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July 4, 2024

Patrick Wruck
Commission Secretary and Manager
Regulatory Services
British Columbia Utilities Commission
Suite 410, 900 Howe Street
Vancouver, BC V6Z 2N3

Dear Patrick Wruck:

**RE: Project No. 1599385
British Columbia Utilities Commission (BCUC)
British Columbia Hydro and Power Authority (BC Hydro)
Lower Mainland Reactive Power Reinforcement Project Contingency Plan
Response to BCUC Staff Questions No. 1**

BC Hydro writes to provide its responses to BCUC Staff Information Request No. 1.

The Contingency Plan sets out BC Hydro's interim approach to meet reactive power needs on the Metro Vancouver Regional Transmission System and the Interior to Lower Mainland Transmission System until 2028. BC Hydro's response to BCUC Staff Information Request 1.3.2 provides a summary of the work expected to be completed by the end of 2028 (i.e., the end of the Contingency Period) and explains why BC Hydro expects that the period from now until 2028 is a reasonable period of time for the Contingency Plan.

As discussed in section 4 of the Contingency Plan, BC Hydro requires additional reactive power resources to supply the necessary reactive power to relieve voltage constraints to support load growth in the Central Fraser Valley Transmission System. Under the Reference load scenario, new resources are required to supply additional reactive power to the Central Fraser Valley Transmission System by 2026 and additional resources will be needed to supply reactive power to the Central Fraser Valley by 2033. Under other load scenarios for High Winter and High Summer load conditions this latter date is advanced to 2027. To meet this need by 2026, BC Hydro is planning to install one +125 MVAR shunt capacitor bank at the Clayburn Substation with a targeted in-service date of March 2026 and one +125 MVAR shunt capacitor bank at the McLellan Substation with a target in-service date of October 2026 (**Substation Upgrades**).

To meet these target in-service dates and to secure contract price certainty, BC Hydro intends to award the contract for the Substation Upgrades by July 17, 2024, and to begin construction by mid-August 2024.

As discussed in BC Hydro's response to BCUC Staff Information Request 1.2.1, BC Hydro acknowledges that the BCUC may require a CPCN application for the Substation Upgrades

under section 45 of the *Utilities Commission Act*; however, BC Hydro does not believe that a CPCN application is necessary in this case. In our April 23, 2024, submission, we suggested that, for certainty, the BCUC could confirm acceptance of BC Hydro's Contingency Plan, if it is satisfied that BC Hydro has met the requirements of the directive.

In its Reasons for Decision to Order No. G-20-24, the BCUC encouraged BC Hydro to continue its efforts to develop, and, in due course, reapply as required for approval of one or more projects that address the need to manage reactive power on the BC Hydro transmission system. The Panel also determined that the Lower Mainland Reactive Power Reinforcement Project is directly tied to the Dismantling Project and to the Control Building Project, and that the three projects should be filed as one.

As discussed in BC Hydro's response to BCUC Staff Information Request 1.1.2, BC Hydro currently intends to file a joint Major Project application in 2026 that includes (the **Amended Lower Mainland Scope**):

- Scope of work to meet the reactive power needs of the Metro Vancouver Regional Transmission System and the Interior to Lower Mainland Transmission System (i.e., the remaining scope from the Lower Mainland Reactive Power Project);
- Burrard Facility Dismantling Project; and
- Burrard Control Building Relocation Project, as applicable.

As discussed in BC Hydro's response to BCUC Staff Information Request 1.1.1, prior to filing the Major Project application, BC Hydro intends to evaluate the feasible alternatives to confirm the Preferred Alternative for the Amended Lower Mainland Scope. This evaluation will consider the BCUC's findings and guidance set out in its Reasons for Decision to Order No. G-20-24.¹

For further information, please contact Joe Maloney at bchydroregulatorygroup@bchydro.com.

Yours sincerely,



Chris Sandve
Chief Regulatory Officer

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Enclosure

¹ Specifically: "The Panel finds that for the Substation Alternative, and the Hybrid Alternative, the scope of work associated with demolition and remediation of the entire BSY site should have been included in the Project scope. Similarly, for the Burrard and Hybrid Alternatives, the Panel finds that the scope of work associated with demolition and remediation of the non-operating areas at BSY should have been included in the immediate scope of those alternatives, and demolition and remediation of the operating areas should have been included in the scope of work upon stopping operations at the BSY plant. In short, the Panel considers that, for the effective review of the merits of the Project, BC Hydro must submit the full scope of work for the Preferred Alternative including the full scope of decommissioning and remediation of BSY, the associated Project costs at a Class 3 estimate, and the resulting rate impact."

British Columbia Utilities Commission Information Request No. 1.1.1 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 1 of 3
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

**1.0 Reference: CONTINGENCY PLAN
Decision and Order G-20-24, p. 40; BC Hydro Lower Mainland Reactive Power Reinforcement Project Contingency Plan (Contingency Plan), pp. 2, 6 Contingency Plan**

By Order G-20-24 and Decision, dated January 24, 2024, the BCUC denied a Certificate of Public Convenience and Necessity (CPCN) to BC Hydro for the Lower Mainland Reactive Power Reinforcement Project (Project). However, on page 40 of the Decision, the BCUC found that BC Hydro had established the need to manage reactive power on its transmission system.

On page 40 of Decision and Order G-20-24, the BCUC stated:

In the meantime, the Panel encourages BC Hydro to continue its efforts to develop, and, in due course, reapply as required for approval of one or more projects that would address the need to manage reactive power on the BC Hydro transmission system to maintain the transfer capability of the Interior to Lower Mainland Transmission System, to maintain voltage control for the Metro Vancouver Regional Transmission System, and to relieve voltage constraints to support load growth in the Central Fraser Valley Regional Transmission System. Alternatively, BC Hydro is at liberty to file another CPCN application for the Project which addresses the deficiencies identified in this decision for BCUC review and approval.

