

**Undertaking 66**

**Undertake to provide Operating Instruction Re Avalon System**

Please see Undertaking 66, Attachment 1, System Operating Instruction T-096: Avalon System and Reserves

**SYSTEM OPERATING INSTRUCTION**

<b>STATION:</b> GENERAL	<b>Inst. No.</b> T-096
<b>TITLE:</b> AVALON CAPABILITY AND RESERVES *, **	<b>Page 1</b> of 5

**INTRODUCTION**

In order to ensure that customer service is maintained, the Energy Control Centre (ECC) shall exercise its authority to reduce risks to the Avalon capability and maintain sufficient Avalon reserves to meet current and anticipated customer demands. The ECC shall be prepared to deal with reserve deficiencies and take appropriate actions in order to maintain the reliability of the Avalon system.

Avalon reserve is required to replace generation or transmission capacity lost due to equipment forced outage, to cover performance uncertainties in generating units or to cover unanticipated increases in demand. Sufficient reserve is required to meet current and forecasted demands under a worst case contingency.

**PROCEDURE**

**A. Calculation of *Total Avalon Capability and Available Avalon Reserve***

Total Avalon Capability is determined using load flow analysis<sup>1</sup> and is based on the availability of equipment on the Avalon for each day. This would include the following:

1. Generation on the Avalon (Holyrood thermal units, Hardwoods GT, Holyrood CT, Holyrood Diesels, Newfoundland Power hydro, Newfoundland Power standby, Fermeuse Wind<sup>2</sup> and Vale Capacity Assistance<sup>3</sup>)
2. Transmission Availability (230 kV transmission lines on the Avalon, 138 kV transmission lines from Stony Brook – Sunnyside and Western Avalon - Holyrood)
3. Reactive resources (capacitor banks in Oxen Pond, Hardwoods and Come By Chance)

Available Avalon Reserve shall be calculated for the current day and the following six days in the manner as indicated below:

$$\text{Available Avalon Reserve for each day} = \text{Total Avalon Capability} ; \text{less} \text{ Forecasted Avalon Peak Load (adjusted for Voltage Reduction}^4 \text{ when applicable)}$$

<sup>1</sup> Base case load flows will be used to determine the Avalon Capability.

<sup>2</sup> Included for the current day based on actual wind output, but assumes no wind generation for the following six days.

<sup>3</sup> Capacity Assistance (when available) from Vale through operation of standby diesel units with a combined capacity of up to 15.8 MW.

<sup>4</sup> Up to 10 MW of Avalon load reduction (on peak) is expected to be achieved through the Voltage Reduction strategy. This is approximated as one-half the total Island reduction.

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**PROCEDURE (cont'd.)**

**B. Assessment and Notification of Available Avalon Reserve**

The available Avalon reserve will be calculated for the current day and the following six days and an assessment will be made against the criteria in the table below and a notification will be issued to stakeholders when available Avalon reserve is below the stated thresholds.

<u>Available Avalon Reserve</u>	<u>Expected Action</u>	<u>Level</u>
> Impact of largest contingency + min reserve <sup>5</sup>	none	0
< Impact of largest contingency + min reserve	Prepare for potential Load Reduction	1
< Impact of largest contingency	Load Reduction	2
< Impact of ½ largest contingency	Conservation	3
Zero/deficit	Rotating Outages	4

Based on the assessment above, perform the following:

- o Level 0 - If the available Avalon reserve is anticipated to be greater than the impact of the largest contingency plus min reserve, the ECC are not expected to perform any further actions; other than to advise the on-call Executive member (Exec On-call) of NLH's Corporate Emergency Response Plan (CERP), Corporate Relations and Newfoundland Power's Control Centre that the available Avalon reserve has returned to normal following a prior Level 1, 2, 3 or 4 notice.
- o Level 1 - If the available Avalon reserve is anticipated to be less than the impact of the largest contingency plus min reserve, the ECC will notify Newfoundland Power's Control Centre, advising of possible requirements for load reduction to maintain sufficient Avalon reserve, if the available Avalon reserve should decrease.
- o Level 2- If the available Avalon reserve is anticipated to be less than the impact of the largest contingency, the ECC will notify Exec On-call (CERP)<sup>6</sup> Corporate Relations<sup>7</sup> and Newfoundland Power's Control Centre<sup>8</sup>, advising of load reduction strategies to maintain sufficient Avalon reserve, if the capability shortfall is not corrected.

<sup>5</sup> Min reserve is 35 MW.

<sup>6</sup> As part of the CERP, the Exec On-Call makes the decision to activate the Corporate Emergency Operations Centre (CEOC) and issues alert notifications. If activated, a partial mobilization is recommended consisting of Deputy Incident Commander, Operations Liaison and Communications Support.

