Naka Power Utilities (NWT) (Naka-NWT)

2025 General Rate Application (GRA)

Hay River Engine Overhauls

Business Case #01

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SECTION 1: EXECUTIVE SUMMARY

1. The Hay River Standby Generation Plant is the backup energy source for approximately 2,063 customers. It operates when the primary source, the Taltson Hydro Generation Plant, is not operating, providing safe and reliable power to customers in Hay River, K'atl'odeeche First Nation, Enterprise and Riverwoods.

2. Typically, the Hay River Standby Generation Plant operates for approximately two weeks per year during annual maintenance on the Taltson Hydro Generation Plant. However, due to complications with NTPC's overhaul of the Taltson Hydro Generation Plant, power generation from the Dam continues to be offline. As a result, the Hay River Standby Generation Plant has been operating continuously since May 2023, which has accelerated the anticipated operating hours for the standby engines. This situation is expected to continue until January 2025 at a minimum, based on the most recent information available from NTPC as of September 2024. Engine maintenance is expected to be required until the plant is transferred to NTPC at the close of the Hay River Disposition, March 1, 2025.

3. Prior to the Taltson Shutdown, the engines in the Hay River Standby Generation Plant operated on a standby basis, running only when the Taltson Hydro Generation Plant was offline, typically for 2 weeks per year. This resulted in low annual run hours for these engines. Standby operating conditions lead to extended periods between maintenance intervals. However, when the engines became the primary source of power for an extended period of time during the Taltson Shutdown, the time until the next manufacturer recommended maintenance intervals accelerated. These engines undergo routine capital maintenance to ensure safe and reliable power was supplied to customers.

SECTION 2: BACKGROUND

4. The Town of Hay River, the Hamlet of Enterprise, Riverwoods and the K'atl'odeeche First Nation receive backup power from the Hay River Standby Generation Plant, which has a total capacity of 8,260 kW supplied through six permanently installed

engines. However, due to the ongoing offline status of the Taltson Hydro Generation Plant, the Hay River Standby Generation Plant has been operating full-time as the primary power source for customers in these areas.

5. All six engines must be adequately maintained to ensure that Naka-NWT can provide safe and reliable power generation. Operating continuously, the engines have increased runtime since 2023 and are projected to continue running until January 2025 due to the ongoing Taltson Shutdown. This extended operation has increased the necessary maintenance for the power generation engines at the Hay River Standby Generation Plant.

6. Power generation engine maintenance involves two types of overhauls: top-end overhauls and major overhauls. Top-end overhauls are the less intensive are typically the first step in an engine’s maintenance cycle. These overhauls can be completed on-site in the Hay River Standby Generation Plant. Major overhauls are more extensive and require complete disassembly of the engine to inspect all major components. Due to their complexity, major overhauls cannot be performed on site and require the engine to be removed from the plant.

SECTION 3: PROJECT DESCRIPTION

7. Naka-NWT plans to overhaul the engines listed in Table 1 during the Test Period. Based on the actual and projected engine run hours, five engines at the Hay River Standby Generation Plant have reached or would soon reach their service intervals for top end or major overhauls.

8. Table 1 provides details on engine run hours since the last overhaul and manufacturer recommended service intervals for each type of engine.

Table 1: Hay River Engine Run Hours

Unit Number	Model	Year	Actuals/Forecast* Maintenance Interval Between Overhauls	Manufacturer Recommended Intervals Between Overhauls	Required Service Type
CUL-197	CAT 3512	1997	9,449	11,000	2nd Top-End Overhaul
CUL-200*	EMD MP 45-A	1975	9,155	8,000	Major Overhaul
CUL-275	CAT 3516	1986	14,279	11,000	2nd Top-End Overhaul
CUL-484	CAT 3512B	2011	7,413	7,500	1st Top-End Overhaul
CUL-566	CAT 3516B	2014	4,988	7,500	1st Top-End Overhaul

*****Forecast hours at the time of overhaul. This routine maintenance is in addition to Business Case #02.

9. It is important to note that actual engine hours when overhauls occurred vary from manufacturer’s recommendations due to specific circumstances. For example, CUL-197 and CUL-275 overhauls were completed slightly earlier or later than the manufacturer’s recommended interval, respectively.

10. These variations were influenced by two factors: the need to balance between generation output and customer demand while also managing other planned maintenance and unplanned repairs for other engines at the Hay River Standby Generation Plant and the availability of contractors to perform the overhaul work.

11. The first top end overhaul on CUL-566 was completed earlier than anticipated due to excessive oil consumption. However, if subsequent monitoring results in CUL-566 remaining normal, it could be operated until it reaches the next manufacturer interval of 15,000 run hours.

SECTION 4: PROJECT SCHEDULE AND COSTS

Table 2: Hay River Engine Overhaul Schedule and Cost ($000)

Unit Number	Required Service Type	Schedule	Cost
CUL-200	Top-End Overhaul	March 2023	$384
CUL-197	Top-End Overhaul	July 2024	$192
CUL-200	Major Overhaul	October 2024	$1,153
CUL-275	Top-End Overhaul	January 2024	$544*
CUL-484	Top-End Overhaul	May 2024	$232
CUL-566	Top-End Overhaul	April 2024	$258

**The CUL-275 top-end overhaul uncovered significant damage that required repair, resulting in higher costs than anticipated for a typical top end overhaul on this type of engine*

SECTION 5: BUSINESS DRIVERS AND BENEFITS

12. The Public Utilities Act imposes the following requirements on Naka-NWT:

> A public utility shall provide safe, adequate and proper service and keep and maintain its property and equipment so that the public utility can provide the service.[1]

13. Naka-NWT must complete routine maintenance of its generation systems. Overhauls are preventative maintenance and, therefore, reduce compounding damage that could affect other engine components, which would result in additional repair/replacement costs. If Naka-NWT does not complete scheduled overhauls in accordance with manufacturer's recommendations, unplanned outages may result due to engine failures, negatively impacting reliability and introducing a public safety risk that available generation capacity is not able to meet the electrical load requirements of the communities served.

[1] *Public Utilities Act*, Section 76 (1).

