Section 2: Customer Operations/Capital Expenditures

Q. The distribution reliability initiative, the transmission line rebuild and the substation refurbishment and modernization programs have been ongoing for a number of years. The responses to PUB-NP-033 and PUB-NP-038 in the 2024 Capital Budget Application indicate that the strategies for two of these programs were established in 2007 and 2006 respectively. Please explain when the strategies for these programs were last reviewed, if Newfoundland Power plans to review them in the future and how they are consistent with current utility best practices.

A. ***A. Distribution Reliability Initiative***

Newfoundland Power's *Distribution Reliability Initiative* ("DRI") targets the Company's worst performing feeders and sections of feeders for capital upgrades. Customers served by these feeders experience service reliability that is considerably below the Company's corporate average. By targeting the worst performing feeders for capital upgrades, Newfoundland Power aims to maintain an adequate and equitable level of service reliability for customers throughout its service territory at the lowest possible cost.

Newfoundland Power has been implementing its DRI for over two decades. Each year, the DRI involves: (i) calculating reliability performance indices for all feeders; (ii) analyzing the reliability data for the worst performing feeders to identify the cause of the poor reliability performance; and (iii) completing engineering assessments for those feeders where poor reliability performance cannot be directly related to isolated events that have already been addressed.[1] In recent years, the Company has supplemented the DRI process by incorporating more granular reliability data provided by the Responder Outage Management System.

The DRI has been effective. In 2023, the Company analyzed the project's overall effectiveness in improving the service reliability experienced by customers. The analysis shows the project has been effective in addressing the poor performance of specific feeders. On average, the project has improved the reliability performance of Newfoundland Power's worst performing feeders by approximately 69%.[2] The percentage improvement for each individual feeder's System Average Interruption Frequency Index ("SAIFI") value before and after the DRI project was averaged across all projects to determine an average SAIFI improvement of 57%.

The DRI is consistent with good utility practice. In 2012, Electricity Canada (formerly the Canadian Electricity Association) began reporting on two additional indices: Customer Hours of Interruption per Kilometer ("CHIKM") and Customers Interrupted

[1] See Newfoundland Power's *2024 Capital Budget Application,* report *1.1 Distribution Reliability Initiative*.

[2] The analysis compared the reliability performance of distribution feeders refurbished under this project by examining the average duration of outages during the five years prior to capital upgrades and five years following capital upgrades. The average outage duration prior to capital upgrades was 8.34 hours. The average outage duration following capital upgrades was 2.62 hours. While the performance of specific feeders has been improved under the DRI, the project has had a minimal impact on overall electrical system reliability.

per Kilometer ("CIKM").[3] CHIKM and CIKM are used to rank the reliability performance of distribution feeders based on the length of line exposed to outages. These indices tend to be more reflective of infrastructure condition and better identify issues associated with shorter feeders. Similar to System Average Interruption Duration Index ("SAIDI") and SAIFI, CHIKM and CIKM are used to rank worst performing feeders that require further analysis of reliability data and, where appropriate, engineering assessments to determine whether targeted upgrades are warranted to improve service reliability. In 2015, Newfoundland Power started using the CHIKM and CIKM indices in its analysis of worst performing feeders.[4] By using indices that consider customer interruptions and circuit length, the worst performing feeders have generally been found in urban settings where the Company has older poles and associated infrastructure.[5]

In Newfoundland Power's view, the DRI continues to serve as a reasonable approach to ensuring all customers experience an equitable level of service reliability.

B. Transmission Line Rebuild Strategy

Transmission lines are the backbone of the electricity system providing service to customers. The *Transmission Line Rebuild Strategy* (the "Strategy") originally submitted with Newfoundland Power's *2006 Capital Budget Application* outlined a multi-year plan for rebuilding the Company's aging and deteriorated transmission lines. The Strategy was developed in response to the fact that many of the Company's transmission lines were constructed in the 1940s, 50s and 60s, and not designed to any particular standard. These transmission lines were not engineered to withstand local environmental conditions and are therefore susceptible to failure. The Strategy recognized the important role transmission lines play in providing reliable service to a large number of customers. It outlined a structured approach to rebuilding the Company's oldest and most deteriorated transmission lines and established that required rebuild projects would be prioritized based on: (i) the physical condition of lines; (ii) the risk of failures; and (iii) the impact a failure would have on customers.

This Strategy continues to be reviewed as part of the Company's annual capital budget applications to prioritize rebuild projects based on the methodology outlined in the Strategy while incorporating updated inspection data.

---

[3] CHIKM is calculated by dividing the number of customer-outage-hours by the kilometers of line. CIKM is calculated by dividing the number of customers that have experienced an outage by the kilometers of line.

[4] Since 2015, Newfoundland Power has completed DRI projects on eight distribution feeders in St. John's, Mount Pearl, and Grand Falls-Windsor.

