

November 21, 2014

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

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

Dear Ms. Blundon:

**Re: Newfoundland and Labrador Hydro – The Board's Investigation and Hearing Into Supply Issues and Power Outages on the Island Interconnected System – Sunnyside Equipment Replacement Project and Western Avalon Terminal Station T5 Tap Changer Replacement**

Further to our letter of October 24, 2014 in relation to the above; Hydro, in consultation with Newfoundland Power, has developed the attached Operating Instruction T-095 to provide direction in the operation of the Western Avalon to Holyrood 138 kV loop until Holyrood transformer T8 is reinstated.

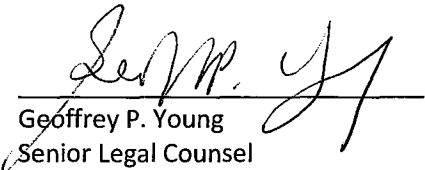
Hydro would also like to inform the Board that the new T1 replacement transformer originally intended for Sunnyside has now successfully passed all factory acceptance testing. This transformer is now being shipped to Holyrood, as a replacement for transformer T8, with arrival expected by the third week of December. Full installation and commissioning is expected to be complete by the end of January.

In the interim, the Operating Instruction T-095 will ensure that the customers served by the Western Avalon to Holyrood loop continue to receive reliable service.

We trust the foregoing is satisfactory. If you have any questions or comments, please contact the undersigned.

Yours truly,

**NEWFOUNDLAND AND LABRADOR HYDRO**

  
\_\_\_\_\_  
Geoffrey P. Young  
Senior Legal Counsel

cc: Gerard Hayes – Newfoundland Power  
Paul Coxworthy – Stewart McKelvey Stirling Scales  
ecc: Roberta Frampton Benefiel – Grand Riverkeeper Labrador

Thomas Johnson – Consumer Advocate  
Danny Dumaresque

## SYSTEM OPERATING INSTRUCTION

<b>STATION:</b> Holyrood, Western Avalon	<b>Inst. No.</b> T-095
<b>TITLE:</b> Holyrood to Western Avalon - 138 kV Loop Plan - Winter of 2014/2015	<b>Page</b> 1 <b>of</b> 5

Since the loss of Sunnyside (SSD) T1 (75/100/125 MVA) transformer in January, the Burin Peninsula has been primarily supplied via SSD T4 (75/100/125 MVA). The intent was to have the SSD T1 replaced before the onset of the winter peak demand period. However, the SSD T1 replacement transformer failed acceptance testing at the manufacturer's facilities on two occasions. This required that Hydro implement the plan of relocating Holyrood (HRD) T8 (230/138 kV, 75/100/125 MVA) to replace SSD T1. Hydro is proceeding with the relocation and re-installation of HRD T8 to SSD with an expected in-service early in December.

The purpose of this document is to outline plans required in the event of the loss of additional transformer capacity or a transmission line<sup>1</sup>, which would impact on the supply capability to Newfoundland Power's customers in the HRD to Western Avalon (WAV) loop while transformer HRD T8 is unavailable. The new transformer, originally targeted for SSD T1, will be installed in the location of HRD T8.

### **Mobile Generation Options**

The following mobile generators may be available to be located in the area supplied by the HRD-WAV loop if necessary for the loss of additional equipment:

- Newfoundland Power's Mobile Gas Turbine (MGT - 6.5 MW)<sup>2</sup>
- Newfoundland Power's Mobile Diesel (MD3 - 2.5 MW)
- Hydro's Holyrood Blackstart Diesel Generation<sup>3</sup> (8 x 2.2 MW units and 8 x 2.5 MVA 600V : 4160V transformers, supplemented with available rental transformers providing the necessary step-up capability)
- Rental Generation Options (0.5, 1, 2 MW diesel units with transformers)

<sup>1</sup> This document is intended to provide guidance for power system 'steady-state' operations. The initial impact and restoration efforts resulting from power system transients (i.e. equipment trips or failures) will be managed by Hydro's Energy Control Centre as part of normal operations and procedures.

<sup>2</sup> Newfoundland Power's Mobile Gas Turbine (MGT - 6.5 MW) will be located in the Holyrood to Western Avalon - 138 kV loop region (Blaketown) as part of this plan.

<sup>3</sup> Holyrood blackstart will be provided by the new 123 MW Combustion Turbine through the Holyrood 230 kV terminal station if these mobiles are removed.

