

Generation

Q. Reference: "2024 Capital Budget Application," Newfoundland Power Inc., June 22, 2023, Supporting Materials, Generation: 4.1, sec. 6.1, p. 15.

A condition assessment and corresponding risk assessment determined that the Lookout Brook Plant contains deteriorated, obsolete and non-standard equipment that needs to be refurbished or upgraded to ensure the continued safe and reliable operation of the Plant. A lifecycle cost analysis confirmed that continued operation of the Plant will provide an economic benefit for Newfoundland Power's customers over the longer term.

- a) Please provide a copy of the condition assessment and corresponding risk assessment.**
- b) Please describe the electrical testing completed during the condition assessment on the generator components that require rewind.**
 - i. How do these test results compare with those received in the past?**
 - ii. Is there a downward trend on the polarization index for the rotor and stator or an upwards trend on power factor tip-up?**
- c) Have visual inspections confirmed critical elements at risk of failure?**

- A.
 - a) The condition and risk assessments have been provided as part of Newfoundland Power's *2024 Capital Budget Application*, report *4.1 Lookout Brook Hydro Plant Refurbishment*. The condition assessment is included as Section 3.0 and the risk assessment is included as Section 4.0.
 - b) Insulation resistance testing was performed on the generator components in December 2022 in advance of the 2023 condition assessment. Newfoundland Power completes insulation resistance testing of all its generators on approximately a two-year cycle as part of its regular maintenance program.

The results of the most recent insulation resistance tests completed on Lookout Brook G3 are provided in Table 1 and Table 2. Table 1 shows the last nine insulation resistance test results. Table 2 shows the last three power factor tests.

| Table 1 Insulation Resistance Test Results Lookout Brook G3 (2007 to 2022) | | | | |
|---|-------------------|---------------------|----------------------|--------------------|
| Date (m/d/y) | Test Voltage (kV) | 1 Minute (gigaohms) | 10 Minute (gigaohms) | Polarization Index |
| 10/12/2007 | 1 | 4.74 | 25.60 | 5.40 |
| 10/23/2008 | 1 | 4.35 | 13.63 | 3.13 |
| 9/27/2011 | 1 | 1.65 | 4.03 | 2.44 |
| 10/7/2013 | 1 | 0.59 | 1.04 | 1.76 |
| 3/24/2015 | 1 | 3.72 | 9.77 | 2.63 |
| 10/24/2017 | 1 | 1.75 | 4.95 | 2.83 |
| 12/13/2019 | 1 | 1.59 | 7.33 | 4.61 |
| 8/17/2021 | 1 | 1.95 | 5.52 | 2.83 |
| 12/7/2022 | 1 | 0.15 | 0.79 | 5.27 |

| Table 2 Power Factor Test Results Lookout Brook G3 (2011 to 2019) | | | | |
|--|--------------|--------------------------|--------------------------|----------|
| Date (m/d/y) | Phase Tested | % Power Factor (0.35 kV) | % Power Factor (1.40 kV) | % Tip Up |
| 09/27/2011 | A - GND | 3.17 | 4.10 | 0.93 |
| 09/27/2011 | B - GND | 2.69 | 3.77 | 1.08 |
| 09/27/2011 | C - GND | 2.68 | 3.93 | 1.25 |
| 09/27/2011 | ABC - GND | 3.12 | 4.37 | 1.25 |
| 10/7/2013 | A - GND | 8.77 | 9.78 | 1.01 |
| 10/7/2013 | B - GND | 8.75 | 9.73 | 0.98 |
| 10/7/2013 | C - GND | 6.32 | 5.85 | (0.47) |
| 10/7/2013 | ABC - GND | 9.04 | 9.87 | 0.83 |
| 12/13/2019 | A - GND | 2.81 | 3.38 | 0.57 |
| 12/13/2019 | B - GND | 2.92 | 3.45 | 0.53 |
| 12/13/2019 | C - GND | 2.97 | 3.58 | 0.61 |
| 12/13/2019 | ABC - GND | 3.01 | 3.54 | 0.53 |

- 1 The Lookout Brook G3 rewind is not proposed as a result of electrical testing results
2 alone. The project is being proposed on the basis of the complete condition
3 assessment. The totality of the assessment, including the age of G3, its criticality,
4 consequence of failure, and the risk of failure associated with continued operation of
5 the generator given its current condition, demonstrates that refurbishment is
6 required to extend the life of the generator.
7
- 8 c) Yes, the visual inspections conducted as part of the condition assessment confirmed
9 that critical elements of the generator are at risk of failure. Newfoundland Power did
10 not complete a full disassembly of the generator during its condition assessment.¹
11 As a result, only areas of the end windings were visible while the condition
12 assessment was being undertaken. Areas of cracking and chipping were noted on
13 the stator end windings, indicating the potential for failure of the insulation system
14 within the generator. The insulation system is considered to be a critical element of
15 a generator.
16
- 17 Other plant systems noted within the report have failed. The powerhouse roof and
18 windows have visible indications of water ingress. The main valve for G3 is visibly
19 and audibly passing water. In addition, the powerhouse crane has failed a third-
20 party inspection and the hoist brake no longer functions.

¹ A full disassembly of the generator would be time consuming, expensive to complete and would require an extended outage. As a result, the generators are not disassembled to complete a condition assessment.