newfoundland labrador hydro
a nalcor energy company

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November 4, 2014

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: An Application by Newfoundland and Labrador Hydro (Hydro) pursuant to Subsection 41 (3) of the Act for the approval of the Purchase of Critical Spares for the Holyrood Thermal Generating Station.

Please find enclosed the original and 12 copies of the above-noted Application, plus supporting affidavit, project proposal, and draft order.

The proposed project involves the purchase of four critical spare motors that when purchased and ready to install at the Holyrood Thermal Generating Station will shorten forced generation outages in the event of a failure of the in-service components, and are necessary for the supply of dependable and reliable power to the Island Interconnected System.

Should you have any questions, please contact the undersigned.

Yours truly,

NEWFOUNDLAND AND LABRADOR HYDRO

Tracey L. Pennell
Legal Counsel

TLP/jc

cc: Gerard Hayes – Newfoundland Power
Paul Coxworthy – Stewart McKelvey Stirling Scales
Sheryl Nisenbaum – Praxair Canada Inc.
ecc : Roberta Frampton Benefiel – Grand Riverkeeper Labrador
Thomas Johnson – Consumer Advocate
Thomas J. O'Reilly, Q.C. – Cox & Palmer
Danny Dumaresque

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

AND IN THE MATTER OF an Application by Newfoundland and Labrador Hydro (Hydro) pursuant to Subsection 41(3) of the *Act*, for approval of the Purchase of Critical Spares for the Holyrood Thermal Generating Station.

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

THE APPLICATION OF NEWFOUNDLAND AND LABRADOR HYDRO (Hydro) STATES THAT:

1. Hydro is 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. Hydro's generating assets consist of nine hydroelectric generating plants, one oil-fired plant, four gas turbines and 25 diesel plants. In addition, Hydro has a number of power purchase agreements in place with non-utility generators to supplement its own generation capacity. Following the January 2014 supply disruption, Hydro engaged in a critical spares assessment to identify equipment that is necessary to have readily available to install at Holyrood Thermal Generating Station (HTGS) to reduce generation down time in the event of an unexpected failure involving the in-service pieces of

equipment. This was a continuation of an enhanced review process initiated by Hydro in 2013 with an asset criticality review of HTGS.

3. The critical spares assessment work completed to date in 2014 has identified four motors that are necessary to have readily available in the event of a forced outage at HGTS due to the unexpected failure of these pieces of equipment. The availability of these critical parts will contribute significantly to the expedited return to service of the affected generating equipment and the reinstatement of maximum generating capacity. Hydro's identified need for critical spares equipment for the HTGS includes the following:

    i. One Forced Draft Fan Motor (applicable to Unit 1 or 2); and

    ii. A Boiler Feed Pump Motor for each of Units 1, 2 and 3.

4. The estimated cost of the critical spares equipment identified in the report is $491,753.

5. The Applicant submits that the proposed purchase of the above noted critical spare motors for the HGTS is necessary to ensure that the electrical system can continue to provide service which is safe and adequate and just and reasonable as required by Section 37 of the *Act*. An Engineering Report supporting this supplemental capital application is enclosed.

6. Hydro therefore makes Application for an Order pursuant to Subsection 41(3) of the *Act* approving the purchase of critical spares for Hydro's generating stations at an estimated capital cost of $491,753 as set out in this Application and in the enclosed project description and justification document.

DATED at St. John's, in the Province of Newfoundland and Labrador, this 4th day of November, 2014.

Tracey L. Pennell
Counsel for the Applicant
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St. John's,
Newfoundland and Labrador
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IN THE MATTER OF the *Electrical Power Control Act,* RSNL 1994, Chapter E-5.1 (the *EPCA*) and the *Public Utilities Act*, RSNL 1990, Chapter P-47 (the *Act*), and regulations thereunder;

AND IN THE MATTER OF an Application by Newfoundland and Labrador Hydro (Hydro) pursuant to Subsection 41(3) of the *Act*, for approval of the Purchase of Critical Spares for the Holyrood Thermal Generating Station.

AFFIDAVIT

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

1. I am Vice-President of Newfoundland and Labrador Hydro, the Applicant named in the attached Application.

2. I have read and understand the foregoing Application.

3. I have personal knowledge of the facts contained therein, except where otherwise indicated, and they are true to the best of my knowledge, information and belief.

