



June 1st, 2022

Hon. Craig Simailak
Minister Responsible for the Qulliq Energy Corporation
Legislative Assembly of Nunavut
P.O. Box 2410, Iqaluit, NU X0A 0H0

Dear Minister Simailak,

RE: The Major Capital Project Permit Applications Respecting Construction of New Power Plants at Chesterfield Inlet and Kugaaruk, Utility Rates Review Council of Nunavut's Report 2022-01.

By letter dated December 13, 2021, the Qulliq Energy Corporation (QEC) applied to the Minister Responsible for QEC for approval of major capital project permits for new power plants in the communities of Chesterfield Inlet and Kugaaruk. By letter dated December 23, 2021, the Minister Responsible for QEC requested advice from the Utility Rates Review Council of Nunavut (URRC) with respect to QEC's applications.

In response to the applications and the Minister's request, please find attached the URRC's Report 2022-01, respecting QEC's major project permit applications.

Yours truly,

Anthony Rose
Chair
Utility Rates Review Council of Nunavut

CC: Premier P.J. Akeeagok, Minister Responsible for the URRC
Jimi Onalik, Deputy Minister, Executive and Intergovernmental Affairs
Rick Hunt, President, Qulliq Energy Corporation
Laurie-Anne White, Executive Director, URRC



Report to the Minister Responsible for the Qulliq Energy Corporation on:
The Major Capital Project Permit Applications Respecting
Construction of New Power Plants at Chesterfield Inlet and Kugaaruk

Report 2022-01

June 1st, 2022

1.0 EXECUTIVE SUMMARY

1. Qulliq Energy Corporation (QEC), as a designated utility, is required pursuant to Section 18.1 of the *Qulliq Energy Corporation Act* (QEC Act), to seek approval from the responsible Minister prior to undertaking a major capital project.
2. On December 13, 2021, QEC applied to the responsible Minister for approval of major capital project permits for new power plants in the communities of Chesterfield Inlet and Kugaaruk (the Applications). On December 23, 2021, the Minister requested advice from the Utility Rates Review Council of Nunavut (URRC) with respect to the Applications.
3. The URRC's consideration of these matters and recommendations are set out in the report. In summary, the URRC recommends:
 - a. That the major capital project permit approvals for construction of new power plants in Chesterfield Inlet and Kugaaruk, be approved subject to the following:
 - i. The project designs in Chesterfield Inlet and Kugaaruk should include sites, buildings, foundations and other aspects of the facility that are designed for a 40-year life.
 - ii. The URRC considers that, for the foreseeable future, the installed firm capacity (IFC) proposed to be in-service in 2027 for Chesterfield Inlet and Kugaaruk greatly exceeds actual demand in those communities. The URRC also notes that this proposed IFC may limit the introduction of renewable energy options via QEC's current Commercial and Institutional Power Producer (CIPP) and upcoming Independent Power Producer (IPP) programs, contrary to the national and territorial aims to reduce greenhouse gas (GHG) emissions overall. As a result, the URRC recommends:
 - That QEC be directed, prior to finalizing plant designs, to develop and submit, for consideration by the Minister, viable plant design alternatives that both meet community capacity needs for the first 10-12 years (the

time period suggested by QEC) and provide for capacity growth over the lifespan of the plants.

- That if the projected costs after tendering exceed the proposed costs for Chesterfield Inlet (for the alternative approved by the Minister) by more than 25 percent, that QEC be instructed to prepare and submit a new major project permit application (MPPA) to the Minister responsible for QEC.
 - That if the projected costs after tendering exceed the proposed costs for Kugaaruk (for the alternative approved by the Minister) by more than 25 percent, that QEC be instructed to prepare and submit a new MPPA to the Minister responsible for QEC.
- b. In addition to the above, the URRC recommends that QEC have its ability to simultaneously plan and execute six large projects assessed by an independent third party with a focus on identifying and mitigating areas of weakness and/or risk.
- c. Further recommendations are included in Section 6.0 URRC Recommendations at the end of the report.

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LIST OF ABBREVIATIONS

AEF	Arctic Energy Fund
BOD	Board of Directors
CIPP	Commercial and Institutional Power Producers
FMB	Financial Management Board
genset	Generator Set
GN	Government of Nunavut
GRA	General Rate Application
IC	Installed Capacity
IFC	Installed Firm Capacity
IPP	Independent Power Producers
IR	Information Request
kW	Kilowatt
MPPA	Major Project Permit Application
N-1	N-1 planning criteria ¹
PPD	Petroleum Products Division
QEC	Qulliq Energy Corporation
QEC Act	<i>Qulliq Energy Corporation Act</i>
RFC	Required Firm Capacity
SAIDI	System Average Interruption Duration Index ²
SAIFI	System Average Interruption Frequency Index ³
URRC	Utility Rates Review Council of Nunavut
URRC Act	<i>Utility Rates Review Council Act</i>

¹ N-1 in this context refers to planning for the outage of the largest generator in the power plant.

² SAIDI - SAIDI is the average outage duration for each customer served (usually measured in minutes or hours over the course of a year).

³ SAIFI - SAIFI is the average number of interruptions that a customer would experience (usually measured in units of interruptions per customer over the course of a year).

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2.0 BACKGROUND

1. Qulliq Energy Corporation (QEC), as a designated utility, is required pursuant to Section 18.1 of the *Qulliq Energy Corporation Act* (QEC Act), to seek approval from the responsible Minister prior to undertaking a major capital project. In this regard, Section 18.1 of the QEC Act provides as follows:

Definition

- (1) In this section, "major capital project" means a capital project that has a total cost that exceeds \$5,000,000.

Major capital project

- (2) The Corporation shall not undertake, nor permit any of its subsidiaries to undertake, a major capital project unless it applies in advance to the Minister for an order giving permission for the project.

Minister may seek advice

- (3) Before responding to an application for permission made under subsection (2), the Minister may seek the advice of the Utility Rates Review Council (URRC) established under the *Utility Rates Review Council Act*.

Corporation to provide information

- (4) The Corporation shall provide the Minister and the URRC with any information necessary for the Minister to decide whether permission should be granted.

What Minister may do

- (5) The Minister may
 - (a) grant permission for undertaking the major capital project, with or without conditions; or
 - (b) refuse permission.

Order

- (6) Permission granted by the Minister under paragraph (5)(a) shall be in the form of an order.

2. Section 7(e) of the *Utility Rates Review Council Act* (URRC Act) states, among others, the purposes of the URRC are to advise the Minister responsible for QEC concerning applications for permission for major capital projects under Section 18.1 of the QEC Act.

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3. On December 13, 2021, QEC applied to the responsible Minister for approval of major capital project permits for new power plants in the communities of Chesterfield Inlet and Kugaaruk (the Applications). On December 23, 2021,⁴ the Minister requested advice from the URRC with respect to the Applications. The URRC's consideration of these matters is set out in this report.

⁴ The URRC's office was closed on December 23rd (as per the GN holiday schedule). The deemed date of receipt, for the purposes of the 150-day deadline for a final report, was January 3, 2022.

3.0 PARTICULARS OF THE APPLICATIONS

3.1 CHESTERFIELD INLET

4. QEC proposed the construction of a new power plant in the community of Chesterfield Inlet to replace the existing power plant. The project would commence after completion of the major project permit process and approval, which was anticipated to be at the end of the second quarter of fiscal year 2022/23. QEC stated in previous applications that it required approval from its Board of Directors (BOD) and the Financial Management Board (FMB) prior to commencing the tendering portion of the schedule, anticipated to be in the fourth quarter of 2022/23. QEC expected to complete the project in the fourth quarter of 2026/27. Chesterfield Inlet is a remote community, located on the western shore of Hudson Bay, in the Kivalliq region of Nunavut, and access is limited to travel by air and sea. QEC provides electric service to residents of the hamlet of Chesterfield Inlet, and several larger electricity loads including the hamlet office and community centre, a school, Arctic College, a health centre, as well as the Northern Store and a Co-op store.
5. QEC submitted that the project has been identified to receive funding from the Arctic Energy Fund (AEF) program for a contribution of 75 percent of eligible expenses. QEC stated its intention to equally allocate the remaining AEF program funding of \$44.887 million between the Chesterfield Inlet and Kugaaruk power plant projects. The total preliminary cost estimate for the project is \$34.956 million, including \$1.554 million of ineligible expenses. Based on QEC's forecast, the AEF contribution would be \$22.444 million, with the remaining \$12.512 million to be provided by QEC.
6. QEC stated that the existing power plant was constructed in 1975, with installed capacity (IC) of 1,040 kilowatts (kW) and installed firm capacity (IFC) of 640 kW. QEC indicated that the power plant had exceeded its 40-year design life, had technical and engineering deficiencies and was in poor condition. QEC stated:
 - a. Aging infrastructure – the facility is 46 years old. The building and ancillary equipment are old and have begun to deteriorate.

