Q. Please provide a copy of *Operations Standard Instruction BA-P-012 (T-001) Operating Reserves*.

A. Please refer to PUB-NLH-002, Attachment 1 for Newfoundland and Labrador Hydro's "BA-P-012 (T-001) Operating Reserves General."

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BA-P-012 (T-001)

Operating Reserves[1,2]

General

Purpose

This procedure outlines the requirements to assess and maintain sufficient operating reserve[3] to meet current and anticipated customer needs under normal operating conditions and for specific contingency situations that result in reductions to resources. Resources are comprised of contributions provided by supply-side and demand-side facilities and/or actions. Supply-side facilities include utility and non-utility generation and may include reserve assistance or purchases from neighbouring systems. Demand-side facilities include measures for reducing load, such as interruptible load, demand management and conservation.

In order to ensure that customer service is maintained, the Energy Control Centre (ECC) shall exercise its authority to reduce risks to resources and maintain sufficient operating reserve to meet current and anticipated customer demands. The ECC shall be prepared to deal with generation and other resource capacity shortages and take appropriate actions, including stakeholder notification, in order to communicate and maintain the reliability of the Island Interconnected System.

Operating reserve[4,5] is required to replace resource capacity lost as a result of an equipment forced outage as well as to cover performance uncertainties in generating units and tie-line capacity, or to cover unanticipated increases in demand. Sufficient operating reserve is required to meet current and forecasted demands under the largest resource contingency, being the greater of:

- the largest generating unit;
- the largest combination of generating units on a single interface (e.g., generation connected to the transmission system via a single transmission line); or
- the largest import over a single transmission interface.

[1]Part of the Corporation's Environmental Management Plan.

[2]Part of the Emergency Response Plan.

[3]This document relates to the current approach to operating reserves – *Available* and S*pinning*. This may be modified in the future to better align with the NERC 10- and 30- minute reserve criteria.

[4]*Available Reserve*, for the Island Interconnected System, is defined as the sum of generation reserve, recallable interchange transactions (exports) and, in specific circumstances, interruptible loads. Generation reserve is defined as the quantity of available generation supply that is in excess of demand, and includes spinning and non-spinning reserve. Generation reserve is equal to available generation supply less current/forecasted demand.

[5]*Spinning Reserve* is included in Available Reserve and defined as unloaded generation that is synchronized to the power system and interruptible load (up to 40 MW from CBPP during the contractual period of Capacity Assistance) that is ready to serve additional demand.

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1.1 Calculation of Available Reserve

Available Reserve shall be calculated in the manner indicated below:

- Available generation[6] of NLH (Hydro + Thermal + Standby[7] + Purchases[8]); plus
- Scheduled firm Import transactions on the Maritime Link; plus
- Available generation of Newfoundland Power (Hydro + Standby); plus
- Available generation of Deer Lake Power (60 Hz Hydro); plus
- Capacity Assistance[9] of Vale (Standby Diesels); less
- Forecasted Island peak load (adjusted for Corner Brook Pulp and Paper and Vale Capacity Assistance, Newfoundland Power Curtailable and Voltage Reduction)[10]; less
- Scheduled Exports on the Maritime Link with firm transmission service.

1.2 Assessment and Notification of Available Reserve

The Available Reserve will be calculated for the current day and the following six days for the peak demand hour forecast for each day. An assessment will be made against the criteria in the table below with notifications to be issued to stakeholders when Available Reserve is below the stated thresholds for anytime within the next week.

Available Reserve[11]	Expected Action	Level
> [Largest Resource Contingency + 70 MW]	None	0
> [Largest Resource Contingency] and < [Largest Resource Contingency + 70 MW]	Prepare for Potential Load Reduction	1
> [½ Largest Resource Contingency] and < [Largest Resource Contingency]	Load Reduction	2
> [Zero or deficit] and < [½ Largest Generating Unit]	Conservation	3
[Zero or deficit; hold f=59.8 Hz]	Rotating Outages	4

[6] Available generation is generation that is in service or planned to be in service; or generation that can be started within 15 minutes.