SECTION 6: EVALUATION OF VIABLE ALTERNATIVES

Alternative 1 - Do Nothing

14. Continue to run power generation engines in the Hay River Standby Generation Plant without completing scheduled maintenance. This alternative is not practical or responsible as failing to replace and maintain components of the engine could result in engine failure and cause a disruption in service for the customers served and would not enable the safe, reliable service that a utility is required to provide.

Alternative 2 - Replace the Existing Engines

15. Replace existing engines with new engines instead of completing scheduled maintenance. This alternative is not practical or responsible as the cost to replace an engine is generally higher than the cost to complete scheduled maintenance, which only replaces engine components as needed. Replacing an engine often requires replacement or upgrading of electrical components in the generation plant, which further adds to the cost associated with installing new engines. At times, replacing an existing unit may be the more economical alternative and is considered case-by-case. However, engine replacement is not recommended as a default solution to address issues. The potential additional costs incurred under this alternative would negatively impact customers.

Alternative 3 - Complete Routine Maintenance of Engines as Recommended

16. Complete top-end and major overhauls of engines as per the manufacturer recommended maintenance schedule. This alternative allows for inspection of internal engine components at regular intervals to ensure Naka-NWT provides its customers with safe and reliable power generation. In addition, completing overhauls avoids the need to upgrade other generation plant systems that would be required if an engine were to be replaced, reducing overall costs. Failure to complete power generation overhauls according to recommended maintenance intervals would result in lower reliability and increased costs, negatively affecting Naka-NWT's customers.

SECTION 7: RECOMMENDATION

17. Proceed with overhauls on CUL-197, CUL-200, CUL-275, CUL-484, CUL-566 power generation engines following the manufacturer maintenance intervals determined by engine run hours. Delivering power safely and reliably is Naka-NWT's obligation as a utility services provider and is the primary driver for completing proactive scheduled maintenance on power generation engines in the Hay River Standby Generation Plant. Maintaining engines according to the manufacturer's recommended maintenance intervals ensures the plant continues to provide a reliable source of backup electricity for Naka-NWT customers in Hay River, Enterprise, Riverwoods and K'atl'odeeche First Nation.

Naka Power Utilities (NWT) (Naka-NWT)

2025 General Rate Application (GRA)

Hay River CUL-200 Repairs

Business Case #02

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SECTION 1: EXECUTIVE SUMMARY

1. The Hay River Standby Generation Plant is the backup energy source for approximately 2,063 customers. It operates when the primary source, the Taltson Hydro Generation Plant, is not operating, providing safe and reliable power to customers in Hay River, K'atl'odeeche First Nation, Enterprise, and Riverwoods.

2. Typically, the Hay River Standby Generation Plant operates for approximately two weeks per year during annual Taltson Hydro Generation Plant maintenance. However, due to complications with the Taltson Hydro Generation Plant Shutdown (Taltson Shutdown), power generation from the Taltson Hydro Generation Plant continues to be offline. As a result, the Hay River Standby Generation Plant has been operating continuously since May 2023, accelerating the anticipated operating hours for the standby engines. This situation is expected to continue until January 2025 at a minimum, based on the most recent information available from NTPC as of September, 2024.

3. The facility's extended full-time operation has resulted in additional unanticipated maintenance for the CUL-200 unit in the Hay River Standby Generation Plant to keep the engine operating efficiently and reliably. This Business Case encompasses unplanned repair work required for the CUL-200 unit.

SECTION 2: BACKGROUND

3. The Town of Hay River, the Hamlet of Enterprise, the community of Riverwoods and K'atl'odeeche First Nation receive power from the Hay River Standby Generation Plant, with a total capacity of 8,260 kilowatts (kW) from six engines supplying backup electricity generation to Naka-NWT customers in those communities. However, under current operating conditions, where generation from the Taltson Hydro Generation Plant continues to be offline, the Hay River Standby Generation Plant has operated full-time as the primary power source. It is essential that all six of these engines are adequately maintained to ensure that Naka-NWT can provide safe and reliable power generation. Running full-time, the engines ran additional hours in 2023 and are projected to continue

to run until January 2025. Additional engine run time is increasing the maintenance work required for power generation engines in the Hay River Standby Generation Plant.

4. The CUL-200 unit, installed in 1975, underwent a top-end overhaul in March 2023 before the Taltson Hydro Generation Plant went offline. CUL-200 is a specialized Electric Motivated Drive (EMD) 2,500 kW generator, the largest capacity generator in the Hay River Standby Generation Plant. It is relied upon as a primary source of generation within the plant. Due to the prolonged duration of the Taltson Shutdown, the unit's run hours have significantly increased relative to the typical run hours the engine would experience in a year operating in a standby plant. The increased run hours and the engine's age have necessitated several repairs. Repairs completed include replacing the scavenge/fuel pump, water pump, piston cooling pump, the governor drive gear due to a broken gear tooth, load share module, actuator (controls fuel), and a worn-out drive bearing to address an oil leak from May 2023 to September 2024.

SECTION 3: PROJECT DESCRIPTION

5. Complete the necessary repairs on the CUL-200, including replacement of the scavenge/fuel pump, water pump, piston cooling pump, the governor drive gear due to a broken gear tooth, load share module, actuator (controls fuel) and a worn-out drive bearing to address an oil leak.[1]

SECTION 4: PROJECT SCHEDULE AND COSTS

2024 - $245,000

SECTION 5: BUSINESS DRIVERS AND BENEFITS

7. The *Public Utilities Act* imposes the following requirements on Naka-NWT:

[1] CUL-200 repairs addressed in this Business Case are in addition to the routine maintenance/overhaul work completed and discussed in Business Case #01.

> A public utility shall provide safe, adequate and proper service and keep and maintain its property and equipment so that the public utility can provide the service.[2]

6. Naka-NWT must complete repairs on its backup generation systems. If Naka-NWT does not complete the required repairs to CUL-200, unplanned outages may occur due to reduced generation capacity in the Hay River Standby Generation Plant, resulting in the plant being unable to meet the electrical load requirements of the communities served. An unplanned generation outage due to reduced generation capacity would negatively affect the reliability and safety Naka-NWT is obligated to provide to customers.