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- b. Generator set (genset) replacement – the oldest genset is only 12 years old, and none of the three gensets are approaching their retirement usage limit. The oldest genset had approximately 57,500 engine hours, the next oldest had about 39,000 engine hours and the newest genset had only 7,100 engine hours. The newest genset (G3) was installed in 2019.
 - c. Safety issues – the facility is very old and is at a higher risk of equipment failure. 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.
 - d. Environmental requirements – the existing plant has two single-walled diesel storage tanks that are not compliant with present codes. The tanks are housed in a gravel berm which does not meet secondary containment requirements.
 7. QEC described Chesterfield Inlet as the oldest permanent settlement in Nunavut, and that it is a growing community with increasing demand for electricity. The 2020/21 peak load was 440 kW and was forecast to be 447 kW in 2021/22. QEC stated that the existing plant meets its required firm capacity (RFC) criterion – which is equal to peak demand plus 10 percent. QEC submitted that the current RFC surplus of about 23 percent would decline to about five percent by 2030/31.
 8. QEC concluded that although the plant's IC could continue to meet the forecast increase in demand for electricity in the community, the deficiencies with the existing power plant placed the community at great risk of QEC not being able to supply safe, reliable power. QEC stated that operating assets beyond their service life would place a larger burden on maintenance and operations personnel by trying to maintain and operate assets that should be replaced.
 9. QEC presented two project options for the purposes of the Application, however, the option to upgrade and replace major components and systems within the existing facility was not considered to be a viable option. QEC stated that the upgrade and replacement was not technically feasible for the following reasons:
 - a. The existing plant has deteriorated and is beyond upgrading.

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- b. The existing plant has no room for expansion and the footprint is too small to accommodate the required new gensets.
 - c. The building no longer meets building codes.
10. QEC stated that the other option would involve the construction of a new power plant at a location outside the community, near the existing Petroleum Products Division (PPD) facility. It would consist of a four-engine generation facility designed for a 40-year life, with IC of 1,820 kW, and IFC of 1,270 kW that would improve reliability, efficiency, operation and safety. The new facility would also include fuel storage consisting of two 90,000-litre double-walled horizontal tanks with fuel pumping facilities, a 300-metre fuel pipeline to connect to the PPD facility, a concrete transformer storage platform, pole racks, space for an emergency generator, a minimum of two storage sea cans, contained storage for new and waste fuel and glycol, and space for other power plant equipment. QEC also noted that it needed to add approximately one kilometre of distribution lines. QEC submitted that it planned to keep the emergency generation unit that was installed in 2019.
 11. QEC submitted that the new power plant would be more fuel efficient, generate less noise and air pollution and would be capable of integrating renewable energy sources.
 12. QEC stated that the new power plant would meet Chesterfield Inlet's peak load projections for 40 years.

3.2 KUGAARUK

13. QEC proposed the construction of a new power plant in the community of Kugaaruk to replace the existing power plant. The project would commence after completion of the major project permit process and approval, which was anticipated to be at the end of the second quarter of fiscal year 2022/23. QEC stated in previous applications that it required approval from its BOD and the FMB prior to commencing the tendering portion of the schedule, anticipated to be in the fourth quarter of 2022/23. QEC expected to complete the project in the fourth quarter of 2026/27. Kugaaruk is a remote community, located on the shore of Pelly Bay, in the Kitikmeot region of Nunavut, and access is limited to travel by air and sea. QEC provides electric service

to residents of the hamlet of Kugaaruk, and a number of larger electricity loads including the hamlet office and community centre, a school, Arctic College, a health centre, as well as a Co-op store.

14. QEC submitted that the project has been identified to receive funding from the AEF program for a contribution of 75 percent of eligible expenses. QEC stated its intention to equally allocate the remaining AEF program funding of \$44.887 million between the Chesterfield Inlet and Kugaaruk power plant projects. The total preliminary cost estimate for the project is \$38.915 million, including \$1.723 million of ineligible expenses. Based on QEC's forecast, the AEF contribution would be \$22.444 million, with the remaining \$16.472 million to be provided by QEC.
15. QEC stated that the existing power plant was constructed in 1974, with IC of 1,420 kW and IFC of 870 kW. QEC indicated that the power plant had exceeded its 40-year design life, had technical and engineering deficiencies and was in poor condition. QEC stated:
 - a. Aging infrastructure – the facility is 47 years old. The building and ancillary equipment are old and have begun to deteriorate.
 - b. Genset replacement – the oldest genset is about 18 years old, and the other two are about 13 years old. The oldest genset had approximately 50,000 engine hours, the next two units had about 52,000 engine hours and 45,000 engine hours. The oldest genset (G1) could be approaching the end of its useful engine life hours by the time the proposed power plant is completed.
 - c. Safety issues – the facility is very old and is at a higher risk of equipment failure. 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.
 - d. Environmental requirements – the existing plant has a single-walled diesel storage tank that is not compliant with present codes. The tank is housed in a berm that is showing signs of coating failure, corrosion, and structural integrity issues that could negatively affect the bottom of the fuel tank.

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16. QEC described Kugaaruk as a growing community with increasing demand for electricity. The 2020/21 peak load was 719 kW and was forecast to be 764 kW in 2021/22. QEC stated that the existing plant did not meet its RFC criterion in 2019/21 – which is equal to peak demand plus 10 percent. QEC submitted that the current RFC surplus/deficit was about zero but was forecast to be in a deficit position by 2025.
 17. QEC provided information showing that although the plant's IC could continue to meet the forecast increase in demand for electricity in the community (in the short term), the deficiencies with the existing power plant placed the community at great risk of QEC not being able to supply safe, reliable power. QEC stated that operating assets beyond their service life would place a larger burden on maintenance and operations personnel by trying to maintain and operate assets that should be replaced.
 18. QEC presented two project options for the purposes of the Application, however, the option to upgrade and replace major components and systems within the existing facility was not considered to be a viable option. QEC stated that the upgrade and replacement was not technically feasible for the following reasons:
 - a. The existing plant has deteriorated and is beyond upgrading.
 - b. The existing plant has no room for expansion and the footprint is too small to accommodate the required new gensets.
 - c. The existing site cannot accommodate the installation of temporary generation.
 - d. The existing site has potential hazards associated with both overhead and underground distribution infrastructure which would disrupt power supply during construction.
 19. QEC stated that the other option would involve the construction of a new power plant at a location outside the community, near the existing PPD facility. It would consist of a four-engine generation facility designed for a 40-year life, with IC of 2,410 kW, and IFC of 1,660 kW that would improve reliability, efficiency, operation and safety. The new facility would also include fuel storage consisting of two 90,000-litre

double-walled horizontal tanks with fuel pumping facilities, a 200-metre fuel pipeline to connect to the PPD facility, a concrete pad for transformer storage, pole racks, storage for new and waste oil, storage for two sea cans, a heated garage, and space for other power plant equipment. QEC also noted that it needed to add approximately 1.25 kilometres of distribution lines. QEC submitted that it planned to keep the recently installed emergency generation unit.

20. QEC submitted that the new power plant would be more fuel efficient, generate less noise and air pollution and would be capable of integrating renewable energy sources.
21. QEC stated that the new power plant would meet Kugaaruk's peak load projections for 40 years.

4.0 PROCESS

4.1 MAJOR OR MINOR APPLICATIONS

22. Under the URRC Act, it is directed that at the sole discretion of the URRC, the URRC shall determine whether an application is either minor or major for the purposes of determining the time required for processing of the application; a minor application provides for a time limit of 90 days for the URRC to report to the responsible Minister while a major application provides a time limit of 150 days. The URRC considered the significant level of investment proposed in the subject Applications, that much of the funding is expected to come from the AEF, thus reducing the investment required by QEC, the need for information requests (IRs) and responses, and the need for submissions from the public. As a result, the URRC determined to treat the Applications as major applications.
23. The URRC determined that the Applications would be considered concurrently and that the 150-day deadline for submitting its report to the Minister would be June 2, 2022.

4.2 PUBLIC CONSULTATION PROCESS

24. On January 31, 2022, the URRC caused notice of the Applications to be provided in each of the affected communities and across Nunavut in accordance with COVID-19 practices used by the Government of Nunavut (GN) at that time. A notice for both Applications was prepared and made available to the residents and customers in all communities, including the communities of Chesterfield Inlet and Kugaaruk. The notices were posted on the URRC website, social media, by letter to each Member of the Legislative Assembly of Nunavut and mayors across Nunavut. QEC also made public service announcements for each of the Applications noting both the opportunity and deadline for making a submission regarding the Applications to the URRC.
25. The URRC also provided an opportunity for the public to make written comments respecting the major project permit applications (MPPAs) by the deadline of February 25, 2022. Public submissions were received from the Hamlet of Kugaaruk

and the Kitikmeot Corporation, dated February 25, 2022. The matters raised in the submissions were addressed by QEC in its responses dated March 11, 2022, and April 8, 2022, and were considered by the URRC in this report.

26. The URRC asked for more information from QEC regarding the Applications. This was conducted through two rounds of IRs. The URRC asked a number of questions that were common to both Applications, as well as questions specific to each application/community. Further, the URRC explored a number of topic areas associated with the potential complexities of conducting six major capital projects concurrently (i.e., the two projects in the December 2021 MPPAs, as well as the four projects in the March 2021 MPPAs). QEC responded to the two rounds of IRs from the URRC on March 4,⁵ 2022, and on April 8, 2022.

⁵ QEC provided a revised response to IR URRC-QEC-5 on April 13, 2022.

