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August 14, 2023

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

Dear Sara Hardgrave:

**RE: Project No. 1599273  
British Columbia Utilities Commission (BCUC)  
British Columbia Hydro and Power Authority (BC Hydro)  
Mainwaring Substation Upgrade Project (Project)  
Semi-Annual Progress Report No. 3  
January 1, 2023, to June 30, 2023 (Semi-Annual Report)**

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BC Hydro writes in compliance with BCUC Order Nos. C-4-22 and G-243-22 to provide its confidential Semi-Annual Report for the Project. Pursuant to Order C-4-22, which states, in part, that BC Hydro file a Material Change Report as soon as practicable and in any event within 30 days of the date on which a material change occurs. To that end, BC Hydro filed a Material Change Report for the Project with the BCUC on August 11, 2023.

BC Hydro is providing the confidential Semi-Annual Report to the BCUC only. A public version of the Semi-Annual Report is being filed under separate cover redacting commercially sensitive and contractor-specific information. BC Hydro seeks this confidential treatment pursuant to section 42 of the *Administrative Tribunals Act* and Part 4 of the Commission's Rules of Practice and Procedure.

August 14, 2023  
Sara Hardgrave  
Acting Commission Secretary and Manager  
Regulatory Services  
British Columbia Utilities Commission  
Mainwaring Substation Upgrade Project (Project)  
CONFIDENTIAL Semi-Annual Progress Report No. 3  
January 1, 2023, to June 30, 2023 (Semi-Annual Report)

For further information, please contact Joe Maloney at  
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Yours sincerely,



Chris Sandve  
Chief Regulatory Officer

jm/kl

Enclosure

# **BC Hydro Mainwaring Substation Upgrade Project**

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## **Semi-Annual Progress Report No. 3**

### **Six Month Period**

**January 1, 2023 to June 30, 2023**

**PUBLIC**

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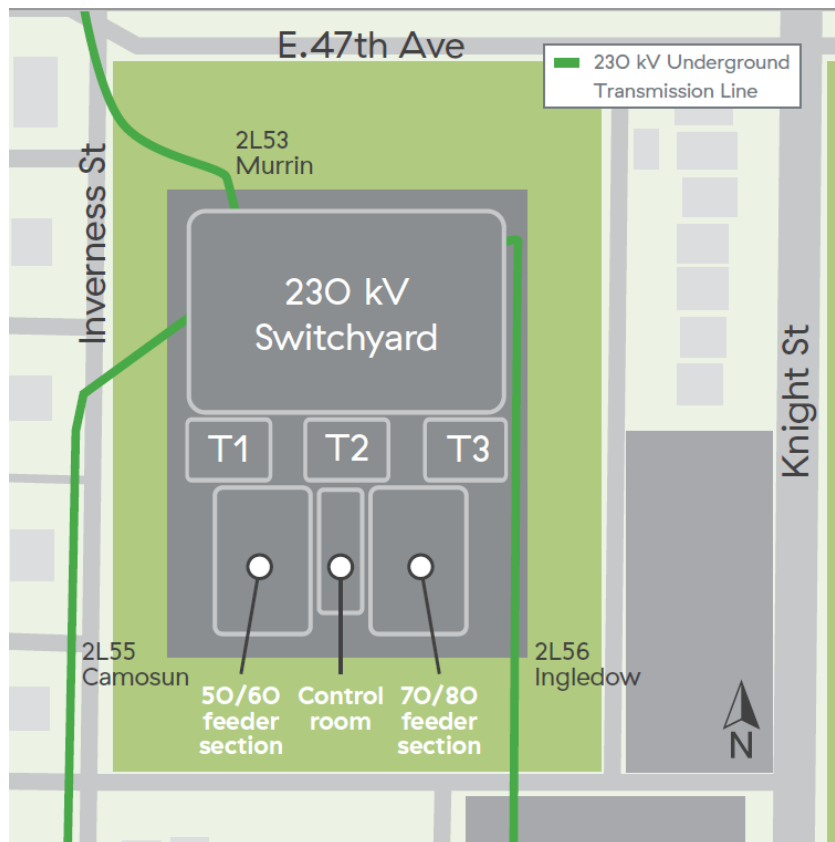
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# 1 Background

## 1.1 Project Overview

The Mainwaring substation is centrally located within the Metro Vancouver Burnaby sub-region, which comprises 16 substations. The Metro Vancouver Burnaby sub-region has the largest load in the BC Hydro system. Based on peak demand, the Mainwaring substation is the seventh largest distribution substation in the BC Hydro system. The Mainwaring substation is a high criticality substation with a normalized criticality score of 83/100 (with zero being the least critical and 100 being the most critical substation). The Mainwaring substation layout is shown in [Figure 1](#) below.