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**Transformation Availability**

The HRD/WAV loop is currently being supplied by five 230/138 kV transformers, with a total capacity of 291.8 MW and a total firm capacity (i.e. assuming the loss of the largest transformer) of 166.8 MVA.

- WAV T3- 41.7 MVA
- WAV T4 - 41.7 MVA
- WAV T5 - 125 MVA
- HRD T6 - 41.7 MVA
- HRD T7 - 41.7 MVA

The 2014/2015 peak load forecast for the HRD/WAV 138 kV loop is 162 MVA (158 MW) with all NP transmission in service.

**PROCEDURE**

Until the replacement transformer is in place for HRD T8, the HRD/WAV 138 kV loop should be operated using the following Transformer and Transmission contingency plans.

**Transformer Contingencies**

**Loss of 125 MVA Transformer at WAV (T5)**

Steady state load flow analysis of this contingency reveals that the WAV and HRD 41.7 MVA transformers would be loaded to 82% and 71% of their nameplate ratings, respectively.

Action Required: None

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### Loss of 41.7 MVA Transformer at HRD (T6 or T7)

The loss of a 41.7 MVA transformer at HRD with HRD T8 relocated would leave a single 41.7 MVA transformer in service at HRD. Analysis of this contingency indicates that, while there would be sufficient transformer capacity within the loop to supply all load, the load distribution along the loop would be expected to result in the single HRD transformer being loaded to 139% of nameplate rating. However, by opening the loop between Springfield and Bay Roberts at peak load, the lone HRD unit would be reduced to 77% of nameplate rating.

Action Required: Open the 39L segment between Springfield and Bay Roberts to limit the load through the remaining transformer at or below its nameplate rating.

### Transmission Line Contingencies

#### Loss of 39L

With an outage to 39L at HRD, all customers can be supplied via WAV during peak load conditions.

Action Required: None

#### Loss of 64L

With an outage to 64L at WAV, HRD T6 and T7 would be loaded beyond their nameplate ratings during peak load conditions. In order to maximize supply to customers under this contingency, HRD T6 and T7 can be loaded to 131% (up to 4 hours, covering the daily peak periods) of their rating as per the *Power Transformer Loading Guidelines – General Emergency Ratings*<sup>4</sup> below. Load flow analysis indicates a maximum loop load of 155.3 MW (HRD T6 and T7 loaded to 131%, WAV T1 and T2 loaded to 100%) can be delivered under this scenario, which is approximately 3 MW less than the winter peak forecast for the loop. Utilizing NP's voltage reduction strategies in this area will allow for all remaining customers to be supplied.

<sup>4</sup> Corresponding to a peak load duration of 4 hours at an ambient temperature of 0°C or less.

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Action Required: Reference Technical Operating Instruction T-082 *Terminal Station Transformer Overloading Guidelines*. It should be noted however that the transformer overload guidelines have been superseded by the table below.

Power Transformer Loading Guidelines

General Emergency Ratings

Allowable loading in p.u. of continuous ampere rating

Peak Load Duration (hrs)	Ambient Temperature			
	<0°C	10°C	20°C	30°C
0.25	1.68	1.63	1.58	1.53
0.5	1.56	1.51	1.46	1.41
1	1.46	1.41	1.36	1.31
2	1.37	1.33	1.28	1.24
4	1.31	1.27	1.22	1.18
8	1.27	1.23	1.19	1.14
24	1.22	1.18	1.14	1.06

When it is expected that a transformer will be loaded beyond its nameplate rating, the Asset Owner<sup>5</sup> shall be notified so that appropriate monitoring of the transformer health is performed.

**Note:** Customer outages will be required if transformer loading exceeds the above guidelines. Close coordination between Hydro and Newfoundland Power will be required. In the event of an outage to 64L, customer outages will be avoided by the use of NP's voltage reduction strategies and/or the operation of NP mobile generation.

<sup>5</sup> Hydro's Manager of Long Term Asset Planning – Generation and Terminals or designate.

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**Other Considerations**

As Newfoundland Power's Mobile Gas Turbine will be installed in the Holyrood to Western Avalon 138 kV loop, it can be operated to reduce the loop load to help further manage the transformer loading and reliable supply of electricity to the region's customers.

**REVISION HISTORY**

<u>Version Number</u>	<u>Date</u>	<u>Description of Change</u>
0	2014-11-14	Original Issue
<b>PREPARED: R. Coish</b>		<b>APPROVED:</b>