5.0 EXAMINATION OF THE APPLICATIONS

5.1 COMMON MATTERS

27. The URRC noted major deficiencies in the format and content in recent MPPAs in URRC Report 2020-01 and URRC Report 2021-02. The URRC notes that the application format and content is essentially the same in the Applications as the Arctic Bay MPPA in 2019, and the four power plant MPPAs in March 2021. Despite the deficiencies of those previous applications, and the number of IRs required by the URRC, QEC has again omitted information that would have assisted the URRC in its understanding of the need identified and the facilities being proposed in the two new applications (e.g., urgency/timing and details regarding the need that was identified; alternatives to meet the need that was identified; details that support QEC’s reasons for selecting the proposed solution). Further, the URRC noted that there was potential risk to QEC associated with the magnitude of conducting numerous major projects concurrently. The URRC made recommendations in both reports regarding its observations and concerns.
28. The URRC will again address several of the common matters in this portion of the report rather than repeat them in its examination of each application.

5.1.1 COMMON MATTERS – ARCTIC ENERGY FUND PROGRAM

29. QEC submitted that both Applications/projects should qualify for funding under the AEF program. QEC stated that \$130.1 million of the \$175 million available from the program had already been committed to other projects. It was also clarified that the remaining funds (\$44.887 million) would be allocated equally between the two projects. The URRC explored this area and the associated risks to QEC further.
30. In addition to information in the Applications, the URRC followed up with IRs to assess how cost overruns/savings in a project would be covered by the AEF program (if at all). The URRC wanted to assess how the potential for cost increases/decreases from one project could affect the amount of AEF funds available to other projects. It was confirmed in the response to URRC-QEC-2b that “If there are cost overruns in other projects underway and QEC decides to apply for AEF funding contribution

against those cost overruns, then the funding amount remaining for the Kugaaruk and Chesterfield Inlet new power plants will decrease.” The URRC finds that QEC’s response was helpful, however, it did not clarify how QEC has been managing the AEF funds to date, and how its decisions regarding the communities that have already accessed the program (or have MPPA projects approved) will affect other communities awaiting/needing new power plants. QEC also failed to demonstrate its ability to finance a shortfall should the AEF funding amount remaining for both projects decrease. The URRC has had little (if any) visibility to QEC’s management of the AEF program funding, other than the amounts included in MPPAs. As a result, the URRC is concerned that risk mitigation may not be in place should cost overruns occur and, further, that cost overruns can be avoided.

31. The URRC notes that QEC has (or will have) MPPA approvals for enough projects to fully utilize the \$175 million available from the AEF program but would like to know more about the communities that still have old power plants needing replacement in the near future. The URRC would like to know the status of these future replacements and the priority/ranking QEC has determined for each.
32. The URRC considers that it would be helpful to have detailed reporting regarding the AEF funds used to date, amounts committed to approved MPPA projects, and amounts for projects proposed/applied for. This information should be part of QEC’s corporate strategic planning process and made available to the Minister Responsible and in the general rate application (GRA). The URRC intends to pursue this matter further in the GRA through the IR process, since it was not provided in the Applications.

5.1.2 COMMON MATTERS – GOVERNANCE AND STAFFING

33. QEC stated its view that its governance process and staffing is adequate to handle the four previously approved MPPAs, as well as these two new MPPAs, concurrently. The URRC notes that the response to information request URRC-QEC-4b provided some clarification regarding QEC’s recent experience as follows: “Based on QEC’s experience, typical incremental costs for consultant engagement is \$0.4 million for a

genset replacement project and \$2.5 million for a power plant replacement project. A breakdown of in-house and external resources to complete the major projects is provided below: senior management positions, as well as the internal/external staffing resources that will be used by QEC.”

34. The URRC notes that QEC appears to be confident that there is sufficient staffing/resources in place to handle the projects concurrently and provided details about the in-house and external resources it planned to use for the various project stages.
35. The URRC notes the changes that QEC has made and the details QEC has provided about its governance and staffing/resources. While the URRC is hopeful that QEC’s efforts are adequate, the URRC considers that it may be of assistance to the Minister Responsible to have more information regarding the previous cost overruns and delays experienced by QEC for recent MPPA projects. The URRC is not aware of any post-completion reviews or assessments regarding those projects. Without a good understanding of the reasons for past delays, cost overruns, and corrective measures to address these same issues in the future, the URRC remains concerned about QEC’s capacity to simultaneously manage six large, complex projects.
36. With respect to establishing QEC’s ability to undertake these major projects, the URRC considers that it is appropriate for QEC to have its ability to simultaneously manage six large projects assessed by an independent third party with a focus on identifying and mitigating areas of weakness and/or risks. The URRC considers that independent oversight and timely reporting would increase the likelihood of completing six MPPA projects on time and on budget.
37. The URRC is concerned about QEC’s ability to manage cash flow, transaction processing and reporting due to these many concurrently run projects when key positions within QEC either are or have been vacant for some time.

5.1.3 COMMON MATTERS – PROJECT MANAGEMENT AND COST CONTROLS

38. Further to the previous section regarding QEC's governance and staffing, the URRC explored the potential risks related to project management and cost controls. The URRC notes that QEC seems to be confident in its ability to manage the projects concurrently and control costs. This is evident in QEC's responses to the URRC's IRs. QEC considers its combined/concurrent approach to be preferable than doing projects in a staggered approach. Further, QEC considers that a single contract is preferable to separate contracts for each power plant.
39. Notwithstanding QEC's confidence, the URRC notes that there is the potential for both benefits and risks when dealing with a single consultant and construction contractor. The URRC previously recommended an independent assessment of QEC's ability to plan and execute the project(s) as applied for.
40. The URRC also considers that regular reporting of progress and costs, compared to set project milestones, is critical to the success of these projects.
41. The URRC considers that the benefits associated with using a single planning, methodology and timeline may be achievable. The URRC also notes QEC's view that the risk of a concurrent approach is less than with a staggered approach.
42. The URRC accepts QEC's concurrent approach to the six MPPA projects, however, the URRC considers that there should be a timely mechanism to report on possible time delays or cost overruns. The URRC recommends that QEC report to the Minister as soon as it is aware of any forecast cost overrun of greater than 25 percent of the Minister-approved cost for any of the two new MPPA projects.

5.1.4 COMMON MATTERS – PROJECT TIMING AND PLANNING HORIZON

43. The URRC notes again that the timing of the two new power plant applications may have limited the options available to QEC. The URRC agrees that there is some urgency to address potential reliability issues at both new sites but considers that this may have been the case for some time now. In this regard, the URRC considers that waiting to address the problems may have limited the available options (particularly

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- the ability to redeploy units from one site to another). From QEC's responses to IRs, it remains unclear what QEC's plans are for the newer and lower operating hour units that will be removed from operation at other sites.
44. The URRC understands that it may not be possible for QEC to definitively state what is feasible for each unit until its condition is fully known. QEC stated that some units may be kept as emergency spares but did not make commitments beyond that. The URRC considers that QEC should include information about generating units removed from power plants. It is recommended that this information be included as related material as part of QEC's enterprise risk management program at the time of the next GRA to confirm that redeployment is being carefully considered.
 45. The URRC is concerned that there is limited transparency in the planning horizon regarding QEC's capital assets. The URRC notes that the age and state of deterioration at the two sites must have been known and present for some time. Similarly, the engine operating hours should be relatively predictable and easily forecast with some degree of certainty well in advance of the units exceeding their retirement limits. The URRC considers that while it is not possible to forecast when a genset will fail, QEC should have a good understanding of how the "normal" engine operating hours will accumulate at its power plants.
 46. The URRC expects that given the age of many of the other power plants in QEC's service territory, there are other urgent needs. In this regard, the URRC considers that waiting to apply for MPPA approval may limit QEC's options to make improvements in an orderly and cost-effective basis. It also limits QEC's opportunities to consider redeployment of newer and lower operating hour units from other sites. It may also limit QEC's ability to undertake major projects in a more staggered approach.
 47. The URRC recommends that QEC should advise the Minister of its plans and timing to improve or replace the power plants at the remaining communities that have power plants more than 40 years old in order that redeployment opportunities can be properly assessed.

5.1.5 COMMON MATTERS – DISMANTLING AND ENVIRONMENTAL REMEDIATION

48. The URRC notes that the Applications contained only limited information about QEC’s plans to address the dismantling of old power plant sites or the environmental remediation of those sites. This matter was pursued in the URRC’s IRs. QEC’s response to URRC-QEC-6a states that “The proposed project does not include decommissioning of the existing power plant in its scope of work or budget. QEC has not yet developed a schedule or estimates related to the decommissioning and site restoration costs of the existing plant and plant site. The decommissioning and site restoration of the existing plant and site would take place one year after the final commissioning of the new power plant. QEC will ensure the decommissioning work complies with all applicable legal standards and that all required environmental permits are in place.”
49. The URRC notes that the approach to decommissioning/dismantling and remediation in these two MPPAs appears to be different from the approach described in the previous four MPPAs. It would be helpful to know if QEC has an approved policy regarding its approach to decommissioning and remediation of power plant facilities and sites no longer in service (as generating facilities).
50. The URRC notes that QEC described the buildings and foundations at the two old power plant sites as being in poor condition. In this regard, the URRC is concerned about the safety and potential liability if these sites are repurposed.
51. The URRC considers that at a minimum these dismantling costs should be estimated, along with any remediation costs QEC expects to incur to determine whether or not the costs are material. The URRC recommends including details about QEC’s plans and a forecast of the costs in its next GRA and also recommends that QEC examine its liability for any repurposed buildings that have unacceptable structural issues. The above information should be provided as information supplemental to QEC’s next GRA. The URRC notes that none of the requested information was provided in the 2022 GRA.