**Figure 1 Mainwaring Substation Layout**



The Mainwaring Substation Upgrade Project (**Project**) addresses significant reliability, safety, environmental, and reputational risks due to the deteriorated condition of the T1 and T3 power transformers and the 50/60 feeder section in the substation. Both the T1 and T3 power transformers have a “Poor” Asset Health Rating (**AHR**) and are reaching their end-of-life. Most of the equipment in the 50/60 series feeder section also have a “Poor” or “Very Poor” AHR. The deterioration of these key assets increases the likelihood of equipment failure, which can cause unplanned outages and impacts to customers, and poses safety risks to workers and the public. Additionally, the presence of Polychlorinated Biphenyls (**PCBs**) in equipment needs to be removed to comply with federal PCB Regulations.<sup>1</sup>

The Project will replace the T1 and T3 power transformers with two new 150 MVA transformers and replace the existing 50/60 feeder section with three new indoor gas insulated feeder sections with a total of 21 feeder positions and all associated equipment. The existing substation fence will be expanded within BC Hydro’s property to accommodate a new gas insulated switchgear building which is shown in [Figure 2](#) below.

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<sup>1</sup> The PCB Regulations are issued under the *Canadian Environmental Protection Act, 1999*, and are intended to protect the health of Canadians and the environment by preventing the release of PCBs to the environment, and by accelerating the phasing out of these substances.

**Figure 2**      **Location of the New Gas Insulated Switchgear Feeder Building**



## 1.2 BCUC Application and Decision

In November 2021, British Columbia Hydro and Power Authority (**BC Hydro**) filed an application with the British Columbia Utilities Commission (**BCUC**) seeking a Certificate of Public Convenience and Necessity (**CPCN**) for the Project (**Application**). At the time of the Application, the Project had a total cost estimate range from \$91.5 million to \$143.3 million, with an expected in-service date of October 2026. The Project schedule planned for all required PCB-containing equipment to be removed from the site before the federal PCB Regulations compliance deadline of December 31, 2025.

On August 16, 2022, the BCUC issued Order No. C-4-22 granting a CPCN to BC Hydro for the Project. In the Order, the BCUC directed BC Hydro to file semi-annual progress reports and a Material Change report in the event of a change to BC Hydro's plan for the Project that would reasonably be expected to have a significant impact on the Project.

BC Hydro files Progress Report No. 3 (**Report**), which provides an update on the Project covering the period from January 1, 2023, to June 30, 2023 (**Reporting**



Period). The Report complies with project reporting requirements for semi-annual progress reports as set out in Appendix A to Order C-4-22. During the Reporting Period, BC Hydro reported two material changes due to schedule delay pursuant to Order C-4-22. The record of all material changes can be found in [Appendix A](#).

Commercially sensitive numbers and content have been redacted. Public disclosure of the redacted information would harm our negotiating position with suppliers and contractors, and ultimately harm our customers.

## 2 Project Status

### 2.1 General Project Status

[Table 1](#) below provides a high-level status update for the Project as of the end of this Reporting Period (June 30, 2023).

**Table 1 Project Status Dashboard<sup>2</sup>**

G Green: No Concerns; A Amber: Some Concerns but in Control; R Red: Serious Concerns

| Status as of:         | June 30, 2023 |   |
|-----------------------|---------------|---|
| <b>Project Status</b> | <b>G</b>      | The Project is in the Implementation phase and is progressing as planned. The overall Project status is green because Safety, Scope, Schedule, Cost, First Nations, Public Engagement, and Environment are green. Site preparatory work and some distribution scope in the vicinity of the feeder building footprint area were completed in the Reporting Period. The site preparation and gas insulated switchgear feeder building construction contract was awarded on May 5, 2023, and the contractor is forecasted to mobilize on the site on July 10, 2023. Stage 2 contracts for power transformers, gas insulated switchgear, and resin impregnated paper bus were awarded and over \$7 million of other equipment and materials required for the Project were also ordered during the Reporting Period. |
| <b>Safety</b>         | <b>G</b>      | Constructability and design measures were considered during Preliminary Design to address potential safety issues during construction, operation, and maintenance. Construction Services was the Prime contractor for site preparatory works and there has not been a safety incident during the Reporting Period. The Prime contractor responsibility will be transferred to BC Hydro Construction Management when the civil general contractor mobilizes in July 2023.  |
| <b>Scope</b>          | <b>G</b>      | Delivery of approved scope and expected performance or functionality is on track.   |

<sup>2</sup> The presented key performance indicators are BC Hydro's internal indicators of project health that reflect performance against BC Hydro-approved scope, schedule, and cost.