SECTION 6: EVALUATION OF VIABLE ALTERNATIVES

<u>Alternative 1 – Remove CUL-200 From Service</u>

7. Remove CUL-200 from service and utilize the remaining generators to provide power to customers. Removing 2,500 kW in generation capacity from the total plant capacity of 8,260 kW would reduce the power generation capacity of the Hay River Standby Generation Plant by 25 percent. During peak loading in winter months, power generation output from the plant reaches up to 4,968 kW. Permanently removing CUL-200 from the plant's capacity would result in only 792 kW of generation capacity when operating under peak load conditions. Under these conditions, every other generator in the plant would need to run to meet power demand. Any issue with one of the other generators would result in power outages to customers during the coldest times of the year, negatively affecting reliability and public safety.

<u>Alternative 2 - Repair CUL-200</u>

8. Complete repairs to CUL-200 as required. This allows Naka-NWT to maintain operation of CUL-200 and retain the 2,500 kW of generation capacity it provides to the Hay River Standby Generation Plant. As the largest generator in the plant, CUL-200 is relied upon as a primary generator to provide power to customers, particularly during peak loading conditions experienced in winter months. Repairs could be completed on site in

2 *Public Utilities Act*, Section 76 (1).

the Hay River Standby Generation Plant by Naka-NWT technicians or local contractors. Completing necessary repairs on CUL-200 would ensure that Naka-NWT maintains adequate generation capacity to continue to provide primary power to customers while the Taltson Hydro Generation Plant remains offline in a cost-effective manner that does not require CUL-200 to be removed from service for an extended period of time.

<u>Alternative 3 - Replace CUL-200</u>

9. Replace CUL-200 with a similar unit. A rough cost estimate Naka-NWT received in September of 2024 for the purchase of a replacement for CUL-200 was approximately $6 million, with 12 months' lead time.

10. Since the Hay River Standby Generation Plant and CUL-200 are required to provide a primary power source for power customers while the Taltson Hydro Generation Plant remains offline, Naka-NWT must ensure that CUL-200 is maintained and remains operational as the largest and primary generator in the Hay River Standby Generation Plant.

11. The 12-month lead time required for replacing CUL-200, and the need for the generator to remain operational to maintain adequate power generation capacity to meet customer demand, means that Naka-NWT would have to continue completing repair and maintenance work on CUL-200, or procure a rental generator, during the time between ordering the replacement generator and its delivery. The cost of a rental to replace CUL-200 while waiting for the new generator to be installed would be approximately $2.9 million.

12. In addition, further costs may be required to upgrade upstream systems within the Hay River Standby Generation Plant in order to integrate a new replacement generator into the existing facility.

13. While there are benefits associated with replacing CUL-200 with a brand new generator, the length of time CUL-200 would need to be offline and the anticipated costs

are prohibitive and would negatively impact customers, so this is not a preferred alternative.

SECTION 7: RECOMMENDATION

9. Proceed with Alternative 2 and complete necessary repairs to CUL-200 to ensure that it remains operational. This alternative would ensure that the Hay River Standby Generation Plant maintains power generation capacity sufficient to meet peak load demands during winter months. This is critical while the Hay River Standby Generation Plant remains the primary source of power for customers in The Town of Hay River, the Hamlet of Enterprise, the community of Riverwoods, and K'atl'odeeche First Nation.

10. Completing the necessary repairs to CUL-200 allows Naka-NWT to meet its utility obligations and provide safe and reliable power to customers in a cost-effective manner. Delivering power safely and reliably is Naka-NWT's obligation as a utility services provider. Failure to complete repairs on CUL-200 would result in power outages during peak loading in winter months or additional costs to replace the engine, which would negatively impact customers.

Naka Power Utilities (NWT) (Naka-NWT)

2025 General Rate Application (GRA)

Fort Providence Engine Replacement

Business Case #03

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SECTION 1: EXECUTIVE SUMMARY

1. The Fort Providence Generation Plant is the primary power source for 348 customers in the Northwest Territories. It provides safe and reliable electricity to the Fort Providence community.

2. To maintain safe and reliable operations, Naka Power Utilities (NWT) (Naka-NWT) adheres to the manufacturer's recommended maintenance schedule, including top-end and major overhauls. CUL-324, the plant's primary generator, is due for a major overhaul. However, given the prevalence of existing issues and the anticipated cost of overhauling this unit, Naka-NWT proposes to replace CUL-324 with a new, higher capacity engine.

SECTION 2: BACKGROUND

3. The Fort Providence Generation Plant contains four diesel generators: one 750 kilowatts (kW) unit, one 500 kW unit, and two 250 kW units. CUL-324, a 500 kW Caterpillar (CAT) generator installed in 1990, is a critical component of the plant. Along with the 750 kW unit, CUL-324 supports most of the community’s electrical load, which ranges from approximately 600-700 kW during peak loading periods in winter months.

4. The manufacturer, CAT, recommends that top-end overhauls be completed every 10,000 hours of operation, and that major overhauls occur every 30,000 hours of operation. CUL-324 currently has approximately 61,000 hours of operation as of August 2024, so the engine is due for its second major overhaul. Table 1 below provides a summary of the engine age, current run hours and next overhaul interval. However, prevalent issues, such as leaks around the head gaskets, indicate that more extensive work would be required than what is typical for a major overhaul in order to return it to service in the Fort Providence Generation Plant. There would be a higher cost for this major overhaul than for a routine major overhaul. Image 1 below shows the engine's condition during the last top-end overhaul, including visible head gasket leaks.

Table 1: Unit Operating Metrics

Unit Name	Installation Date	Hours (August 1, 2024)	Next Overhaul (Operating Hours)
CUL-324	1990	60,769	60,000

Image 1: Top-end of CUL-324

5. Given the anticipated cost of the work required to complete a major overhaul on CUL-324 that would be adequate to return the engine to service in the plant, and the high probability of increased future operating costs due to persistent issues over the life cycle of this engine, replacing the engine would be the more economical option in this case. Benefits of a new engine include increased reliability, reduced maintenance costs, and improved efficiency. In addition, new engines have a factory warranty, more readily available parts, and an electronic sensor that could be connected to the plant's SCADA system for remote monitoring and diagnostics.

6. In addition to the cost and operational benefits of replacing CUL-324 with a new engine, the replacement engine would have a capacity of 750 kW instead of 500 kW. The increased capacity would enable the new 750 kW engine to operate independently,

without the use of other standby engines, during maintenance of the existing 750 kW engine, as 750 kW capacity exceeds the community's peak electrical load. Replacing the existing CUL-324 with a new, larger engine would enhance the reliability of the power system for Fort Providence customers.