5.1.6 COMMON MATTERS – FINANCIAL AND RATE EFFECTS

52. The URRC notes that QEC provided estimates of the capital requirements for each project along with the forecast rate effects. QEC did not submit that it had any concerns about its ability to finance the capital expenditures (net of AEF funding).
53. The URRC agrees with QEC's assessment that the rate effects do not appear to be out of line. QEC must provide safe and reliable service at just and reasonable rates. In the subject MPPAs, the forecast rate increases appear to be reasonable, subject to other recommendations in this report. The URRC will assess the Applications in more detail, with respect to the need and proposed alternatives. Regardless, the reasonableness of the capital expenditure estimates/actuals and associated rate effects will be addressed in more detail in QEC's next applicable GRA.

5.1.7 COMMON MATTERS – RENEWABLE POWER

54. QEC submitted that the two new power plants would be capable of integrating renewable energy sources, such as wind turbines or solar panels, should opportunities arise in the future. The URRC also notes that in response to previous IRs, QEC referred to its plans to enable the integration of renewable power via other programs such as net metering, Commercial and Institutional Power Producers (CIPP) and Independent Power Producers (IPP).
55. The URRC notes that the development and investment in renewable power by QEC has not been the preferred approach. QEC stated that its preferred approach is to enable others to develop and invest in renewable generation and to connect them to QEC's systems. The URRC notes that this appears to align with QEC's governing legislation and GN policy, as well as the approach taken in many other jurisdictions.
56. The URRC notes that the public submissions related to renewable power. It was suggested that QEC could be incorporating renewable generation into its new diesel generation plant at Kugaaruk. QEC responded to the submissions. Further details about the submissions and QEC's response are provided later in this report.

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57. The URRC notes QEC's statements in the Applications and in previous applications that diesel generation is currently the only reliable source of electricity available which is particularly critical in view of the harsh conditions in the territory and the remoteness of each community necessitating stand-alone power plants. The URRC also notes that QEC has taken some steps to enable the development of renewable power by others. QEC stated in its response to the Hamlet of Kugaaruk that it has implemented pilot projects and is in the process of constructing a power plant in Kugluktuk which will be integrated with renewable energy and a storage system.
 58. The URRC accepts that QEC is required to provide safe and reliable service to its customers. As noted above, QEC's preferred approach is to provide that service using diesel-fuelled generation, while enabling the development of renewables by others.
 59. The URRC notes that QEC's recent (and historic) generation planning/sizing decisions do not consider renewable generation to be a firm/reliable source. The URRC has concluded that with the above CIPP and net metering programs, and the pending IPP application, QEC intends to design its facilities to match long-term load forecast without the benefit of or recognizing the ability of third-party power or renewable power in the future. This has, and will likely continue to result in diesel-fuelled capacity that exceeds peak load/RFC requirements for many years, leaving little room for renewable generation (should it prove to be a firm/reliable source). The URRC notes that QEC is not required by legislation to invest in renewable generation or rely on others in order to provide safe and reliable service (i.e., it is solely QEC's responsibility). Notwithstanding, the URRC considers that the time to plan/size generation is when the plant or gensets have reached the end of their useful life, or when additional generating capacity is required.
 60. The URRC considers that a more appropriate matching of planned generation to developing demand would result in an opportunity to consider renewables and other forms of supply on a more frequent basis, as well the potential opportunity to access clean energy federal funding if and when it is available.

61. The URRC considers that the diesel-fuelled power plants proposed in the Applications are long-lived (typically 40 years, plus or minus) which could either lock in QEC to the use of diesel, or result in stranded assets if QEC has non-diesel options that are economically and environmentally sustainable in the future (e.g., another technology displaces diesel-fuelled generation). The URRC notes that the development of renewables will be the subject of future applications, such as CIPP and IPP, but QEC has not applied in the Applications to install renewable generation or storage. The URRC will consider those future applications (for IPP or other renewable generation and energy storage) when asked to by the Minister Responsible. Until then, the only viable power plants applied for rely on diesel-fuelled generation.

5.1.8 COMMON MATTERS – AIR AND NOISE EMISSIONS

62. The URRC asked QEC for further information about its planned installation of equipment to address air and noise emissions from its new power plants in Chesterfield Inlet and Kugaaruk. The questions were similar to those made in previous MPPAs.
63. QEC's responses did not provide additional details about the noise or air quality benefits associated with the new power plants other than general statements. The URRC does not consider its previous IRs to be onerous. The URRC believes that any time QEC is proposing to make expenditures it should be able to both forecast the cost and quantify the benefit/savings. In the case of noise, it is a relatively simple calculation based on the noise emissions provided by the manufacturer of the equipment to be installed. For air emissions, the manufacturer should also be able to quantify the benefits of the equipment/scrubber being installed.
64. The URRC accepts that the incremental cost of QEC's proposed air and noise reduction equipment is not unreasonable, but it would also be helpful if QEC could provide the actual standard/benefit it is planning to achieve in the proposed power plants with the incremental cost, noting that both proposed power plant sites are much farther away from residents than the existing sites.

5.1.9 COMMON MATTERS – APPLICATION COMPLETENESS REGARDING THE ASSESSMENT OF NEED AND FACILITY OPTIONS

65. The URRC notes again that the Applications contained very limited information regarding the specific need in each community and the viable options for addressing need. In recent MPPAs, QEC’s approach (for the most part) has been to state what the problem with the current facilities is (e.g., deterioration of the buildings/infrastructure, generating units etc.), but then not specifically provide an analysis to support the capacity or operational requirements (i.e., in terms of RFC, IFC or any other operational criteria QEC considers relevant). The URRC notes that information regarding population growth, and the associated peak load was provided in the Applications and IR responses, however, QEC did not provide much detail about the actual need it was targeting, other than to have sufficient capacity to meet the 40-year forecast requirement.
66. The URRC also notes that QEC’s “standard” approach to meeting the vaguely defined need has usually been to present a “do-nothing” option, perhaps another option that is not viable, and the preferred option. The URRC is usually provided with only one viable option, and little else to review or consider.
67. The URRC considers that the combination of a vaguely defined need and minimal viable options or alternatives to meet that need leaves the URRC with few options to address as part of its review. The URRC’s approach has been to ask for more information about the application and/or to ask about other options or alternatives that QEC may have considered. The responses have not contributed fully to URRC’s understanding of the decision process that QEC has followed in preparing its applications. The URRC does not consider QEC’s standard approach as set out above to be the best practice in terms of application content.
68. The URRC notes from QEC’s IR responses that additional information and transparency at the application stage could drastically improve the URRC’s understanding of QEC’s rationale and proposed project(s). A well-defined need in terms of size, load variability and duration, time frame and other operational

requirements would greatly assist the URRC, particularly when considering the various options to address the need.

69. The URRC considers that there must be several viable options for meeting the need at each community. The URRC notes from recent power plant applications that there are four- and five- engine solutions, as well as numerous ratings for the proposed gensets in each power plant (e.g., 550, 850, 900, 950, 1,100, 1,350 kW and much larger units). QEC has typically applied for a single IC and IFC noting that its dispatch programming is set at 80 percent of capacity of each engine to ensure reliability and good fuel economy.
70. The URRC notes that power plant design and configuration may have elements of both “art and science.” However, the current Applications have provided little information that would enhance the URRC’s understanding of QEC’s rationale for its proposed options. The response to URRC-QEC-5g provides very helpful information, however, it did not provide any reason why QEC continues to give only one viable option in its MPPAs.
71. The URRC again notes that the proposed options in each of the two new power plants is for all of the capacity needed to meet the communities’ long-term needs although the plant gensets certainly reach the end of their useful lives prior to the 40-year timeline used by QEC in its Applications. The URRC appreciates that this may be a viable approach, but notes that it may result in overbuilding of capacity. Overspending in the Applications could limit QEC’s ability to optimize the amount of capital it spends in other communities and the efficient use of the AEF funds available. It may also effectively be a barrier to the future development of renewable energy in those communities. It also does not provide the Minister with options that may reduce the impact on the territorial debt cap. The URRC recommends that future MPPAs provide an assessment of other feasible approaches. For example, future power plant applications could be based on long-term forecast needs but provide flexible approaches for meeting those needs as they grow/change, including the addition of renewable generation (by QEC or others). The URRC agrees that QEC

should design its sites and building envelopes for the long term but does not agree with plans to oversize or prematurely install gensets/capacity in those building envelopes. As noted elsewhere in this report, any over design increases the risk of stranded assets, and may also discourage the future development of alternative generation.

