Q. Please explain in detail any additional risks and costs that will arise should the Customer Service System replacement Project by delayed by 2, 3 and 5 years. Both quantitative and qualitative information to describe the risks and costs should be provided where available.

A. A. Introduction

Newfoundland Power's Customer Service System ("CSS") is critical to the provision of service to customers. CSS supports all essential customer service functions, including: (i) program and service delivery; (ii) account management and billing; and (iii) customer communications and contact management.[1]

Critical failure of CSS would result in significant manual effort to maintain minimum service levels. It would practically result in delayed customer bills, substantially longer wait times for customer enquiries, and an inability to resolve certain customer requests, including enrollment in programs and services. The criticality of CSS requires Newfoundland Power to diligently monitor and manage any technical and functional risks facing the system's continued operation.

CSS was implemented in 1993 with an expected service life of 20 years. The Company is proposing to replace the system by 2023 following 30 years of operation.

Replacement of the system is necessary to mitigate risks facing the provision of service to customers. These risks are increasing. Newfoundland Power's proposed *CSS Replacement Project* for 2021-2023 mitigates these risks in a manner that provides continuity in customer service delivery at least cost.

Any deferral of system replacement would result in operating CSS during a period of "high" risk. In Newfoundland Power's assessment, based on the criticality of CSS, deferring this project would be inconsistent with prudent risk management and the least-cost delivery of reliable service to customers.

Section B of this response provides an overview of Newfoundland Power's approach to managing the risks facing CSS, including a detailed discussion of the risks facing CSS in 2018 and how those risks have since increased.

Section C of this response describes how deferral of the *CSS Replacement Project* by 2, 3 or 5 years would increase risks and costs to Newfoundland Power's customers.

[1] For an overview of customer service delivery at Newfoundland Power, see the *2021 Capital Budget Application, Volume 1, Customer Service Continuity Plan,* page 2.

B. Risk Management

B.i General

Extending the useful service life of CSS has required diligently managing both the probability and consequence of system failure.

Newfoundland Power maintains contingency plans for all of its critical business applications, including CSS. Contingency plans are designed to minimize the impact of short-term system failures on customers and Company operations. With respect to CSS, contingency plans ensure Newfoundland Power can continue to resolve basic customer enquiries while system failures are being addressed.[2] These contingency plans would not, however, be sufficient to provide customers with acceptable service levels in the event of a prolonged CSS failure.[3]

Newfoundland Power has monitored and managed the risks facing CSS over its service life. Risks are monitored annually. Risk assessments were completed in 1996, 2003, 2013 and 2018.

The 2018 risk assessment was completed by Ernst and Young LLP ("EY").[4] The assessment examined the risks facing CSS in 2018 and how those risks were expected to change over the next 5 to 10 years. Risks were measured across various dimensions and assigned a rating from "low" to "high" based on the probability of occurrence and the impact on Newfoundland Power's operations.[5]

Overall, the assessment showed that the vendor, support and business enabling risks facing CSS were unacceptable in 2018 and were expected to increase within 5 to 10 years.[6] Newfoundland Power therefore developed a plan to ensure continuity in its customer service delivery by replacing CSS over the 2021-2023 timeframe. Recent increases in risks confirm the need to proceed with this project in 2021.

B.ii Vendor Risks

Vendor risks consider the probability and consequences of vendors no longer manufacturing, upgrading or supporting their products.

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2 A detailed overview of Newfoundland Power's contingency plan for CSS is provided in response to Request for Information PUB-NP-017.

3 As described in response to Request for Information PUB-NP-017, Newfoundland Power's contingency plan is designed to return CSS to operation within 4 to 24 hours. A prolonged failure would be outside the scope of the Company's contingency plan and require longer than 24 hours to return the system to operation.

4 A copy of this report was originally filed with the Board in response to Request for Information PUB-NP-008 as part of Newfoundland Power's *2019/2020 General Rate Application.*

5 See EY, *CSS Technical Risk Assessment*, June 2018, page 7.

6 See EY, *CSS Technical Risk Assessment*, June 2018, page 21, Figure 4.6.

Vendor risks may result in 3 principal challenges:

(i) When products are no longer manufactured and sold, it becomes virtually impossible to obtain reliable replacement parts in response to equipment failures;
(ii) When vendors no longer invest in upgrading their products, the products become outdated, functionally limited and more vulnerable to risks (e.g. cybersecurity threats); and
(iii) When vendors no longer support their products, the specialized skills necessary to respond to failures are no longer available.

EY assessed that the vendor risks for core CSS technologies were "moderate-high" in 2018. Vendor risks were forecast to increase to "high" within 5 to 10 years.

