newfoundland labrador hydro
a nalcor energy company

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May 6, 2021

Board of Commissioners of Public Utilities
Prince Charles Building
120 Torbay Road, P.O. Box 21040
St. John's, NL A1A 5B2

Attention: Ms. Cheryl Blundon
Director of Corporate Services & Board Secretary

Dear Ms. Blundon:

Re: Application for Approval of an Overhaul of Holyrood Thermal Generating Station Unit 1 Boiler Feed Pump East

Please find enclosed Newfoundland and Labrador Hydro's application for approval to complete an overhaul of the Holyrood Thermal Generating Station ("Holyrood TGS") Unit 1 boiler feed pump east. This project is required to support continued safe and reliable operation of the Holyrood TGS at rated output through March 31, 2023. The estimated cost of this project is $443,000 and it is scheduled for completion prior to the 2021–2022 winter operating season.

Should you have any questions, please contact the undersigned.

Yours truly,

NEWFOUNDLAND AND LABRADOR HYDRO

Shirley A. Walsh
Senior Legal Counsel, Regulatory
SAW/sk

Encl.

ecc: **Board of Commissioners of Public Utilities**
Jacqui Glynn
PUB Official Email

Newfoundland Power
Kelly C. Hopkins
Dominic J. Foley
Regulatory Email

Consumer Advocate
Dennis M. Browne, Q.C., Browne Fitzgerald Morgan & Avis
Stephen F. Fitzgerald, Browne Fitzgerald Morgan & Avis
Sarah G. Fitzgerald, Browne Fitzgerald Morgan & Avis
Bernice Bailey, Browne Fitzgerald Morgan & Avis

Industrial Customer Group
Paul L. Coxworthy, Stewart McKelvey
Denis J. Fleming, Cox & Palmer
Dean A. Porter, Poole Althouse

Labrador Interconnected Group
Senwung Luk, Olthuis Kleer Townshend LLP
Julia Brown, Olthuis Kleer Townshend LLP

Application for Approval of an Overhaul of Holyrood Thermal Generating Station Unit 1 Boiler Feed Pump East

May 6, 2021

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An application to the Board of Commissioners of Public Utilities

IN THE MATTER OF the *Electrical Power Control Act, RSNL 1994*, Chapter E-5.1 ("EPCA") and the *Public Utilities Act, RSNL 1990*, Chapter P-47 ("*Act*"), and regulations thereunder;

IN THE MATTER OF an application by Newfoundland and Labrador Hydro ("Hydro") for approval of the overhaul of Holyrood Thermal Generating Station ("Holyrood TGS") Unit 1 Boiler Feed Pump East pursuant to Section 41(3) of the *Act*.

TO: The Board of Commissioners of Public Utilities ("Board")

THE APPLICATION OF HYDRO STATES THAT:

A. Background

1. Hydro, a corporation continued and existing under the *Hydro Corporation Act, 2007*, is a public utility within the meaning of the *Act*, and is subject to the provisions of the *Electrical Power Control Act, 1994*.

2. Hydro is the primary generator of electricity in Newfoundland and Labrador. As part of its generating assets, Hydro owns and operates the Holyrood TGS, which has three oil-fired generating units providing an installed capacity of 490 MW. The Holyrood TGS represents approximately one third of Hydro's Island Interconnected System generating capacity and approximately one quarter of the total Island Interconnected System capacity when included with all other customer-owned generation.

B. Application

3. Holyrood TGS Unit 1 was commissioned in 1970. It was originally designed to produce 150 MW and was upgraded to 170 MW in 1988.

4. In its 2021 Capital Budget Application ("2021 CBA"), Hydro provided the Holyrood TGS Overview Future Operation and Capital Expenditure Requirements ("Holyrood Overview Report").[1] The

[1] "2021 Capital Budget Application," Newfoundland and Labrador Hydro, rev. 2 filed November 2, 2020 (originally filed August 4, 2020), vol. I, Holyrood Overview tab.

Holyrood Overview Report provided information on the short- and medium-term operational outlook and schedule for the Holyrood TGS, the maintenance strategy through each of the operational phases, and a summary of planned capital expenditures for 2021–2025.

5. At the time the 2021 CBA was filed, Hydro anticipated that the Holyrood TGS would continue operations as a generating facility until March 31, 2022, after which it would transition into standby mode. This schedule was made to ensure reliable service for customers while the Muskrat Falls assets were being brought online and proven reliable.