7. Replacing CUL-324 with a 750 kW engine is estimated to cost approximately $500,000, making it a more cost-effective option than a major overhaul projected to cost around $515,000. Refer to Table 2 below.

Table 2: CUL-324 Major Overhaul Cost vs. Replacement Costs ($000)

Alternatives	Engine or Engine Overhaul	Transportation	Installation	Container Costs, including Peripherals	Total
Major Overhaul of CUL-324*	300	30	60	125	515
Replacement with 750kW Engine	425	15	60	-	500

*Alternatives 2 and 3 anticipated to have approximately the same costs

SECTION 3: PROJECT DESCRIPTION

8. Replace the existing 500 kW CUL-324 engine with a new 750 kW engine.

SECTION 4: PROJECT SCHEDULE & COSTS

2025 - $500,000

SECTION 5: BUSINESS DRIVERS AND BENEFITS

9. The *Public Utilities Act (PUA)* imposes the following requirements on Naka-NWT:

> A public utility shall provide safe, adequate and proper service and keep and maintain its property and equipment so that the public utility can provide the service.[1]

[1] *Public Utilities Act*, Section 76 (1).

10. To meet the above requirement, Naka-NWT must either replace the power generation engine CUL-324 or perform a major overhaul. Based on the condition of CUL-324, if Naka-NWT were to complete a second major overhaul and return CUL-324 to service, there would be an increased risk of engine failure compared to purchasing and installing a new replacement engine.

11. Replacing CUL-324 would reduce the risk of unforeseen issues in the future that could lead to the engine failure, necessitating a forced replacement and incurring replacement costs in additional to the cost of the overhaul. An unplanned failure of CUL-324 would also negatively impact reliability in the community.

12. In addition, replacing the existing engine and one of the 250 kW engines with a new 750 kW model offers several advantages, including increased reliability, reduced maintenance costs, improved efficiency, a factory warranty, readily available parts, and an electronic sensor for remote monitoring and diagnostics. These benefits would positively impact future operating costs.

13. The new 750 kW model can also be installed at the location of the 250 kW engine that is to be replaced, addressing operational difficulties and safety risks associated with the current use of a storage container to house CUL-324.

SECTION 6: EVALUATION OF VIABLE ALTERNATIVES

Alternative 1 – Complete a Second Major Overhaul

14. Completing a second major overhaul on CUL-324 is not the preferred alternative. It is anticipated to result in higher overall costs than other alternatives due to high upfront costs to complete the overhaul, as well as higher-than-normal anticipated maintenance costs after CUL-324 returns to service.

15. A typical scope of work for a major overhaul would not be sufficient to fully address CUL-324's underlying issues, as stated in paragraph 4 above. Compared to a new engine, unplanned failures, maintenance, or repairs would require CUL-324 to be taken offline until the engine is restored to operational condition. This increased risk of unplanned

events could lead to power supply disruptions during peak winter demand, negatively impacting safety and reliability.

16. To prevent an unplanned event from causing power supply disruptions, Naka-NWT would incur additional costs to obtain a rental unit and maintain adequate capacity for Fort Providence customers.

17. There is also a risk that, if Naka-NWT were to try to complete a second major overhaul on CUL-324, the engine may fail inspection. Given the engine's age and visible wear, the manufacturer will thoroughly inspect its condition before performing the second major overhaul. If the engine fails inspection, a replacement would be necessary. In that case, Naka-NWT will incur avoidable costs in addition to the cost of an engine replacement.

<u>Alternative 2 – Replace CUL-324 with New 750 kW Engine Installed within the Plant</u>

18. Replace the existing CUL-324 and one 250 kW unit with a new 750 kW power generation engine within the existing facility. This alternative mitigates the risk of potential supply disruptions in Fort Providence, given the ongoing maintenance concerns, noted above, in connection with continued use of the existing engine even after a second major overhaul.

19. This alternative offers increased reliability, reduced maintenance costs, and improved efficiency compared with Alternative 1. Under this alternative, the existing CUL-324 would remain operational until the new engine is installed since CUL-324 is currently housed in a mobile storage container. The new engine would replace the existing 250 kW engine in its current location.

20. In addition to the lower upfront and overall maintenance costs associated with a new engine, as compared to conducting a second major overhaul, replacing CUL-324 with a 750 kW engine would also allow for the removal of a 250 kW engine. This alternative would result in a power generation configuration at the Fort Providence Generation Plant of two 750 kW engines and one 250 kW engine. The 750 kW

replacement engine could serve as backup for the other 750 kW engine without relying on other standby engines, as the peak load in Fort Providence is between 600-700 kW. Under most circumstances, either of the 750 kW engines could adequately handle the power demands. This allows for scheduled maintenance on one engine while the other remains operational. The 250 kW engine serves as contingency capacity. Accordingly, Naka-NWT could always meet customer demand. By reducing the total number of engines at the Fort Providence Generation Plant, overall maintenance costs would be lower.

<u>Alternative 3 – Replace CUL-324 with New 750 kW Engine in Existing Storage Container</u>

21. Replace the existing CUL-324 engine with a new 750 kW engine in the current location of the CUL-324 engine. CUL-324 is currently housed in a storage container attached to the Fort Providence Generation Plant.

22. This is not a preferred alternative. The storage container has several limitations, including insufficient space for a larger engine, restricted access/egress due to its elevated position on pilings, and ventilation issues that have caused overheating issues with CUL-324 during the summer months. The existing storage container poses safety risks to Naka-NWT technicians due to access and egress issues and reliability concerns arising from the ventilation problems that have caused outages.

<u>Alternative 4 – Replacement of 500kw Generator</u>

23. Replace the existing CUL-324 engine (500 kW) with a new 500 kW engine in the current location of the CUL-324 engine. CUL-324 is either within the Fort Providence Generation Plant or housed in the existing storage container attached to the Fort Providence Generation Plant.

24. As mentioned above, in Alternative 3, using the existing storage container is not a suitable option as an installation location. Although a 500 kW engine could be installed at the Fort Providence Generation Plant, it does not have enough capacity to handle the peak load in the community. To meet the demand during peak periods, an additional 250 kW generator would need to operate simultaneously. This would increase long-term

maintenance costs, fuel consumption costs, and the risk of reliability issues due to the requirement for multiple engines to run simultaneously.