SWORN at St. John's in the Province of Newfoundland and Labrador this 4th day of November 2014, before me:

Barrister – Newfoundland and Labrador

Robert J. Henderson

(DRAFT ORDER)
NEWFOUNDLAND AND LABRADOR
BOARD OF COMMISSIONERS OF PUBLIC UTILITIES

AN ORDER OF THE BOARD

NO. P.U. __ (2014)

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

AND IN THE MATTER OF an Application by Newfoundland and Labrador Hydro (Hydro) pursuant to Subsection 41(3) of the *Act*, for approval of the Purchase of Critical Spares for the Holyrood Thermal Generating Station.

WHEREAS Newfoundland and Labrador Hydro ("Hydro") is 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 *EPCA;* and

WHEREAS Subsection 41(3) of the *Act* requires that a public utility not proceed with the construction, purchase or lease of improvements or additions to its property where:

a) the cost of construction or purchase is in excess of $50,000; or
b) the cost of the lease is in excess of $5,000 in a year of the lease,

without prior approval of the Board; and

WHEREAS in Order No. P.U. 42(2013) the Board approved Hydro's 2014 Capital Budget in the amount of $97,805,300; and

WHEREAS in Order No. P.U. 16(2014) the Board approved Hydro's proposal to proceed with the purchase and installation of 100 MW of combustion turbine generation at the Holyrood Thermal Generating Station, with cost recovery to be determined by the Board in a future Order; and

WHEREAS in Order No. P.U. 23(2014) the Board approved a supplementary amount of $580,000 to the Allowance for Unforeseen Items related to expenditures for the Holyrood Unit 3 east forced draft fan motor and the Sunnyside and Holyrood breaker overhauls and ordered that recovery of these expenditures would be addressed upon receipt of a further application from Hydro; and

WHEREAS the Board approved supplementary 2014 capital expenditures in: Order No. P.U. 29(2014) in the amount of $7,197,800 in 2014 and $1,266,400 in

i) 2015 for the purchase and replacement of the Sunnyside T1 transformer and associated equipment, modification to the protection relay system and addition of a 230 kV breaker at the Sunnyside Terminal Station; and

ii) Order No. P.U. 32(2014) in the amount of $1,452,500 to replace the tap changer on the T5 transformer at the Western Avalon Terminal Station;

and ordered that recovery of these expenditures would be addressed in a subsequent order of the Board following a further application by Hydro; and

WHEREAS the Board approved supplementary 2014 capital expenditures in:

i) Order No. P.U. 33(2014) in the amount of $3,632,200 to replace insulators on transmission lines TL-201 and TL-203; and

ii) ii) Order No. P.U. 34(2014) in the amount of $636,700 in 2014 and $360,000 in 2015 for the replacement of the excitation transformers at the Bay d'Espoir generating station; and

WHEREAS the Board approved supplementary 2014 capital expenditure in Order No. P.U. 36(2014) in the amount of $958,800 for the installation of additional transformer capacity at the Wabush Substation by relocating the transformer from the Quartzite Substation and associated modifications to the Wabush Substation; and

WHEREAS the Board also approved the supplementary 2014 capital expenditure in Order No. P.U. 38 (2014) in the amount of $320,600 for the approval to replace an Air Compressor at the Holyrood Thermal Generating Station; and

WHEREAS on November 4, 2014 Hydro applied to the Board for approval to purchase four motors as critical spares for the Holyrood Thermal Generating Station (the "Application"); and

WHEREAS the Board is satisfied that the 2014 supplemental capital expenditure for the approval to purchase critical spares for the Holyrood Thermal Generating Station is necessary to allow Hydro to provide service and facilities which are reasonably safe and adequate and just and reasonable.

IT IS THEREFORE ORDERED THAT:

1. The proposed capital expenditure of $491,753 for the approval to purchase critical spares for the Holyrood Thermal Generating Station.

2. Hydro shall pay all expenses of the Board arising from this Application.

DATED at St. John's, Newfoundland and Labrador, this day of , .

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A Report to
The Board of Commissioners of Public Utilities

	Electrical
	Mechanical
	Civil
	Protection & Control
	Transmission & Distribution
	Telecontrol
	System Planning

PURCHASE OF CRITICAL SPARE MOTORS

HOLYROOD THERMAL GENERATING STATION

NEWFOUNDLAND AND LABRADOR HYDRO

November 2014

newfoundland labrador hydro
a nalcor energy company

Table of Contents

1.0 INTRODUCTION

In this 2014 Capital Budget Supplemental Application, Newfoundland and Labrador Hydro (Hydro) proposes to purchase spare critical motors for Holyrood Thermal Generating Station (HTGS). The critical spare motors will facilitate an expedited return to service for the associated generating units, should HTGS experience an outage due to the failure of an in-service critical motor as identified in this report. These critical spares were identified during an evaluation that commenced in 2014. It is the intention of Hydro to purchase these critical spares and have them on site to support ongoing, reliable service to customers.