🟢 Green: No Concerns; 🟡 Amber: Some Concerns but in Control; 🔴 Red: Serious Concerns

|                          |   |  |
|--------------------------|---|--|
| <b>Schedule</b>          | 🟢 | The Project met the end-of-Definition-phase milestone in December 2022 and progressed on schedule. The Project is not forecasted to miss any key milestones against the BC Hydro-approved schedule. During the Reporting Period, the forecast PCB removal milestone was advanced to June 2024, which allowed the status to change from amber to green. The June 2024 forecast is close to the BC Hydro PCB removal deadline of March 2024 and is earlier than the federal PCB Regulations deadline of December 2025. |
| <b>Cost</b>              | 🟢 | The forecast Expected Amount is within the BC Hydro-approved Expected Amount.  |
| <b>First Nations</b>     | 🟢 | The Project has minimal or no incremental adverse impacts on Aboriginal rights or Aboriginal title. No concerns or questions have been raised by First Nations during the Reporting Period.  |
| <b>Public Engagement</b> | 🟢 | No new issues. Contact is being maintained with the City of Vancouver and other external stakeholders, including nearby residents.   |
| <b>Environment</b>       | 🟢 | There have been no environmental incidents and no archaeological incidents for the Project to date.  |

## 2.2 Major Accomplishments and Work Completed

### 2.2.1 Procurement Activities

As reported in Progress Report No. 2, BC Hydro committed to Original Equipment Manufacturer Design (Stage 1) work of \$████ million in the Definition phase for long lead time equipment (new power transformers, resin impregnated paper bus, and gas insulated switchgear).

During the Reporting Period, BC Hydro awarded supply and/or installation work (Stage 2) of \$████ million to the Original Equipment Manufacturers for supply of power transformers, supply and installation of gas insulated switchgear, and supply and installation of resin impregnated paper bus.

During the Reporting Period, BC Hydro awarded the Indigenous procurement opportunity for site preparation and gas insulated switchgear feeder building construction for \$████ million to Graham Infrastructure Ltd., the designated business partner of a First Nation whose traditional territory the Mainwaring substation is located. This contractor is referred to as the civil general contractor.

The above contracts are summarized in section [5.2](#).

During the Reporting Period, BC Hydro awarded contracts for the supply of current limiting reactors. This contract is not included in section [5.2](#) as it does not exceed \$3.0 million.

### **2.2.2 Contract Management Activities**

All contracts are progressing well with no issues. Stage 1 work for the power transformer contract is complete and Stage 2 of the work has begun. During the Reporting Period, the power transformer designs were released for manufacturing. Stage 1 work for the resin impregnated paper bus is 80% complete and gas insulated switchgear is 90% complete.

### **2.2.3 Engineering and Design**

During the Reporting Period, the following engineering and design works were advanced:

- The civil, electrical, and mechanical designs of the new gas insulated switchgear feeder building and the site preparation (e.g., expansion of the substation ground) were completed and issued for construction;
- The designs for two of the four-way distribution maintenance holes – which are in the area of the new gas insulated switchgear feeder building - were issued for construction to enable these maintenance holes to be installed before the mobilization of the civil general contractor;
- The designs of the switchyard, remaining distribution scope, protection and controls, as well as the supervisory control and data acquisition were progressed from 65% completion towards 95% completion;
- The design of the telecommunication system was progressed from 35% completion towards 95% completion;

- BC Hydro received and accepted vendor designs for the gas insulated switchgear and resin impregnated paper bus, including layouts and schematics, comprising majority of the vendor design deliverables; and
- More detailed design studies were completed for the distribution scope, including conducting underground utilities surveys to inform the design assumptions. Based on the study findings, the likelihood of the risk of increased distribution material and installation effort, which was noted in section 6 of Progress Report No. 2, was lowered from the Progress Report No. 2 forecast. An update of this risk is provided in section [1](#).

#### **2.2.4 Construction Activities**

Construction activities completed to-date include site preparation and early construction work before the mobilization of the civil general contractor that is scheduled for July 2023. The following is a list of the key construction activities completed during the Reporting Period:

- Removal of PCB contaminated circuit breaker 12CB56;
- Installation of a temporary 2.4-meter-high metallic fence along the south side of the substation property (see [Figure B-1](#) in [Appendix B](#));
- Construction of a temporary parking area in the north quadrant of the substation property (see [Figure B-2](#) in [Appendix B](#));
- Demolition of the existing microwave tower structure and tower foundation (see [Figure B-6](#) in [Appendix B](#));
- Removal of the top 0.3 metres of soil from the footprint of the gas insulated switchgear building on the south side of the substation property (see [Figure B-7](#) in [Appendix B](#)). The soil was redeposited and seeded within the substation property;
- Installation of two four-way distribution maintenance holes in the new gas insulated switchgear feeder building area (see [Figure B-8](#) in [Appendix B](#)); and

- Installation of one distribution duct bank in the new gas insulated switchgear feeder building area (see [Figure B-9](#) in [Appendix B](#)).

### **2.2.5 Environment and Heritage**

There are no reportable environmental incidents and no archaeological finds or issues for the Project to date.

