  
 20 the project cost higher than originally estimated and approved. It has been determined  
 21 the project requires additional funds of \$0.770 million, increasing the total project cost to  
 22 \$5.755 million. The increase in project cost were a result of:

- 23 • Higher construction cost received from bidders compared to projected contractor  
 24 costs, even taking contingency into account;
- 25 • Increase in generation set cost rising by about 40% due to increased efficiency of  
 26 new model available, lower gas emissions and market inflation; and
- 27 • Long project timeline arising due to increased lead time for genset delivery  
 28 resulting in management cost increase.



1 Although the project cost now exceeds \$5 million, prior to awarding the contract, which  
 2 had a deadline of September 5, 2024, QEC required approval from the Minister to  
 3 proceed with this Project.

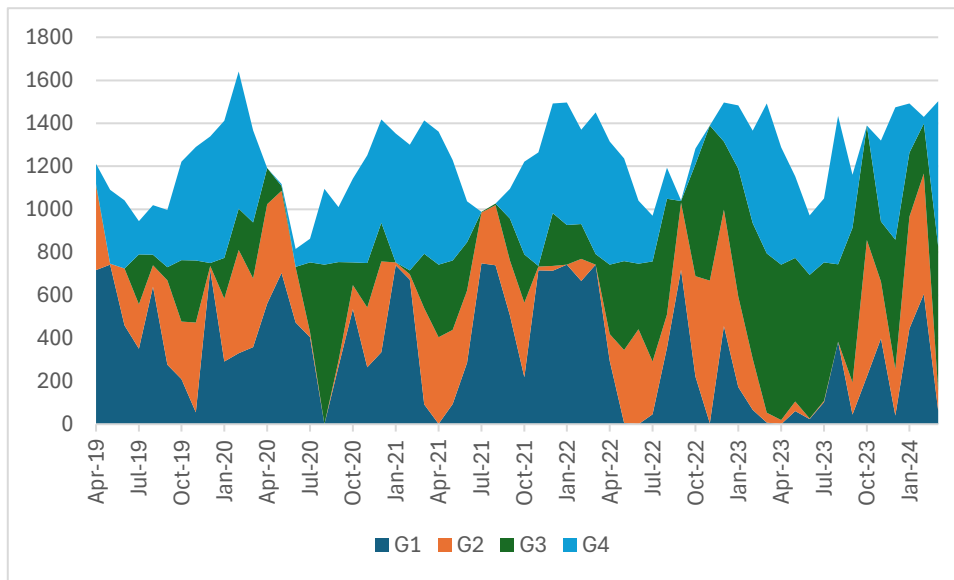
4 Given the unique situation, this approach is prudent and necessary to ensure this project  
 5 is not delayed and costs do not increase further.

6 Within the MPPA, QEC indicated that they have scheduled to file a Major Project Permit  
 7 Application (MPPA) in September 2024 for multiple Genset replacements, which would  
 8 include this project as a courtesy measure to provide the URRC with the opportunity to  
 9 review the reasonableness of the costs associated with the project.

### 10 2.1.2 Genset Condition and Operation

11 Baker Lake genset G4 is a 550kW unit installed in 2011. Since April 2019 it has run for  
 12 approximately 48% of the hours in the year (Figure 2.2).