SECTION 7: RECOMMENDATION

25. Proceed with Alternative 2 – replace the aging power generation engine, CUL-324, with a new 750 kW engine and decommission the 250 kW engine at the Fort Providence Generation Plant. Compared to completing a second major overhaul on CUL-324, this timely upgrade and replacement to a 750 kW engine is a more reliable and cost-effective solution. It avoids the potential liabilities of increased maintenance and repair costs and decreased engine efficiency due to component failures in the aging asset.

26. This alternative also allows for the decommissioning of one 250 kW engine, reducing the total number of engines at the plant and lowering overall maintenance costs. Due to the infeasibility of installing the engine in the existing storage container, along with the associated safety and reliability concerns, Naka-NWT should install the new engine within the main plant building. Overall, Alternative 2 ensures Naka-NWT would continue to fulfill its utility obligations by providing safe and reliable power in a cost-effective manner.

Naka Power Utilities (NWT) (Naka-NWT)

2025 General Rate Application (GRA)

Wekweètì Fuel Tank

Business Case #04

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SECTION 1: EXECUTIVE SUMMARY

1. The Wekweètì Power Plant is the primary power source for approximately 65 customers in the Northwest Territories. Over the past five years, the community's electrical load has grown, increasing the generation required to meet demand. Correspondingly, there has been increased diesel fuel consumption at this power plant.

2. Naka-NWT proposes to install a 58,000 Liter (L) fuel storage tank at the Wekweèti Power Plant to increase the total storage capacity at the facility from 230,000 L to 288,000 L.

SECTION 2: BACKGROUND

3. The Wekweèti Power Plant consists of three power generation engines connected to a bulk fuel supply of approximately 230,000 L. Wekweèti is a remote community accessible only by winter road for a brief period each year. As a result, fuel resupply is limited to once per year at the end of March when the winter road is suitable for transporting heavy loads. Due to the annual resupply constraint imposed by winter roads, the community's electrical load and the plant's generation capacity are measured in annual quantities.

4. The approximate annual power generation capacity of the Wekweèti Power Plant, with a bulk fuel storage capacity of 230,000 L, is 770,500 kW. From 2019 to 2023, the generation required to supply the community's annual power consumption increased from approximately 630,000 kW to 722,000 kW, an average annual growth of 22,900 kW, which equates to an average of 5,700 L of additional fuel required each year. Total annual power and fuel consumption from 2019 to 2023 is detailed in Table 1 below.

Table 1: Wekweèti Annual Fuel Consumption from 2019 to 2023 ($000)

	2019	**2020**	**2021**	**2022**	**2023**
Generation Required (KWh)	630	647	689	710	722
Liters of Fuel Consumed	192	193	205	210	215

5. The annual power consumption growth trend in Wekweèti indicates that the community will have insufficient fuel supply without additional fuel storage to increase the plant's available supply and yearly generation capacity. When fuel was delivered in April 2024, Naka Power Utilities' (NWT) (Naka-NWT) fuel reserves could only supply an additional 15,000 L, which is approximately 21 days of the power supply based on an average consumption during the winter months.

SECTION 3: PROJECT DESCRIPTION

6. Naka-NWT proposes to install a 58,000 L fuel storage tank at the Wekweèti Power Plant to increase the total storage capacity at the facility from 230,000 L to 288,000 L. Based on the five-year average consumption growth rate, a 58,000 L fuel tank should be sufficient to supply the community's energy needs until 2033.

SECTION 4: PROJECT SCHEDULE AND COSTS

2024 - $138,000

SECTION 5: BUSINESS DRIVERS AND BENEFITS

7. The *Public Utilities Act* imposes the following requirements on Naka-NWT:

> A public utility shall provide safe, adequate and proper service and keep and maintain its property and equipment so that the public utility can provide the service.[1]

8. Increasing the Naka-NWT's fuel storage in Wekweèti would ensure an adequate supply to meet continued demand growth and leave a contingency if fuel delivery is delayed in future years. If Naka-NWT fails to provide additional fuel storage, the generation plant engines could run out of fuel, leading to a sudden power outage and equipment damage, which is most likely to occur in winter months when supply is lower and demand is high. Continuing to operate the Wekweèti Plant on narrow annual fuel reserve margins, introducing a risk of depleting the fuel supply in the community, would

[1] *Public Utilities Act*, Section 76 (1).

negatively affect public safety for residents in Wekweèti and the reliability of the power supply.

SECTION 6: EVALUATION OF VIABLE ALTERNATIVES

Alternative 1: Do Nothing

9. Continue operating the engines without additional fuel storage. If Naka-NWT continues to operate at the current fuel storage limit of 230,000 L, and the current load growth trend continues, the community's generation fuel reserves at the Wekweèti Power Plant could be fully depleted before the annual resupply within the next two-years. Depletion of fuel reserves would result in a power outage to the entire community in winter months, when the reserve is at its lowest.

10. To mitigate the risk of a complete power outage under this Do Nothing alternative, Naka-NWT could purchase fuel from the Petro Products Division (PPD) or airlift it into the community. However, both options have potential drawbacks:

- PPD Purchase: Fuel costs from PPD could fluctuate, and supply limitations may arise during high demand. Additionally, purchasing fuel from PPD assumes sufficient reserves are available for Naka-NWT to purchase if necessary.
- Airlifting Fuel: Airlifting fuel is expensive due to transportation costs and has weather-related risks. It is typically only used in situations of necessity.

11. Both options above are temporary solutions with associated risks, including increased transportation or purchase costs and potential supply or transportation challenges. The long-term outlook and potential consequences of a power outage, as well as volatility in fuel costs and availability of supply due to reliance on a third party, make these alternatives less desirable.

Alternative 2: Renewable Energy

12. Naka-NWT installs a renewable energy source, such as solar panels with a battery energy storage system (BESS), to increase the capacity in Wekweètì. This solution offers

an alternative to the community's current reliance on fossil fuels and presents benefits with respect to sustainability and supporting energy transition.

13. However, the initial investment in solar and BESS infrastructure would be significant. These projects require planning, installation, and commissioning time, making them less suitable for immediate energy needs. Implementing a solar and BESS system requires careful planning, engineering, and permitting.