[7] Standby generation includes gas turbine/diesel generation.

[8] *NLH* Purchases include wind generation for the current day based on actual wind output, but assumes no wind generation for the following six days.

[9] Refer to Schedule 1 at the end of this procedure for the details of the Capacity Assistance agreements.

[10] Up to 20 MW of load reduction (on peak) is expected to be achieved through the reduction of voltage at the major delivery points on the system as well as on Newfoundland Power's system.

[11] Hydro plans to have Available Reserve to cover its largest resource contingency (e.g., largest generating unit) plus an additional 70 MW. During normal operation this ensures that an amount of Spinning Reserve is available to cover the loss of the largest unit, with an additional 70 MW that can be activated or placed on-line to meet minimum Spinning Reserve requirements for system frequency regulation under the loss of a large generating unit (i.e., on-line regulating reserve to cover performance uncertainties in generating units, especially wind and other variable generation, and unanticipated increases in demand).

Based on the assessment above, perform the following:

- **Level 0**
  - If the Available Reserve is anticipated to be greater than the largest resource contingency plus 70 MW, the ECC is not expected to perform any further actions, other than to communicate to advise the appropriate stakeholders that Available Reserve has returned to normal following a prior Level 1, 2, 3, or 4 notice.
- **Level 1**
  - If the Available Reserve is anticipated to be less than the largest resource contingency plus 70 MW, the ECC will notify Newfoundland Power's Control Centre to advise them of the possible requirement for load reduction strategies should the Available Reserve decrease.
- **Level 2**
  - If the Available Reserve is anticipated to be less than the largest resource contingency, the ECC will notify Hydro's Exec On-Call under the Corporate Emergency Response Plan (CERP),[12] Corporate Communications,[13] and Newfoundland Power to advise them of the requirement for load reduction strategies should the generation shortfall not be corrected. The ECC shall also notify the Nova Scotia System Operator (NSSO) of the potential deficit in Available Reserves.
- **Level 3**
  - If the Available Reserve is anticipated to be less than half of the largest resource contingency, the ECC will notify Hydro's Exec On-call (CERP), Corporate Communications, and Newfoundland Power, to advise them of a requirement for customer conservation strategies should the generation shortfall not be corrected. The ECC shall also notify the NSSO of the potential deficit in Available Reserves.
- **Level 4**
  - If the Available Reserve is anticipated to approach zero or fall into a deficit, the ECC will notify Hydro's Exec On-call (CERP), Corporate Communications, and Newfoundland Power to advise them of a requirement for rotating outages should the generation shortfall not be corrected. The ECC shall also notify the NSSO of the potential deficit in Available Reserves.

The following is the standard message that will be communicated by Corporate Communications and posted on the NLSO OASIS website if it is anticipated that a notification is to be made under Level 2, 3, or 4 or a return to Level 0 (note that a Level 1 notification is only communicated between the two control centres of Newfoundland Power and the NLSO):

> *"The NLSO is advising that the Available Island reserve is at (or has returned to) a notification level [0, or 2–4] for [insert date here]. The Available Reserve is expected to be [insert reserve amount in MW], calculated from an available resource capacity of [insert available capacity in MW] and a peak load forecast of [insert peak forecast in MW]."*

[12] As part of the CERP, the Exec On-Call makes the decision to activate the Corporate Emergency Operations Centre (CEOC) and issues alert notifications.

[13] Corporate Communications is responsible for activating the joint communication plan between NLH and Newfoundland Power.

Refer to CMN-P-008 – NLSO OASIS Communication Protocol for further information on posting messages in OASIS.