13 **Figure 2.2 – Genset Run Hours – April 2019 through March 2024**



14

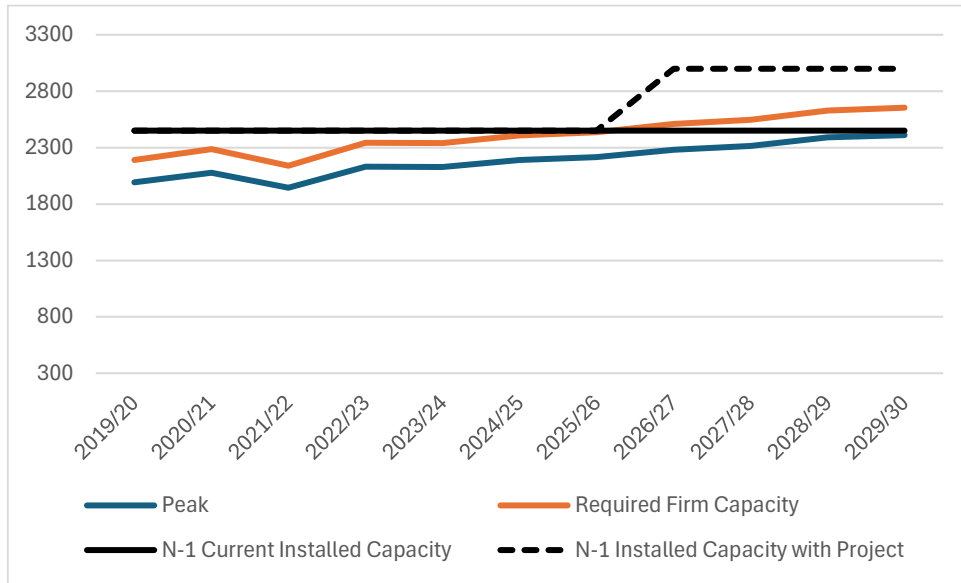
### 15 2.1.3 Required Firm Capacity

16 Baker Lake’s community peak has been increasing since 2021/22, driving the need for  
 17 greater installed capacity. QEC’s current load forecast incorporating NU3000 housing plan  
 18 projects the existing plant will not meet the required firm capacity criteria by approximately  
 19 2026, as shown in Figure 2.3. Replacing the existing 550 kW unit with a new 1100 kW unit  
 20 would increase the available firm capacity, enabling the plant to meet the community’s peak  
 21 load for the foreseeable future.





1 **Figure 2.3 – Community Peak and Required Firm Capacity (kW)**



2

3 **2.2 Rankin Inlet**

4 **2.2.1 Project Background**

5 Rankin Inlet is located on the west coast of Hudson Bay in the Kivalliq Region of Nunavut.  
 6 It is the largest hamlet and second largest settlement in Nunavut. The population of the  
 7 community was 2,975 in the 2021 census, an increase of 4.68% from the 2016 census.<sup>3</sup>  
 8 Access to the community is primarily by air at the Rankin Inlet airport or by sealift. Table  
 9 2.2 summarizes the current genset line-up installed in the community. There is also  
 10 currently a Detroit 12V4000 emergency generator located in the community.

11 **Table 2.2: Rankin Inlet Genset Line-up**

Unit Number	Brand and Model	Capacity (kW)	Year Installed	Operating Hours
G3	MTU 16V4000	950	2019	23,295
G4	Cat D 3606	1500	2011	59,770
G5	EMD 8V710	1450	2006	63,590
G6	EMD 12V-710	2150	2003	89,759

12 QEC is proposing to replace two existing gensets (G5 & G6) within the Rankin Inlet plant:

- 13 • Genset G5 is a 1450 kW unit installed in 2006. QEC is proposing to replace the  
 14 existing G5 unit with a higher capacity 3500 kW unit. Currently, G5 genset is

<sup>3</sup> Statistics Canada. 2021 Census of Canada. Available:  
<https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=9810000201#data> Accessed, September 20, 2024.



1 derated and can only operate up to 80% capacity (i.e. 1160kW). The genset is  
2 unreliable and requires replacement. Operationally, unit G5 was out of service for  
3 almost a year in 2023/24 and has required several major overhauls beyond the  
4 typical major overhaul schedule.

- 5 • Genset G6 is a 2150 kW unit installed in 2003. QEC is proposing to replace the  
6 existing genset G6 with a higher capacity 4400 kW unit. G6 genset was taken out  
7 of service in January 2024 due to a major failure and the parts to repair the unit  
8 have long lead times. Operationally, this unit has had several major overhauls  
9 beyond the typical major overhaul schedule. QEC is proposing replacement due to  
10 lack of reliability of the generation set, high risk of sudden failure, spare parts for  
11 the engine being no longer available from the manufacturer in a timely manner and  
12 accordingly higher maintenance cost incurred for the engine.

13 Overall, the currently installed G5 and G6 units fail to meet the test of reliability,  
14 availability of spare parts and required firm capacity, as such it is imperative that  
15 proposed replacements be made. To compensate for the current shortfall of lost  
16 generation from the G5 and G6 units and meet the community demand, QEC overruns  
17 the other genset units (G3 and G4) at a 100%-110% rated capacity and installed an  
18 emergency 1.5MW mobile modular unit which operates continuously. This situation  
19 results in QEC forgoing regular maintenance of these units to maintain power provision to  
20 the community, which is inconsistent with QEC's and utility industry standards.