5.2 PUBLIC SUBMISSIONS

5.2.1 THE HAMLET OF KUGAARUK AND KITIKMEOT CORPORATION

72. The Hamlet of Kugaaruk and the Kitikmeot Corporation submitted feedback on QEC's application to replace the current Kugaaruk power plant. Both supported the need to replace the power plant.
73. The Kitikmeot Corporation submission expressed concerns that QEC's proposed power plant did not include details on how renewable energy resources and storage could be integrated into the future power plant design, would not lead to future reductions in diesel fuel consumption, and would result in reliance on fossil fuels well into the 2060s. The Kitikmeot Corporation also included a statement that it does "support Kugaaruk's goal to ensure that its future energy supply is reliable, cost effective and increasingly sustainable. By working with the community and by incorporating existing technology options into plant design, a new power plant at Kugaaruk could maintain full capability to supply the community's needs while reducing carbon emissions, future diesel consumption, diesel subsidies and QEC's investment in the replacement plant. This approach will also encourage local Inuit-led entrepreneurial efforts to develop the means of supplying renewable energy integrated into QEC's grid."
74. The Hamlet of Kugaaruk also expressed support for the need to replace and upgrade the diesel power generation facility in Kugaaruk. The Hamlet submitted that QEC's proposed investment in a four-unit power plant with IC of 2,410 kW and IFC of 1,660 kW provides firm capacity that may not be utilized until after the end of life of the new power plant (i.e., in 2065). The Hamlet submitted that by not installing the

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- fourth genset QEC could save \$8 million that could instead be used for the development of renewables and storage.
75. The Hamlet provided project options comparing QEC's proposed four-unit diesel plant to alternatives that incorporated solar generation and storage. The Hamlet estimated the total capital and levelized cost of the QEC proposal and two alternatives. The Hamlet submitted that both of the alternatives would result in a lower levelized cost. The Hamlet also submitted that its alternatives provided additional flexibility to QEC when gensets needed to be replaced.
 76. The Hamlet submitted that "It is the Hamlet's belief that if community scale renewables are not planned into the design of the new Kugaaruk Power Plant then it will be technically challenging and economically infeasible to develop, finance and obtain sufficient electricity service revenue from QEC once QEC has made the proposed investment in the new Kugaaruk Power Plant. Thus, for diesel reduction, local supply security, cost effectiveness and sustainability objectives to be achieved, renewable generation and energy storage need to be part of the new Kugaaruk Power Plant design."

5.2.2 QEC RESPONSES TO PUBLIC SUBMISSIONS

77. QEC responded to the Kitikmeot Corporation that its proposed new power plants with 40-year lives is in line with its mandate to provide safe and reliable electricity service to Nunavummiut. QEC added that this did not suggest Kugaaruk's power supply would rely on fossil fuels well into the future. QEC submitted that the new generators would be more fuel efficient than the old ones and that QEC believed in fostering renewable generation while continuing to provide reliable and efficient power.
78. QEC noted that it has renewable generation programs such as net metering and CIPP, and it plans to submit an IPP policy for consideration in 2022. QEC submitted that, other than enabling the integration of renewables (through the control system), the installation of renewable capacity by QEC would be an additional expense and would remove opportunities for customers to invest in renewable generation themselves.

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79. QEC's response to the Hamlet of Kugaaruk was similar to its response to the Kitikmeot Corporation. QEC also provided reasons why the Hamlet's proposal was not a feasible solution: it needs to evaluate the performance of the Kugluktuk hybrid power plant; it needs to better understand the optimal penetration level of renewable generation in a community; it did not consider a three-engine design with solar and battery storage with a third-party IPP to be a feasible solution; further discussions with the Hamlet may result in an unacceptable delay in construction of the power plant (and risk the loss of AEF funding).
 80. QEC submitted some conditions that must be met in order to maintain generator fuel efficiency and reliability. Further, QEC submitted that "Three engine plants prevent maintenance from being performed as one unit out of service often means both of the other units are needed to provide power and cannot be taken down for basic maintenance such as oil and filter changes thereby putting the engines at risk if basic maintenance is not performed on time."

5.2.3 URRC RESPONSE TO PUBLIC SUBMISSIONS

81. The URRC notes the public submissions and QEC's responses. It is noted that both the Kitikmeot Corporation and the Hamlet of Kugaaruk support the need to replace and upgrade the diesel-fuelled power plant in Kugaaruk. The URRC also notes that an alternative power plant design was provided in response to the one proposed by QEC.
82. The URRC's consideration of the public submissions and QEC's responses are reflected in the analysis and recommendations included in other sections of this report. However, some observations by the URRC are:
 - a. The alternative design proposed by the Hamlet is the only possible (potentially viable) alternative for the URRC to consider.
 - b. The Hamlet may be accurate in its suggestion that unless renewable generation and storage are considered in the planning and design of a new facility then it may make it technically and economically unfeasible to do it later on.

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- c. The roles/responsibilities/rules, etc. regarding the addition of generation by a third party that will be relied on by QEC has not been applied for or tested.
 - d. QEC's reasons for dismissal of a three-engine design are not in alignment with the N-1 planning criteria QEC has suggested (and the URRC has used).
83. The URRC notes that QEC seems to be suggesting an N-2 or N-3 planning criteria. QEC suggested that if one unit is unavailable, and another unit requires basic maintenance, it created a risk the basic maintenance could not be performed on time. Further, it appears that QEC has also not considered the connection of emergency generation that it stated will be remaining in the community, when making those suggestions. The URRC notes that QEC's actual generation planning criteria may be different than the stated ones. This, in combination with a lack of transparency in its assessment of alternatives, is concerning to the URRC.
84. The URRC considers that it would be better to wait for the results of the Kugluktuk hybrid power plant before committing QEC capital to additional renewable generation and energy storage in its power plants. The URRC notes that the Minister requested a review of the QEC Applications, not a review of power plants that incorporated both diesel and renewable generation (whether or not it is a QEC investment, IPP or joint venture with a hamlet). Given that QEC will design its replacement plants with the ability to connect renewables, and that the IPP process is pending, the hamlet may decide to invest in such projects in the future. However, decisions of the hamlets, Inuit organizations, or entrepreneurs to invest may be negatively affected by QEC's plans to install 40-year capacity when the plant is initially constructed.

5.3 CHESTERFIELD INLET

5.3.1 CHESTERFIELD INLET – NEED FOR THE PROJECT

85. The URRC notes the stated need to address the condition of the 46-year-old Chesterfield Inlet power plant and the associated reliability, environmental and safety concerns. The URRC explored the need to address the deficiencies of the existing

power plant in more detail through IRs. The responses by QEC clarified several aspects of the Application related to need that were of interest to the URRC.

86. QEC provided information in the Application that the existing power plant had capacity to meet Chesterfield Inlet's peak load projections until beyond 2030, however, QEC stated that it placed an 80 percent limit on generation, meaning it could only meet needs until 2026. QEC provided population and peak load projections in the Application. The URRC accepts that the existing power plant would meet QEC's RFC criterion until about 2032, only if the plant's deficiencies could be addressed.
87. QEC identified a number of deficiencies with the existing power plant in the Application and IR responses. The URRC notes that:
 - a. Condition of plant – the existing plant was constructed in 1975 and the 46-year-old facility suffers from various deficiencies. QEC submitted that the existing switchgear is not arc flash resistant which increases the fire and safety risk of the facility. QEC provided more details in the response to URRC IR1-QEC-1a along with photographs of the degraded portions of the facility.
 - b. Buildings – the building structure is in poor condition and with no room for expansion. The foundation is heaving and shifting, creating a strain on piping and other equipment/systems.
 - c. Generating units – QEC provided the age and operating hours of the existing units. None of the units have reached their end of life, and QEC stated they were in good condition. One unit was relatively new, with low operating hours.
 - d. Fuel storage – the fuel storage tanks are single-walled, and the gravel berm does not meet secondary containment requirements. QEC stated that the fuel storage equipment does not meet current federal codes and standards.
 - e. Load growth and reliability – demand at Chesterfield Inlet is increasing. QEC forecast RFC based on forecast peak load growth. The current IFC would continue to meet the forecast RFC until about 2032/33. The System Average Interruption Duration Index (SAIDI)/System Average Interruption Frequency Index (SAIFI)

information provided in response to URRC IR1-QEC-5b does not paint the picture of poor reliability. Instead, QEC stated in that IR response that “plant replacement decision for these communities is based on condition and asset life, not on reliability statistics.”

- f. QEC quantification and details regarding need – QEC did not quantify or provide details regarding need other than to state that a more safe and reliable power plant was required.
- 88. The URRC notes that there is a risk of failure due to the condition of the building and foundation, however, those problems have been addressed to date. The repair/maintain solution appears to be a low-cost solution, since the generating units are all relatively “healthy.” It is not clear how long the “aging infrastructure” problem could continue to be met in this manner.
- 89. Notwithstanding previous decisions to maintain and upgrade the power plant, the URRC accepts that the condition of the existing power plant, with the exception of the gensets themselves, is approaching the end of its useful life. QEC has provided enough information to demonstrate that the condition of the power plant could reduce its ability to continue to operate reliably in the near future and could at a minimum present a safety risk to employees.
- 90. In view of the foregoing, the URRC agrees with QEC that doing nothing is not an option. The power plant facility, including the foundation, building, fuel storage tanks, major electrical equipment and infrastructure do not appear to be capable of continuing to provide safe and reliable service to Chesterfield Inlet.
- 91. The URRC notes that QEC did not quantify or provide details regarding the need, other than to state that there is a need to improve the reliability of the Chesterfield Inlet power plant. The need was not specified in terms of the amount of IC and IFC, or if all of the proposed 1,820 kW IC and 1,270 kW IFC is required in the short to medium term. The URRC concludes that some additional capacity is required, as well as new buildings, storage and ancillary equipment.