1.3 Maintaining Spinning and On-Line Regulating Reserve

Under normal operations the ECC shall take action to meet a targeted Spinning Reserve that is sufficient to cover the loss of the largest resource contingency. Typically this is Holyrood Unit 1 or 2 (170 MW) or Bay d'Espoir Unit 7 (154.4 MW). During contingency operations the ECC shall take steps to maintain a minimum Spinning Reserve of 70 MW for system frequency regulation (on-line regulating reserve). Such actions include the following: placing in service all available generating capacity, cancelling outages to generating units that have a short recall, recalling non-firm exports on the Maritime Link, deploying all available standby and demand side resources, including Corner Brook Pulp and Paper and Vale Capacity Assistance as well as Newfoundland Power curtailable load, cancelling industrial interruptible load, and further reducing system load through procedures such as voltage reductions.

The ECC should request capacity and energy from the market through the Nalcor Energy Marketing group (NEM) when it deems that resources and load reduction strategies are not sufficient to reliably meet current or forecasted demand. Under a contingency event the ECC can request Reserve Assistance from the NSSO which, if available, can be activated within ten minutes and extended for up to 120 minutes. Following the 120 minutes, Emergency Energy may be made available from NSPI under commercial arrangements. **Note that Reserve Assistance and Emergency Energy are not firm products and may not be available or may be recalled by the NSSO at any time following its activation.**

The following guideline shall be followed by the ECC Shift Supervisor – Reliability, and System Operator – Balancing and Interchange in the sequence outlined in order to maintain sufficient on-line regulating and Spinning Reserve in order to maintain the reliability of the Island Interconnected System.

Sequence for Maintaining Spinning and On-Line Regulating Reserve ***

1.3.1 Resource Dispatch

*** Note that under a contingency event (e.g., the sudden loss of a large generating unit) – perform the actions in Section 1.5 – Reserve Assistance and Emergency Energy to provide time to carry out the steps listed below, while market-based real-time energy transactions are being sought and implemented.

1. Place in service all of Hydro's available hydroelectric generation.
2. Request Newfoundland Power to maximize their hydroelectric generation.
3. Make a Capacity Request of Deer Lake Power to maximize their hydroelectric generation.
4. Request Non-Utility Generators to maximize their hydroelectric and wind generation (i.e., start any offline wind turbines if available).
5. Maximize Holyrood thermal generation.
6. Make a request to cancel outage(s) to hydroelectric generating unit(s) that have a short recall.
7. Recall non-firm exports on the Maritime Link.

8. Start and load standby generators, both Hydro and Newfoundland Power units, in order of increasing average energy production cost with due consideration for unit start-up time.[14]
9. Request Corner Brook Pulp and Paper for Capacity Assistance (up to 90 MW of load reduction in block sizes of 20, 40, 60, or 90 MW).
10. Request Vale for Capacity Assistance (7.6 MW – standby diesels).
11. Request Vale for Capacity Assistance (up to 6 MW load reduction).
12. Request Newfoundland Power to interrupt its Curtailable loads (typically up to 10 MW and can take up to two hours to implement).

1.3.2 Load Reduction

1. Cancel all non-firm power delivery to customers and ensure all industrial customers are within contract limits.
2. Inform Newfoundland Power of Hydro's need to reduce supply voltage at the major delivery points to minimum levels to facilitate load reduction. Implement voltage reduction.
3. Request Newfoundland Power to implement voltage reduction on its system.

1.4 Maintaining Frequency near the Standard 60 Hz

If the Spinning Reserve continues to decrease below the minimum level and all resources and load interruption strategies have been deployed, the system frequency should be watched closely. In order to protect the integrity of the system, and to avoid the potential for cascading outages the system frequency shall be maintained above 59.8 Hz. **If not already performed, the ECC should request capacity and energy from the market through the Nalcor Energy Marketing group (NEM) to support the system frequency and minimize any customer impact.**

Sequence for maintaining frequency near the standard 60 Hz ***

1.4.1 Firm Load Interruption

***** Note that under a contingency event (e.g., the sudden loss of a large generating unit) – perform the actions in Section 1.5 – Reserve Assistance and Emergency Energy to provide time to carry out the steps listed below, while market-based real-time energy transactions are being sought and implemented.