The 2018 assessment of vendor risks reflected the forecast obsolescence of key CSS hardware and software components.[7] This obsolescence has since materialized.

From a hardware perspective, CSS runs on Integrity servers provided by Hewlett Packard Enterprises ("HPE"). HPE provided notice in June 2020 that these servers are no longer being manufactured and the existing supply is not expected to last beyond this year. This obsolescence materialized faster than market guidance had previously suggested.[8]

Server obsolescence is a critical issue for CSS. Server hardware is foundational. Failure of server hardware can lead to overall system failure. Additionally, all critical CSS software components must be compatible with the server hardware. Server obsolescence therefore forces obsolescence upon other software components.

From a software perspective, CSS runs on an OpenVMS operating system with a user interface developed using the PowerHouse and Axiant programming languages.

The OpenVMS operating system was once provided by HPE.[9] HPE moved away from providing or supporting this software. The operating system is now provided by a comparatively smaller vendor, VMS Software. Guidance from industry-leading

[7] Vendor risks were measured through 2 risk dimensions: (i) vendor market share, which considers the penetration of vendors' products in the market; and (ii) vendor health, which considers the financial health of vendors and their commitment to continued investment in their products. Vendor risks were examined through publicly available data and information, including vendors' product roadmaps, as well as industry guidance. For EY's assessment of vendor risks, see *CSS Technical Risk Assessment*, June 2018, pages 7 to 14.

[8] Previously published information indicated Integrity servers would be available until at least December 2021. Impacting HPE's plan was an announcement from Microsoft that they were discontinuing the Itanium microprocessor, a core component of the Integrity servers.

[9] The OpenVMS operating system provides the environment in which CSS operates. OpenVMS is the successor to the VMS Operating System that was produced by Digital Equipment Corporation, which was first released in 1977. The OpenVMS server operating system and Integrity server hardware are highly integrated.

experts, including Gartner Inc., has described the future of this operating system as "precarious" and have cautioned corporations continuing to use this software.[10]

The PowerHouse and Axiant programming languages are no longer commonplace in the industry.[11] These programming languages no longer register on popularity indices that track the use and relevancy of this type of software. Training in the use of these programming languages is no longer available through postsecondary institutions or through the vendor itself.[12] Additionally, third-party costs for these programming languages have increased by approximately 10% annually.[13] This increase in costs is indicative of software with a declining customer base which, in turn, is an indicator of obsolescence. Obsolescence of the programming languages effectively means that, if CSS fails, options to address the failure are limited.[14]

Overall, these vendor risks place CSS in a position where the equipment and expertise necessary to maintain system availability and performance is deteriorating.

B.iii Support Risks

Support risks consider the probability and consequences of CSS no longer having the necessary capacity and expertise to ensure system availability and performance.

CSS has been supported and maintained using internal expertise since 1998. Transitioning to an internal support model was necessary to extend the system's service life.[15]

Since 1998, a small team with highly specialized skills has been responsible for: (i) troubleshooting issues that arise during day-to-day operations (e.g. batch billing failures); (ii) implementing system enhancements necessary to continue providing responsive and efficient customer service; and (iii) overseeing periodic system upgrades. Providing this support requires resources with in-depth knowledge of CSS functionality

[10] See Gartner Inc., *IT Market Clock for Bimodal Compute Infrastructure*, 2017. Additionally, as of the 2018 assessment, the market share for the OpenVMS operating system had declined to 0.3%, compared to 12.8% to 23.1% for competing systems. See the EY, *CSS Technical Risk Assessment*, June 2018, page 8.

[11] Programming languages are the software tools used to create and enhance the modules that enable system functionality. For example, when a customer calls Newfoundland Power, a Customer Service Representative uses a CSS screen created with a programming language (Axiant) that displays information on that customer. The programing language ensures the correct information is retrieved from the CSS Oracle database and displayed in a legible manner.

[12] In the past, Newfoundland Power's employees have availed of training programs provided by the vendor of its programming languages. The current vendor of the PowerHouse and Axiant programming languages, Unicom Global, confirmed in 2020 that they do not currently employ training personnel to deliver such training.

[13] For information on support costs for programming languages, see response to Request for Information CA-NP-075, page 2, footnote 9.

[14] Programming language obsolescence would practically result in either: (i) a non-critical failure or deficiency being unresolved; or (ii) a critical failure or deficiency being resolved by way of manual processes or the implementation of separate software to provide equivalent functionality.

[15] Newfoundland Power was notified that vendor support of CSS was ending in 1997. The Company completed a technical migration project in 1998 to move the system to a platform that could be supported internally.