6. On September 28, 2020, Hydro advised the Board of an updated schedule for completion of the Muskrat Falls Project reflecting the impacts of the COVID-19 pandemic on project execution.[2] In light of the update to the Muskrat Falls Project schedule, Hydro advised that it would be extending the Holyrood TGS readiness to operate to March 31, 2023. Hydro made the decision to further extend the operations of the Holyrood TGS as a generating station to ensure reliable service for customers while the Muskrat Falls Project Assets and the Labrador-Island Link are brought online and proven reliable.

7. Due to the change in production requirements, additional capital work is necessary to extend the operational life of the Holyrood TGS. The overhaul of the Unit 1 boiler feed pump east was identified in the Reliability and Resource Adequacy Study – 2020 Update[3] as being required in 2021 for the reliable operation of the Holyrood TGS, should the operation of the Holyrood TGS be extended to March 31, 2023.

8. Hydro intends to fully execute the overhaul of the Unit 1 boiler feed pump east project during the planned outages in 2021, prior to the 2021–2022 winter season.

9. Unit 1 has both an east and west boiler feed pump. Each pump individually supports half of the generation for Unit 1. Together, the pumps allow Unit 1 to operate at its rated capacity of 170 MW.

[2] "The Liberty Consulting Group Eighth Quarterly Monitoring Report on the Integration of Power Supply Facilities to the Island Interconnected System – Monthly Update," Newfoundland and Labrador Hydro, September 28, 2020.
[3] "Reliability and Resource Adequacy Study – 2020 Update – Volume II: Near-Term Reliability Report," Newfoundland and Labrador Hydro, November 18, 2020.

10. Unit 1 boiler feed pump east was placed in service in 1970 and was last overhauled in 2015. Hydro overhauls boiler feed pumps on a six-year cycle, which is consistent with Original Equipment Manufacturer recommendations and the conditions observed by Hydro during previous overhauls. Based on Hydro's six-year overhaul frequency standard, the next overhaul is due in 2021.

11. Hydro did not propose the overhaul in its 2021 CBA as, at that time of filing the 2021 CBA, it was anticipated that Holyrood TGS would transition from normal production through reduced production to post-steam operation on March 31, 2022. However, Hydro's subsequent commitment to extend Holyrood TGS as a generating facility until March 31, 2023 makes this project required during 2021.

12. Hydro believes that a continued extension of this overhaul is an unacceptable risk. If an overhaul is not completed at this time, the pump could fail while in operation. Such failure would result in the reduction of 50% of Unit 1's generating capacity for several weeks. An overhaul is necessary at this time to maintain Hydro's safety and reliability standards, including Hydro's ability to meet customer demand during peak periods.

13. Further detail with respect to this project is found in the project description and justification document attached to this application as Schedule 1.

14. The project is scheduled for completion prior to the 2021–2022 winter season and has an estimated capital cost of $443,000.

C. Hydro's Request

15. Hydro submits that the proposed capital expenditures detailed above and further described in Schedule 1 to this application are necessary to ensure that Hydro can continue to provide service which is safe and adequate and just and reasonable as required by Section 37 of the *Act.*

16. Therefore, Hydro makes application that the Board make an Order pursuant to Section 41(3) of the *Act* approving the capital expenditure of approximately $443,000 for the Overhaul Unit 1 Boiler Feed Pump East project as more particularly described in this application and in the project description and justification document attached as Schedule 1.

D. **Communications**

17. Communications with respect to this application should be forwarded to Shirley A. Walsh, Senior Legal Counsel, Regulatory for Hydro.

DATED at St. John's in the Province of Newfoundland and Labrador this 6th day of May, 2021.

NEWFOUNDLAND AND LABRADOR HYDRO

Shirley A. Walsh
Counsel for the Applicant
Newfoundland and Labrador Hydro
500 Columbus Drive P.O. Box 12400
St. John's, NL A1B 4K7
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Schedule 1

Overhaul Unit 1 Boiler Feed Pump East – Holyrood Thermal Generating Station

Overhaul Unit 1 Boiler Feed Pump East – Holyrood Thermal Generating Station

May 6, 2021

A report to the Board of Commissioners of Public Utilities

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Executive Summary

To support the continued safe and reliable operation of the Holyrood Thermal Generating Station ("Holyrood TGS") at rated output through the 2021–2022 and 2022–2023 winter operating seasons, Newfoundland and Labrador Hydro ("Hydro") is proposing to overhaul the Holyrood TGS Unit 1 boiler feed pump east. This pump is one of two pumps that supply the high-pressure feedwater required for steam production in Boiler No. 1.

Hydro's historical experience with the boiler feed pumps has demonstrated that an overhaul frequency of six years is appropriate based on the observations made during previous overhauls. Additionally, this cycle is consistent with Original Equipment Manufacturer ("OEM") recommendations. As the Holyrood TGS Unit 1 boiler feed pump east was last overhauled in 2015 and has been in normal service throughout the past six years, it is now due for overhaul in 2021.