21 Proposed replacement of the gensets will resolve maintenance issues with the units,  
22 allow for normal operation and maintenance of the other gensets in the power plant, and  
23 increase reliability of power supply in the community. Additionally, higher capacity on the  
24 proposed new gensets will ensure QEC meets projected demand increases in the  
25 community.

26 Proposed capacities of these new gensets are higher than the existing ones, therefore,  
27 upgrade to the fuel system, cooling system, exhaust system and some modifications of  
28 PLC will be required.

29 These projects involve the design, purchasing and delivery of the gensets, radiators and  
30 hospital type silencers, installation the new gensets with all ancillary equipment,  
31 commissioning, testing and incorporation of the new equipment into the power plant  
32 system, training personnel and providing as built drawings. It should be noted that QEC  
33 plans to install in Rankin Inlet new engines that QEC previously added in inventory upon  
34 approval of the application.

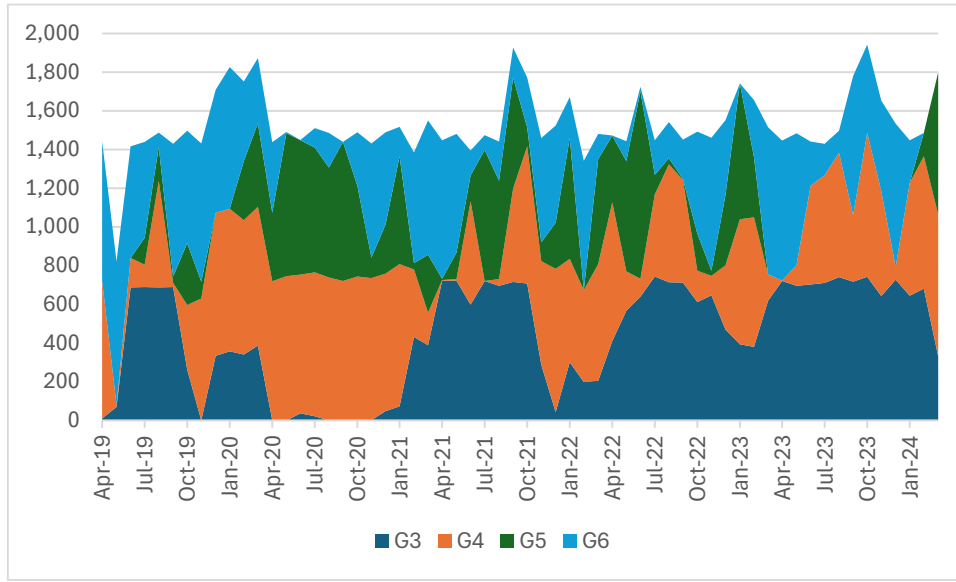
### 35 **2.2.2 Genset Condition and Operation**

36 Rankin Inlet Genset G5 is a 1450 kW unit installed in 2006. Since April 2019 it has run for  
37 approximately 34% of the hours in the year, however it was out of service for most of the  
38 most recent fiscal year (Figure 2.4).



1 Rankin Inlet Genset G6 is a 2150 kW unit installed in 2003. Since April 2019 it has run for  
2 approximately 51% of the hours in the year, however it has been largely unreliable and out  
3 of service since January 2024. (Figure 2.4).