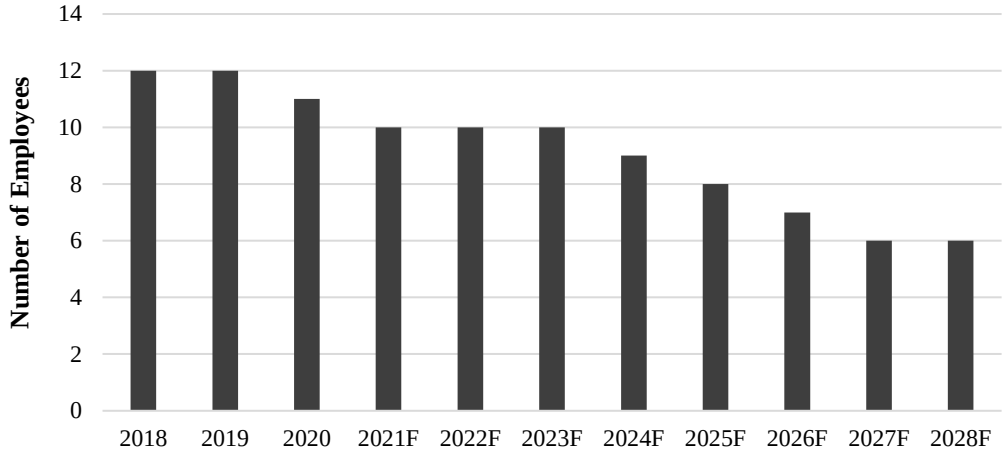
and customer service business processes, as well as technical skills in application design and computer programming.

EY assessed that the support risk for CSS was "moderate" in 2018. The support risk was forecast to increase to "high" within 5 to 10 years.

The 2018 assessment of support risks reflected the reasonably small size of the CSS support team, the forecast number of retirements among this team, and the barriers that exist to replacing those resources.[16]

Figure 1 provides the CSS support capacity at the time of the 2018 assessment and a forecast of support capacity to 2028 assuming employees retire as eligible.

Figure 1:
CSS Support Capacity
(2018 to 2028F)



Assuming employees retire as they become eligible, the support capacity for CSS is forecast to decrease by 25% from 2018 levels by 2024 and by 50% by 2027. This forecast does not account for any unexpected losses of capacity over this period.

Substantial barriers exist to replacing lost capacity. CSS is a highly customized system that is unique to Newfoundland Power. Employees becoming eligible for retirement have a high degree of expertise in CSS functionality and customer service business processes. These employees have, in effect, worked to design and deliver the technologies and processes used to serve customers over recent decades.

Additionally, as described previously, the computer programming and application design skills necessary to support and enhance CSS are no longer commonplace in the labour market. The ability to recruit and retain employees to work on obsolete technologies is therefore practically constrained.

[16] For EY's assessment of support risks, see the *CSS Technical Risk Assessment*, June 2018, pages 14 to 16.

Overall, these support risks place CSS in a position where the expertise necessary to maintain system availability and performance is forecast to deteriorate considerably.

B.iv Business Enabling Risks

Customers' service expectations and business requirements change over time.[17] Business enabling risks consider the probability that CSS will no longer deliver the functionality necessary to continue meeting customers' service expectations and other regulatory or business requirements.

EY assessed that the business enabling risk for CSS was "moderate-high" in 2018. The business enabling risk was forecast to increase to "high" within 5 to 10 years.

The 2018 assessment of business enabling risk reflected the cost and complexity of delivering new functionality in CSS.[18]

CSS has been routinely enhanced over its service life. These enhancements have been necessary to meet customers' service expectations and other requirements. On average, a significant enhancement to CSS has been required to deliver new functionality every 2 ½ years.[19] Examples of significant enhancements include the delivery of the Automated Payment Plan in 1996, the Equal Payment Plan in 1997, the Provincial Government Energy Rebate in 2011 and the RSP Surplus Refund in 2016.

The functionality of CSS has now been fully extended. Enhancing the system has generally become too costly and complex to implement. For example, CSS could not be enhanced to deliver the One-Time Customer Bill Credit in July 2020. The Provincial Government directed this credit be provided to customers as early as practicable.[20] Due to limitations with CSS, delivering this credit quickly required the use of a fixed service date to determine customer eligibility and the manual assessment of over 1,000 customers to confirm their eligibility.[21]

Additional examples of the functional limitations of CSS include the billing of Net Metering Customers and certain General Service customers, which are currently completed via manual processes, and the inability to deliver any new rate designs.