The Panel also directs BC Hydro to file, within 90 days of the date of this decision, its contingency plan to manage the need for reactive power on its transmission system in the interim.

In footnote 5, on page 2 of the Contingency Plan, BC Hydro states:

BC Hydro may adjust the anticipated length and actions under the Contingency Period if it appears necessary to do so in the future. BC Hydro is still considering what long-term solutions are necessary to address the Metro Vancouver and Interior to Lower Mainland needs in consideration of the Commission’s Decision. BC Hydro will provide an update in a subsequent filing or as part of a Revenue Requirements application, likely in 2027.

On page 6 of the Contingency Plan, BC Hydro provides a breakdown of the anticipated capital and operating costs over the duration of the Contingency Plan in Table 1.

In footnote 16 on page 6 of the Contingency Plan, BC Hydro states:

The capital costs shown in Table 1 are planning allowances produced for future projects for capital planning purposes. There is a high degree of uncertainty associated with planning allowances. The costs shown in Table 1 assume that Unit 3 is found to be in critical condition and that BC Hydro proceeds with the refurbishment of Unit 2.

British Columbia Utilities Commission Information Request No. 1.1.1 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 2 of 3
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

1.1.1 Please further discuss BC Hydro’s long-term plans to address its reactive power needs for the Interior to Lower Mainland and Metro Vancouver transmission systems, including any future BCUC approvals that may be sought (i.e. CPCN, section 44.2 capital expenditure schedule, other) including any alternatives under consideration.

RESPONSE:

In the short-term, BC Hydro plans to address its reactive power needs for the Interior to Lower Mainland and Metro Vancouver transmission systems, by utilizing the Burrard Synchronous Condenser Station (BSY) as outlined in the Contingency Plan, until a longer-term solution can be put into service.

BC Hydro’s longer-term solution¹ to address its reactive power needs for the Interior to Lower Mainland and Metro Vancouver transmission systems is outlined in the table below. The table summarizes the alternatives that BC Hydro is currently anticipating it will consider, prior to filing a Major Project application for this work, expected in 2026.

¹ BC Hydro would like to clarify what was meant by the term “long-term solutions” in footnote 5, on page 2 of the Contingency Plan (as stated in the pre-amble). BC Hydro was referring to our plans to address the reactive power needs for the Interior to Lower Mainland and Metro Vancouver Regional transmission systems until ~2034 when Step 1 of the South Coast Upgrades are put into service, which is known and identified in the 2021 Updated Integrated Resource Plan Near-Term Actions (refer to page 61 of the Updated 2021 IRP): <https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/integrated-resource-plans/current-plan/integrated-resource-plan-2021.pdf>.

	Substation Alternative		Burrard Alternative	Hybrid Alternative
	Meridian Option	Ingledow Option	Refurbish Option	
Lower Mainland Reactive Power Project - Remaining Scope ²	Ingledow: Install 2 × +125 MVar shunt capacitor banks.	Ingledow: Install 1 × +250 MVar shunt capacitor bank.	BSY: Refurbish existing hydrogen-cooled synchronous condensers.	BSY: Make investments to sustain operation until 2035. Implement Substation Alternative Meridian Option ahead of 2035 BSY stop of operations.
	Meridian: Install 2 × 132 MVar shunt reactors.	Ingledow: Install 2 × 132 MVar shunt reactors.		
	BSY: Stop operation.	BSY: Stop operation.		BSY: Stop operation in 2035.
Burrard Facility Dismantling Scope	BSY: Remove unused assets and complete remediation of the entire BSY site (both operating and non-operating).	BSY: Remove unused assets and complete remediation of the entire BSY site (both operating and non-operating).	BSY: Remove unused assets and complete remediation (for non-operating area only).	BSY: Remove unused assets and complete remediation of the entire BSY site (both operating and non-operating).
Burrard Control Building Relocation Scope	Design and construct new switchyard control building. ³	Design and construct new switchyard control building.		Design and construct new switchyard control building.

² This is the scope of work to meet the reactive power needs of the Metro Vancouver Regional Transmission System and the Interior to Lower Mainland Transmission System.

³ There is an existing transmission switchyard at the Burrard site. The Burrard Switchyard is a switching station on the major power transfer path in the Metro Vancouver area. It connects the Meridian 500 kV Substation on the source side to major substations on the load side, such as Walters Substation in North Vancouver, Murrin Substation in Vancouver, and Newell Substation in Burnaby. Therefore, the Burrard Switchyard is planned to remain in service after BSY stops operating. The controls for the existing switchyard are currently located inside the BSY building. As a result, if BSY is to stop operating and the assets are removed, a new control building will need to be designed and constructed in the existing switchyard.

British Columbia Utilities Commission Information Request No. 1.1.2 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 1 of 2
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

1.0 Reference: CONTINGENCY PLAN
Decision and Order G-20-24, p. 40; BC Hydro Lower Mainland Reactive Power Reinforcement Project Contingency Plan (Contingency Plan), pp. 2, 6 Contingency Plan

By Order G-20-24 and Decision, dated January 24, 2024, the BCUC denied a Certificate of Public Convenience and Necessity (CPCN) to BC Hydro for the Lower Mainland Reactive Power Reinforcement Project (Project). However, on page 40 of the Decision, the BCUC found that BC Hydro had established the need to manage reactive power on its transmission system.

On page 40 of Decision and Order G-20-24, the BCUC stated:

In the meantime, the Panel encourages BC Hydro to continue its efforts to develop, and, in due course, reapply as required for approval of one or more projects that would address the need to manage reactive power on the BC Hydro transmission system to maintain the transfer capability of the Interior to Lower Mainland Transmission System, to maintain voltage control for the Metro Vancouver Regional Transmission System, and to relieve voltage constraints to support load growth in the Central Fraser Valley Regional Transmission System. Alternatively, BC Hydro is at liberty to file another CPCN application for the Project which addresses the deficiencies identified in this decision for BCUC review and approval.