During the Reporting Period, approximately 20 trees were removed from the south side of the substation property, in preparation for the construction of the new gas insulated switchgear feeder building, as the trees were within the footprint of the new building (see [Figure B-3](#) and [Figure B-4](#) in [Appendix B](#)). Also, one tree was removed from the east side of the substation property for the development of an access laneway along the east side of the substation property for civil construction purposes. Tree protection fencing was installed around the remaining trees on site (see [Figure B-5](#) in [Appendix B](#)). One City of Vancouver tree was removed south of the substation for the relocation of a guy wire for an existing distribution pole (see section [2.2.7](#) for more details).

### **2.2.6 First Nations**

No concerns or questions were raised by First Nations during the Reporting Period. A Project update will be shared with First Nations in July 2023 and will include an overview of the upcoming Project activities and information regarding the Soil Management Plan. BC Hydro will continue to engage with First Nations on current and upcoming potential procurement opportunities.

### **2.2.7 Public Engagement**

No new issues were identified during the Reporting Period. Work is ongoing to address issues raised to-date as summarized in Table 5-2 of the Application. Regular contact is maintained with the City of Vancouver and other external stakeholders, including nearby residents, to advise them of upcoming activities.

During the Reporting Period, discussions continued with the City of Vancouver regarding construction to support the Project proceeding on schedule. The discussions to date have been productive.

At BC Hydro's request, the City of Vancouver installed temporary "No Parking" signs at the north side of the substation site in early January 2023 to facilitate access to the new temporary parking area. The City of Vancouver installed additional temporary "No Parking" signs at the north, south and west sides of the substation site, and along Culloden Street in June 2023 to facilitate construction and large vehicle movement in the area.

BC Hydro updated the Project website in January 2023 to advise stakeholders and other interested parties of the activities that would occur throughout the year.<sup>3</sup>

In January 2023, the MLA for Vancouver-Kensington, and key contacts for Sir Sanford Fleming Elementary School and Sunset Community Center were provided with an e-mail notification of the upcoming construction work.<sup>4</sup>

Residents and businesses immediately surrounding the Mainwaring substation property were notified by hand-delivered flyers on February 8, 2023, that trees within the BC Hydro property would be removed mid-month. No feedback was received.

On April 24, 2023, signs were placed on a City of Vancouver tree at the intersection of Culloden Street and the lane south of the substation to advise that the tree would be removed to accommodate the relocation of an existing guy wire from the substation property. The guy wire is for an existing distribution pole that is south of the substation and near the tree. Despite BC Hydro's attempts, it was not possible to relocate the guy wire without the removal of the tree. In accordance with City of Vancouver requirements, the signs were in place for two weeks prior to the tree

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<sup>3</sup> <https://www.bchydro.com/energy-in-bc/projects/mainwaring.html>.

<sup>4</sup> While preparing this Report, we noticed that the e-mail notification of the upcoming construction work was reported in Progress Report No. 2 (for the period ending December 31, 2022), whereas BC Hydro sent the email notification on January 4, 2023, in the subsequent reporting period of Progress Report No. 3 (this report). The e-mail notification is therefore re-reported here.

being removed. No feedback was received. The tree was removed, and a new tree will be planted nearby, post-construction.

On June 16, 2023, signs were placed on two City of Vancouver trees near the north-east corner of the substation property to advise that the trees would be removed to accommodate the development of an access laneway along the east side of the substation property. The access laneway will be used by large civil construction vehicles to reduce traffic on local roads. In accordance with City of Vancouver requirements, the signs were in place for two weeks prior to the planned date of the trees' removal. No feedback was received. The trees will be removed July 5, 2023, and new trees will be planted post -construction.

In Progress Report No. 2, BC Hydro noted that it planned to hold a virtual open house in May 2023. During the Reporting Period, BC Hydro decided to provide a letter to stakeholders instead of hosting a virtual open house because there has been little interest in the Project to date (i.e., few people have attended past open houses, and no feedback was received in response to tree removal notices). A letter was prepared and will be mailed on July 6, 2023, to advise stakeholders and other interested parties of the activities that will be occurring in 2023.

### **2.2.8 Regulatory, Permits, and Authorizations**

There were no permitting requirements during the Reporting Period.

### **2.3 Project Challenges**

There have been no project challenges during the Reporting Period.

During the Reporting Period, BC Hydro extended the closing date of the request for proposal for the gas insulated switchgear feeder building contract by one month due to multiple requests from the proponents. This resulted in a month delay in award of the contract from April to May 2023.

Not all discipline deliverable designs progressed to the expected 95% completion as more effort and time than expected were required for the development of vendor designs.

The design of the distribution duct bank along Inverness Street requires extensive consultation with the City of Vancouver and may result in design changes that will increase the forecast cost and schedule for the distribution scope. BC Hydro will continue to engage with the City of Vancouver to improve our understanding of this risk.