5.3.2 CHESTERFIELD INLET – ALTERNATIVE OPTIONS TO MEET THE NEED

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92. QEC presented two project options for the purposes of the Application, however, the option to upgrade and replace major components and systems within the existing facility was not considered to be a viable option. QEC stated that the upgrade and replacement option was not technically feasible for the reasons previously stated, being mainly due to age and deterioration of equipment/structure and the small footprint of the plant site. The URRC agrees that the upgrade and replacement option at the existing plant site is not a reasonable and prudent approach.
93. The URRC notes that QEC only provided one other viable option in the Application. The URRC explored this option further via IRs and was not provided with any other viable options to consider.
94. The URRC has the following observations about the option applied for by QEC:
- a. Size and configuration (proposed IFC) – the IFC increased from 640 kW to 1,270 kW, which extends the RFC/IFC test from 2032/33 to 2062/63. The current RFC is only 510 kW, growing to 572 kW when the proposed facility would be in service, so is all 1,270 kW of IFC required in the short to medium term?
 - b. Timing – the timing to do something appears to be relatively urgent due to the condition of the building/infrastructure and foundation.
 - c. Siting/location – the proposed location appears to be an upgrade to the existing location. It is farther away from the residences and is much closer to the PPD facility. Further, with the proposed new fuel storage and pipeline there is no need to truck fuel to the power plant. However, the final site location and approvals have not been secured by QEC.
 - d. Other electrical facilities – the new facilities should improve reliability and safety. They should also make it easier to incorporate renewable generation at some time in the future.
 - e. Fuel storage – the new storage facilities will provide adequate bulk storage as well as a pipeline to access the nominated fuel needed. This should reduce the cost to

QEC and reduce the risk associated with handling and trucking fuel. The new storage facilities should also be compliant with environmental requirements.

95. The URRC notes that the proposed alternative meets the general need stated by QEC. As previously noted, the URRC does not have enough information to comment on whether or not it is the only viable solution. Further, there was no information or IR response by QEC that would shed light on how the Chesterfield Inlet project ranks in priority compared to the Kugaaruk project, or other communities with aging power plants.
96. The URRC notes that this project proposes to replace generating units that appear to have remaining operating hours, and that the proposed solution provides much more IFC than the current RFC and will for quite some time. It is not clear how much of the capital expenditures “saved or deferred” at Chesterfield Inlet could be directed to another site with urgent needs. QEC stated that it “recognizes the need for a long-term approach to prioritize and maximize the benefit of capital expenditures while providing safe and reliable electricity service.”
97. The URRC also notes that the possibility of phasing in some of the new capacity was not addressed in the Application and was discounted by QEC in its IR responses. The URRC accepts that QEC’s current planning appears to focus on maximizing the use of the AEF program in the near term, but the URRC considers that future planning could assess replacements and expansions that match local demand in stages while still maximizing the AEF fund allocations, rather than an immediate installation that provides for forecast demand that is forecast to occur at the end of a 40-year period. The URRC has concerns about the reliability of a genset installed in year one of a project to meet the needs of a community in years 30 to 40. QEC stated that engine operating life is 10-12 years, and that plant capacity could be upgraded at that time. It would be useful to know if staging capacity expansions would enable QEC to be more efficient in its capital expenditures and also address issues in more communities in a timely and cost-effective manner.

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98. The URRC notes that QEC's preferred option would involve the construction of a new power plant at a location outside the community. As previously stated, it would consist of a four-engine generation facility designed for a 40-year life, with IC of 1,820 kW, and IFC of 1,270 kW that would improve reliability, efficiency, operation and safety. The new facility would also include fuel storage consisting of two 90,000-litre double-walled horizontal tanks, an approximately 300-metre fuel pipeline to connect to the PPD facility with fuel pumping facilities, a transformer storage platform, pole racks, contained storage for new and waste fuel and glycol, a heated garage, and other ancillary equipment. QEC would also require approximately one kilometre of distribution lines.
 99. The URRC notes that the IFC of 1,270 kW exceeds the forecast peak load until almost the year 2066 (based on the revised response to URRC IR-QEC-5d), and the IFC exceeds the RFC until about 2062. Given that Chesterfield Inlet is a growing community and the plant is being built for long-term use, the URRC accepts that the proposed site and building envelope is reasonable on a long-term basis.
 100. The URRC accepts that a four-engine design provides additional flexibility for operation and maintenance, but other designs may also be viable (particularly if the location has an emergency generator). However, the costs/benefits of other design options or staged configurations of larger and smaller gensets were not provided for the URRC's consideration and may have allowed QEC to reduce its initial capital expenditure at Chesterfield Inlet, and address needs in other communities. The URRC has already expressed its observation that QEC's actual generation planning criteria may be different than the stated ones, in combination with a lack of transparency in its assessment of alternatives is concerning to the URRC.
 101. The URRC notes that QEC provided information about the effects of the proposed power plant on its forecast capital expenditures and rates. The URRC agrees that the forecast increase in rates appears to be reasonable but will consider this matter further in the context of a GRA. Similarly, the forecast capital expenditures appear to be reasonable – before and after funding is received from the AEF program. However,

due to the size of the project, the URRC would be concerned if the federal funding was not in place as described in the Application and IR responses. The URRC also considers that a staged project could result in lower capital investment in the initial period, and hence lower rates to consumers, and a reduced impact on the territorial debt cap. The URRC is also interested in the competitiveness of the tender process and the likelihood that QEC will receive reasonable bids.

102. The URRC notes that QEC plans to complete the new power plant in 2026/27. The URRC agrees that this target date is desirable based on the need, as discussed earlier in this report.
103. The URRC notes that QEC has not finalized its site for the proposed power plant. The URRC would be concerned if QEC is required to make material changes to its proposed completion date of 2026/27, or if its forecast cost increased significantly.
104. The URRC notes that QEC intends to decommission and restore the site of the existing plant one year after the final commissioning of the new power plant. QEC also stated it would ensure the decommissioning work complies with all applicable legal standards and that all required environmental permits are in place. The URRC is interested in updates about the progress and forecast cost of this and other remedial work and recommends that QEC include that information in the next GRA.
105. The URRC agrees that QEC's preferred option is a viable option based on the information and assumptions provided in the Application. It will improve safety and reliability, comply with current environmental regulations, and primarily due to the location being farther away from residents, it will improve air quality and reduce the noise level.
106. In view of all of the above, the URRC recommends that QEC be approved to proceed with replacement of the power plant. The URRC agrees that any replacement site, buildings, foundations and other aspects of the facility should be designed for a 40-year life. However, the URRC disagrees with QEC's proposal to install all capacity (initially) for a peak load (and RFC) that may not occur should the 40-year forecast prove to be overstated years after commissioning of the new power plant. The URRC

considers that QEC should be able to provide more financially/economically efficient alternatives that stage IFC to more closely match peak load as it materializes, while maximizing the allocation of the AEF funds remaining. The URRC considers that QEC's applied-for (and only viable option) has excess capacity (especially in excess of what would normally be required using the N-1 planning criteria applied in other Canadian jurisdictions).

107. It is not the URRC's responsibility to plan/design QEC's power plants, however, it is clear there are other viable/feasible options QEC could have provided in the Applications for consideration by the Minister. Those could be: three-unit designs (with an emergency generator and/or the ability to expand to a fourth unit when needed); four-unit designs with smaller IFC installed initially (but with the option to install larger units, or the addition of a fifth unit, in the future); or designs that include renewable generation and energy storage. As stated, QEC may have assessed other viable options, but none were included in the Application for review by the Minister and the URRC (or others outside QEC).

108. The URRC recommends that the Minister require QEC to provide an alternative that would address the URRC's concerns stated above, while still meeting the timelines for AEF funding and Chesterfield Inlet's needs. In addition, the URRC recommends the following, among others:

- QEC be approved to proceed with replacement of the power plant. The URRC agrees that any replacement site, buildings, foundations and other aspects of the facility should be designed for a 40-year life. However, the URRC disagrees with QEC's proposal to install all capacity (initially) for a peak load (i.e., RFC) that may not occur should the 40-year forecast prove to be overstated years after commissioning of the new power plant. Moreover, the URRC considers the proposed IFC of 1,270 kW to be in excess of the RFC of 1,008 kW (in the year 2052) even when the IFC is reduced to the 80 percent factor used by QEC (which reduces the "usable" capacity to 1,016 kW). The URRC considers that QEC should be able to provide more financially/economically efficient alternatives that

stage IFC to more closely match peak load as it materializes. By better matching capacity to demand (as it grows) a lower cost facility could be realized. The maximum AEF efficiency is captured when 75 per cent of the project cost can be covered by the AEF funds. Given that the AEF funds allocated to each project is \$22.4 million, at 75 percent this means a project of \$30 million would utilize AEF funding in the most efficient manner. This also minimizes the amount that must be provided by GN/customers, while reducing impact on GN debt cap. The URRC believes a project closer to this cost could be realized by better matching IFC to demand.

- QEC should provide alternatives that more closely adhere to N-1 planning criteria, which could initially allow for three-unit power plants (especially when there is an emergency generator already located in the community that it has identified will remain, and/or others that may be available from other communities installing new power plants). This should provide flexibility to QEC to install a fourth unit if/when it is required or use other technologies in the future. Using these principles, the routine maintenance should be able to be scheduled in such a manner as to avoid doing so during peak times.
- QEC could also provide a four-unit power plant alternative that meets capacity needs for the first 10-12 years (the time period suggested by QEC), that could be reduced to a three-unit diesel plant later on, with additional capacity from renewable generation and energy storage (if feasible at that time).
- QEC should provide an updated design, cost estimate and schedule for the Minister's review and approval. The generating capacity of the updated design should be sized so that the initially installed generating equipment will meet the RFC of Chesterfield Inlet for the first 10-12 years of operation while providing for additional capacity when forecasts materialize. This would align with the timing QEC stated whereby it would reassess capacity. This will also preserve/defer capital and allow for flexibility to add additional generating capacity more closely

to the need, whether it is renewable (with energy storage), some other technology, or diesel-fired.