<sup>7</sup> Corporate Relations is responsible for activating the joint communication plan between NLH and Newfoundland Power.

<sup>8</sup> ECC will advise the NP Control Centre once internal alignment is achieved on the alert level through the CERP process.

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**PROCEDURE (cont'd.)**

- o Level 3- If the available Avalon reserve is anticipated to be less than the impact of half the largest contingency, the ECC will notify Exec On-call (CERP), Corporate Relations and Newfoundland Power's Control Centre, advising of customer conservation strategies to help maintain sufficient Avalon reserve, if the capability shortfall is not corrected.
- o Level 4 - If the available Avalon reserve is anticipated to approach zero or fall into a deficit, the ECC will notify Exec On-call (CERP), Corporate Relations and Newfoundland Power's Control Centre, advising of rotating outages in order to maintain supply point voltages and transmission line loadings within acceptable ranges.

The following is the standard message that will be communicated if it is anticipated that a notification is to be made under Level 1, 2, 3 or 4; or a return to Level 0:

*"System Operations is advising that the available Avalon reserve is at a notification level [0-4] for [insert date here]. The available Avalon reserve is expected to be [insert reserve amount in MW], calculated from the total Avalon capability of [insert available capacity in MW] and a peak Avalon load forecast of [insert peak forecast in MW]."*

**C. Operational requirements to cover largest contingency**

The ECC shall maintain sufficient Avalon reserve to cover performance uncertainties in generating units and transmission equipment and unanticipated increases in demand. Such actions include the following: placing in service all available generating and transmission capacity, cancelling outages to generating units and transmission equipment that have a short recall, deploying all available standby resources, including Vale Capacity Assistance, cancelling Avalon industrial interruptible load and reducing Avalon load, through procedures such as public conservation notices, voltage reductions, curtailing interruptible loads and non-essential firm loads.

The ECC shall use the following guideline in the sequence outlined in order to cover the largest contingency, maintain the reliability of the Avalon and minimize service impacts to customers:

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**PROCEDURE (cont'd.)**

**Normal Sequence**

1. Determine the Avalon capability under worst case contingency and the Avalon load threshold for operating standby units.
2. Based on this threshold and expected loads, determine requirements for staffing and potential operation for standby generation on the Avalon and notify appropriate personnel of standby staffing requirements.

To position the Avalon power system in order to cover off the single largest contingency, perform the following:

3. Ensure all NLH static reactive resources are in service (i.e. capacitor banks).
4. Request Newfoundland Power to maximize Avalon hydro generation.
5. Increase Holyrood real and reactive power up to the maximum Holyrood capability.
6. Start and load (to minimum) standby generators on the Avalon, both Hydro's and Newfoundland Power's, to cover the largest contingency once the Avalon load threshold for operation is exceeded. (At this point in time it is important to notify Avalon customers taking non-firm power and energy that if they continue to take non-firm power, the energy will be charged at higher standby generation rates.)
7. Request Newfoundland Power to curtail its interruptible loads on the Avalon (typically up to 10 MW and can take up to 2 hours to implement).
8. Request Vale for all available Capacity Assistance and to put all its available capacitor banks in service.

**Load Reduction**

9. Cancel all non-firm power delivery to customers and ensure Avalon industrial customers are within contract limits.
10. Inform Newfoundland Power of Hydro's need to reduce supply voltage at Hardwoods and Oxen Pond to minimum levels to facilitate load reduction. Implement voltage reduction (if not already in a reduced voltage condition).
11. Request Avalon Industrial customers to shed non-essential loads, informing them of system conditions.

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**PROCEDURE (cont'd.)**

Rotating Outages

If the Avalon reserve continues to decrease below the minimum level, the Avalon voltages and transmission line loadings should be watched closely. Delivery point voltages at CBC (212 kV) and Hardwoods and Oxen Pond (62.5 kV) need to be maintained. Transmission line loadings need to be kept to within thermal ratings. If voltages or line loadings deviate outside of acceptable operating ranges, perform the following:

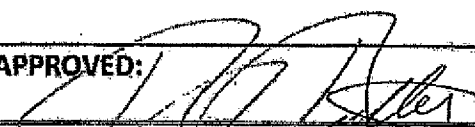
12. Request Newfoundland Power to shed load by rotating feeder interruptions.

\* Part of the Environmental Plan.  
\*\* Part of the Emergency Response Plan

**REVISION HISTORY**

<u>Version Number</u>	<u>Date</u>	<u>Description of Change</u>
0	2015-06-26	Original Issue

**PREPARED:** J. Tobin

**APPROVED:**   
2015-06-26