4 **Figure 2.4 – Genset Run Hours – April 2019 through March 2024**



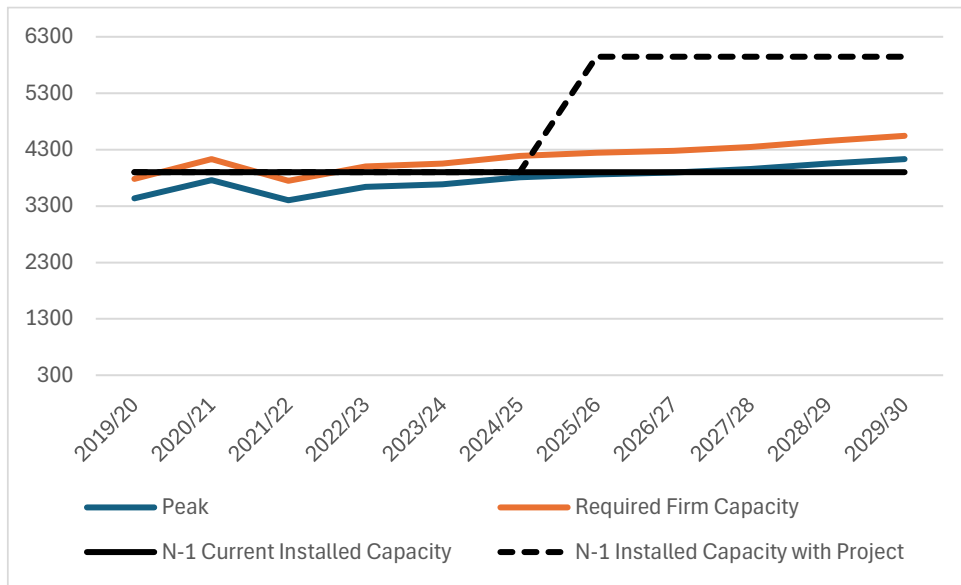
5

6 **2.2.3 Required Firm Capacity**

7 Rankin Inlet’s community peak has been increasing since 2021/22, driving the need for  
8 greater installed capacity. QEC’s current plant does not meet the required firm capacity  
9 criteria and is not in line with the N-1 rules, as shown in Figure 2.5. Replacing the existing  
10 gensets with larger units would increase the available firm capacity, satisfy requirements  
11 of N-1 rule and increase reliability of power supply.



1 **Figure 2.5 – Community Peak and Required Firm Capacity (kW)**



2  
 3 **2.3 Iqaluit**

4 **2.3.1 Project Background**

5 Iqaluit is located in the Qikiqtaaluk Region of Nunavut (Figure 2.1). The population of the  
 6 community was 7,429 in the 2021 census, a slight decrease of 4.0% from the 2016  
 7 census.<sup>4</sup> Access to the community is primarily by air at the Iqaluit airport or by sealift.  
 8 Table 3 summarizes the current genset line-up installed in the community. There is also  
 9 currently a CAT 3406C 320kW black start generator located at the plant.

10 **Table 2.3: Iqaluit Genset Line-up<sup>5</sup>**

Unit Number	Brand and Model	Capacity (kW)	Year Installed	Operating Hours
G1	Wart 9R32	3000	1993	130,903
G2	Wart 12V32	4300	2000	157,013
G3	Wart 12V200	2000	1996	96,561
G4	Cat D 3612	3300	1992	151,734
G7	Wart 12V32	5000	2013	44,322
G8	Wart 12V32	5000	2013	47,774

11  
<sup>4</sup> Statistics Canada. 2021 Census of Canada. Available: <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=9810000201#data> Accessed, September 20, 2024.