[5] Electricity Canada's *Worst Performing Feeders, Service Continuity Committee: A New Measures Working Group Whitepaper* indicates that utilities use different methodologies for calculating worst performing feeders. The use of SAIDI and SAIFI are common. Within Canada, the indices used by each utility differ in methodology and use. In 2023, Newfoundland and Labrador Hydro added the CHIKM and CIKM indices to the analysis completed in their *Upgrade Worst-Performing Distribution Feeders* program. See Hydro's *2024 Capital Budget Application, Program 11, Upgrade Worst-Performing Distribution Feeders (2024-2025)*, page 2, lines 5 to 9.

The Strategy has been effective. Its effectiveness can be demonstrated in the remaining transmission lines in the Strategy which were not designed to any particular standard.[6] The effectiveness of the Strategy can also be demonstrated in the age profile of the Company's transmission assets, particularly wooden support structures.[7] Additionally, the Strategy has ensured the reliable operation of the Company's transmission lines in serving customers.[8]

As described above, good utility practice involves a structured and comprehensive approach to preventative and corrective maintenance for critical transmission assets. Newfoundland Power's transmission lines are inspected annually and follow the Company's *Transmission Line Inspection and Maintenance Practices*. These inspections identify preventative and corrective maintenance necessary to ensure the reliable operation of critical transmission assets.[9]

National construction standards are applied to ensure the Company's electrical system is constructed and maintained to withstand local climatic conditions. Newfoundland Power designs transmission lines to meet Canadian Standards Association ("CSA") standards and guidelines outlined in *CSA standard C22.3 – Overhead Systems*. This standard designates Newfoundland Power's service territory as either severe or heavy weather loading areas.

---

[6] Newfoundland Power owns and operates 111 transmission lines, which span approximately 2,100 kilometers. In 2006, there were 34 transmission lines identified in the Strategy which were constructed in the 1940s, 50s and 60s, and not designed to any particular standard. This equates to approximately 31% of transmission lines not designed to any particular standard. At the end of 2024, approximately 85%, or 29 transmission lines, will have been completed under the Strategy. There are five transmission lines remaining to be addressed under the Strategy, which equates to approximately 5% of transmission lines not designed to any particular standard.

[7] As a result of the Strategy, the age profile of wooden support structures on the transmission system is favourable, with approximately 2% having exceeded the industry expected useful service life of 58 years. The execution of the Strategy has improved the age profile of transmission wooden support structures through a structured approach to addressing the Company's oldest and most deteriorated transmission lines.

[8] As a result of their criticality, transmission lines are maintained to operate to a high standard of reliability. In the five-year period from 2018 to 2022, transmission and substation outages combined have contributed to an annual average of less than 30 outage minutes per customer. This reliability performance is the result of the execution of the Strategy and the annual implementation of the Company's *Transmission Inspection and Maintenance Practices*. Over the five-year period from 2003 to 2007, around the beginning of the implementation of the Strategy, transmission and substation outages combined contributed to an annual average of approximately 1 hour.

[9] The most recent review of Newfoundland Power's asset management strategies was conducted in 2014 by The Liberty Consulting Group ("Liberty"). Liberty concluded, "*Inspectors appropriately prioritize deficiencies, and assign repairs in accordance with them. They verify the condition of wood transmission poles through sound and reasonably complete examination practices*." See Liberty's *Report on Island Interconnected System to Interconnection with Muskrat Falls addressing Newfoundland Power Inc.*, December 17, 2014, page 50. Liberty also concluded, "*Newfoundland Power annually budgets various rebuild and modernization capital projects to address transmission, distribution, and substation reliability issues and to proactively address aged equipment condition and obsolescence issues. Annual capital strategies include measures (Transmission Rebuild Strategy, Rebuild Distribution Lines Projects, DRI, and Substation Refurbishment and Modernization Strategy) well targeted to the needs of its equipment. Asset management strategies have promoted improved system reliability since 1998, while keeping annual capital T&D expenditures under control.*" See Liberty's *Report on Island Interconnected System to Interconnection with Muskrat Falls addressing Newfoundland Power Inc.*, December 17, 2014, page 51.

Newfoundland Power's transmission design criteria ensures its transmission lines are adequately designed and constructed to provide reliable service to its customers, including the consideration of historical major weather events experienced within its service territory.

Newfoundland Power actively participates in several technical interest groups such as the Centre for Energy Advancement through Technological Innovation ("CEATI") to maintain awareness and alignment with industry best practices.

C. Substation Strategic Plan

Substation assets are critical to electricity system reliability experienced by customers. Newfoundland Power's *Substation Refurbishment and Modernization Plan* is an element of the *Substation Strategic Plan* (the "Plan") included in Newfoundland Power's *2007 Capital Budget Application*.[10] The Plan changed the way substation capital projects were planned and executed at Newfoundland Power.[11] Prior to establishing this Plan, the Company executed substation work on a component-by-component basis. For example, in the 1990s the Company had a program to replace all 2-piece insulators in substations. Following an assessment of all substations, the Company shifted its approach in 2007 to focus on the overall condition of individual substations.[12]

The Company reviews the Plan each year as part of the annual capital planning process. The primary purpose of the annual review is to prioritize substation refurbishment and modernization projects based on the methodology outlined in the Plan and to reflect the results of the Company's substation inspections, which occur eight times annually. For example, the Plan was last reviewed in 2023 in preparation for the *2024 Capital Budget Application*, which confirmed that continued implementation of the Plan is appropriate given the age and condition of the Company's substation assets.[13]

The Plan has been effective. Its effectiveness can be demonstrated in the age profile of some of the Company's substation equipment.[14] The Plan has also been effective as it continues to serve its intended purpose of realizing productivity and reliability benefits for customers.[15] Additionally, the Plan has ensured the reliable operation of the

[10] See Newfoundland Power's *2007 Capital Budget Application*, report *2.1 Substation Strategic Plan*, page 6.

