newfoundland labrador hydro
a nalcor energy company

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August 14, 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 Replacement of an Air Compressor at 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.

Should you have any questions, please contact the undersigned.

Yours truly,

NEWFOUNDLAND AND LABRADOR HYDRO

Tracey Pennell
Legal Counsel

TLP/cp

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,* R.S.N.L. 1994, Chapter E-5.1 (the *EPCA*) and the *Public Utilities Act*, R.S.N.L. 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 Replacement of an Air Compressor at 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 uses air compressors as an essential auxiliary system for its Holyrood Thermal Generating Station. The air compressor for Unit 1 (Compressor No.1) was installed in 1993.

3. In January 2013 the original equipment manufacturer assessed Compressor No.1 and advised that a failure of the compressor was likely. Hydro therefore rented a spare compressor for Holyrood and had it ready for installation in the event of the failure of

the air compressor. A replacement air compressor was recommended so Hydro planned to include this air compressor replacement project in its 2015 capital budget.

4. Compressor No.1 experienced a major component failure in early 2014 which rendered it inoperable. As a temporary measure, Hydro installed the rented replacement air compressor and investigated and considered whether an overhaul of the failed air compressor was feasible. It was determined that due to the obsolescence of the air compressor and to the failure of its internal components, the overhaul would require the custom manufacture of many of the internal components at high costs and long delivery times, causing an overhaul to be at a much higher cost than a replacement.

5. The estimated cost of this project is $320,600.

6. The Applicant submits that the proposed replacement of the air compressor 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 attached.

7. Hydro therefore makes Application for an Order pursuant to section 41(3) of the Act approving the replacement of the Compressor No.1 at Holyrood at an estimated capital cost of $320,600 as set out in this Application and in the attached project description and justification document.

DATED at St. John's, in the Province of Newfoundland and Labrador, this 14th day of August, 2014.

Tracey L. Pennell
Counsel for the Applicant
Newfoundland and Labrador Hydro
500 Columbus Drive P.O. Box 12400
St. John's,
Newfoundland and Labrador
A1B 4K7
Telephone: (709) 778-6671
Facsimile: (709) 737-1782

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 Replacement of an Air Compressor at the Holyrood Thermal Generating Station

AFFIDAVIT

I, Paul W. Humphries, 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 System Operations and Planning, 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 14 day of August 2014, before me:)

Tracy Pennell
Barrister – Newfoundland and Labrador

Paul W. Humphries

A REPORT TO

THE BOARD OF COMMISSIONERS OF PUBLIC UTILITIES

"THE BOARD"

REGISTERED PROFESSIONAL ENGINEER R.N. SEYMOUR SIGNATURE PROVINCE OF NEWFOUNDLAND	Electrical
	Mechanical
	Civil
	Protection & Control
	Transmission & Distribution
	Telecontrol
	System Planning

Replace Air Compressor – Compressor No. 1

Holyrood Thermal Generating Plant

August 14, 2014

newfoundland labrador hydro
a nalcor energy company

1 SUMMARY

The long term asset plan for the Holyrood Thermal Generating Station (Holyrood) identified the requirement to replace the No. 1 air compressor, one of three in the plant, in 2015. However, a recent failure of the unit, the reliability concerns with it, as well as the temporary compressor rented as a back-up, and an inspection by the OEM have resulted in the requirement to replace the No. 1 air compressor in 2014, prior to the 2014/2015 winter season.

This project will replace compressor No. 1 at Holyrood with a new air compressor. The existing compressor No. 1 was installed in 1993.

The option of overhauling the existing compressor package to extend its life to the end of 2021 is estimated to be greater than this project budget because replacement items would need to be custom manufactured at a high cost with long delivery.

1

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2 PROJECT DESCRIPTION

This project will replace compressor No. 1 at Holyrood Thermal Generating Station (Holyrood) with a new air compressor. The project will be completed using internal labour.

3 JUSTIFICATION

The existing compressor (Atlas Copco Model: ZR3-67) is obsolete as many replacement parts such as the gearbox and gear train are no longer available. The compressor was installed in 1993.