During the Reporting Period, BC Hydro evaluated opportunities for advancing the PCB Equipment Removal Complete milestone from July 2025 to an earlier date as one of the treatments for the risk of missing the federal PCB Regulations compliance deadline.<sup>5</sup> The Project identified an opportunity to advance the removal date for the existing PCB-contaminated T1 power transformer by switching the sequence of removal for the existing power transformers T1 and T3. The removal of PCB-contaminated T1 is now planned for spring/summer 2024 instead of spring/summer 2025, advancing the forecast date for the PCB Equipment Removal Complete milestone by 13 months. BC Hydro previously planned to remove the T3 power transformer first because the remaining transformer capacity would be higher, reducing BC Hydro's reliance on Distribution circuit ties for supply redundancy. After considering the options for the replacement sequence, including their associated risk levels, BC Hydro decided to replace the T1 power transformer first because it provides the best opportunity to minimize the risk of missing the federal PCB Regulations compliance deadline.

## 2.4 Plans for Next Six Months

BC Hydro plans to undertake the following activities from July 2023 to December 2023:

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<sup>5</sup> The risk of missing the PCB deadline was presented in section 6.4.1 of the Application and updates to the risk are provided in section 6 herein.



- Progress to 95% completion for the designs of the switchyard, remaining distribution scope, protection and controls, and telecommunication system, as well as the supervisory control and data acquisition;
- Complete the designs for switchyard civil and electrical installation - including the associated protection and controls and supervisory control - and issue the designs for construction;
- Complete the mobilization of the civil general contractor to site;
- Excavate the footprint for the gas insulated switchgear feeder building on the south side of the substation property, including removal and disposal of approximately 4,500 cubic metres of excavated soil;
- Install the foundation formwork and place the foundation concrete placement for the gas insulated switchgear feeder building;
- Remove the southern portion of the existing substation fence;
- Remove two City of Vancouver trees and three trees within the substation property on the north-east corner of substation. This is for the development of an access laneway for large civil construction vehicle traffic along the east side of the substation property; and
- Remove the southern hedge row.

### **3 Scope Change Summary**

There was no approved change in scope during this Reporting Period.

### **4 Project Schedule**

As of the end of this Reporting Period (June 30, 2023), the forecast Project in-service date remains as December 2026. As explained in Progress Report No. 1, this is a two-month delay from the in-service date of October 2026 stated in the

Application. There is no change to the forecast Project in-service date as compared to the prior report's forecast.

[Table 2](#) below provides the forecast dates for the Project's Major Milestones as of June 30, 2023, and a comparison to the estimated dates provided in Table 4-4 of the Application and the prior report's forecast as of December 31, 2022. Variances are explained in section [4.1.1](#).

**Table 2                      Project Major Milestones as of June 30, 2023**

| Row No. | Description of Major Milestone                          | Estimated Date in Application Dated Nov 5, 2021 | Prior Report's Forecast as of Dec. 31, 2022 | Actual / Current Forecast as of Jun. 30, 2023 | Status vs Estimated Date in Application and Comments |
|---------|---|---|---|---|--|
| 1       | Stage 1 Contract Award - Transformers                   | July 2021                                       | July 2021                                   | July 2021                                     | Complete   |
| 2       | Application Filed with BCUC                             | November 2021                                   | November 2021                               | November 2021                                 | Complete   |
| 3       | Requested BCUC Decision Date                            | August 2022                                     | August 2022                                 | August 2022                                   | Complete   |
| 4       | Stage 2 Contract Award – Transformers                   | October 2022                                    | February 2023                               | March 2023                                    | Complete   |
| 5       | Gas Insulated Switchgear Feeder Building Contract Award | October 2022                                    | April 2023                                  | May 2023                                      | Complete   |
| 6       | Construction Services Mobilization                      | November 2022                                   | January 2023                                | January 2023                                  | Complete   |
| 7       | Contractor Mobilization <sup>6</sup>                    | January 2023                                    | June 2023                                   | July 2023                                     | Forecasting Delay                                    |
| 8       | Asset In-Service Date - T4 Transformer                  | September 2024                                  | October 2024                                | October 2025                                  | Forecasting Delay                                    |
| 9       | PCB Equipment Removal Complete                          | January 2025                                    | July 2025                                   | June 2024                                     | Forecasting Early                                    |
| 10      | Asset In-Service Date - T5 Transformer                  | March 2025                                      | October 2025                                | October 2024                                  | Forecasting Early                                    |
| 11      | Project In-Service Date                                 | October 2026                                    | December 2026                               | December 2026                                 | Forecasting Delay                                    |
| 12      | Project Complete  | October 2027                                    | June 2028                                   | June 2028                                     | Forecasting Delay                                    |

<sup>6</sup> This refers to the civil general contractor.

#### 4.1.1 Schedule Variance Explanation for Forecast as of June 30, 2023

[Table 3](#) below provides the reasons for the variances between the Application dated November 5, 2021, and the Actual / Current Forecast as of June 30, 2023.