The Panel also directs BC Hydro to file, within 90 days of the date of this decision, its contingency plan to manage the need for reactive power on its transmission system in the interim.

In footnote 5, on page 2 of the Contingency Plan, BC Hydro states:

BC Hydro may adjust the anticipated length and actions under the Contingency Period if it appears necessary to do so in the future. BC Hydro is still considering what long-term solutions are necessary to address the Metro Vancouver and Interior to Lower Mainland needs in consideration of the Commission's Decision. BC Hydro will provide an update in a subsequent filing or as part of a Revenue Requirements application, likely in 2027.

On page 6 of the Contingency Plan, BC Hydro provides a breakdown of the anticipated capital and operating costs over the duration of the Contingency Plan in Table 1.

In footnote 16 on page 6 of the Contingency Plan, BC Hydro states:

British Columbia Utilities Commission Information Request No. 1.1.2 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 2 of 2
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

The capital costs shown in Table 1 are planning allowances produced for future projects for capital planning purposes. There is a high degree of uncertainty associated with planning allowances. The costs shown in Table 1 assume that Unit 3 is found to be in critical condition and that BC Hydro proceeds with the refurbishment of Unit 2.

- 1.1.2 Please discuss any future projects that may be undertaken by BC Hydro on the Burrard Synchronous Condenser Station (BSY), related to decommissioning and remediation, and any BCUC approvals that may be sought. In the response, please include any future uses for the BSY site, if known.

RESPONSE:

BC Hydro initiated the Burrard Facility Dismantling project in April 2024 to determine the appropriate decommissioning scope and remediation efforts to be undertaken to enable a future industrial use. Future potential industrial uses for the BSY site are still in development at this time. The Dismantling project will identify the specific dismantling scope and site remediation efforts needed to support a variety of potential future industrial uses. This scope will be informed by the applicable regulatory and environmental requirements, and will allow BC Hydro to produce a more accurate economic model for our alternatives analysis.

BC Hydro intends to seek approval for this work, by filing a Major Project application in 2026 for the following projects (the Amended Lower Mainland Scope):

- **Scope of work to meet the reactive power needs of the Metro Vancouver Regional Transmission System and the Interior to Lower Mainland Transmission System (i.e., the remaining scope from the Lower Mainland Reactive Power Project);**
- **Burrard Facility Dismantling Project; and**
- **Burrard Control Building Relocation Project, as applicable.**

Additionally, BC Hydro is planning on initiating a separate project to plug the saltwater cooling water ducts at BSY as an early decommissioning activity to reduce worker safety risk during the Contingency Period. Given the cost of the project is expected to be below \$5 million, BC Hydro is not expecting to pursue any approvals from the BCUC prior to project start.

British Columbia Utilities Commission Information Request No. 1.1.3 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 1 of 3
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

1.0 Reference: CONTINGENCY PLAN
Decision and Order G-20-24, p. 40; BC Hydro Lower Mainland Reactive Power Reinforcement Project Contingency Plan (Contingency Plan), pp. 2, 6 Contingency Plan

By Order G-20-24 and Decision, dated January 24, 2024, the BCUC denied a Certificate of Public Convenience and Necessity (CPCN) to BC Hydro for the Lower Mainland Reactive Power Reinforcement Project (Project). However, on page 40 of the Decision, the BCUC found that BC Hydro had established the need to manage reactive power on its transmission system.

On page 40 of Decision and Order G-20-24, the BCUC stated:

In the meantime, the Panel encourages BC Hydro to continue its efforts to develop, and, in due course, reapply as required for approval of one or more projects that would address the need to manage reactive power on the BC Hydro transmission system to maintain the transfer capability of the Interior to Lower Mainland Transmission System, to maintain voltage control for the Metro Vancouver Regional Transmission System, and to relieve voltage constraints to support load growth in the Central Fraser Valley Regional Transmission System. Alternatively, BC Hydro is at liberty to file another CPCN application for the Project which addresses the deficiencies identified in this decision for BCUC review and approval.

The Panel also directs BC Hydro to file, within 90 days of the date of this decision, its contingency plan to manage the need for reactive power on its transmission system in the interim.

In footnote 5, on page 2 of the Contingency Plan, BC Hydro states:

BC Hydro may adjust the anticipated length and actions under the Contingency Period if it appears necessary to do so in the future. BC Hydro is still considering what long-term solutions are necessary to address the Metro Vancouver and Interior to Lower Mainland needs in consideration of the Commission's Decision. BC Hydro will provide an update in a subsequent filing or as part of a Revenue Requirements application, likely in 2027.

On page 6 of the Contingency Plan, BC Hydro provides a breakdown of the anticipated capital and operating costs over the duration of the Contingency Plan in Table 1.

In footnote 16 on page 6 of the Contingency Plan, BC Hydro states:

British Columbia Utilities Commission Information Request No. 1.1.3 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 2 of 3
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

The capital costs shown in Table 1 are planning allowances produced for future projects for capital planning purposes. There is a high degree of uncertainty associated with planning allowances. The costs shown in Table 1 assume that Unit 3 is found to be in critical condition and that BC Hydro proceeds with the refurbishment of Unit 2.

- 1.1.3 Please clarify what updates will be provided for the Contingency Plan and for the Project in a subsequent filing or a revenue requirements application in 2027. In the response, please discuss whether the next filing will include an update to Table 1.

RESPONSE:

BC Hydro does not plan on filing a Contingency Plan update, but will include certain updates in its next revenue requirements application (RRA) as discussed below.

In response to the Contingency Plan, BC Hydro initiated the Fraser Valley CBN / MLN Capacitive Reinforcement project in March 2024. This project comprises of installing a +125 MVar shunt capacitor bank at the Clayburn Substation and a +125 MVar shunt capacitor bank at the McLellan Substation, along with related ancillary equipment (Substation Upgrades).