14. Naka-NWT is aware that the community is currently evaluating renewable energy options, including solar and BESS.

15. While solar and BESS offer long-term benefits, the upfront costs, planning requirements, and time constraints make them less suitable as an immediate solution to the current fuel shortage issue.

Alternative 3: Add Additional Fuel Storage

16. Install a new 58,000 L fuel tank at the Wekweèti Power Plant. This expansion would significantly increase Naka-NWT's fuel storage capacity, ensuring adequate supply to meet the community's growing energy needs. With additional fuel storage, the risk of power outages due to fuel shortages would be substantially reduced. The increased capacity would help Naka-NWT maintain the necessary fuel supply for future growth and increased electricity demand.

17. While installing a new fuel tank involves upfront costs, the long-term benefits, such as energy security, cost control, and reduced risk of power outages, would ensure that Naka-NWT fulfills its utility obligations by providing a reliable and safe supply of electricity to the community.

SECTION 7: RECOMMENDATION

18. Proceed with Alternative 3 and install a new 58,000 L fuel storage tank at the Wekweèti Power Plant. This alternative ensures a reliable and cost-effective power supply, as it increases generation capacity immediately, significantly reducing the risk of

power outages and guaranteeing an adequate energy supply for the community. While Naka-NWT intends to collaborate with the community on exploring renewable energy options in the area, the immediate risks associated with insufficient generation capacity present risk to system reliability and customer safety in the short term, particularly during the winter months, which require implementation of a more immediate solution as outlined above.

Naka Power Utilities (NWT) (Naka-NWT)

2025 General Rate Application (GRA)

Pine Point Substation Protection Upgrade

Business Case #05

SECTION 1: EXECUTIVE SUMMARY

1. Naka Power Utilities (NWT) (Naka-NWT) operates and maintains the Pine Point Substation approximately 100 km southeast of the Town of Hay River in the Northwest Territories. Naka-NWT proposes to upgrade the substation to replace the Real-Time Terminal Unit (RTU) and Distance Relay, which are obsolete and at the end-of-life.

2. Replacement of the RTU and Distance Relay is necessary to ensure the continued safe and reliable operation of the substation and to facilitate the integration of future projects into the transmission system. In addition, upgrading the equipment would enhance the reliability and safety of the power system for customers by providing Naka-NWT with real-time monitoring and control capabilities through the RTU and enabling more accurate fault detection and isolation through the Distance Relay, reducing the duration of power system interruptions.

SECTION 2: BACKGROUND

5 Naka-NWT started operating the Pine Point Substation in the 1980s. Located approximately 100 kilometers southeast of the Town of Hay River, the substation primarily receives power from the Taltson Hydro Generation Plant, which is transmitted to customers in Hay River, Enterprise, K'atl'odeeche First Nation, and Riverwoods through Naka-NWT's 72 kilo-volt (kV) transmission line, 6L10.

6 The communication and protection systems in the substation consist of several key components: RTU, Distance Relay, a Differential Relay and the Overcurrent Protection Relay. These components are integrated within the substation to provide safe and reliable electricity to customers in the South Slave region.

7 An RTU serves as a vital communication link between the substation's equipment and the central control center. RTUs allow power system operators to monitor and control various aspects of the substation remotely, enhancing efficiency, reliability, and safety.

8 The Distance Relay is a protective device used in power systems to detect and isolate faults on transmission lines. By utilizing voltage, current, and resistance signals,

the Distance Relay determines the approximate distance of a fault on a transmission line from the substation and initiates proper protective actions.

9 The Differential Relay and Overcurrent Protection Relays protect the substation equipment by monitoring current increases that may damage the equipment. If current exceeds a predetermined threshold, a fault would be triggered, and the relay would immediately stop power flow to prevent damage. A Differential Relay monitors the difference between the transformer's expected current input and output to detect potential problems before they escalate to a power system event and cause service interruptions. The Overcurrent Protection Relay is another safety feature used to monitor the current flowing through a transformer.

10 The existing RTU and Distance Relay protection in Naka-NWT's Pine Point Substation are obsolete and have reached end of life. The existing RTU in the Pine Point Substation, a General Electric (GE) D20 model installed in 1993, is at the end of its life and obsolete. GE no longer has replacement parts for the GE D20 RTU in the substation. The Differential Relay and Overcurrent Protection Relay were updated in 2006, but the Distance Relay was not. The existing Distance Relay in the Pine Point Substation is a Schweitzer Engineering Laboratories (SEL) 321 model, is now at the end of its life and obsolete. The most recent firmware update from SEL for the Distance Relay model in the substation, SEL 321, was released in 2008.

11 Replacement of the end-of-life RTU and Distance Relay in the Pine Point Substation ensures that Naka-NWT continues to provide safe and reliable power to customers. The upgraded equipment supports Naka-NWT’s ability to effectively operate and monitor the Pine Point Substation, and the power system by increasing its resilience to potential disruptions caused by power system events through access to better data enabled by these protection upgrades.

SECTION 3: PROJECT DESCRIPTION

12 Replace the RTU and Distance Relay which are obsolete and at end-of-life.

SECTION 4: PROJECT SCHEDULE

2025 - $194,000

SECTION 5: BUSINESS DRIVERS AND BENEFITS

13 The *Public Utilities Act* imposes the following requirements on Naka-NWT:

> A public utility shall provide safe, adequate, and proper service and keep and maintain its property and equipment so that the public utility can provide the service.[1]

14 Failing to replace the end-of-life RTU and Distance Relay would negatively impact power system reliability and public safety due to a lack of real-time information on critical substation infrastructure. Without remote monitoring and visibility enabled by the RTU and the Distance Relay, Naka-NWT would be unable to detect emerging power system events early, potentially leading to power outages or equipment damage. This could disrupt the supply of hydroelectrical energy to Hay River, Enterprise, K'atl'odeeche First Nation, and Riverwoods while the relays undergo emergency repair or replacement. The process of finding parts or procuring new equipment could further prolong the outage, increasing the power costs in the meantime. Additionally, if it continues to use end-of-life technology, Naka-NWT may encounter compatibility issues with future power system upgrades or additions, limiting the substation's flexibility and adaptability. By investing in the RTU and Distance Relay upgrade, Naka-NWT would mitigate these risks and ensure the continued reliable and safe operation of the Pine Point Substation.