<sup>5</sup> G4 unit is currently in the process of replacement

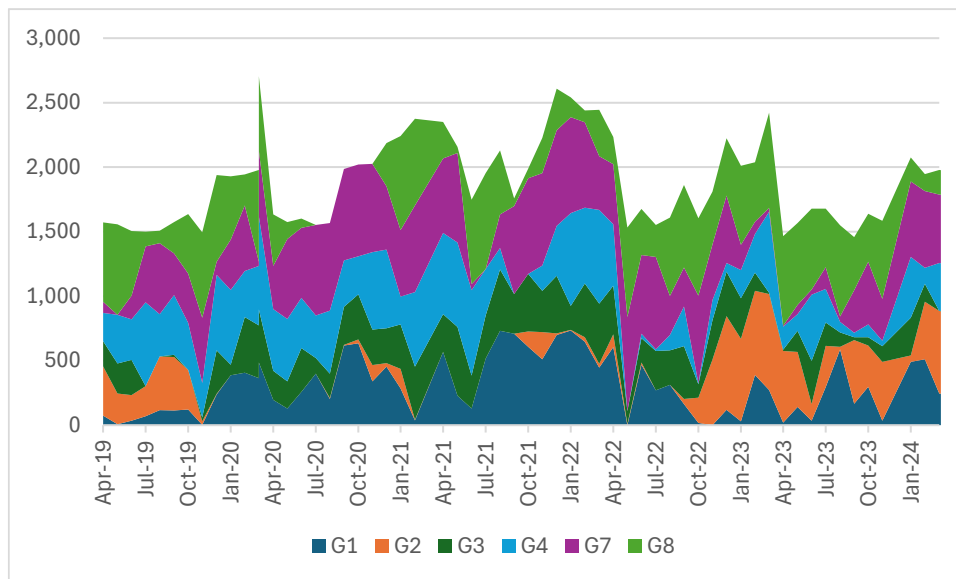


- 1 The project involves replacing the existing G1 3000 kW genset with a similar kW rating
- 2 and all associated auxiliary equipment.
- 3 The project involves the design, purchasing and delivery of the genset, radiator and hospital
- 4 type silencer, reinforcement of the foundation and support structures of the ancillary
- 5 equipment, installation the new genset with all ancillary equipment, commissioning, testing
- 6 and incorporation of the new equipment into the power plant system, training personnel
- 7 and providing as built drawings.

### 8 2.3.2 Genset Condition and Operation

9 Iqaluit's genset G1 is a 3000 kW unit installed in 1993. It has exceeded the manufacturer's  
10 recommended useful operating life of 120,000 hours based on the running time. QEC  
11 completed level 4 generator service in December 2023. Some spare parts for the engine  
12 are no longer available. Failure to undertake the genset replacement will result in higher  
13 risk of outages and failures in the community impacting power supply reliability. Since April  
14 2019, the engine has run for approximately 41% of the hours in the year (Figure 2.6).

15 **Figure 2.6 – Genset Run Hours – April 2019 through March 2024**

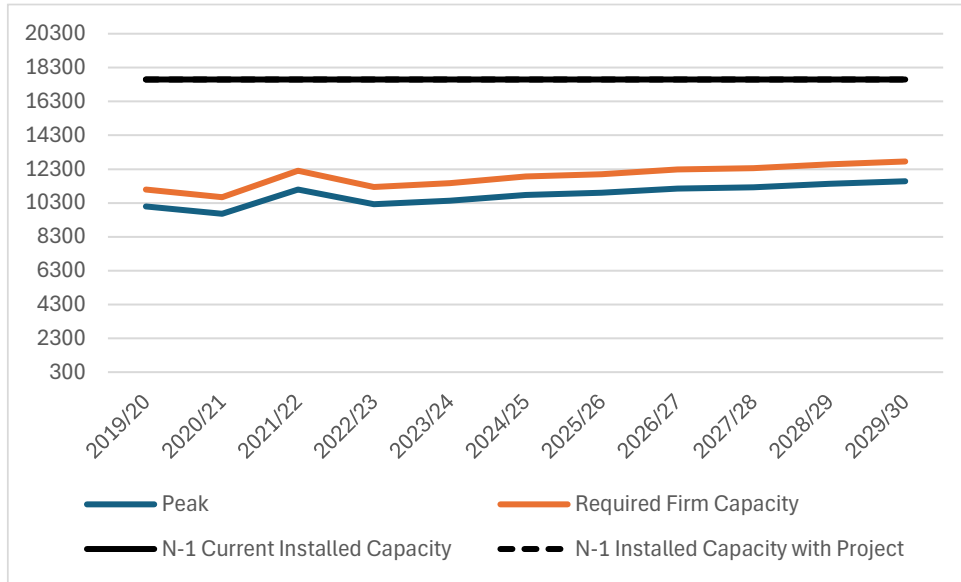


- 16
- 17 **2.3.3 Required Firm Capacity**
- 18 Iqaluit's Inlet's community peak has been increasing since 2020/21 as shown in Figure 2.7.
- 19 Additionally, half of the generation units in the community are over 30 years of age. Iqaluit
- 20 typically needs three to four engines running for most of the year, as such relying on aging
- 21 gensets puts the community at increased risk of engine failures. Spare parts for engines of
- 22 this age are difficult to obtain, leading to significant downtime and lack of availability.



1 Replacing the aging G1 3000 kW unit with a similar rating unit would maintain the firm  
 2 capacity in the community while providing a more reliable and available unit. This ensures  
 3 the community continues to meet the required firm capacity criteria.