BC Hydro expects to file its next RRA in February 2025 and will include information on the Fraser Valley CBN / MLN Capacitive Reinforcement project consistent with the reporting requirements of the 2018 Capital Filing Guidelines.

With regards to the work required to maintain the necessary synchronous condenser units available at BSY that is also part of the Contingency Plan, the Operating costs within Table 1 will form part of the operating costs included within BC Hydro’s next RRA but the costs will not be discussed or presented at the same level of detail as the Contingency Plan.

BC Hydro interprets the meaning of “the Project” in the IR question, to be referring to the Lower Mainland Reactive Power Project. For the portions of the Project not included in the Contingency Plan, BC Hydro intends to seek approval by filing a Major Project application in 2026 for the following projects (the Amended Lower Mainland Scope):

- **Scope of work to meet the reactive power needs of the Metro Vancouver Regional Transmission System and the Interior to Lower Mainland Transmission System (i.e., the remaining scope from the Lower Mainland Reactive Power Project);**

British Columbia Utilities Commission Information Request No. 1.1.3 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 3 of 3
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

- **Burrard Facility Dismantling Project; and**
- **Burrard Control Building Relocation Project, as applicable.**

Information on this work will also be included in a future revenue requirements application consistent with the reporting requirements of the Capital Filing Guidelines.

British Columbia Utilities Commission Information Request No. 1.2.1 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 1 of 3
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

2.0 Reference: CONTINGENCY PLAN
BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN Proceeding, Exhibit B-1, pp. 3-10, 3-11; Contingency Plan, pp. 2, 5, 10-11
Scope of Work

On page 2 of the Contingency Plan, BC Hydro explains that its proposal is similar to the Hybrid Alternative but adjusted to the work required until the end of 2028.

On pages 5, 6, and 10 of the Contingency Plan, BC Hydro describes the scope of work as follows:

- Major maintenance of BSY Unit 3 in Spring 2025
- Refurbish Unit 3 or Unit 2, depending on results of the condition assessment of Unit 3
- Install a +125 MVAR shunt capacitor bank at Clayburn and a +125 MVAR shunt capacitor bank at McLellan.

On page 6 of the Contingency Plan, BC Hydro states the capital costs for BSY are estimated to be \$8.1 million and the operating and maintenance costs are estimated to be \$26.1 million during the contingency period. On page 11, BC Hydro states the Authorized Cost of the Substation Upgrades is \$48.9 million.

On pages 3-10 – 3-11 of the Application, BC Hydro describes the scope of the Hybrid Alternative, including:

- Keep BSY operational until 2035 by:
 - Replacing windings on 2 BSY synchronous condensers;
 - Returning BSY Unit 2 to service;
 - Refurbish and replace BSY ancillary services components as necessary;
- By 2035, install shunt capacitors and reactors at Clayburn, Ingledow, Meridian and McLellan substations;
- Install a +125 MVAR shunt capacitor bank at Clayburn and a +125 MVAR shunt capacitor bank at McLellan;
- Install a new control building for the BSY switchyard;
- Remove unused BSY assets and remediate the BSY site in 2036.

1.2.1 Please explain whether the Contingency Plan project meets the definition of an extension under the 2018 Capital Filing Guidelines.

British Columbia Utilities Commission Information Request No. 1.2.1 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 2 of 3
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

RESPONSE:

Yes, the Substation Upgrades component of the Contingency Plan meets the definition of an extension under the 2018 Capital Filing Guidelines, as further explained below.

The Contingency Plan filed on April 23, 2024 (Plan) is BC Hydro’s plan to address three specific needs identified in the Application for a Certificate of Public Convenience and Necessity (CPCN) for the Lower Mainland Reactive Power Reinforcement Project (Project) during the Contingency Period (as defined in the Plan).

Under the Plan, BC Hydro will:

- 1. Maintain the necessary synchronous condenser units available at BSY in order to maintain voltage control for the Metro Vancouver Regional Transmission System;**
- 2. Maintain the necessary synchronous condenser units available at BSY in order to manage reactive power on BC Hydro’s transmission system to maintain the transfer capability of the Interior to Lower Mainland Transmission System; and**
- 3. Install a +125 MVAR shunt capacitor bank at the Clayburn Substation and a +125 MVAR shunt capacitor bank at the McLellan Substation, along with related ancillary equipment (Substation Upgrades) to relieve voltage constraints on the Central Fraser Valley Transmission System to meet load growth.**

As identified in the Contingency Plan, the actions required under points 1 and 2 above are the same (i.e., to maintain the necessary synchronous condenser units available at BSY). Under the definition of “extension” of the 2018 Capital Filing Guidelines, maintaining the necessary synchronous condenser units available at BSY would not be considered an “extension”.

The Substation Upgrades to support the Central Fraser Valley would be considered an “extension”. As stated in the Plan, the Authorized Cost for Substation Upgrades is \$48.9 million. On their own, the cost for the Substation Upgrades is below the Expenditure Threshold for Power System projects that triggers a CPCN application.

BC Hydro acknowledges that the BCUC has denied the CPCN for the Project that includes the Substation Upgrades as part of the Project and can require a CPCN for the Substation Upgrades; however, BC Hydro does not believe that a CPCN application is necessary in this case because:

British Columbia Utilities Commission Information Request No. 1.2.1 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 3 of 3
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

1. **The need for the Substation Upgrades was extensively examined by the BCUC and Interveners during the review of the CPCN application for the Project, and was accepted by the BCUC in its Decision and Order G-20-24;¹**
2. **There are no other means for BC Hydro to meet the need during the Contingency Period; and**
3. **The BCUC will continue to have oversight of the expenditures of the Contingency Plan through revenue requirements applications, as outlined in BC Hydro's response to BCUC Staff IR 1.1.3.**

¹ Refer to page 9 of BCUC Order G-20-24.