At the time of Hydro's 2021 Capital Budget Application ("2021 CBA"),[1] Hydro anticipated that the Holyrood TGS would transition from normal production through reduced production to post-steam operation on March 31, 2022.[2] As such, Hydro did not propose overhaul of Unit 1 boiler feed pump east in 2021. Hydro's subsequent commitment to extending Holyrood TGS generation until March 31, 2023[3] results in a requirement for this project during 2021.[4]

Hydro believes this overhaul is required to support safe and reliable operation of the Holyrood TGS through March 31, 2023, including Hydro's ability to meet customer demand during peak periods. However, should the successful integration and demonstrated reliability of the Muskrat Falls Assets occur prior to Hydro's execution of the full scope of this project, careful consideration will be given to the necessity of executing the full scope. Where there is opportunity to mitigate some portion of capital costs, Hydro will ensure prudency in its capital expenditures and notify the Board of Commissioners of Public Utilities ("Board") of such change, as appropriate.

[1] "2021 Capital Budget Application," Newfoundland and Labrador Hydro, rev. 2 filed November 2, 2020 (originally filed August 4, 2020).
[2] "Extension of Holyrood Thermal Generation Station as a Generating Facility," Newfoundland and Labrador Hydro, February 14, 2020.
[3] On September 28, 2020, Hydro advised the Board of its decision to extend operation of the Holyrood TGS as a generating facility to March 31, 2023.
[4] The requirement for completion of this project to support continued operation until March 31, 2023 was outlined in Hydro's "Reliability and Resource Adequacy Study – 2020 Update – Volume II: Near-Term Reliability Report,," Newfoundland and Labrador Hydro, November 18, 2020, vol. II, app. A.

The budget estimate for this project is $443,000. The overhaul is scheduled to be completed prior to the 2021–2022 winter operating season.

Contents

1.0 Introduction

The Holyrood TGS Unit 1 boiler feed pump east is one of two pumps that supply the high-pressure feedwater required for steam generation in Boiler No. 1. Boiler feed pumps have historically been overhauled every six years. Individually, each pump supports 50% of Unit 1's generation capacity. The two pumps, operating together, support the full generation capacity of Unit 1 (170 MW). Boiler feed pumps are exposed to high temperatures, high pressure, and high flow velocity. This contributes to significant wear on the equipment. Timely overhaul is required to inspect and address any issues that, if left unresolved, may cause the pump to fail while in operation. The failure of a boiler feed pump would result in the reduction of 50% of Unit 1's generating capacity for several weeks.

At this time, Hydro anticipates the need to carry out the full scope of the boiler feed pump overhaul. Should the successful integration and demonstrated reliability of the Muskrat Falls Assets occur prior to Hydro's execution of the full scope of this project, careful consideration will be given to the necessity of executing the full scope. Where there is opportunity to mitigate some portion of capital costs, Hydro will ensure prudency in its capital expenditures and notify the Board of such change, as appropriate.

2.0 Background

2.1 Existing System

The Holyrood TGS Unit 1 boiler feed pump east, shown in Figure 1, was placed in service in 1970. The pump receives water from the deaerator tank and feeds it to high-pressure heaters and then the boiler. The pump has nine stages and its rated capacity is 1,185 gpm[5] at a differential pressure of 2,225 psi.[6]

[5] Gallon per minute ("gpm").
[6] Pounds per square inch ("psi").

Figure 1: Unit 1 Boiler Feed Pump East

2.2 Operating Experience

Hydro's experience with the Holyrood TGS boiler feed pumps has demonstrated that overhaul every six years is appropriate based on the observations made during previous overhauls. Additionally, this cycle is consistent with OEM recommendations.

The six-year frequency of boiler feed pump overhauls has contributed to reliable operation of Unit 1. As the Holyrood TGS Unit 1 boiler feed pump east was last overhauled in 2015 and has been in normal service throughout the past six years, it is now due for overhaul in 2021.

In October 2020, there was an in-service failure of Unit 1 boiler feed pump west. The spare volute impeller cartridge was used to restore Unit 1 boiler feed pump after this failure. Such failures leave the Holyrood TGS inventory without a spare volute impeller cartridge for several months, which poses a risk of reducing the generating capacity at Holyrood if a boiler feed pump in Unit 1 or Unit 2 fails before returning the refurbished spare to the inventory. The overhaul of Unit 1 boiler feed pump east reduces this risk by reducing the likelihood of an in-service failure requiring use of the critical spare.