4 **Figure 2.7 – Community Peak and Required Firm Capacity (kW)**



5

6 **3.0 Assessment of Project Options**

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

9 QEC considered the following options as potential solutions to address the deficiencies of  
 10 the existing gensets.

11 **Option 1 – Defer Genset Replacements**

12 This option involves deferring the proposed genset replacements. This option is not viable  
 13 as it puts the community at risk of not providing reliable and sustainable power, which is  
 14 contrary to QEC's mandate.

- 15 • Baker Lake's community peak and required firm capacity is forecast to exceed the  
 16 existing installed firm capacity by 2026 with increased load expected from Nunavut  
 17 Housing project.
- 18 • Rankin Inlet's genset G5 and G6 are currently unreliable, experience frequent  
 19 breakdowns and have been out of service for extended periods. This combined  
 20 with the rising peak and extremely high maintenance requirements puts the  
 21 community at increased risk of unreliable and unsustainable power supply.



- 1 • Iqaluit genset G1's operating hours are over the manufacturer's recommended  
 2 operating hours of 120,000 and some spare parts for the engine are no longer  
 3 available. Failure to undertake the genset replacement will result in higher risk of  
 4 outages and failures in the community impacting power supply reliability.

## 5 Option 2 – Complete Genset Replacements

6 This option involves replacing the gensets in each community with the recommended units  
 7 as discussed above. This is the most preferred option for the communities. Table 3.1  
 8 provides initial budget estimates for these projects. Budgets have been prepared based on  
 9 recent experience with pricing for similar projects.

10 **Table 3.1 - Project Budgets (\$000)**

	Baker Lake G4	Rankin Inlet G5	Rankin Inlet G6	Iqaluit G1
QEC Payroll – Regular	170	100	70	165
QEC Payroll – OT	105	45	43	78
Materials & Land Rights	20	60	-	60
QEC Travel & Lodging	35	30	20	20
QEC Meals and Incidentals	15	18	13	
Vehicle & Equipment Rentals	40	50	60	100
Contractor Labour	1,424	1,980	2,075	1,849
Contractor Materials	2,410	5,130	4,890	4,485
Contractor Travel & Lodging	160	135	145	190
Contractor Meals & Incidentals	120	95	68	104
Sub-total	4,499	7,643	7,384	7,051
Contingency 15%	675	1146	1108	1058
Overhead and IDC 11%	569	967	934	892
<b>Total</b>	<b>5,743</b>	<b>9,756</b>	<b>9,426</b>	<b>9,001</b>

11  
 12 In selecting the Genset replacement for each community, QEC has an established set of  
 13 operational criteria (1200 rpm for large genset, 1800 rpm for small genset, continuous rating  
 14 etc.) which applies for procuring gensets. In addition, QEC includes a clause that each  
 15 manufacturer or supplier must ensure that replacement or spare parts are available within  
 16 short notice. Based on QEC's operational criteria and availability of replacement/spare  
 17 parts, usually two to three manufacturers participate in QEC's request for proposal process.  
 18 The model and capacity of gensets for each community may vary depending on load  
 19 demand, however manufacturers do not usually vary significantly.

20 These genset replacement projects are standard maintenance upgrades which QEC need  
 21 to embark on to ensure reliable and efficient power supply are provided to customers.







## 1 **5.0 Grounds in Support of the Application**

2 The implementation of the proposed projects is very important to QEC's customers. The  
3 projects will address the need to maintain reliability and meet capacity planning  
4 requirements.

5 Power is an essential service in Nunavut and QEC must plan to be able to deliver reliable  
6 electricity. The projects will address current forecasted shortfalls in capacity, the need to  
7 replace units nearing or beyond their anticipated useful life, and address maintenance  
8 issues related to unreliable generators and unavailability of spare or replacement parts.

9 In support of the application, QEC is filing the following additional material:

- 10 • Appendix 1: Project briefs for each Genset replacement project explaining the  
11 rationale for each project.
- 12 • Appendix 2: Data source which supports each figure for community peak and  
13 required firm capacity.

## 14 **6.0 Project Timelines**

15 Due to the long lead times currently being experienced for procurement and delivery of  
16 materials, these projects are anticipated to be completed by the 2025/26 fiscal year for  
17 Baker Lake G4 and Rankin Inlet G6 generators and in 2026/27 fiscal year for Iqaluit G1  
18 and Rankin Inlet G5 generator sets. Construction spending for genset replacements  
19 typically occurs over two years.