Q. (Reference Application Schedule B, Substation Refurbishment and Modernization, page 12 of 99) It is stated "*This project is justified on the obligation to provide reliable service to customers at least cost and cannot be deferred.*"

a) Please provide evidence based on reliability criteria that Newfoundland Power will be unable to provide reliable service at least cost if it were to delay this project.
b) Please quantify the impact on the following if the project were delayed by two years: 1) reliability, 2) cost, and 3) the risk and consequences of failure.
c) Given that this project has been ongoing since 2007, what efficiency improvements have been made in the administration of the program and how much have these improvements decreased the costs of the program?

A. a) Newfoundland Power manages its capital expenditures in a manner that balances both the cost and reliability of the service provided to its customers.[1] The Company is focused on maintaining current levels of overall service reliability for its customers at the lowest possible cost.[2] The 2022 *Substation Refurbishment and Modernization* project is consistent with this objective.

Newfoundland Power owns and operates 131 substations. Substations are critical to the provision of reliable service to customers. An unplanned substation outage can result in the loss of service to a thousand or more customers. The likelihood of a substation outage is higher for substations with deteriorated and obsolete equipment that lacks the functionality of modern protection and control systems.

The *Substation Strategic Plan* (the "Plan") recognized the aging condition of the Company's substations.[3] It provides a structured approach for refurbishing and modernizing Company substations. The Plan's criteria for substation refurbishment and modernization includes, among others:

(i) Oil sampling and analysis to determine the condition and need to replace transformers;
(ii) The replacement of components that have deteriorated or are prone to failure, such as switches that are over 30 years old;
(iii) The installation of galvanized steel structures and building upgrades to address issues such as corrosion;
(iv) The replacement of electromechanical relays with microprocessor-based relays; and
(v) Varmint proofing to prevent outages by small animals and birds.[4]

[1] See response to Request for Information NLH-NP-042.
[2] See response to Request for Information CA-NP-014.
[3] See the *2007 Capital Budget Application, Report 2.1 Substation Strategic Plan*, page 3.
[4] Ibid, page 6 *et seq.*

The annual *Substation Refurbishment and Modernization* project provides a long-term approach to maintaining approximately 4,000 pieces of critical substation equipment. Addressing deteriorated and substandard equipment reduces in-service failures and ensures compliance with current industry standards.

The 2022 *Substation Refurbishment and Modernization* project includes the refurbishment and modernization of:

(i) Humber Substation, which provides service to approximately 1,000 customers in the downtown core of Corner Brook. The HUM-T2 transformer and related 4.16 kV infrastructure is at end of life and requires replacement.[5]

(ii) Tors Cove Substation, which enables the transmission of low-cost energy produced at the Company's Tors Cove Plant.[6] The TCV-T1 transformer is at end of life and requires replacement.[7]

(iii) Glovertown Substation, which requires transformer spill containment and modernization of transformer protection and controls for GLV-T1. This project is being completed in conjunction with the 2022 rebuild of transmission line 124L. As part of the rebuild, a section of transmission line 124L will be reconfigured to provide looped transmission service to approximately 2,700 customers in the Glovertown area. For information on this project, see response to Request for Information CA-NP-029.

The 2022 *Substation Refurbishment and Modernization* project also includes ground grid and substation monitoring upgrades at various substations to meet current standards.[8]

The planned refurbishment and modernization of Newfoundland Power's substations is consistent with maintaining current levels of service reliability for customers at the lowest possible cost.

b) Delaying the *Substation Refurbishment and Modernization* project by 2 years would increase the risk of component failure at the substations proposed to be addressed in 2022. The primary consequences of component failure are reduced service reliability to a significant number of customers served by those substations and increased costs.[9]

Failure of HUM-T2 or the deteriorated 4.16 kV infrastructure at Humber Substation would result in an extended outage to approximately 1,000 customers until a portable substation can be mobilized.

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5 See the *2022 Capital Budget Application, Report 2.1 2022 Substation Refurbishment and Modernization, Appendix B*.

6 See response to Request for Information NLH-NP-002.

7 Ibid., *Appendix C*.

8 Ibid, page 16 *et seq*.

9 For information on Newfoundland Power's approach to quantifying risks and benefits, see response to Request for Information CA-NP-014.