- Sound financial and project management controls should be in place to optimize/minimize the cost of the new power plant and ensure that the project's timelines are met.
- Provide information about the status of the approvals necessary for finalization of the site for the Chesterfield Inlet power plant.
- Provide information to the URRC about the detailed plans, cost and status of the cleanup at the existing power plant and any redeployment/reutilization of the gensets in the next applicable GRA.
- If QEC is unable to access funding from the AEF program as stated in the Application and IR responses, that the Minister instruct the corporation to prepare and submit a new MPPA for approval as the loss of the funding would be considered a significant change.
- That QEC review the options available once the bids have been received with a view to reconsidering the project, if the bid costs vary materially from the amount approved by the Minister and that QEC advise the Minister of its conclusions. The URRC considers a variance greater than 25 percent from the initial estimate to be material.

5.4 KUGAARUK

5.4.1 KUGAARUK – NEED FOR THE PROJECT

109. The URRC notes the stated need to address the condition of the 47-year-old Kugaaruk power plant and the associated reliability, environmental and safety concerns. The URRC explored the need to address the deficiencies of the existing power plant in more detail through IRs. The responses by QEC clarified several aspects of the Application related to need that were of interest to the URRC.

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110. QEC provided information in the Application that the existing power plant had capacity to meet Kugaaruk’s peak load projections until beyond 2030. QEC provided population and peak load projections in the Application. The URRC accepts that the existing power plant would meet QEC’s RFC criterion until about 2025, only if the plant’s deficiencies could be addressed.
111. QEC identified a number of deficiencies with the existing power plant in the Application and IR responses. The URRC notes that:
- a. Condition of plant – the existing plant was constructed in 1974 and the 47-year-old facility suffers from various deficiencies. QEC submitted that the existing switchgear is not arc flash resistant which increases the fire and safety risk of the facility. QEC provided more details in the response to URRC IR1-QEC-1a along with photographs of the degraded portions of the facility.
 - b. Buildings – the building structure is in poor condition and with no room for expansion. The foundation is heaving and shifting, creating a strain on piping and other equipment/systems.
 - c. Generating units – QEC provided the age and operating hours of the existing units. None of the units have reached their end of life, and QEC stated were no immediate issues/concerns regarding their condition. Two of the three units should have significant operating life remaining, but the oldest unit will approach the end of its useful life by the planned completion date for the proposed new power plant.
 - d. Fuel storage – the fuel storage tank is single-walled, and the berm is showing signs of coating failure, corrosion and structural integrity issues. QEC stated that the fuel storage equipment does not meet current federal codes and standards.
 - e. Load growth and reliability – demand at Kugaaruk is increasing. QEC forecast RFC based on forecast peak load growth. The current IFC would continue to meet the forecast RFC until about 2025. The SAIDI/SAIFI information provided in response to URRC IR1-QEC-5b does not paint the picture of poor reliability. Instead, QEC stated in that IR response that “plant replacement decision for these communities is based on condition and asset life, not on reliability statistics.”

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- f. QEC quantification and details regarding need – QEC did not quantify or provide details regarding need other than to state that a more safe and reliable power plant was required.
112. The URRC notes that there is a risk of failure due to the condition of the building and foundation, however, those problems have been addressed to date. The repair/maintain solution appears to be a low-cost solution, since the generating units are all relatively “healthy.” It is not clear how long the “aging infrastructure” problem could continue to be met in this manner.
113. Notwithstanding previous decisions to maintain and upgrade the power plant, the URRC accepts that the condition of the existing power plant, with the exception of the gensets themselves, is approaching the end of its useful life. QEC has provided enough information to demonstrate that the condition of the power plant could reduce its ability to continue to operate reliably in the near future and could at a minimum present a safety risk to employees.
114. In view of the foregoing, the URRC agrees with QEC that doing nothing is not an option. The power plant facility, including the foundation, buildings, fuel storage tanks, major electrical equipment and infrastructure do not appear to be capable of continuing to provide safe and reliable service to Kugaaruk.
115. The URRC notes that QEC did not quantify or provide details regarding the need other than to state that there is a need to improve the reliability of the Kugaaruk power plant. The need was not specified in terms of the amount of IC and IFC, or if all of the proposed 2,410-kW IC and 1,660-kW IFC is required in the short to medium term. The URRC concludes that some additional capacity is required, as well as new buildings, storage and ancillary equipment.

5.4.2 KUGAARUK – ALTERNATIVE OPTIONS TO MEET THE NEED

116. QEC presented two project options for the purposes of the Application, however, the option to upgrade and replace major components and systems within the existing facility was not considered to be a viable option. QEC stated that the upgrade and

replacement option was not technically feasible for the reasons previously stated, being mainly due to age and deterioration of equipment/structure and the small footprint of the plant site. The URRC agrees that the upgrade and replacement option at the existing plant site is not a reasonable and prudent approach.

117. The URRC notes that QEC only provided one other viable option in the Application. The URRC explored this option further via IRs and was not provided with any other viable options to consider.

118. The URRC has the following observations about the option applied for by QEC:

- a. Size and configuration (proposed IFC) – the IFC increased from 870 kW to 1,660 kW, which extends the RFC/IFC test from 2025/26 to well beyond 2067. The current RFC is about 860 kW, growing to 875 kW when the proposed facility would be in service, so is all 1,660 kW of IFC required in the short to medium term?
- b. Timing – the timing to do something appears to be relatively urgent due to the condition of the building/infrastructure and foundation.
- c. Siting/location – the proposed location appears to be an upgrade to the existing location. It is farther away from the residences and is much closer to the PPD facility. Further, with the proposed new fuel storage and pipeline there is no need to truck fuel to the power plant. However, the final site location and approvals have not been secured by QEC. The URRC notes that the preferred alternative contains artifacts of archeological significance and may require approval by other GN authorities.
- d. Other electrical facilities – the new facilities should improve reliability and safety. They should also make it easier to incorporate renewable generation at some time in the future.
- e. Fuel storage – the new storage facilities will provide adequate bulk storage as well as a pipeline to access the nominated fuel needed. This should reduce the cost to

QEC and reduce the risk associated with handling and trucking fuel. The new storage facilities should also be compliant with environmental requirements.

119. The URRC notes that the proposed alternative meets the general need stated by QEC. As previously noted, the URRC does not have enough information to comment on whether or not it is the only viable solution. Further, there was no information or IR response by QEC that would shed light on how the Kugaaruk project ranks in priority compared to the Chesterfield Inlet project, or other communities with aging power plants.
120. The URRC notes that this project proposes to replace generating units that appear to have remaining operating hours, and that the proposed solution provides much more IFC than the current RFC and will for quite some time. It is not clear how much of the capital expenditures “saved or deferred” at Kugaaruk could be directed to another site with urgent needs. QEC stated that it “recognizes the need for a long-term approach to prioritize and maximize the benefit of capital expenditures while providing safe and reliable electricity service.”
121. The URRC also notes that the possibility of phasing in some of the new capacity was not addressed in the Application and was discounted by QEC in its IR responses. The URRC accepts that QEC’s current planning appears to focus on maximizing the use of the AEF program in the near term, but the URRC considers that future planning could assess replacements and expansions that match local demand in stages while still maximizing the AEF fund allocations, rather than an immediate installation that provides for forecast demand that is forecast to occur at the end of a 40-year period. The URRC has concerns about the reliability of a genset installed in year one of a project to meet the needs of a community in years 30 to 40. QEC stated that engine operating life is 10-12 years, and that plant capacity could be upgraded at that time. It would be useful to know if staging capacity expansions would enable QEC to be more efficient in its capital expenditures and also address issues in more communities in a timely and cost-effective manner.