**Table 3      Schedule Variance Explanation for  
Forecast as of June 30, 2023**

| Row in<br><a href="#">Table 2</a> | Explanation   | Variance to<br>Application |
|-----------------------------------|---|----------------------------|
| 4                                 | <ul style="list-style-type: none"> <li>• <a href="#">Progress Report No. 1</a>: Forecasting delay of two months due to needing more time to complete the Preliminary Design estimate;</li> <li>• <a href="#">Progress Report No. 2</a>: Forecasting delay of additional two months due to more time required to assess the sequencing of the replacement transformers and negotiate the price for the Stage 2 Contract; and</li> <li>• <a href="#">Progress Report No. 3</a>: Forecasting delay of additional month due to more time required to assess the sequencing of the replacement transformers and negotiate the price for the Stage 2 Contract.</li> </ul> | 5 months                   |
| 5                                 | <ul style="list-style-type: none"> <li>• <a href="#">Progress Report No. 1</a>: Forecasting delay of five months due to needing more time to prepare the specifications for the site preparation and gas insulated switchgear building request for proposal;</li> <li>• <a href="#">Progress Report No. 2</a>: Forecasting delay of additional one month to extend the bid period to accommodate the year-end holiday season; and</li> <li>• <a href="#">Progress Report No. 3</a>: Forecasting delay of additional month due to more time needed in pre-award negotiations. The variance to the Application is 7 months.<sup>7</sup></li> </ul>                    | 7 months                   |
| 6                                 | <ul style="list-style-type: none"> <li>• <a href="#">Progress Report No. 1</a>: Forecasting delay of two months due to needing more time to complete the Preliminary Design estimate; and</li> <li>• <a href="#">Progress Report Nos. 2 to 3</a>: No change.</li> </ul>   | 2 months                   |
| 7                                 | <ul style="list-style-type: none"> <li>• <a href="#">Progress Report No. 1</a>: Forecasting delay of two months due to needing more time to complete the Preliminary Design estimate;</li> <li>• <a href="#">Progress Report No. 2</a>: Forecasting delay of additional three months due to delay in contract award and time needed by the contractor to complete pre-mobilization submissions; and</li> <li>• <a href="#">Progress Report No. 3</a>: Forecasting delay of additional month due to time needed by the contractor to complete pre-mobilization activities.</li> </ul>  | 6 months                   |
| 8                                 | <ul style="list-style-type: none"> <li>• <a href="#">Progress Report No. 1</a>: Forecasting delay of one month due to the timing of available outage window for replacing the transformer;</li> <li>• <a href="#">Progress Report No. 2</a>: No change; and</li> <li>• <a href="#">Progress Report No. 3</a>: Forecasting delay of additional 12 months due to switching sequence of transformer replacement to prioritize removal of PCB-contaminated T1. The variance to the Application is 13 months.<sup>7</sup></li> </ul>   | 13 months                  |

<sup>7</sup> This schedule delay was reported as a material change in a Material Change report. The material change and the Material Change report are recorded in the Record of Material Changes in [Appendix A](#).

| Row in<br><a href="#">Table 2</a> | Explanation  | Variance to<br>Application |
|-----------------------------------|--|----------------------------|
| 9                                 | <ul style="list-style-type: none"> <li>• <a href="#">Progress Report No. 1</a>: Forecasting delay of six months<sup>7</sup> due to the timing of available outage window for replacing the transformer and due to leaving the T1 power transformer in place longer to eliminate the temporary installation of the T5 power transformer.<sup>8</sup> While the July 2025 PCB removal completion date still meets the December 31, 2025 deadline as required by federal regulation, BC Hydro is implementing the risk treatments listed in section 1 to be in compliance;</li> <li>• <a href="#">Progress Report No. 2</a>: No change; and</li> <li>• <a href="#">Progress Report No. 3</a>: Forecasting advance of additional 13 months due to switching sequence of transformer replacement to prioritize removal of PCB-contaminated T1.</li> </ul> | -7 months                  |
| 10                                | <ul style="list-style-type: none"> <li>• <a href="#">Progress Report No. 1</a>: Forecasting delay of seven months<sup>7</sup> due to the timing of available outage window for replacing the transformer and due to leaving the T1 power transformer in place longer to eliminate the temporary installation of the T5 power transformer;<sup>8</sup></li> <li>• <a href="#">Progress Report No. 2</a>: No change; and</li> <li>• <a href="#">Progress Report No. 3</a>: Forecasting advance of additional 12 months due to switching sequence of transformer replacement to prioritize removal of PCB-contaminated T1.</li> </ul>   | -5 months                  |
| 11                                | <ul style="list-style-type: none"> <li>• <a href="#">Progress Report No. 1</a>: Forecasting delay of two months due to needing more time to complete the Preliminary Design estimate; and</li> <li>• <a href="#">Progress Report Nos. 2 to 3</a>: No change.</li> </ul>  | 2 months                   |
| 12                                | <ul style="list-style-type: none"> <li>• <a href="#">Progress Report No. 1</a>: Forecasting delay of eight months,<sup>7</sup> consisting of delay of two months due to needing more time to complete the Preliminary Design estimate, plus delay of six months to allow more time after the in-service date to prepare and review the Project Completion and Evaluation Report, including providing a briefing to BC Hydro’s Board of Directors, before filing the Project Completion and Evaluation Report with the BCUC; and</li> <li>• <a href="#">Progress Report Nos. 2 to 3</a>: No change.</li> </ul>  | 8 months                   |