British Columbia Utilities Commission Information Request No. 1.2.2 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 1 of 3
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

**2.0 Reference: CONTINGENCY PLAN
BC Hydro Lower Mainland Reactive Power Reinforcement
Project CPCN Proceeding, Exhibit B-1, pp. 3-10, 3-11;
Contingency Plan, pp. 2, 5, 10-11
Scope of Work**

On page 2 of the Contingency Plan, BC Hydro explains that its proposal is similar to the Hybrid Alternative but adjusted to the work required until the end of 2028.

On pages 5, 6, and 10 of the Contingency Plan, BC Hydro describes the scope of work as follows:

- Major maintenance of BSY Unit 3 in Spring 2025
- Refurbish Unit 3 or Unit 2, depending on results of the condition assessment of Unit 3
- Install a +125 MVAR shunt capacitor bank at Clayburn and a +125 MVAR shunt capacitor bank at McLellan.

On page 6 of the Contingency Plan, BC Hydro states the capital costs for BSY are estimated to be \$8.1 million and the operating and maintenance costs are estimated to be \$26.1 million during the contingency period. On page 11, BC Hydro states the Authorized Cost of the Substation Upgrades is \$48.9 million.

On pages 3-10 – 3-11 of the Application, BC Hydro describes the scope of the Hybrid Alternative, including:

- Keep BSY operational until 2035 by:
 - Replacing windings on 2 BSY synchronous condensers;
 - Returning BSY Unit 2 to service;
 - Refurbish and replace BSY ancillary services components as necessary;
- By 2035, install shunt capacitors and reactors at Clayburn, Ingledow, Meridian and McLellan substations;
- Install a +125 MVAR shunt capacitor bank at Clayburn and a +125 MVAR shunt capacitor bank at McLellan;
- Install a new control building for the BSY switchyard;
- Remove unused BSY assets and remediate the BSY site in 2036.

1.2.2 Please compare the scope of work in the Contingency Plan with the scope of work in the Hybrid Alternative in the period through the end of 2028.

RESPONSE:

Please refer to the table below, which compares the scope of work in the Contingency Plan with the scope of work in the Hybrid Alternative outlined in the original Application in the period through the end of 2028.

The main reason for the difference in the scope of work is the underlying assumptions on the number of synchronous condenser units that are required.

The Hybrid Alternative assumes that under a Base Case scenario, BC Hydro would need to have the equivalent of four BSY synchronous condensers available to absorb reactive power on the Metro Vancouver System during low load conditions (i.e., four units at -50 MVAR for a total of -200 MVAR) and to maintain voltage control for the Metro Vancouver Regional Transmission System.

Due to the incremental costs of having four BSY synchronous condenser units available, BC Hydro's Contingency Plan assumes that the reactive power needs of the Metro Vancouver Transmission System require three reliable synchronous condenser units available at BSY throughout the Contingency Period and to continue to rely on emergency operating procedures (i.e., including taking transmission lines out of service if necessary) to control voltages on the Metro Vancouver System.

Scope	Hybrid Alternative (Scope up to 2028)	Contingency Plan
Major Maintenance of Unit 3	Included	Included
Major Maintenance of Unit 4	Included	Included
Buntzen Pumphouse Backup Power Supply Installation	Included	Included
Unit 2 Refurbishment	Included	Included
Unit 3 Refurbishment	Included	Not Included
Cooling Systems Replacement	Included	Not Included
Protection and Control System Replacement	Included	Not Included
Electrical Components Replacement	Included	Not Included

British Columbia Utilities Commission Information Request No. 1.2.2 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 3 of 3
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

Scope	Hybrid Alternative (Scope up to 2028)	Contingency Plan
Structural/Architectural Replacement	Included	Not Included
Install Shunt Capacitors and Reactors at Ingledow and Meridian Substations	Not Included	Not Included
Install A +125 MVar Shunt Capacitor Bank at Clayburn	Included	Included
Install A +125 MVar Shunt Capacitor Bank at McLellan;	Included	Included

British Columbia Utilities Commission Information Request No. 1.3.1 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 1 of 2
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

**3.0 Reference: CONTINGENCY PLAN
BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN Proceeding, Exhibit B-1, Appendix E-1, E-2; Contingency Plan, pp. 2, 5, 10, 11 Substation Upgrades**

BC Hydro filed its CPCN application for the Project (Application), which included transmission assessment studies for the Interior to Lower Mainland 500 kV Transmission System and the Central Fraser Valley Regional Transmission System in Appendices E-1 and E-2, respectively.

On page 10 of the Contingency Plan, BC Hydro states it will install one +125 MVAR shunt capacitor bank at the Clayburn Substation and one +125 MVAR shunt capacitor bank at the McLellan Substation, along with the necessary related ancillary equipment (**Substation Upgrades**).

In footnote 11 of page 5 of the Contingency Plan, BC Hydro states:

Please note, the Commission’s recent decision on BC Hydro Updated 2021 Integrated Resource Plan [2021 IRP] has triggered the need for a new transmission study. This study could impact the dates in the Application. However, the new transmission study cannot begin until after a Western Electricity Coordinating Council audit is completed which is scheduled to take place in September and October of 2024. Notwithstanding that a new transmission study will not be complete until sometime in 2025 and BC Hydro believes that the dates in the Application (e.g., Appendix E-1, Appendix E-2, Table 2-2, and pages 2-20 to 2-21) continue to be appropriate for the purpose of this Contingency Plan.

- 1.3.1 Please confirm, or explain otherwise, that the transmission assessment studies included in Appendices E-1 and E-2 to the Application, are no longer valid.

RESPONSE:

Not confirmed. The transmission assessment studies included in Appendices E-1 and E-2 to the Application are still valid.