The compressor was planned for replacement in 2015 as part of Hydro's long term asset plan. This was considered appropriate timing, given asset condition and available back-ups. However, On January 21, 2014 the original equipment manufacturer (OEM) carried out an inspection on the air compressor No. 1 (see inspection report in Appendix A) and noted the following:

"Most parts for this machine are not available or obsolete. This machine has passed its useful life and should be replaced. The cost to maintain this machine with custom replacement parts is much more than the cost of buying a new reliable VSD air compressor. Based on the prior reports from other service reps and my opinion, I strongly recommend the replacement of this air compressor as soon as possible to maintain a reliable air system".
The OEM also stated that "*failure of the HP and LP elements will happen very soon."*

A budget estimate to overhaul the existing compressor package to extend its life to the end of 2021 is greater than this project budget because most components of the existing compressor are obsolete and replacement items would need to be custom manufactured at a high cost and long delivery. In addition, some original parts will remain; and therefore, the overall reliability of such an old machine cannot be ensured. Two major components, the

rotor screws, now have interference fits and the need for replacement is imminent.

3.1 Existing System

Presently there are three permanent air compressors installed at Holyrood, including the one proposed to be replaced by this project. They are connected through a common pipe air distribution system and available to supply air for the production of atomizing steam and operation of pneumatic equipment for the three power generating units. If one compressor fails and the demand on the system increases above what only two compressors can supply, there will be a risk of starving the downstream components of the air system without the use of the third compressor. Without sufficient air being supplied, pneumatic equipment cannot function properly and it could disrupt or reduce the production of electricity at Holyrood.

Existing compressor No. 1 is a fixed speed stationary two-stage, water-cooled rotary screw type package (see Figure 1). It produces compressed air at 10.5 bar (152 psi) at a flow rate of 315 liters per second. It is driven by an electric motor and has one low pressure and one high pressure compressor element each individually bolted to the housing of a common step-up gearbox. The compressor/motor unit is mounted on a common base frame. The power is transmitted from the motor through a rubber bolt type coupling and the unit is supported on vibration dampers at three points on the base frame.

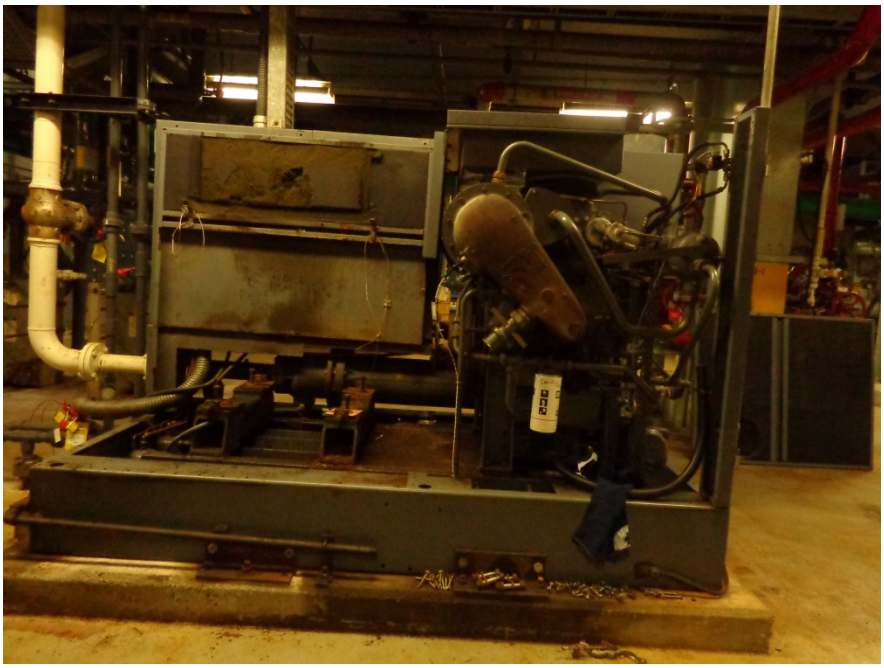

Figure 1: Existing Compressor No. 1

3.2 Operating Experience

During a preventive maintenance service call in January 2013, an OEM (Atlas Copco) technician indicated that the reliable operation of compressor No.1 is at risk (see Appendix B). Problems that the OEM technician identified included; corrosion of the compressor screws and rotor interference, high intercooler pressure of 296 kPa (maximum recommended intercooler pressure is 276 kPa), high temperature of 205^{o}C on low pressure element (close to the shutdown temperature, 220^{o}C) and high temperature outlet water caused by not enough water flow through the compressor due to internal restrictions. These problems increase the potential for unexpected compressor failures.