## 5 Project Costs

### 5.1 Project Cost Summary as of June 30, 2023

As reported in Semi-Annual Progress Report No. 1, an updated preliminary estimate was endorsed by BC Hydro’s Gate Board on September 16, 2022. The updated preliminary estimate has an Expected Amount of \$129.5 million, Authorized Amount

<sup>8</sup> As noted in BC Hydro’s response to BCUC IR 2.27.1, during review of the construction outage staging plan with Transmission & Distribution System Operations, BC Hydro identified that the temporary installation of the T5 power transformer could be eliminated if the sequence was modified. By leaving the T1 power transformer in place longer and removing the T3 power transformer first, the remaining transformer capacity is higher, and BC Hydro is able to rely on Distribution circuit ties for the remaining supply redundancy.

of \$156.3 million, and estimating accuracy range of +15%/-10% around the Expected Amount of the Implementation phase. The Expected Amount and Authorized Amount were approved by the BC Hydro Board of Directors in December 2022, which was the first approval of these amounts for the purpose of completing the Implementation phase.

As of the end of the Reporting Period (June 30, 2023), the actual costs incurred total \$14.4 million. The forecast Expected Amount as of June 30, 2023, is \$125.1 million, a decrease of \$3.6 million from the prior report's forecast as of December 31, 2022.

[Table 4](#) below provides the actual costs incurred to June 30, 2023. The table also provides the forecast Expected Amount and Authorized Amount as of June 30, 2023, and a comparison to the Project Cost Range Breakdown provided in Table 4-2 of the Application and the prior report's forecast of December 31, 2022.

Variances greater than \$1.0 million between the Project Cost Range Breakdown provided in Table 4-2 of the Application (Table 4, column A) and the Project's forecast cost as of June 30, 2023, (Table 4, column E) are explained in section [5.1.1](#).

**Table 4 Project Expenditure Summary - Application, Forecast and Actual Cost as of June 30, 2023<sup>9</sup>**

| Row No. | Description   | Estimate Analysis  |   |                               | Forecast Analysis                              |  |                                      |                                     |                                 | Actuals Analysis               |                             |                        |
|---------|---|--|---|-------------------------------|--|--|--------------------------------------|-------------------------------------|---------------------------------|--------------------------------|-----------------------------|------------------------|
|         |   | A  | B   | C                             | D  | E  | F                                    | G                                   | H                               | I                              | J                           | K                      |
|         |   | Project Cost Range in Application dated Nov. 5, 2021 (\$M) | Implementation Approval <sup>10</sup> (\$M) | Variance to Application [B-A] | Prior Report's Forecast of Dec. 30, 2022 (\$M) | Current Forecast as of Jun. 30, 2023 (\$M) | Variance to Prior Report (\$M) [E-D] | Variance to Application (\$M) [E-A] | Variance to Application % [G/A] | Actuals to Jun. 30, 2023 (\$M) | % of Current Forecast [I/E] | % of Application [I/A] |
| 1       | Pre-Implementation Phase Costs<br>Excluding Interest During Construction and Capital Overhead |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
|         | <b>Implementation Phase Costs</b>   |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
|         | <b>Direct Construction Costs</b>  |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 2       | Site Work, Temporary Work, Foundation & Steel Structure                                       |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 3       | Bus Work & Grounding  |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 4       | Major Equipment <sup>11</sup>   |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 5       | Gas Insulated Switchgear Feeder Building  |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 6       | Gas Insulated Switchgear  |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 7       | Protection & Control, Automation, SCADA & Telecommunication                                   |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 8       | Distribution  |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |

<sup>9</sup> Due to the use of rounded numbers, certain columns and rows may not calculate precisely to the numbers provided.  
<sup>10</sup> Implementation Approval refers to cost breakdown for the Expected Amount and Authorized Amount that are approved by the BC Hydro Board of Directors, as of the end of the Reporting Period. The basis for the Implementation Approval shown here is the updated preliminary estimate as of September 16, 2022.  
<sup>11</sup> Includes power transformers, instrument transformers, station service transformers, current limiting reactors, neutral reactors, surge capacitors, disconnect switches, and surge arresters.