At the time of the filing of Hydro's 2021 CBA, Hydro anticipated that the Holyrood TGS would transition from normal production through reduced production to standby on March 31, 2022, and would therefore have reduced levels of production though 2021. Based on this assessment, Hydro determined

that it was appropriate to forego the planned 2021 overhaul. However, Hydro has since committed to having the Holyrood TGS fully available for generation until March 31, 2023 to ensure reliable service for customers while the Muskrat Falls Project Assets and the Labrador-Island Link are brought online and proven reliable, making it necessary to complete this project in 2021.[7]

2.3 Maintenance History

Unit 1's boiler feed pump east was last overhauled in 2015. At that time, Hydro replaced the volute impeller cartridge with a refurbished spare. The volute impeller cartridge that was removed was refurbished and stored as a spare for use in the next boiler feed pump overhaul or as a critical spare to allow expedited return to service should an in-service failure occur on any of the Unit 1 or Unit 2 boiler feed pumps.

Hydro completes annual preventative maintenance work for the parts of the boiler feed pump that can be accessed and worked on without outage or disruption to operation. Preventative maintenance activities include, but are not limited to, inspecting the following:

- Oil levels;
- Coupling alignment;
- Holding down bolts;
- Glands;
- Oil pump and filter housing for loose fittings;
- Signs of oil and water leakage; and
- Oil pump coupling and bolting.

[7] Overhaul of the Unit 3 boiler feed pump east is also planned for the 2021 annual outage season and was submitted as part of Hydro's 2021 CBA. The boiler feed pumps on Unit 3 are a different design than those on Unit 1 and Unit 2. Hydro maintains a spare volute in inventory for both pump designs. Hydro expects to have both refurbished volutes returned to inventory for the winter 2021–2022 season.

3.0 Analysis

3.1 Identification of Alternatives

Hydro considered the following alternatives:

- Deferral of the overhaul;
- Condition-Based refurbishment; and
- Overhaul.

3.2 Evaluation of Alternatives

3.2.1 Deferral of the Overhaul

Given the higher than anticipated levels of production at the Holyrood TGS to date when compared to the original forecast, as well as the extension of Holyrood TGS as a generating facility to March 31, 2023, an extension of this overhaul beyond six years poses an unacceptable risk of failure for the boiler feed pump east. A boiler feed pump failure while in operation results in a loss of 50% of Unit 1 generation capacity for several weeks while the pump is being repaired. Additionally, in-service failure results in the use of the spare volute impeller cartridge, leaving no spare available for Unit 1 or Unit 2 for several months. Hydro has determined that this alternative poses an unacceptable level of risk to reliability. Further, in-service failure of a boiler feed pump may cause additional damage to pump components, which may result in additional repair costs and loss of production when compared to the cost of a planned overhaul.

3.2.2 Condition-Based Refurbishment

Hydro collects some condition-related data while the pump is in-service from installed instrumentation. Additional data is collected through measurements and testing performed during annual preventative maintenance. To date, the data collected through each of these means has not proven to be adequately comprehensive to inform an accurate prediction as to whether the unit can operate reliably through to the next planned outage. Hydro has determined that, due to the limited information available, making decisions based on asset condition is not a viable alternative for boiler feed pumps.

3.2.3 Overhaul

Overhaul consists of the disassembly, inspection, refurbishment as necessary, reassembly, and recommissioning of the boiler feed pump east. The six-year overhaul cycle was recommended by the OEM and supported by Hydro's third-party consultant, Wood Canada Limited, which was engaged by

Hydro to provide an opinion on this and other projects. Because operation since the last overhaul in 2015 has been comparable to that of previous cycles, overhaul at this time is required. Further, Hydro has determined that the six-year frequency is warranted and appropriate based on observed condition during previous overhauls. Boiler feed pumps operate under high wear conditions. Many components of the pump can erode, crack, or otherwise fail, leading to poor pump performance or sudden failure. In some circumstances, failures of certain components have resulted in collateral damage to the pump barrels, requiring additional repair and associated costs. Therefore, overhaul is required to support the continued safe and reliable operation of Holyrood TGS Unit 1.

3.3 Recommended Alternative

Hydro has determined that the six-year frequency is warranted and appropriate based on observed condition during previous overhauls. As the Holyrood TGS is anticipated to be fully available for generation until March 31, 2023, Hydro recommends the overhaul alternative to appropriately mitigate the risk of failure of the boiler feed pump east and subsequent loss of generation capacity.