Hydro's identified need for critical spare motors at HTGS includes the following:

1. One Forced Draft Fan Motor applicable to Unit 1 or 2; and
2. A Boiler Feed Pump Motor for each of Units 1, 2 and 3.

The estimated cost of the critical spare motors identified in this report is $491,753.

In addition to the motors currently identified as critical spares for HTGS, Hydro's 2014 company-wide critical spares review is nearing completion and it is anticipated that further capital submissions may be required to secure additional critical spares. If necessary, a second supplementary capital application will follow once the 2014 review is complete. Further ongoing reviews are also planned for future years to ensure that the available critical spares remain current and reasonable to support changes in asset condition and dispatch requirements.

2.0 BACKGROUND

Hydro is the primary generator of electricity in Newfoundland and Labrador. Hydro sells its power to utility, industrial and 35,000 residential and commercial customers in over 200 communities across the province. Hydro's generating assets consist of nine hydroelectric plants, one oil-fired plant, four gas turbines and 25 diesel plants. In addition, Hydro has entered into a number of power purchase agreements with non-utility generators to supplement its own generation capacity.

Following the January 2014 supply disruption, Hydro established a key action to review critical spares in 2014. This was a continuation of an enhanced review process initiated in 2013 with an asset criticality review in Holyrood. The review is ongoing; however, presently identified spare motors meeting criteria for capitalization are discussed below.

3.0 PROJECT DESCRIPTION

Hydro's critical spare review process was developed by the Long-Term Asset Planning departments based upon industry best practices. The review at HTGS was completed by a team of engineering and operations personnel. The team completed the asset criticality analysis, which considered seven factors that could be impacted should a particular asset fail while in service. The factors include:

1. Health and Safety - covers both people and plant;
2. Output (MW);
3. Quality of Output - controlled or uncontrolled shutdown;
4. Utilization - how often the equipment is used;
5. Alternatives - loss mitigation (backup equipment, etc.);
6. Environment - negative impact;
7. Time to effect - immediate or delayed impact.

Each of the criteria was scored and multiplied to give a total score for ranking the criticality of the asset being analyzed.

The critical spares assessment work completed to date in 2014 has identified four motors that are necessary to have readily available in the event of a forced outage at HTGS in light of the January 2014 unusual events. The availability of these motors contributes significantly to an expedited return to service of the associated generating units.

In the event of a motor failure and no spare motor is available, Hydro would attempt to repair the motor. The turnaround time to repair a 4160V motor post failure can vary from three to four weeks, depending on the failure mode, availability of labour for repair, and availability of spare parts. In the event of a non-repairable motor failure, delivery times for a replacement 4160V motor can vary from several months to nearly one year, depending on

the manufacturer, application, and specifications. While it is unlikely the multiple events of January 2014 would occur again in a similar manner, availability of these critical spares would improve a situation such as was experienced in January 2014.

Hydro has identified two types of motors to procure as spare due to their critical nature:

3.1 Forced Draft Fan Motor – Unit 1 or 2

Generating Units 1 and 2 at HTGS are sister units and have two forced draft fans each to supply combustion air to the boiler furnaces. The fans draw air from the top of the boiler house through ducts connected to each fan inlet. The fans are driven by 4160V, 1500hp electric motors on each unit. These motors are critical to the unit being able to supply its rated capacity. Hydro is proposing to purchase one spare to serve a failure on either Unit 1 or 2.

Generating Unit 3 at HTGS also has two forced draft fan motors. These motors are not interchangeable with the motors on Units 1 and 2. On December 26, 2013, one of the motors on Unit 3 failed. The failure of this motor resulted in a 100 MW de-rating of available generating capacity on Unit 3, allowing for maximum de-rated capacity of 50 MW with one fan operational. The failed motor was removed, repaired by a contractor through a period of significant overtime, and replaced 18 days after failure. The failure occurred at a time of significant cold weather in the province and increased demand for energy on the Island Interconnected System.

Hydro has identified a need for a spare forced draft fan motor that can be used at either Units 1 or 2. Due to the design of the combustion air supply systems, if an in-service motor fails on Units 1 or 2, all generating capacity for the unit is lost, whereas for Unit 3, loss of a motor would result in a partial loss of generating capacity, as was demonstrated during the events of last winter. HTGS could see a reduced generating capacity of 175 MW for the

period of time following a forced draft fan motor failure on Unit 1 or 2 while the motor is repaired or a new one sourced, if a spare is not purchased ahead of time and ready to install. See Table 1 for impact to generating capacity upon failure of this critical motor.