[11] The scope of individual *Substation Refurbishment and Modernization* projects have increased since 2007 based on the condition of the Company's substations as determined through annual inspections.

[12] Typically, the requirement to refurbish or replace substation equipment is minimal during the first 40 years in service. During this period, substation equipment is replaced or refurbished if condition warrants. Beyond 40 years of age, the requirement for refurbishment or replacement increases.

[13] For the results of this review, see Newfoundland Power's *2024 Capital Budget Application*, report *2.1 2024 Substation Refurbishment and Modernization*, *Section 2.2 Substation Asset Assessment*.

[14] For example, the age profile of circuit breakers has improved as a result of the Plan, as well as the *PCB Bushing Phase-out* and *Replacements Due to In-Service Failures* projects and programs. Additionally, the age profile of the Company's protection relays has also improved with the modernization of protection devices which began in the early 2000s.

[15] From a cost perspective, execution of the Plan has coordinated substation refurbishment and modernization projects with other major substation projects. Examples include coordination with *Additions Due to Load*

Company's substations in serving customers. Substations are maintained to operate to a high standard of reliability.[16] In the five-year period from 2018 to 2022, transmission and substation outages combined have contributed to an annual average of less than 30 outage minutes per customer.[17] Overall, the continued execution of the Plan has allowed Newfoundland Power to maintain its substations in a manner consistent with the environmentally responsible least-cost delivery of reliable service to customers.

Good utility practice involves a structured and comprehensive approach to preventative and corrective maintenance for critical substation assets. Maintenance programs are intended to keep critical assets in good working order, prolong their life and reduce in-service failures. Newfoundland Power's substations are inspected eight times annually. These inspections identify preventative and corrective maintenance necessary to ensure the reliable operation of critical substation assets.[18] Inspection results are incorporated into the Company's annual update of the Plan. Under this plan, the maintenance cycle for major substation equipment is coordinated with the individual substation refurbishment and modernization projects. This coordination provides productivity and service benefits for customers.

To align with good utility practice, Newfoundland Power incorporates industry guidelines into the Plan which include:

(i) *IEEE C37.91 – IEEE Guide for Protecting Power Transformers;*
(ii) *IEEE 80 – IEEE Guide for Safety in AC Substation Grounding;*
(iii) *IEEE 979 – Guide for Substation Fire Protection;* and
(iv) *IEEE 980 – Guide for Containment and Control of Oil Spills in Substations.*

Decisions on the condition of assets incorporate recommendations made by industry institutions such as the International Council of Large Electric Systems and the Electric Power Research Institute.

Newfoundland Power regularly participates in industry interest groups such as the CEATI's Stations Equipment group. This group is intended to optimize substation plant

Growth projects and *PCB Removal* projects. This coordination achieves efficiencies in project planning and execution. For example, it reduces costs to customers associated with the installation of portable substations.

[16] Individual substations provide service to an average of approximately 2,400 customers, with the largest substation providing service to over 10,000 customers.

[17] Over the five-year period from 2003 to 2007, around the beginning of the implementation of the Plan, transmission and substation outages combined contributed to an annual average of approximately 1 hour.

[18] The most recent review of Newfoundland Power's asset management strategies was conducted in 2014 by The Liberty Consulting Group ("Liberty"). Liberty concluded, "*Newfoundland Power's substation inspection, corrective maintenance, and preventive maintenance practices are consistent with good utility practices*." See Liberty's *Report on Island Interconnected System to Interconnection with Muskrat Falls addressing Newfoundland Power Inc.*, December 17, 2014, page 51. Liberty also concluded, "*Newfoundland Power uses an effective combination of periodic O&M inspection and maintenance programs and capital transmission, distribution, and annual capital substation capital rebuild and modernization projects to address condition, reliability, and operating issues with its transmission, distribution, and substation assets.*" See Liberty's *Report on Island Interconnected System to Interconnection with Muskrat Falls addressing Newfoundland Power Inc.*, December 17, 2014, page 49.

assets and develop new cost-efficient and reliable equipment applications for a changing electricity industry. This group provides webinars, facilitates surveys, and supplies research for ongoing industry challenges.

Newfoundland Power ensures it aligns with good utility practice by regularly referring to current and relevant industry data as well as contributing and participating in industry interest groups.

Overall, Newfoundland Power's DRI, *Transmission Line Rebuild Strategy* and *Substation Refurbishment and Modernization Plan* continue to be appropriate in assessing capital expenditure requirements annually, provide productivity and reliability benefits to customers, and are consistent with good utility practice.