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[17] For example, the customer website provides self-service options for customers and the ability to check the status of ongoing outages. The website is now the most frequently used communication channel among customers. This service option was not available to customers 20 years ago. See the *2021 Capital Budget Application, Volume 1, Customer Service Continuity Plan*, page 3.

[18] For EY's assessment of business enabling risks, see the *CSS Technical Risk Assessment*, June 2018, pages 17 to 19.

[19] To date, there have been 11 significant enhancements to the functionality of CSS over its 27-year service life (27 years / 11 enhancements = enhancement every 2.5 years).

[20] See Order in Council OC2020-081, paragraph 3.

[21] See response to Request for Information PUB-NP-002 filed in relation to Newfoundland Power's *Application for Approval to Issue a One-Time Bill Credit to Newfoundland Power Customers in accordance with Order in Council OC2020-081*, filed June 1, 2020.

These types of functional limitations are common with legacy systems, such as CSS.[22] By comparison, each of these functions, including bill credits, various billing options and complex rate designs, is standard within a modern solution.

C. Impact of Deferral on Risks and Costs

C.i General

Replacement of CSS is a 3-year effort. Deferring the *CSS Replacement Project* by 2, 3 or 5 years would require the existing system to continue in operation for an additional 5 to 8 years, or until 2025 to 2028. Each of these years is within a timeframe where the risks facing CSS are forecast to be "high."[23] A "high" level of operational risk is unacceptable for a critical business application such as CSS.

While the risks facing CSS are "high" throughout the 2025 to 2028 timeframe, these risks generally increase in severity the longer CSS is in operation.

This section provides both qualitative and quantitative information describing how deferral of the *CSS Replacement Project* by 2, 3 or 5 years would increase both risks and costs to customers.

C.ii Impact on Risks

Deferring the *CSS Replacement Project* by 2, 3 or 5 years increases risks across all 3 dimensions described above.

First, deferring the *CSS Replacement Project* would increase vendor risks.

The risk of continuing to operate Integrity servers will increase annually. Integrity servers are no longer being manufactured. The supply of spare parts to respond to equipment failures, such as memory modules, is expected to diminish annually. This increases the risk of a prolonged system failure.[24]

The timing of when vendor risks materialize is not always predictable. This was observed in 2020, when the Integrity servers became obsolete earlier than anticipated.

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[22] Newfoundland Power's CSS belongs to the family of Customer/1 billing systems implemented in the 1980s and 1990s. Cognizant, a multinational information technology services company, indicates: *"CIS transformations carried out in the 1990s are quickly proving inadequate for handling the influx of changes brought about by regulation and innovations such as the smart grid, electric vehicles, mobile technologies and self-service portals"* (see Cognizant, *CIS Transformation: Unlocking the value of Utilities' Customer Information Systems*, December 2013). This is consistent with industry experience. For example, these types of functional limitations were key drivers of Hydro One's replacement of its Customer/1 system in 2012. For more information, see response to Request for Information PUB-NP-018.

[23] The 2018 risk assessment of EY indicated the risks facing CSS are forecast to increase to "high" over the 2023 to 2028 timeframe.

[24] For example, the CSS disaster recovery server experienced the failure of 2 memory modules in 2020. These modules were replaced by HPE under an existing support contract. However, support for these types of failures in the future will be contingent upon the availability of spare parts.

While it is unclear when the supply of spare parts of Integrity servers will be exhausted, it is reasonable to expect this risk to increase annually as the existing supply diminishes.

Additionally, given that the hardware and software components of CSS must be compatible, this hardware obsolescence also poses risks to the software underpinning CSS, including the server operating system and programming languages.

Second, deferring the *CSS Replacement Project* would increase support risks.

The Company's support capacity for CSS is forecast to decline annually over the period 2023 to 2027. Assuming employees retire as they become eligible, the support capacity for CSS is forecast to decrease from normal 2018 levels by 33% if replacement is deferred by 2 years, 42% if replacement is deferred by 3 years, and 50% if replacement is deferred by 5 years. This forecast does not account for any unexpected losses of capacity over this period.

This decrease in capacity increases risks from both day-to-day support and project execution perspectives.

From a day-to-day support perspective, a decrease in capacity increases the risk of insufficient resources to prevent and respond to system failures. CSS cannot be adequately supported and maintained with a decline in support capacity of 33% or more. Barriers to recruiting and retaining employees to work with obsolete technology increases the severity of this risk.

From a project execution perspective, employees eligible to retire by 2028 are among the foremost experts in CSS and Newfoundland Power's customer service business processes. Industry research indicates that inadequate staffing is the top issue experienced by utilities implementing replacement projects of this nature.[25] The retirement of these employees prior to system replacement would therefore increase risks to the project being executed according to plan.