4.0 Project Description

4.1 Scope

This project consists of the disassembly, inspection, refurbishment as necessary, reassembly, and recommissioning of Holyrood TGS Unit 1 boiler feed pump east. Parts, including the volute impeller cartridge, will be replaced as necessary in this overhaul. If required, the volute impeller cartridge will be replaced with a refurbished cartridge from Hydro's spares inventory. The volute impeller cartridge which is removed from the pump will then be refurbished and returned to inventory as a critical spare to support the boiler feed pumps in both Units 1 and 2 prior to the next winter operating season. Figure 2 shows the volute impeller cartridge.

Figure 2: Volute from Unit 1 Boiler Feed Pump (Identical in East and West Pumps of Unit 1 and Unit 2)

Disassembly and reassembly will be executed by internal resources. The overhaul will be performed by an experienced feedwater pump service contractor. The service contractor will be engaged to do the following:

- Perform a detailed condition assessment of the assembly of the entire pump through on-site inspection;
- Provide recommendations and guidance with respect to on-site disassembly and reassembly; and
- Off-Site condition assessment and refurbishment of the volute impeller cartridge.

4.2 Estimate

The estimate for this project is shown in Table 1.

Table 1: Project Estimate ($000)

Project Cost	2021	2022	Beyond	Total
Material Supply	1.0	0.0	0.0	1.0
Labour	124.6	0.0	0.0	124.6
Consultant	0.0	0.0	0.0	0.0
Contract Work	255.0	0.0	0.0	255.0
Other Direct Costs	0.0	0.0	0.0	0.0
Interest and Escalation	24.3	0.0	0.0	24.3
Contingency	38.1	0.0	0.0	38.1
Total	**443.0**	**0.0**	**0.0**	**443.0**

4.3 Schedule

Hydro intends to complete the boiler feed pump overhaul during the planned Unit 1 outage in 2021. Following the overhaul, the pump will be returned to service and the volute impeller cartridge will be refurbished and placed into inventory as a critical spare for both the Unit 1 and Unit 2 boiler feed pumps. The anticipated project schedule is shown in Table 2. All planned work will be completed for the pump to be available for service prior to the winter 2021–2022 operating season. Additionally, the volute impeller cartridge is expected to be refurbished and available as a critical spare for the winter 2021–2022 operating season.

Table 2: Project Schedule

Activity	Start Date	End Date
Planning:		
Prepare planning documentation.	May 2021	June 2021
Design:		
Prepare technical specifications for the overhaul and technical support.	June 2021	June 2021
Procurement:		
Award overhaul and technical support contracts.	June 2021	June 2021
Construction:		
Dismantle, inspect, and reassemble pump using spare volute impeller cartridge.	July 2021	August 2021
Refurbish old volute impeller cartridge and place in spare inventory.	July 2021	December 2021
Closeout:		
Prepare closeout documentation	October 2021	December 2021

5.0 Conclusion

To support the continued safe and reliable operation of Unit 1 at the Holyrood TGS for the 2021–2022 and 2022–2023 winter operating seasons, Hydro proposes to overhaul the Unit 1 boiler feed pump east in 2021. The boiler feed pumps are overhauled on an established six-year frequency. Unit 1 boiler feed pump east was last overhauled in 2015. Based on historic and forecast production, an overhaul of the Unit 1 boiler feed pump east is required in 2021.

Unit 1 generating capacity is 170 MW. Failure of the Unit 1 boiler feed pump east would result in a loss of 50% of this generating capacity for several weeks. The overhaul is required to maintain the pumps operating condition and to contribute to the reliable operation of Unit 1's availability for full generation capabilities until March 31, 2023.

Affidavit

newfoundland labrador hydro
a nalcor energy company

IN THE MATTER OF the *Electrical Power Control Act, RSNL 1994*, Chapter E-5.1 ("EPCA") and the *Public Utilities Act, RSNL 1990*, Chapter P-47 ("*Act*"), and regulations thereunder;

IN THE MATTER OF an application by Newfoundland and Labrador Hydro ("Hydro") for approval of the overhaul of Holyrood Thermal Generating Station ("Holyrood TGS") Unit 1 Boiler Feed Pump East pursuant to Section 41(3) of the *Act*.

AFFIDAVIT

I, Terry Gardiner, Professional Engineer, of St. John's in the Province of Newfoundland and Labrador, make oath and say as follows:

1. I am Vice President, Engineering and Technology of Newfoundland and Labrador Hydro, the Applicant named in the attached application.
2. I have read and understand the foregoing application.
3. To the best of my knowledge, information, and belief, all of the matters, facts, and things set out in this application are true.

SWORN at St. John's in the Province of Newfoundland and Labrador this 6th day of May 2021, before me:)

Barrister, Newfoundland and Labrador

Terry Gardiner, P. Eng.