SECTION 6: EVALUATION OF VIABLE ALTERNATIVES

<u>Alternative 1: Do Nothing</u>

15 In this alternative, the GE D20 RTU and SEL 321 Distance Relay remain in service at the Pine Point Substation. However, due to the lack of availability of replacement parts and firmware upgrades, maintenance and repair solutions for this outdated equipment are no longer available from the manufacturers. Naka-NWT has been sourcing parts from used devices that were removed from service. However, spare parts are no longer

[1] *Public Utilities Act*, Section 76 (1).

available, and the current platform has been discontinued in favour of platforms compatible only with newer generation protection relays. This lack of support would directly impact visibility and data access for critical power system infrastructure. Due to the remote location of the Pine Point Substation, approximately 100 kilometers southeast of Hay River, notification response times for troubleshooting and repairs would be longer, potentially resulting in extended outages without the ability to proactively monitor the system for signs of a developing power system event.

16 The increased risk of unexpected failures in the protection relays at the Pine Point Substation, including the potential for public safety risks during winter outages, coupled with higher operational costs due to inefficiencies involved in manually monitoring the substation in a remote location, make this alternative not feasible.

<u>Alternative 2: Replace RTU, Distance , Differential and Overcurrent Protection Relays</u>

17 In this alternative, all substation protection relays would be replaced and upgraded to newer generation technology. Replacing all four relays would enhance remote monitoring, troubleshooting, reliability, protection coordination, and access to manufacturer-supported products. This would lead to faster outage response and restoration time, as well as preventatively reduce maintenance spending. However, replacing the Differential Relay and Overcurrent Protection Relay, along with the RTU and Distance Relays, would increase the overall cost of the substation protection upgrade.

18 Despite the noted improvements associated with replacing all four relays, the Differential and Overcurrent Protection Relays in Naka-NWT's Pine Point Substation still have useful life remaining and continue to be supported by the manufacturers. A recent study by SEL, “The Useful Life of Microprocessor-based relays: A Data-driven Approach”,[2] indicates that “Based on data, microprocessor-based relays manufactured from high-quality materials, using high-quality processes, can reliably perform within specification during, and beyond, their intended service life of 20-years.”

[2] Haas, D., Leoni, M., Zimmerman, K., Genz, A., & Mooney, T. (n.d.). The Useful Life of Microprocessor-Based Relays: A Data-Driven Approach. Schweitzer Engineering Laboratories, Inc.

Alternative 3: Replace RTU and Distance Relay

19 This alternative involves replacing the outdated RTU and Distance Relay in the Pine Point Substation, without replacing the Differential and Overcurrent Protection Relays. This replacement would prudently address the risks associated with continuing to utilize obsolete equipment.

20 Replacing the end-of-life RTU and Distance Relay with a newer generation relay technology would significantly enhance the reliability and safety of the Pine Point Substation. The new RTU and Distance Relay would provide Naka-NWT with greater visibility into remotely located critical power system infrastructure through access to data related to substation equipment status and notifications concerning potential emerging power system events that could result in power outages. Enhanced data access and remote monitoring capabilities would enable more efficient troubleshooting and restoration in response to unexpected power system events. Additionally, replacing the RTU and Distance Relay with newer technology would support compatibility between substation relays and facilitate integration with future transmission system developments.

21 As Naka-NWT would not replace the Differential and Overcurrent Protection Relays, it would conduct ongoing maintenance and testing to verify their reliability and condition. As noted in the SEL study, these assets could operate effectively beyond the manufacturer’s suggested 20-year service life, provided test results remain positive, and the manufacturer continues to supply parts and compatible firmware.

22 This alternative would still create a significantly upgraded protection system at the Pine Point Substation, ensuring Naka-NWT continues to fulfill its utility obligations by providing safe and reliable power to customers. It would reduce the risk of equipment failures and associated service disruptions while being more cost-effective than replacing the entire protection system.

SECTION 7: RECOMMENDATION

23 Proceed with Alternative 3, replacing the end-of-life and obsolete RTU and Distance Relay with a newer generation relay technology. This alternative would replace

obsolete equipment before an unexpected failure that could negatively impact customer reliability and safety in Hay River, Enterprise, K'atl'odeeche First Nation, and Riverwoods.

24 The upgraded substation protection system would enhance reliability and resilience through increased visibility provided by data that could be used to monitor the power system for developing issues that may result in outages. By reducing the risk of equipment failures associated with using end-of-life equipment, the new RTU and Distance Relay would not only improve the substation's performance but also enhance its ability to integrate with future projects and adapt to changing energy demands.

Naka Power Utilities (NWT) (Naka-NWT)

2025 General Rate Application (GRA)

Mobile Tie-In - Hay River Plant

Business Case #06

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SECTION 1: EXECUTIVE SUMMARY

1. The Hay River Standby Generation Plant is the backup energy source for approximately 2,063 customers. It operates when the primary source, the Taltson Hydro Generation Plant, is not operational, providing safe and reliable power to customers in Hay River, K'atl'odeeche First Nation, Enterprise and Riverwoods.

2. The Hay River Standby Generation Plant typically operates for approximately two weeks per year during annual maintenance at the Taltson Hydro Generation Plant. However, due to ongoing complications with the Taltson Hydro Generation Plant Shutdown (Taltson Shutdown), power generation from the Taltson Hydro Generation Plant remains offline. As a result, the Hay River Standby Generation Plant has been operating continuously since May 2023. This situation is expected to continue until January 2025 at a minimum, based on the most recent information available from NTPC as of September 2024.

3. To maintain a reliable power supply while the Hay River Standby Generation Plant remains the primary power source, Naka Power Utilities (Naka-NWT) proposes to install a temporary generator to increase the plant's total capacity. The temporary generator must also be integrated with the existing generation system.

SECTION 2: BACKGROUND

4. The Town of Hay River, the Hamlet of Enterprise, Riverwoods and the K'atl'odeeche First Nation receive backup power from the Hay River Standby Generation Plant, which has a total capacity of 8,260 kW supplied through six permanently installed engines. However, due to the ongoing offline status of the Taltson Hydro Generation Plant, the Hay River Standby Generation Plant has been operating full-time as the primary power source for customers in these areas.