1. Request Industrial Customers to shed non-essential loads, informing them of system conditions.
2. Request Newfoundland Power to shed load by rotating feeder interruptions. At the same time, shed load by rotating feeder interruptions in Hydro's rural distribution areas. Follow instruction for rotating outages, CMN-P-020, latest revision.

[14] At this point in time it is important the ECC notify 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.

1.5 Reserve Assistance and Emergency Energy

Note that only under a contingency event can the ECC request Reserve Assistance or Emergency Energy from the Nova Scotia System Operator (NSSO) – per instruction *BA-P-007 - NLSO - NSSO Reserve Assistance Responsibility and Activation* and *BA-P-037 -NLSO - NSSO Emergency and Security Energy Transactions and Activation.* Contingency events include a trip of a unit or sudden deration, a requirement for a sudden offload and shut of a unit, or a failed start.

Reserve Assistance

- Reserve Assistance is available as a short term product (within 10 minutes) following a contingency event. The ECC may request reserve assistance up to 50% of the contingent loss to a maximum of 100 MW. The initial period is up to 30 minutes.
- During the initial 30 minute Reserve Assistance period the ECC should perform the steps as outlined above in Sections 1.3.1 to 1.3.2. If sufficient resources are not available the ECC shall request a market based solution (i.e. contact NLH – Production Planning and/or NEM).
- In the event that on-line regulating and Spinning Reserve requirements are not able to be met by internal resources in 30 minutes, reserve assistance can be extended for an additional 90 minutes (only if available from the NSSO system).
- All energy provided under Reserve Assistance is treated as inadvertent.

Emergency Energy

- Emergency Energy can be sought from NSSO as a last resort, when market-based real-time energy transactions are not available in a timely fashion in order to maintain on-line regulating and Spinning Reserve requirements.
- Emergency Energy is a commercial product with pre-defined energy rates.

Reference Documents

CMN-P-008 *NLSO OASIS Communication Protocol*

CMN-P-020 *Rotating Outages*

BA-P-007 *NLSO - NSSO Reserve Assistance Responsibility and Activation*

BA-P-037 NLSO - *NSSO Emergency and Security Energy Transactions and Activation*

NLH and NSPI Interconnection Operators Agreement, 07/31/2012, Schedules A2, C9 and C10

Schedule 1 – Capacity Assistance Arrangements

Provider	Contracted Capacity	Conditions
Corner Brook Pulp and Paper	Up to 90 MW in the following increments: - 20 MW - 40 MW - 60 MW - 90 MW	• Notification Period – 10 minutes • Period – 4 hours (minimum) to 6 hours (maximum) • Maximum number of curtailments – 2 per day, 30 per winter • Total Assistance Period – 150 hours per winter • Term – November 1 to April 30 (Annually) • Test – Tested annually, 90 MW planned to be available
Vale Generation	7.6 MW	• Notification Period – 20 minutes • Period – Up to 6 hours (maximum) • Maximum number of curtailments – 2 per day, 20 per winter • Total Assistance Period – 100 hours per winter • Term – December 1 to March 31 (Annually) • Test – Tested annually, 7.6 MW planned as available
Vale Load Curtailment	6 MW	• Notification Period – 60 minutes • Period – 3 hours (minimum) to 6 hours (maximum) • Maximum number of curtailments – 2 per day, 10 per winter • Total Assistance Period – 50 hours per winter • Term – December 1 to March 31 (Annually) • Test – Tested annually, 6 MW planned as available

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16	K. Goulding	General revisions	2018/08/28
17	K. Andrews	Added reference to CMN-P-008	2018/11/15
18	J. Tobin	Added CBPP interruptible load to spinning reserves (up to 40 MW)	2019/02/04

Document Reviewers

Position	Signature	Approval Date
Supervisor, Energy Control Centre		2019/02/04

Document Approvers

Position	Signature	Approval Date
Manager, System Operations and Integration Support		2019/02/04

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