To reduce the risk of a compressor failure, and the possibility of not being able to provide adequate air supply at Holyrood Thermal Generating Station, Hydro rented a portable compressor in January of 2013 and located it at Holyrood. It would be available for immediate installation if one of the existing compressors failed and Hydro planned to replace compressor No. 1 in 2015 under its planned capital program. In January of 2014 compressor No. 1 failed and it was determined that it would take several months to repair a

component. Another internal inspection of the compressor took place at that time which substantiated the earlier assessment but heightened the urgency. At that time the portable rental unit was installed outside and placed in service however it was exposed to the weather. Temporary mechanical and electrical connections were made and frequent manual refueling was required. Refueling was required every 4-6 hours by truck. Hydro decided it could no longer accept the reliability of compressor No. 1 and the temporary portable installation for the 2014-15 winter peak generation season. For this reason Hydro is submitting this supplemental capital budget proposal to replace compressor No. 1 in 2014.

3.2.1 Environmental Performance

Technology has changed whereby a modern compressor replacement unit is more energy efficient than the older existing ones resulting in less power requirements to produce compressed air. Reduced power requirements translates into reduced fuel consumption to produce that power and fewer emissions of metals, sulphur dioxide, nitric oxides, particulate and greenhouse gases being produced.

3.2.2 Maintenance or Support Arrangements

From April 1, 2000 to March 31, 2010, there was a service agreement with the OEM to perform preventive maintenance. Hydro internal labor has provided maintenance since March 31, 2010 with requests for service calls made to the OEM as required.

3.2.3 Maintenance History

Preventative maintenance was carried out by the manufacturer at time intervals of 4,000, 8,000, and 16,000 hours under the service agreement. The basic cost of the service provided was $24,774 per year.

There have been no major upgrades carried out on the air compressor No. 1. The five-year corrective maintenance history is shown in Table 1:

Table 1: Five-Year Corrective Maintenance History

Year	Corrective Maintenance ($000)
2013	0.0
2012	0.0
2011	0.9
2010	0.0
2009	1.9

3.2.4 Anticipated Useful Life

The anticipated life expectancy of a new compressor is 20 years. The existing air compressor No. 1 has been maintained to reliably meet this expected life. It is now past 20 years of age and at the end of its life expectancy. This has been confirmed by the OEM service call in 2013 and the inspection in January 2014.

4 CONCLUSION

The air compressor system is a critical auxiliary system necessary for power generation at Holyrood Thermal Generating Station. Replacement of the air compressor No.1 at Holyrood is required because it is obsolete and has reached the end of its service life and its reliability cannot be maintained. Certain parts of the compressor including the gearbox and gear train are no longer readily available.

4.1 Budget Estimate

The budget estimate for this project is provided in Table 2.

Table 1: Budget Estimate

Project Cost: *($ x1,000)*	**2014**	**2015**	**Beyond**	**Total**
Material Supply	182.0	0.0	0.0	182.0
Labour	74.5	8.0	0.0	82.5
Consultant	0.0	0.0	0.0	0.0
Contract Work	0.0	0.0	0.0	0.0
Other Direct Costs	1.1	0.0	0.0	1.1
Interest and Escalation	1.9	2.4	0.0	4.3
Contingency	0.0	50.7	0.0	50.7
TOTAL	**259.5**	**61.1**	**0.0**	**320.6**

4.2 Project Schedule

The anticipated project schedule is provided in Table 3.

Table 3: Project Schedule

Activity		Start Date	End Date
Planning	Open the project; and Prepare scope statement	August 2014	August2014
Design	Prepare technical specifications for supply of new compressor	August 2014	August2014
PUB Approval	Supplemental application approval by the Public Utilities Board	August 2014	August 27, 2014
Procurement	Supply of new compressor - Tender package - Award contract - Delivery of the compressor	 August 2014 August 27, 2014 August 2014	 August 2014 August 28, 2014 December 2014
Construction	Replace the compressor	December 2014	December 2014
Commissioning	Start-up and commissioning of the compressor	December 2014	December 2014
Closeout	Closeout package	December 2014	January 2015

APPENDIX A

OEM Service Report on January 22, 2014

Atlas Copco

Visit Report

Customer Details			
NEWFOUNDLAND & LABRADOR HYDRO	*Contact:*	MIKE JONES 709-229-2134	
HOLYROOD GENERATING PLANT			
	Report date:	22/01/2014	
A0A 2R0 CONCEPTION BAY			

Equipment

Equipment:	ZR3A 60			*Running Hours:*	25873	*hours*
Serial Number:	AIF011834			*Load Hours:*	18012	*hours*
Visit date:	22/01/2014	*Order Number:*	156725	*Accumulated Volume:*		*1000 m³*
Contract Number:		*PO number:*	20571-000			

Work Comments

Stephane Leblanc
Jan 21 -2014
No reading machine stop with motor problem
Service 8000 hours on ZR3 #1 AIF 011834
Upon my arrival machine was down due a motor problem.
I do the service as per discussion with customer
Most parts for this machine are not available or obsolete
This machine has past its useful life and should be replaced. the cost to maintain this machine with custom replacement parts is much more than the cost of buying a new reliable VSD air compressor.
Based on the prior reports from other service reps and my opinion, I strongly recommend the replacement of this air compressor as soon as possible to maintain a reliable air system.
Even with the new motor, failure of the HP and LP elements will happen very soon.