Failure of TCV-T1 would result in islanding 27.8 GWh produced at Tors Cove Plant. Loss of the transformer would require mobilization of a portable substation, if available. Replacement of the transformer on an emergency basis would require approximately 1 year to procure and install. It would be unlikely that a portable substation would be available for the duration of this period, as their deployment is prioritized to respond to customer outages. Loss of generation from the Tors Cove Plant for up to 1 year would increase the cost of energy from Newfoundland and Labrador Hydro ("Hydro") by up to $1.2 million.[10]

Additionally, unplanned maintenance is generally more costly than planned maintenance. Planned work can be organized such that multiple deficiencies can be addressed in the same site visit, maximizing the efficiency of the work. Unplanned work often occurs after normal work hours, which results in higher costs. This includes higher labour and contractor costs for work completed on an emergency basis, as well as higher materials costs for any materials that are not readily available to undertake the necessary repairs.

Delaying the 2022 *Substation Refurbishment and Modernization* project would therefore be inconsistent with maintaining reliable service for customers at the lowest possible cost.

c) The Plan fundamentally changed Newfoundland Power's approach to executing capital projects for its substations. The Plan organized refurbishment and modernization projects on a substation-by-substation basis. Prior to this Plan, the Company executed substation work on a component-by-component basis.[11]

Administration of the Plan has allowed the Company to realize efficiency benefits for its customers. As examples, Plan administration has:

(i) Coordinated *Substation Refurbishment and Modernization* projects with other major substation projects. Examples include coordination with *Additions Due to Load Growth* projects and PCB removal projects.[12] This coordination achieves efficiencies in project planning and execution. For example, it has reduced costs associated with the installation of portable substations by over

[10] The energy related value of production is estimated using 4.3 ¢/kWh. This is the estimated energy related value of production from the Company's hydro facilities divided by normal annual hydroelectric production. (4.3 ¢/kWh = $18,573,000 / 434.8 GWh). These estimates are calculated to reflect post Muskrat Falls marginal costs using the 2022 marginal cost values for energy. See the *2022 Capital Budget Application, Report 1.1 Facility Rehabilitation,* footnote 2.

[11] 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] For example, there have been 7 *Additions Due to Load Growth* capital projects that have been combined with *Substation Refurbishment and Modernization* projects since 2007. As well, coordinating *PCB Bushing Phase-out* projects with *Substation Refurbishment and Modernization* projects has occurred 10 times.

$1 million.[13] This coordination achieves efficiencies while also reducing the requirement for customer outages.

(ii) Increased the level of remote control and monitoring in Newfoundland Power's substations.[14] Since 2014, the Company has completed the remote control and monitoring of all distribution feeders through the *Substation Refurbishment and Modernization* project. This allows Power System Operators to prevent or respond to certain customer outages without the assistance of field crews.[15]

(iii) Included detailed assessments of alternatives to ensure the least-cost alternative is selected for customers. For example, a net present value analysis determined that upgrading the existing 4.16 kV infrastructure to 12.5 kV will reduce costs to customers by approximately $1.6 million over 20 years in comparison to a like-for-like replacement.[16]

(iv) Resulted in fewer individual relay protection system components to deliver the same functionally.[17] This results in less equipment to maintain and less equipment that may fail in service. This too provides an efficiency benefit for customers.

[13] There have been 27 instances where the capital project was aligned with power transformer maintenance, which required the installation of a portable substation. The typical cost to install a portable substation is approximately $50,000. Avoiding the installation of portable substations in 27 instances reduces costs to customers by approximately $1.4 million (27 x $50,000 = $1.4 million).

[14] This includes the installation of monitoring equipment on substation power transformers and circuit breakers. It also includes under-frequency control of substation breakers and reclosers.

[15] This includes the ability to remotely access relay settings and fault event data from relay protection devices.

[16] See the *2022 Capital Budget Application, Report 2.1 Substation Refurbishment and Modernization, Appendix B,* page B-11.

[17] The replacement of electromechanical relay schemes with microprocessor-based protective relays has reduced the number of components required to provide protection of electrical equipment in substations.