

1 Q. **Reference: Reliability and Resource Adequacy Study – 2022 Update, October 3, 2022, page 2,**  
2 **lines 8-10.**

3 The reliability of the LIL is a crucial driver for the reliability of the Island  
4 Interconnected System. Since the 2018 Filing and 2019 Update, the LIL has had  
5 reliability challenges as a result of structural and software issues.

6 Please provide a table summarizing all LIL outages due to software issues since January 1, 2022.

7 In the table, please include:

- 8 i. description of the software issue;
- 9 ii. whether the outage was monopole or bipole;
- 10 iii. length of the outage; and
- 11 iv. actions taken to restore the LIL to service.

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14 A. A forced outage is defined as the state in which equipment is unavailable for normal  
15 operation but is not in the scheduled outage state (i.e., an outage that is not a  
16 scheduled outage). A planned outage, also referred to as scheduled outage, is an outage  
17 that can be scheduled at least one week in advance. This includes planned maintenance,  
18 which is normally conducted on annual basis, and unplanned maintenance or repair,  
19 which can be deferred at least one week subsequent to discovery of the need for  
20 maintenance or repair. If the outage is extended due to additional work, which would  
21 have otherwise caused a forced outage, the excess period is counted as a forced outage.  
22 Per the definition, planned outages in the attachment include maintenance activities  
23 and repairs.

24 Please refer to NP-NLH-066, Attachment 1 for details.

**NP-NLH-066, Attachment 1**  
**Reliability and Resource Adequacy Study Review**

Outage Start	Outage End	Outage Duration (Hours)	Equipment Impacted	Outage Type	Description of Software Issue	Steps Taken to Return the Labrador-Island Link ("LIL") to Service
26-Jan-2022	27-Jan-2022	29.8	Pole 2	Forced	Planned emergency stop of Pole 1 for runback testing caused Neutral Bus Over Voltage and propagated into Pole 2 trip.	Issue was investigated and control sequence of emergency stop was incorrect. Issue was corrected in later version of software and only HMI operated emergency stop was used in the interim.
26-Jan-2022	29-Jan-2022	75	Pole 1	Forced	Planned emergency stop of Pole 1 for runback testing caused Neutral Bus Over Voltage and propagated into Pole 2 trip.	Analysis was completed and determined that electrical equipment was healthy and pole was available for service.
28-Jan-2022	29-Jan-2022	22.5	Pole 2	Forced	Common Neutral Area Protection mis-operated when switching from Metallic Return to Ground Return to allow for Pole 1 to be brought back online.	Issue investigated and temporary settings for protection issued to avoid mis-operation. Correct settings issued in future software release.
26-Feb-2022	24-Mar-2022	635.5	Pole 2	Forced	Pole 1 trip upon deblock caused the loss of its control lanes. As a result, Pole 2 was incorrectly attempting to compensate for the loss of Pole 1. Power was not able to be controlled and emergency stop was used to block Pole 2 at time deemed appropriate by NLSO.	LIL was returned to service once conditions that caused the event were understood. Full reset of Pole 1 and Pole 2 controls were completed to resolve the issue. Issue was corrected in later version of software.
1-Apr-2022	1-Apr-2022	5.7	Pole 2	Planned	Interlocking issue with B43B63 caused loss of configuration and Pole 1 could not be deblocked until both poles were out of service.	Pole 2 removed from service to establish correct bipole configuration and both poles returned to service.
8-Apr-2022	8-Apr-2022	6.1	Bipole	Planned	End to End Runback testing between LIL and Maritime Link.	LIL available for service once testing completed. No additional steps required.
20-May-2022	20-May-2022	3.6	Bipole	Planned	End to End Runback testing between LIL and Maritime Link.	LIL available for service once testing completed. No additional steps required.
21-May-2022	21-May-2022	4	Pole 1	Planned	Replacement of failed Valve Based Electronics card.	Valve Based Electronics card replaced.
2-Jun-2022	2-Jun-2022	3.5	Bipole	Planned	Outage to complete networking configuration changes in GE telecommunication equipment.	LIL available for service once networking configurations completed. No additional steps required.
8-Jun-2022	14-Jun-2022	142.1	Bipole	Planned	Bipole outage to install and complete static checks on new control software.	LIL available for service once installation and static checks completed. No additional steps required.
14-Jun-2022	16-Jun-2022	54	Bipole	Planned	New control software dynamic commissioning. This version of software was required to implement several key functions of the LIL.	
16-Jun-2022	20-Jul-2022	811.7	Pole 1	Forced	During new control software dynamic commissioning tests, the control system incorrectly opened the Neutral Bus Switch without blocking the converter.	Pole 1 unavailable until equipment inspections were completed. Contractor recalled software from site. Reverted to previous software version at site.
16-Jun-2022	24-Jun-2022	192	Pole 2	Forced	Pole 2 tripped Valve Based Electronics protection due to a discrepancy between control and protection subracks.	Investigation revealed an error in programming caused database flooding in the control system. This resulted in delayed updates in blocking status of the converter. When there is a disagreement in the status, the lane is made unavailable. When both lanes are unavailable, the converter is blocked. Interim solution was to operate the LIL with a single Muskrat Falls electrode conductor in service. Programming error was fixed in a later version of software.
16-Aug-2022	22-Aug-2022	149	Bipole	Planned	Outage to install new control software. Software required to address issues identified in previous control software dynamic commissioning.	LIL available for service once software load completed. No additional steps required.
22-Aug-2022	30-Aug-2022	198.5	Bipole	Planned	Dynamic commissioning for new control software. LIL ran at various power levels as per dynamic commissioning schedule.	LIL available for service once dynamic commissioning completed. No additional steps required.
3-Sep-2022	12-Sep-2022	220.1	Bipole	Planned	ECC Points testing. LIL run at various power levels during different stages of testing.	LIL available for service once ECC points testing completed. No additional steps required.
20-Sep-2022	21-Sep-2022	24.1	Bipole	Planned	Outage taken for testing and punch closures.	LIL available for service once testing/punch closure completed. No additional steps required.
12-Nov-2022	14-Nov-2022	63.3	Bipole	Planned	ECC offline points testing prior to 495MW test, gamma calibration tests and heat run.	LIL available for service once ECC points testing completed. No additional steps required.
15-Nov-2022	15-Nov-2022	0.7	Bipole	Planned	ECC offline points tests prior to 495MW tests, gamma calibration tests and heat run.	LIL available for service once ECC points testing completed. No additional steps required.
15-Nov-2022	15-Nov-2022	0.6	Bipole	Planned	90MW limit to perform remaining online ECC points testing prior to 495MW test, gamma calibration tests, and heat run.	LIL available for service once ECC points testing completed. No additional steps required.
24-Nov-2022	1-Dec-2022	174.9	Pole 2	Forced	Pole 2 tripped during 700MW pole compensation test. Gamma measurement error resulted in commutation failures, triggering DC Over Current.	Issue was investigated and gamma measurement above 1 p.u. (450 MW per pole) was incorrect. Issue to be corrected in future release of software and 450 MW bipole limit imposed in the interim.