Third, deferring the *CSS Replacement Project* would increase business enabling risks.

To date, the functional limitations of CSS have been managed in a manner that has largely avoided a degradation of service to customers. Historically, this has been achieved through implementing manual business processes and designing custom-built applications to provide missing functionality.

On average, Newfoundland Power has been required to implement a significant enhancement to CSS every 2 ½ years. The probability that Newfoundland Power would be required to implement new functionality to meet new requirements within the next 5 to 8 years is therefore reasonably high, and increases with each year the project is deferred.

[25] TMG Consulting notes that "general inadequate staffing" was the top challenge cited by utilities who have recently replaced their Customer Information System. See TMG Consulting, *CIS Replacement Risk Mitigation*, April 2016, page 7.

As with the One-Time Customer Bill Credit in 2020, the timing and scope of these new requirements is not always predictable.

C.iii Impact on Costs

Deferring the *CSS Replacement Project* would increase overall costs to customers.

Newfoundland Power upgrades its server infrastructure every 7 years. This exceeds the industry average of 5 years for server upgrades.[26]

These periodic upgrades ensure the Company's IT environment operates reliably and securely. The servers underpinning CSS were last upgraded in 2015. Consistent with past practice, a capital project would be required in 2021 to upgrade CSS to the last line of Integrity servers. The total cost of this upgrade is estimated at approximately $1.6 million.

This upgrade would be necessary to manage short-term reliability and security risks. However, this upgrade does not mitigate any risks that drive the need for system replacement. Spare parts for equipment failure would continue to be in short supply, support capacity would continue to diminish, and functional limitations would remain. System replacement would still be required. As a result, this investment in obsolete technology would serve to increase overall costs to customers.

Additionally, Newfoundland Power's *Customer Service Continuity Plan* is the result of a multi-year assessment and planning effort at an actual cost of approximately $1.2 million.[27] Deferring the *CSS Replacement Project* by 2, 3 or 5 years would require updating the costs and information contained in Newfoundland Power's plan. This update would be required to ensure an accurate project cost estimate and continued adherence to industry best practices. The cost of updating this information is contingent upon the degree of change in the market in the coming years.

While the information above outlines 2 known costs should the *CSS Replacement Project* be deferred, it cannot reasonably account for any unpredictable costs that may arise. For example, it cannot account for any costs necessary to maintain minimum service levels for customers should CSS experience a prolonged failure.[28] To date, Newfoundland

[26] Research from Gartner Inc. indicates that servers have a useful service life of approximately 5 years.

[27] The budget for this assessment and planning effort was approximately $1.3 million. For additional information on these costs, see response to Request for Information PUB-NP-008 filed as part of Newfoundland Power's *2019/2020 General Rate Application.*

[28] For example, Newfoundland Power bills an average of approximately 14,000 customers daily. If CSS were to experience a prolonged failure, customer billing would require manually: (i) recording each customer's meter reading; (ii) comparing the reading to the previous month to calculate the customer's energy usage and charges; and (iii) creating and issuing individual customer invoices. The Company also manages over 1,200 customer calls daily. If CSS were to experience a prolonged failure, each customer call would be addressed through manual processes using paper forms. These manual requirements would be well beyond the day-to-day capabilities of Newfoundland Power.

Power has managed the risks facing CSS such that a prolonged failure has not occurred. As a result, there is no reasonable benchmark for these costs.

D. Conclusion

Newfoundland Power's CSS has been extended to its maximum service life.

Deferring system replacement beyond the proposed 2021-2023 timeframe would result in operating a critical business application with a "high" risk of failure. This would represent an unacceptable level of risk to the provision of service to customers.

This heightened level of risk is the practical result of operating obsolete technology with diminished support capacity, as well as a general inability to adapt legacy technology to meet future requirements. The timing of these risks is not always predictable and is largely beyond the operational control of Newfoundland Power.

Replacing CSS over the 2021-2023 timeframe effectively mitigates these risks. Short-term measures are in place to manage the recent obsolescence of the CSS servers.[29] Replacement by 2023 will also enable senior resources with in-depth expertise in CSS technology, functionality and customer service delivery to be available for the duration of the replacement project.

Replacing CSS over the 2021-2023 timeframe also avoids an additional $1.6 million investment in obsolete technology, as well as additional assessment and planning costs that would be required should the project be deferred by 2, 3 or 5 years.

The 2021-2023 replacement timeframe for CSS is therefore consistent with the continued provision of reliable service to customers at least cost.

[29] In response to the recent obsolescence of the Integrity servers, Newfoundland Power removed an existing server from its CSS development environment to act as an additional spare.