5. All six engines must be adequately maintained to ensure that Naka-NWT can provide safe and reliable power generation. Operating continuously, the engines have increased runtime since 2023 and are projected to continue running until January 2025

due to the ongoing Taltson Shutdown. This extended operation has increased the necessary maintenance for the power generation engines at the Hay River Standby Generation Plant.

6. Completing maintenance on any engine requires shutting it down and stopping its power generation until maintenance and repairs are completed and it can be restored to service. During peak winter loading, the Hay River Standby Generation Plant generates up to 4,968 kW of power. Considering the total permanently installed generation capacity of 8,260 kW, during peak loading, only 3,292 kW of generation capacity would remain available. In such conditions, any issue with the plant's primary generator, CUL-200, would reduce the available capacity by 2,500 kW, leaving only 792 kW available. Consequently, derating or loss of any other generator would result in power outages necessitating the temporarily addition of additional generation capacity as a contingency.

7. The Hay River Standby Generation Plant typically operates only during warmer months when the Taltson Hydro Generation Plant undergoes annual maintenance. Therefore, to prudently manage capital additions, NWT proposes to add a temporary backup generator at the Hay River Standby Generation Plant to provide a temporary solution, while the extended Taltson Shutdown is in effect, to address the need for additional capacity during engine maintenance.

8. A temporary backup generator must be directly connected to the main power plant bus in order to be utilized. Integrating the temporary generator into the main plant power bus adds the contingency capacity necessary to perform maintenance and repairs on permanent engines within the plant.

9. By having a backup generator available, Naka-NWT can minimize disruptions to power supply and ensure the Hay River Standby Generation Plant continues to provide safe and reliable power to customers year-round while the Taltson Hydro Generation Plant remains offline.

SECTION 3: PROJECT DESCRIPTION

10. Install a temporary generator at the Hay River Standby Generation Plant by installing a switch cube outside the main plant building to create a safe connection point between the temporary generator and the main power plant bus. This would allow the temporary generator's capacity to be safely added to the capacity of the permanently installed generators.

SECTION 4: PROJECT SCHEDULE AND COSTS

2023 – $99,000
2024 – $25,000

SECTION 5: BUSINESS DRIVERS AND BENEFITS

11. The Public Utilities Act imposes the following requirements on Naka-NWT:

> A public utility shall provide safe, adequate and proper service and keep and maintain its property and equipment so that the public utility can provide the service.[1]

12. This Mobile Tie-In project must be completed to meet the above requirements and ensure the safety of Naka-NWT technicians when installing and connecting the temporary generator to the Hay River Standby Generation Plant main bus. Without a safe method of connecting and disconnecting the temporary generator, a power outage would be required to integrate it with the plant to provide contingency generation capacity.

SECTION 6: EVALUATION OF VIABLE ALTERNATIVES

Alternative 1: Do Not Install Switch Cube

13. In this alternative, the temporary generator, required to provide the necessary contingency generation, would need to be directly connected to the Hay River Standby Generation Plant's main electrical bus for Naka-NWT to continue operating as the primary electricity provider while the Taltson Hydro Generation Plant remains offline. Facilitating a direct connection to the main electrical bus would require a complete plant outage,

[1] *Public Utilities Act*, Section 76 (1).

impacting all downstream customers in Hay River, K'atl'odeeche First Nation, Enterprise and Riverwoods. Outages would be required for connecting and disconnecting the temporary generator, as well as to accommodate any maintenance or repairs on the temporary generator. These outages would have significant negative impacts on Naka-NWT's obligation to provide reliable power to its customers.

Alternative 2: Install a Switch Cube

14. In this alternative, the temporary generator would be connected to the Hay River Standby Generation Plant's main electrical bus through a switch cube. Adding the switch cube to connect the temporary generator to the power system enables a physical, and visual, separation between the generator and the main power supply, allowing Naka-NWT technicians to safely connect, disconnect, and complete maintenance work on the temporary generator. A visual separation is a standard safety measure required for Naka-NWT technicians to safety work on power system apparatus by ensuring it is physically isolated from any potential source of electrical energy.

15. Installing a switch cube supports customer reliability by allowing the temporary generator to be connected to the plant and add to the total generation capacity without requiring an outage. By eliminating the need for an outage to connect, disconnect, or perform maintenance on the temporary generator Naka-NWT could integrate the required contingency generation capacity while fulfilling its utility obligations to provide safe and reliable power to its customers.

Alternative 3: Upgrade the Plant Switch Gear

16. In this alternative, the temporary generator would be connected to the main electrical bus of the Hay River Standby Generation Plant using upgraded electrical switchgear. This upgrade would allow for the temporary generator to be connected without requiring a plant outage once the switchgear is installed. However, installing the plant switchgear itself would necessitate a complete outage of the Hay River Standby Generation Plant. While similar to Alternative 2, in terms of avoiding future outages once

the switchgear is in place this alternative involves replacing the existing plant switchgear instead of installing a separate switch cube outside the plant buildings.

17. Upgrading switchgear would involve a complete replacement of the existing switchgear to accommodate the integration of the temporary generation unit. This would necessitate a complete outage of the Hay River Standby Generation Plant to complete the upgrade and significant costs for replacing specialized equipment. Additionally, upgrading the switchgear could potentially require other plant upgrades to ensure compatibility, further increasing costs.

18. While upgrading the switch gear may offer long-term benefits due to modernizing these components of the generation plant, including creating a built-in ability to integrate temporary mobile generation units, the associated cost and lead times for the specialized equipment, as well as the significant outage required to complete the work, introduce risks that do not allow Naka-NWT ability to meet its utility obligations. Customers would be negatively impacted by high costs and the loss of power for the duration of the upgrade, significantly impacting reliability. Given that the Hay River Standby Generation Plant is currently the primary source of power for downstream communities, this alternative is not feasible.

SECTION 7: RECOMMENDATION

19. Proceed with Alternative 2 and install a switch cube to facilitate a safe connection between the temporary generator to the Hay River Standby Generation Plant's main electrical bus. This practical and cost-effective solution addresses the need for reserve capacity at the plant, enabling maintenance and repairs on permanently installed engines during peak load periods while ensuring Naka-NWT can fulfill its utility obligation to provide safe and reliable power.