The system constraints related to maintaining the Interior to Lower Mainland transfer capability and the Metro Vancouver voltage control identified as part of Appendix E-1 are still valid and have been used as preliminary inputs for the ongoing Network Integration Transmission Service (NITS) system impact studies.

British Columbia Utilities Commission Information Request No. 1.3.1 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 2 of 2
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

However, the assumptions included as part of Appendix E-1 were that BSY would only have three units operating until October 2025, followed by the retirement of BSY and the installation of the scope of work included in the Lower Mainland Reactive Power Reinforcement Project for providing future support, instead of the Contingency Plan.

The preliminary inputs from Appendix E-1 that inform Step 1 and Step 2 in the 2021 Integrated Resource Plan (IRP) Near-Term Actions do not offer any reactive power absorption support to help maintain voltage control during light load operating conditions for the Metro Vancouver Regional Transmission System as the reactors that were planned to be installed as part of the Lower Mainland Reactive Power Reinforcement Project were meant to address this.

The system constraints related to voltage performance to support load growth in the Central Fraser Valley identified as part of Appendix E-2, including the locations and ratings of the reactive power equipment at Clayburn Substation and McLellan Substation are still valid.

Our recent Transmission System Planning (TSP) assessments are showing that the timing of the need has advanced earlier than the outlined dates of 2025/2026 for Clayburn Substation and 2027 during high load conditions for McLellan Substation due to recent load forecasts.

British Columbia Utilities Commission Information Request No. 1.3.1.1 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 1 of 1
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

**3.0 Reference: CONTINGENCY PLAN
BC Hydro Lower Mainland Reactive Power Reinforcement
Project CPCN Proceeding, Exhibit B-1, Appendix E-1, E-2;
Contingency Plan, pp. 2, 5, 10, 11
Substation Upgrades**

BC Hydro filed its CPCN application for the Project (Application), which included transmission assessment studies for the Interior to Lower Mainland 500 kV Transmission System and the Central Fraser Valley Regional Transmission System in Appendices E-1 and E-2, respectively.

On page 10 of the Contingency Plan, BC Hydro states it will install one +125 MVAR shunt capacitor bank at the Clayburn Substation and one +125 MVAR shunt capacitor bank at the McLellan Substation, along with the necessary related ancillary equipment (**Substation Upgrades**).

In footnote 11 of page 5 of the Contingency Plan, BC Hydro states:

Please note, the Commission’s recent decision on BC Hydro Updated 2021 Integrated Resource Plan [2021 IRP] has triggered the need for a new transmission study. This study could impact the dates in the Application. However, the new transmission study cannot begin until after a Western Electricity Coordinating Council audit is completed which is scheduled to take place in September and October of 2024. Notwithstanding that a new transmission study will not be complete until sometime in 2025 and BC Hydro believes that the dates in the Application (e.g., Appendix E-1, Appendix E-2, Table 2-2, and pages 2-20 to 2-21) continue to be appropriate for the purpose of this Contingency Plan.

1.3.1 Please confirm, or explain otherwise, that the transmission assessment studies included in Appendices E-1 and E-2 to the Application, are no longer valid.

1.3.1.1 If confirmed, please discuss the impacts, if any, of the recent 2021 IRP decision, on the Substation Upgrades scope in the Contingency Plan, including any adjustments that may be required to the locations, staging and ratings of the reactive power support facilities previously identified in the transmission assessment studies.

RESPONSE:

Please refer to BC Hydro’s response to BCUC Staff IR 1.3.1 where we explain that the transmission assessment studies included in Appendices E-1 and E-2 to the application are still valid.

British Columbia Utilities Commission Information Request No. 1.3.2 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 1 of 2
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

**3.0 Reference: CONTINGENCY PLAN
BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN Proceeding, Exhibit B-1, Appendix E-1, E-2; Contingency Plan, pp. 2, 5, 10, 11 Substation Upgrades**

On pages 10 and 11 of the Contingency Plan, BC Hydro states:

While the Substation Upgrades are part of the Contingency Plan, once in service, they will also provide a longer-term solution for the reactive power needs of the Central Fraser Valley System. With the Substation Upgrades, BC Hydro does not anticipate that any significant additional capacitive resources will be needed in the Central Fraser Valley until 2041.

On page 2 of the Contingency Plan, BC Hydro states:

BC Hydro has used 2028 as the end date for this Contingency Plan because BC Hydro currently considers this a reasonable period of time before more permanent solutions can be put in place to manage these needs (the **Contingency Period**).

In footnote 5, on page 2 of the Contingency Plan, BC Hydro states:

BC Hydro may adjust the anticipated length and actions under the Contingency Period if it appears necessary to do so in the future. BC Hydro is still considering what long-term solutions are necessary to address the Metro Vancouver and Interior to Lower Mainland needs in consideration of the Commission’s Decision. BC Hydro will provide an update in a subsequent filing or as part of a Revenue Requirements application, likely in 2027.

1.3.2 Please elaborate on the reasons why BC Hydro considers the end date of 2028 to be reasonable for the Contingency Plan.

RESPONSE:

BC Hydro considers the end date of 2028 to be reasonable for the Contingency Plan due to the following reasons:

- 1. The equivalent of three BSY synchronous condenser units, coupled with emergency procedures, can support the near-term reactive power needs to maintain voltage control in the Metro Vancouver Regional Transmission System; and**

British Columbia Utilities Commission Information Request No. 1.3.2 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 2 of 2
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

2. **The equivalent of three BSY synchronous condenser units are sufficient to maintain transfer capability in the Interior to Lower Mainland Transmission System until 2028.**

Further, BC Hydro believes 2028 is a sufficient timeframe for BC Hydro to carry out the following work:

- **Identification of the specific requirements to support the BSY site’s potential future use;**
- **Development of information required to support a Class 3 cost estimate for the Burrard Facility Dismantling project, including:**
 - ▶ **A contaminated site investigation (a Stage 1 and Stage 2 Preliminary Site Investigation [PSI] and a Detailed Site Investigation may be required);**
 - ▶ **An Archaeological Impact Assessment (AIA), as required; and**
 - ▶ **Contractor input/proposals for dismantling including work methodology and constructability review.**
- **Development of the Class 3 cost estimate for the Burrard Facility Dismantling project;**
- **Confirmation of the Preferred Alternative based on an evaluation of the feasible alternatives;**
- **Development of a Major Project application for the Preferred Alternative that addresses the issues raised by the BCUC in Decision and Order G-20-24 for the Lower Mainland Reactive Power Reinforcement Project; and**
- **BCUC to review and provide a decision on the Major Project Application.**

BC Hydro is planning to complete this work prior to the end of 2028 (i.e., prior to the end date for the Contingency Plan) and considers this a reasonable period of time before more permanent solutions can be put in place for the Metro Vancouver Regional Transmission System and the Interior to Lower Mainland Transmission System.

British Columbia Utilities Commission Information Request No. 1.3.3 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 1 of 2
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

**3.0 Reference: CONTINGENCY PLAN
BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN Proceeding, Exhibit B-1, Appendix E-1, E-2; Contingency Plan, pp. 2, 5, 10, 11 Substation Upgrades**

On pages 10 and 11 of the Contingency Plan, BC Hydro states:

While the Substation Upgrades are part of the Contingency Plan, once in service, they will also provide a longer-term solution for the reactive power needs of the Central Fraser Valley System. With the Substation Upgrades, BC Hydro does not anticipate that any significant additional capacitive resources will be needed in the Central Fraser Valley until 2041.

On page 2 of the Contingency Plan, BC Hydro states:

BC Hydro has used 2028 as the end date for this Contingency Plan because BC Hydro currently considers this a reasonable period of time before more permanent solutions can be put in place to manage these needs (the **Contingency Period**).

In footnote 5, on page 2 of the Contingency Plan, BC Hydro states:

BC Hydro may adjust the anticipated length and actions under the Contingency Period if it appears necessary to do so in the future. BC Hydro is still considering what long-term solutions are necessary to address the Metro Vancouver and Interior to Lower Mainland needs in consideration of the Commission’s Decision. BC Hydro will provide an update in a subsequent filing or as part of a Revenue Requirements application, likely in 2027.

1.3.3 Please discuss under what circumstances BC Hydro would be required to adjust the anticipated length and actions of the Contingency Period.

RESPONSE:

BC Hydro would be required to adjust the anticipated length and actions of the Contingency Period under the following circumstances:

- **If it takes longer than two years to develop the information required to support a Major Project application for the remainder of the Amended Lower Mainland Scope; and**

British Columbia Utilities Commission Information Request No. 1.3.3 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 2 of 2
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

- **If a proceeding on the future Major Project application takes longer than 12 months.**

If the Contingency Period was extended, BC Hydro would re-evaluate system need and review the Contingency Plan approach to supporting Metro Vancouver Regional Transmission System and the Interior to Lower Mainland Transmission System reactive power needs.

Changing system needs in the future may require BC Hydro to re-evaluate its transmission plan to ensure system performance requirements are met.

British Columbia Utilities Commission Information Request No. 1.3.3.1 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 1 of 2
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

**3.0 Reference: CONTINGENCY PLAN
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Contingency Plan, pp. 2, 5, 10, 11
Substation Upgrades**

On pages 10 and 11 of the Contingency Plan, BC Hydro states:

While the Substation Upgrades are part of the Contingency Plan, once in service, they will also provide a longer-term solution for the reactive power needs of the Central Fraser Valley System. With the Substation Upgrades, BC Hydro does not anticipate that any significant additional capacitive resources will be needed in the Central Fraser Valley until 2041.

On page 2 of the Contingency Plan, BC Hydro states:

BC Hydro has used 2028 as the end date for this Contingency Plan because BC Hydro currently considers this a reasonable period of time before more permanent solutions can be put in place to manage these needs (the **Contingency Period**).

In footnote 5, on page 2 of the Contingency Plan, BC Hydro states:

BC Hydro may adjust the anticipated length and actions under the Contingency Period if it appears necessary to do so in the future. BC Hydro is still considering what long-term solutions are necessary to address the Metro Vancouver and Interior to Lower Mainland needs in consideration of the Commission’s Decision. BC Hydro will provide an update in a subsequent filing or as part of a Revenue Requirements application, likely in 2027.

1.3.3 Please discuss under what circumstances BC Hydro would be required to adjust the anticipated length and actions of the Contingency Period.

1.3.3.1 Please explain the risks associated with adjusting the length of the Contingency Period and discuss how BC Hydro plans to mitigate each of these risks.

RESPONSE:

The main risks associated with increasing the length of the Contingency Period are increased exposure to the possibility of synchronous condenser equipment

British Columbia Utilities Commission Information Request No. 1.3.3.1 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 2 of 2
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

failure and thus increased un-reliability associated with all synchronous condenser units and their respective supporting infrastructure (e.g., transformers and protection and control systems).

Outages to the synchronous condensers could then result in constraints on the transmission system, including reduction in service capability, and reductions in system reliability potentially including unplanned outages to customers.

BC Hydro will mitigate these risks by continuing to inspect, maintain, and repair the synchronous condenser equipment as required during the Contingency Period.

Other risks are additional costs to continue sustaining the synchronous condensers and their supporting infrastructure.

British Columbia Utilities Commission Information Request No. 1.3.4 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 1 of 2
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

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BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN Proceeding, Exhibit B-1, Appendix E-1, E-2; Contingency Plan, pp. 2, 5, 10, 11 Substation Upgrades**

On pages 10 and 11 of the Contingency Plan, BC Hydro states:

While the Substation Upgrades are part of the Contingency Plan, once in service, they will also provide a longer-term solution for the reactive power needs of the Central Fraser Valley System. With the Substation Upgrades, BC Hydro does not anticipate that any significant additional capacitive resources will be needed in the Central Fraser Valley until 2041.