Recommended Repair

ZR3 #1 AIF 011834
Need To be replaced or complete overhaul

Estimated work hour:

Time Confirmation

Date	Service Engineer	Activity Type	Hour/mileage
20.01.2014	Stephane Leblanc	OIL-FREE>50 RT	5.00 H
20.01.2014	Stephane Leblanc	TRAVEL TIME RT	1.00 H

Material Confirmation

Part Number	Part Description	Quantity unit
2906011200	ZR3 8000H MAINTENANCE KIT	1

Work Done

Operations

- ☑ Check condition of air intake chamber
- ☑ Check/clean condensate drain(s)
- ☑ Check for presence of water in lube oil
- ☑ Change compressor oil filter
- ☑ Check motor (coupling) alignment arr.1
- ☑ Check safety valve+switches
- ☑ Check sensitive bolt/cpling connections
- ☑ Inspect/change air filter element(s)
- ☑ Replace diaphragm of air throttle valve
- ☑ Check condition:balance piston diaphragm
- ☑ Check functioning of check valve
- ☑ Replace bearing block(air intake valve)

Measurement Points

Counter	Current Value	Unit	Date
Running hours	25873	H	21/01/2014
Loaded hours	18012	H	21/01/2014
Motor start	10036	#	21/01/2014

Atlas Copco Compressor Compressors Canada — A Company Within the Atlas Copco Group
30 Montrose
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Atlas Copco

Visit Report

Customer Details		
NEWFOUNDLAND & LABRADOR HYDRO	*Contact:*	MIKE JONES 709-229-2134
HOLYROOD GENERATING PLANT		
	Report date:	22/01/2014
A0A 2R0 CONCEPTION BAY		

Measurement Points

Counter	Current Value	Unit	Date
Module time	38390	h	21/01/2014
Load relay	109525	#	21/01/2014

Customer Confirmation

Signed by Jamie Curtis 709 229 2191 at 22/01/2014 02:33:29 PM

Atlas Copco Compressor Compressors Canada — A Company Within the Atlas Copco Group
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APPENDIX B

OEM Letter on January 22, 2013

Status of Air Compressor No. 1

Atlas Copco

Newfoundland and Labrador Hydro
Holyrood Thermal Generating Plant
Conception Bay, NF, A0A 2R0

January 22nd 2013

Attention of: Brent Peddle, Mechanical Engineer

Object: Status of Atlas Copco Compressor ZR3-67 (AIF011834) unit#1

Sir,

Equipment:	Atlas Copco Oil Free Compressor ZR
Model:	ZR3-67
Serial #:	AIF011834
Age of unit:	20 years
Operating Hours:	24065
Outcome to utilization:	Your operations are at risks. Unit will fail in the near future. Technicians have been outlining this in reports for 2 years. The compression screws are corroded. • The helicoidally male part will touch the female one • Consequently it will fuse together. Intercooler pressure is over 40 psi, close to its shutdown temperature. Low Pressure Element of 205C is close to the shutdown. All these parameters are a sign of wear to the machine.

As outlined before the unit is 20 years old in a difficult environment where saline water proximity and very extreme temperatures have an impact on components we should not replace in the normal life of a compressor (gears, coolers, and piping) Some of these parts may not be available when you will require them.

All these factors will increase the price to overhaul the unit and increase the potential for unexpected failure.

Atlas Copco Compressors Canada
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Customer service: 1.800.667.9875

♦ Head Office: Montreal ♦ Branches: Toronto ♦ Kitchener ♦ Calgary ♦ Edmonton ♦ Vancouver ♦

(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 Replacement of an Air Compressor at 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:

i) Order No. P.U. 29(2014) in the amount of $7,197,800 in 2014 and $1,266,400 in 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) 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 also 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 on August 14, 2014 Hydro applied to the Board for approval to replace an Air Compressor at the Holyrood Thermal Generating Station (the "Application"); and

WHEREAS the Board is satisfied that the 2014 supplemental capital expenditure for the approval to replace an Air Compressor at 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 $320,600 for the approval to replace an Air Compressor at 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 , .

_____

_____

_____ _____