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122. The URRC notes that QEC's preferred option would involve the construction of a new power plant at a location outside the community. As previously stated, it would consist of a four-engine generation facility designed for a 40-year life, with IC of 2,410 kW, and IFC of 1,660 kW that would improve reliability, efficiency, operation and safety. The new facility would also include fuel storage consisting of two 90,000-litre double-walled horizontal tanks, an approximately 200-metre fuel pipeline to connect to the PPD facility with fuel pumping facilities, a concrete pad for transformer, pole racks, storage for new and waste oil, and other ancillary equipment. QEC would also require approximately 1.25 kilometres of distribution lines.
123. The URRC notes that the IFC of 1,660 kW exceeds the forecast peak load until well beyond 2067 (based on the revised response to URRC IR-QEC-5d), and the IFC also exceeds the RFC until well beyond 2067. Given that Kugaaruk is a growing community, and the plant is being built for long-term use, the URRC accepts that the proposed site and building envelope is reasonable on a long-term basis.
124. The URRC accepts that a four-engine design provides additional flexibility for operation and maintenance, but other designs may also be viable (particularly if the location has an emergency generator). However, the costs/benefits of other design options or staged configurations of larger and smaller gensets were not provided for the URRC's consideration and may have allowed QEC to reduce its initial capital expenditure at Kugaaruk, and address needs in other communities. The URRC has already expressed its observation that QEC's actual generation planning criteria may be different than the stated ones, in combination with a lack of transparency in its assessment of alternatives is concerning to the URRC.
125. The URRC notes that QEC provided information about the effects of the proposed power plant on its forecast capital expenditures and rates. The URRC agrees that the forecast increase in rates appears to be reasonable but will consider this matter further in the context of a GRA. Similarly, the forecast capital expenditures appear to be reasonable – before and after funding is received from the AEF program. However, due to the size of the project, the URRC would be concerned if the federal funding

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- was not in place as described in the Application and IR responses. The URRC also considers that a staged project could result in lower capital investment in the initial period, and hence lower rates to consumers, and a reduced impact on the territorial debt cap. The URRC is also interested in the competitiveness of the tender process and the likelihood that QEC will receive reasonable bids.
126. The URRC notes that QEC plans to complete the new power plant in 2026/27. The URRC agrees that this target date is desirable based on the need, as discussed earlier in this report.
 127. The URRC notes that QEC has not finalized its site for the proposed power plant. The URRC would be concerned if QEC is required to make material changes to its proposed completion date of 2026/27, or if its forecast cost increased significantly.
 128. The URRC notes that QEC intends to decommission and restore the site of the existing plant one year after the final commissioning of the new power plant. QEC also stated it would ensure the decommissioning work complies with all applicable legal standards and that all required environmental permits are in place. The URRC is interested in updates about the progress and forecast cost of this and other remedial work and recommends that QEC include that information in the next GRA.
 129. The URRC agrees that QEC's preferred option is a viable option based on the information and assumptions provided in the Application. It will improve safety and reliability, comply with environmental regulations, and primarily due to the location being farther away from residents, it will improve air quality and reduce the noise level.
 130. In view of all of the above, the URRC recommends that QEC be approved to proceed with replacement of the power plant. The URRC agrees that any replacement site, buildings, foundations and other aspects of the facility should be designed for a 40-year life. However, that URRC disagrees with QEC's proposal to install all capacity (initially) for peak load (i.e., RFC) that may not occur should the 40-year forecast prove to be overstated years after commissioning of the new power plant. The URRC considers that QEC should be able to provide more financially/economically efficient

alternatives that stage IFC to more closely match peak load as it materializes, while maximizing the allocation of the AEF funds remaining. The URRC considers that QEC's applied-for (and only viable option) has excess capacity (in excess of what would normally be required using the N-1 planning criteria applied in other Canadian jurisdictions).

131. It is not the URRC's responsibility to plan/design QEC's power plants, however, it is clear there are other viable/feasible options QEC could have provided in the Applications for consideration by the Minister. Those could be: three-unit designs (with an emergency generator and/or the ability to expand to a fourth unit when needed); four-unit designs with smaller IFC installed initially (but with the option to install larger units, or the addition of a fifth unit, in the future); or designs that include renewable generation and energy storage. As stated, QEC may have assessed other viable options, but none were included in the Application for review by the Minister and the URRC (or others outside QEC).

132. The URRC recommends that the Minister require QEC to provide an alternative that would address the URRC's concerns, while still meeting the timelines for AEF funding and Kugaaruk's needs. In addition, the URRC recommends the following, among others:

- QEC be approved to proceed with replacement of the power plant. The URRC agrees that any replacement site, buildings, foundations and other aspects of the facility should be designed for a 40-year life. However, the URRC disagrees with QEC's proposal to install all capacity (initially) for a peak load (i.e., RFC) that may not occur should the 40-year forecast prove to be overstated years after commissioning of the new power plant. Moreover, the URRC considers the proposed IFC of 1,660 kW to be in excess of the RFC of 1,161 kW (in the year 2067) even when the IFC is reduced to the 80 percent factor used by QEC (which reduces the "usable" capacity to 1,328 kW). The URRC considers that QEC should be able to provide more financially/economically efficient alternatives that stage IFC to more closely match peak load as it materializes. By better matching

capacity to demand (as it grows) a lower cost facility could be realized. The maximum AEF efficiency is captured when 75 percent of the project cost can be covered by the AEF funds. Given that the AEF funds allocated to each project is \$22.4 million, at 75 percent this means a project of \$30 million would utilize AEF funding in the most efficient manner. This also minimizes the amount that must be provided by GN/customers, while reducing the impact on the GN debt cap. The URRC believes a project closer to this cost could be realized by better matching IFC to demand.

- QEC should provide alternatives that more closely adhere to N-1 planning criteria, which could initially allow for three-unit power plants (especially when there is an emergency generator already located in the community, and/or others that may be available from other communities installing new power plants). This should provide flexibility to QEC to install a fourth unit if/when it is required or use other technologies in the future. Using these principles, the routine maintenance should be able to be scheduled in such a manner as to avoid doing so during peak times.
- QEC could also provide a four-unit power plant alternative that meets capacity needs for the first 10-12 years (the time period suggested by QEC), that could be reduced to a three-unit diesel plant later on, with additional capacity from renewable generation and energy storage (if feasible at that time).
- QEC should provide an updated design, cost estimate and schedule for the Minister's review and approval. The generating capacity of the updated design should be sized so that the initially installed generating equipment will meet the RFC of Kugaaruk for the first 10-12 years of operation while providing for additional capacity when forecasts materialize. This would align with the timing QEC stated whereby it would reassess capacity. This will also preserve/defer capital and allow for flexibility to add additional generating capacity more closely to the need, whether it is renewable (with energy storage), some other technology, or diesel-fired.

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- Sound financial and project management controls should be in place to optimize/minimize the cost of the new power plant and ensure that the project's timelines are met.
 - Provide information about the status of the approvals necessary for finalization of the site for the Kugaaruk power plant, including from the Inuit Heritage Trust in respect to the archeological matters of concern identified in the Application.
 - Provide information to the URRC about the detailed plans, cost and status of the cleanup at the existing power plant and any redeployment/reutilization of the gensets in the next applicable GRA.
 - If QEC is unable to access funding from the AEF program as stated in the Application and IR responses, that the Minister instruct the corporation to prepare and submit a new MPPA for approval as the loss of the funding would be considered a significant change.
 - That QEC review the options available once the bids have been received with a view to reconsidering the project, if the bid costs vary materially from the amount approved by the Minister and that QEC advise the Minister of its conclusions. The URRC considers a variance greater than 25 per cent from the initial estimate to be material.

6.0 URRC RECOMMENDATIONS

133. Having considered the foregoing matters, the URRC recommends as follows:

Project-specific recommendations

That the major capital project permit approvals for construction of new power plants in Chesterfield Inlet and Kugaaruk, be approved subject to the following recommendations.

- The project designs in Chesterfield Inlet and Kugaaruk should include sites, buildings, foundations and other aspects of the facility that are designed for a 40-year life.

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- That QEC be directed, prior to finalizing plant designs, to develop and submit, for consideration by the Minister, viable plant design alternatives that both meet community capacity needs for the first 10-12 years (the time period suggested by QEC) and provide for capacity growth over the lifespan of the plants.
 - That if the projected costs after tendering exceed the proposed costs for Chesterfield Inlet (for the alternative approved by the Minister) by more than 25 percent, that QEC be instructed to prepare and submit a new MPPA to the Minister responsible for QEC.
 - That if the projected costs after tendering exceed the proposed costs for Kugaaruk (for the alternative approved by the Minister) by more than 25 percent, that QEC be instructed to prepare and submit a new MPPA to the Minister responsible for QEC.
 - That the prudence of the actual cost of each of the projects be examined at the time each is proposed to be included in rate base.
 - That, at the time of the next applicable GRA, QEC provide details about the removal of assets, related to the two MPPAs, that are no longer used and required to be used (e.g., gensets, buildings and ancillary equipment). This should include the retirement of the assets and associated dismantling and cleanup costs.

General recommendations

- That QEC provide information to the URRC about the detailed plans, cost and status of the cleanup at the existing power plants, an assessment of residual liability for the sites that have unacceptable structural issues after removal from service, and any plans for redeployment/reutilization of the gensets in the next applicable GRA.
- That future MPPAs provide an assessment of other feasible approaches/options rather than replace or not (with the latter always being unacceptable nor feasible given current/future demand). For example, future power plant applications could

be based on long-term forecast needs but provide flexible approaches for meeting the needs as they change.

- That if QEC is unable to access funding from the AEF program, or any other future federal fund assistance programs, as stated in any of the Applications and IR responses, that the Minister instruct the corporation to prepare and submit a new MPPA for approval as the loss of the funding would be considered a significant change.
- That QEC have its ability to simultaneously plan and execute six large projects assessed by an independent third party with a focus on identifying and mitigating areas of weakness and/or risk.
- That QEC advise the Minister of its plans and timing to improve or replace the power plants at the remaining communities that have power plants more than 40 years old or have structural damage to the building site in order that redeployment opportunities can be properly assessed. This information should also be provided in the next GRA as supplemental information stemming from those plans and assessments.

134. Nothing in this report shall prejudice the URRC in its consideration of any other matters respecting QEC.

**ON BEHALF OF THE
UTILITY RATES REVIEW COUNCIL OF NUNAVUT**



DATED: June 1st, 2022

**Anthony Rose, Chair
Utility Rates Review Council of Nunavut**