On page 2 of the Contingency Plan, BC Hydro states:

BC Hydro has used 2028 as the end date for this Contingency Plan because BC Hydro currently considers this a reasonable period of time before more permanent solutions can be put in place to manage these needs (the **Contingency Period**).

In footnote 5, on page 2 of the Contingency Plan, BC Hydro states:

BC Hydro may adjust the anticipated length and actions under the Contingency Period if it appears necessary to do so in the future. BC Hydro is still considering what long-term solutions are necessary to address the Metro Vancouver and Interior to Lower Mainland needs in consideration of the Commission’s Decision. BC Hydro will provide an update in a subsequent filing or as part of a Revenue Requirements application, likely in 2027.

1.3.4 Please explain how the decision was made to implement a solution to address the need for reactive power compensation for the Central Fraser Valley until 2041.

RESPONSE:

The Fraser Valley Regional Assessment Study included as Appendix E-2 to the original Application had a time horizon of 2022 to 2041. As outlined in sections 4.3 (pages 30, 31 and 32 of 38), 4.4 (page 32 of 38), and 4.6 (page 33 of 38) of Appendix E-2, the study indicates that additional reactive power support would be required at Clayburn Substation by late 2025 or 2026.

British Columbia Utilities Commission Information Request No. 1.3.4 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 2 of 2
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

Further, the above-noted sections also show that additional reactive power support would be required at McLellan Substation by 2033 under similar conditions; however, this would be advanced to 2027 under High Summer and High Winter load conditions.

As a result, BC Hydro concluded that in order to relieve voltage constraints to support load growth in the Central Fraser Valley Transmission System before the end of 2028 (the Contingency Period), BC Hydro must install a +125 MVAR shunt capacitor bank at the Clayburn Substation and a +125 MVAR shunt capacitor bank at the McLellan Substation, along with related ancillary equipment as part of the Contingency Plan.

Due to the time horizon outlined in Appendix E-2, this would address the reactive power needs for the Central Fraser Valley Transmission System until 2041.¹

If smaller shunt capacitor banks were installed at Clayburn Substation and McLellan Substation, a future project would then be required to add sufficient reactive power support to the Central Fraser Valley Transmission System to address the known reactive power demand until 2041. As discussed in BC Hydro’s response to BCUC Staff IR 1.3.4.1, a short-term approach to solving the Central Fraser Valley reactive power needs would increase complexity, cause a delay in equipment in-service dates and costs overall for no supplementary benefit.

¹ This was acknowledged by the Panel pursuant to Decision and Order G-20-24: “With respect to the need to relieve voltage constraints to support load growth in the Central Fraser Valley Regional Transmission System, the Panel accepts BC Hydro’s assessment that the Central Fraser Valley load is expected to experience a 20-year average load growth of approximately 1.5 percent annually. The Panel agrees with BC Hydro’s assessment that it is beginning to experience voltage constraints in the Central Fraser Valley 230 kV system due to the load growth in the Central Fraser Valley over the last several years and that additional capacitive resources beyond what is currently supplied by the BSY condensers will be required by 2026. The Panel further accepts BC Hydro’s assessment that additional reactive power resources beyond those proposed in the Application are not anticipated until 2041.”

British Columbia Utilities Commission Information Request No. 1.3.4.1 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 1 of 2
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

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On page 2 of the Contingency Plan, BC Hydro states:

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In footnote 5, on page 2 of the Contingency Plan, BC Hydro states:

BC Hydro may adjust the anticipated length and actions under the Contingency Period if it appears necessary to do so in the future. BC Hydro is still considering what long-term solutions are necessary to address the Metro Vancouver and Interior to Lower Mainland needs in consideration of the Commission’s Decision. BC Hydro will provide an update in a subsequent filing or as part of a Revenue Requirements application, likely in 2027.

1.3.4 Please explain how the decision was made to implement a solution to address the need for reactive power compensation for the Central Fraser Valley until 2041.

1.3.4.1 Please identify and describe any short-term solutions to manage reactive power on the Central Fraser Valley system over the duration of the Contingency Plan. As part of the response, please explain why BC Hydro dismissed each of these short-term solutions in the Contingency Plan for a solution that addresses the longer term need for reactive power on the Central Fraser Valley System.

British Columbia Utilities Commission Information Request No. 1.3.4.1 Dated: June 14, 2024 British Columbia Hydro & Power Authority Response issued July 4, 2024	Page 2 of 2
British Columbia Hydro & Power Authority BC Hydro Lower Mainland Reactive Power Reinforcement Project CPCN	

RESPONSE:

Please refer to BC Hydro’s response to BCUC Staff IR 1.3.4 if smaller shunt capacitor banks were installed, a future project would then be required to add sufficient reactive power support to the Central Fraser Valley Transmission System to address the known reactive power demand until 2041.

A different, short-term focused project would require significant amounts of rework in terms of planning and design and would increase complexity and costs for the Central Fraser Valley scope overall.

In addition, procurement of different equipment with varying lead times would be required. This would also increase BC Hydro’s sunk costs as contracts for the major equipment required for the Substation Upgrades under the Contingency Plan (and Application) have already been awarded.

An additional future project would also require additional outages and resources.

As a result, a short-term approach to solving the Central Fraser Valley reactive power needs would increase complexity, cause a delay in equipment in-service dates and costs overall for no supplementary benefit.

Further, the need for the Central Fraser Valley Scope was examined by the BCUC and Interveners during the review of the CPCN application for the Project, and was accepted by the BCUC in its Decision and Order G-20-24.¹

As a result, BC Hydro concluded that it was prudent not to pursue a short-term solution for the Central Fraser Valley work.

¹ Refer to page 9 of BCUC Order G-20-24.