Hydro is not proposing to purchase a spare for Unit 3. Hydro now has engineering drawings for the fan motors on Unit 3 identifying the parts and all required information to stock parts for those motors. Hydro does not have in its possession the same information for the Unit 1 and 2 motors being proposed through this supplemental capital budget application. If a Unit 3 fan motor fails going forward, Hydro can make a repair for less cost and as quickly as a new spare motor could be installed.

Figure 1: Holyrood Stage 1 Forced Draft Fan Motor

3.2 Boiler Feed Pump Motors – Units 1, 2 and 3

Generating Units 1, 2 and 3 at HTGS each have two boiler feed water pumps. These pumps supply water at high pressure to the boilers for producing steam. Each pump is capable of supplying water for 50 percent capacity of the boiler. The pumps are driven by 3000hp, 4160V motors on Units 1 and 2; and a 2350hp, 4160V motor on Unit 3.

Experience has shown that these motors can fail without warning, albeit infrequently to date. On October 14, 1993, the Unit 2 boiler feed pump motor failed and impacted the generating capacity of HTGS. The failure of a boiler feed pump motor on Units 1, 2 or 3 will de-rate a unit's output by approximately half.

In consideration of the motor failures experienced in October 1993 and December 2013, Hydro has identified the need for a spare boiler feed pump motors for each of Units 1, 2 and 3. The boiler feed pump motors for Units 1, 2 and 3 are not interchangeable and the fit of motor to pump is different for all units. Therefore, a spare motor is deemed necessary for each unit.

Figure 2: Holyrood Boiler Feed Pump Motor

It is expected that having the spare forced draft fan motor for Units 1 and 2, and spare boiler feed water motors for Units 1, 2 and 3 will allow for generating capacity to be restored four to six days following a failure as compared to a longer timeframe, at a minimum, similar to what was experienced in December 2013/January 2014 with the Unit 3 forced draft fan motor failure, i.e. 18 days. In that instance, the contractor worked significant overtime to get this motor repaired. If it is not possible to work as much overtime on a future failure, or the motor is not repairable, the generating unit will be out of service for an even longer period of time.

To summarize, the critical motors identified for purchase at HTGS and associated generating units are listed in Table 1.

Table 1 – Critical Motors and Associated Generating Units

Unit	Generating Capacity (MW)	Proposed Critical Motor	Expected Capacity with Critical Motor Failed (MW)
Holyrood Unit 1	175	Boiler Feed Pump Motor	87.5
Holyrood Unit 2	175	Boiler Feed Pump Motor	87.5
Holyrood Unit 3	150	Boiler Feed Pump Motor	75
Holyrood Unit 1 or 2	175	Stage 1 Forced Draft Fan Motor	0

4.0 PROJECT ALTERNATIVES

The purpose of this application is to obtain critical spare motors for HTGS to reduce down-time for key generating units in the event of an unexpected failure involving these pieces of equipment. Purchase of critical spares allows for expediting the return to service of the affected generating facilities to its maximum possible capacity. Alternatives to the purchase of the spares noted in this application include: to repair, where possible, the existing motor; when not possible to repair, to procure post failure, replacement motor; or to replace all critical motors under planned capital future investments. These alternatives are described in more detail below.

Alternative 1: Purchase Critical Spare Motors

The benefits of purchasing critical spare motors identified in this report have been discussed in the previous section. Purchasing spare critical motors for HTGS will expedite a return to service of the unit's maximum generating capacity following a failure of the motor.

Alternative 2: Repair Failed Motors

Risks associated with this alternative include, but are not limited to, additional downtime incurred while undergoing motor repair, being unable to readily procure parts, and putting back in service a motor that has a known failure as this may be an indication end of life is nearing for some motor components. Repairing motors may, in some instances, be more cost effective that purchasing select spares, however, the risks associated with this alternative will result in a unit being out of service and total generation capacity available reduced for longer than if a spare critical motor were readily available.

Alternative 3: Procure New Motors Post Failure

Risks associated with this alternative include, but are not limited to, long lead time for delivery of the motor and increased costs associated with expedited delivery of the

replacement motor. These risks could increase the time Hydro's system operates with reduced capacity at HTGS than if a spare was already procured. In addition, there are generally increased costs associated with urgent motor delivery requests, due to the higher labour costs for manufacturing (i.e. overtime to make the motor quickly) and also higher shipping costs associated with expedited shipping.

Alternative 4: Replace Critical Motors under Planned Future Investments

Risks associated with this alternative include failures occurring before the planned project can be completed, as well as removing from service motors that are not yet at the end of their service life. This can be an unnecessarily costly approach.

Alternatives to purchasing critical spare motors for HTGS are discussed above, along with the alternative's risks to generation availability. If the critical motors discussed do fail and no spare is previously procured, there will be an increase in generating facility downtime and, correspondingly, decreased generating capacity for a longer period of time than if a spare had been purchased. Additionally, increased costs for procurement of critical motors can be expected when seeking components on short notice.

5.0 PROJECT COST

The estimated cost to complete all work associated with purchasing the identified critical spare motors for HTGS is $491,753. Table 2 provides a breakdown of the proposed critical spare motor purchases.

Table 2 – Critical Spare Motors for HTGS

Critical Motor	**Estimate**
Stage 1 Forced Draft Fan Motor – Units 1 or 2	$99,335
Boiler Feed Pump Motors – Units 1, 2, 3	$392,418
Total	**$491,753**

6.0 PROJECT SCHEDULE

The purchase of the critical spare motors proposed is necessary to expedite the return to service of the generating units at HTGS in the event of a failure of a critical motor identified in this report. It is Hydro's intention to procure and take receipt of the identified motors as soon as possible. The current delivery date for the motors is end of January 2015, however, Hydro is working with the supplier to try to advance the delivery date.

Considering Hydro experienced a motor failure at HTGS in the last 12 months, a purchase order has been issued for the motors at HTGS with the objective of getting the motors in place as quickly as possible. The purchase order has been issued with the following clause "Hydro needs to obtain approval of the purchase transaction prior to title of any products and equipment passing to Hydro. In the event that Hydro does not obtain approval to complete the purchase Hydro will reimburse the supplier for its Hydro approved reasonable and unavoidable out of pocket expenses arising from this supply."

7.0 JUSTIFICATION

The deliberate review of required critical spare motors for HTGS has been a focused effort following the system supply deficiencies of winter 2013/2014 and is a continuation of the layered approached to critical spares reviews initiated by Hydro as an element of its Asset Management program in 2011 . The aim of the review is to procure and have in place equipment spares that will expedite a return to service of maximum generating capacity following a forced outage due to a failure of equipment. The motors identified in this application are capital in nature and as such are being submitted for supplemental approval.

Due to the timing of this review, its ongoing nature, and as assets age toward end of service life and system demands and supporting reliability needs develop, the currently identified motors were not included in the 2014 capital budget. Further, the review had not yet clearly concluded the motors were required as critical spares in advance of filing the 2015 Capital Budget (submitted to the Board of Commissioners of Public Utilities on August 1, 2014). Therefore, the current application is required to be submitted as a supplemental capital expenditure.

In light of the experience at HTGS on December 26, 2013, when failure of the forced draft fan motor on Unit 3 de-rated the unit's capacity to 150 MW from 50 MW, Hydro deems it to be an unacceptable risk to defer the procurement of the identified critical motors to the next budgeting cycle. The fan motor failure on Unit 3 occurred during a significant cold weather event and contributed to generating capacity deficiency on the Island Interconnected System. Deferring the purchase of the spare motors was discussed in Section 4 – Alternatives, and Hydro deems deferral is not prudent in light of the evolved system conditions experienced last winter. In order to return HTGS to expected operating capacity following a failure of one of the motors discussed in this report, it is prudent and in the interest of customers to proceed with the purchase of the identified critical spare motors.

A net present value of alternatives from Section 4 was determined not to be applicable and hence not completed. The selection of alternative is based on reliability, specifically, restoring maximum possible generating capacity following an outage, thereby delivering ongoing, reliable service to customers from existing assets.

8.0 CONCLUSION

Experience has shown that key motors at HTGS may experience a failure earlier than anticipated and without warning. Expedited return to service following a motor failure is an expectation of customers. To expedite return to service, critical spare motor availability is vital.

Through a structured critical spares review for generating facilities, Hydro has identified four critical spare motors to procure and be ready for installation at HTGS. Purchasing these spare motors for HTGS will provide for expedited return to service of a generating unit should there be a failure of one of these critical motors. The currently identified critical spare motors at HTGS that require capitalization are included in this application.

Hydro views the purchase of the critical spare motors is required without delay. Hydro submits this supplemental application to the Public Utilities Board for approval of the associated capital expenditures.