| Row No. | Description   | Estimate Analysis  |   |                               | Forecast Analysis                              |  |                                      |                                     |                                 | Actuals Analysis               |                             |                        |
|---------|---|--|---|-------------------------------|--|--|--------------------------------------|-------------------------------------|---------------------------------|--------------------------------|-----------------------------|------------------------|
|         |   | A  | B   | C                             | D  | E  | F                                    | G                                   | H                               | I                              | J                           | K                      |
|         |   | Project Cost Range in Application dated Nov. 5, 2021 (\$M) | Implementation Approval <sup>10</sup> (\$M) | Variance to Application [B-A] | Prior Report's Forecast of Dec. 30, 2022 (\$M) | Current Forecast as of Jun. 30, 2023 (\$M) | Variance to Prior Report (\$M) [E-D] | Variance to Application (\$M) [E-A] | Variance to Application % [G/A] | Actuals to Jun. 30, 2023 (\$M) | % of Current Forecast [I/E] | % of Application [I/A] |
| 9       | Asset Dismantle and Removal                                   |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 10      | General Construction Requirements                             |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 11      | <b>Total Direct Construction Costs</b>                        |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
|         | <b>Indirect Construction Costs</b>                            |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 12      | General Management  |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 13      | Engineering & Design  |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 14      | <b>Total Indirect Construction Costs</b>                      |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 15      | <b>Implementation Costs Before Contingency &amp; Loadings</b> |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 16      | Contingency   |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 17      | Escalation  |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 18      | Capital Overhead  |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 19      | Interest During Construction                                  |  |   |                               |  |  |                                      |                                     |                                 |                                |                             |                        |
| 20      | <b>BC Hydro Expected Amount</b>                               | 114.4  | 129.5                                       | 15.1                          | 128.7 <sup>12</sup>                            | 125.1 <sup>12</sup>                        | -3.6                                 | 10.7                                | 9                               | 14.4                           | 12                          | 13                     |

<sup>12</sup> Rows 20 and 21 do not add up to row 22 in columns D and E, for the following reason: the forecasted expected amount at completion (row 20, columns D and E) varies over the life of the project and can be less than the approved BC Hydro Expected Amount (row 20, column B). The Project Reserve and BC Hydro Authorized Amount (rows 21 and 22) cannot be increased without BC Hydro approval.

| Row No. | Description                | Estimate Analysis  |   |                               | Forecast Analysis                              |  |                                      |                                     |                                 | Actuals Analysis               |                             |                        |
|---------|----------------------------|--|---|-------------------------------|--|--|--------------------------------------|-------------------------------------|---------------------------------|--------------------------------|-----------------------------|------------------------|
|         |                            | A  | B   | C                             | D  | E  | F                                    | G                                   | H                               | I                              | J                           | K                      |
|         |                            | Project Cost Range in Application dated Nov. 5, 2021 (\$M) | Implementation Approval <sup>10</sup> (\$M) | Variance to Application [B-A] | Prior Report's Forecast of Dec. 30, 2022 (\$M) | Current Forecast as of Jun. 30, 2023 (\$M) | Variance to Prior Report (\$M) [E-D] | Variance to Application (\$M) [E-A] | Variance to Application % [G/A] | Actuals to Jun. 30, 2023 (\$M) | % of Current Forecast [I/E] | % of Application [I/A] |
| 21      | Project Reserve (Loaded)   | 28.9   | 26.8  | -2.1                          | 26.8 <sup>13</sup>                             | 26.8                                       | 0.0                                  | -2.1                                | -7                              | 0.0                            | 0                           | 0                      |
| 22      | BC Hydro Authorized Amount | 143.3 <sup>14</sup>  | 156.3 <sup>15</sup>                         | 13.0                          | 156.3  | 156.3                                      | 0.0                                  | 13.0                                | 9                               | 14.4                           | 9                           | 10                     |
| 23      | Project Cost Range         | 143.3 - 91.5   | 148.9-116.6                                 |                               |  |  |                                      |                                     |                                 |                                |                             |                        |

<sup>13</sup> While preparing this Report, we noticed that the forecast project reserve in [Table 4](#) (column E, row 21) provided in Report No. 2 was incorrectly stated as the difference between the BC Hydro Authorized Amount (row 22) and the Forecast Expected Amount (row 20). In [Table 4](#) herein, we have amended the project reserve in column D to match the Implementation Approval amount (column B), as there have been no changes to project reserve since Implementation Approval. In [Table 5](#), row 21, we have amended the cost variance explanation for Progress Report No. 2 to explain that there have been no changes to the project reserve.

<sup>14</sup> Estimating accuracy range of +25%/-20% of the Expected Cost of the Implementation phase.

<sup>15</sup> Estimating accuracy range of +15%/-10% of the Expected Cost of the Implementation phase.



### 5.1.1 Project Cost Variance Explanation

The table below provides the reasons for the variances between the Application dated November 5, 2021, and the forecast as of June 30, 2023, for variances greater than \$1.0 million.

**Table 5 Cost Variance Explanation for Forecast as of June 30, 2023**

| Row in <a href="#">Table 4</a> | Explanation <sup>16</sup>   | Variance to Application (\$M) |
|--------------------------------|---|-------------------------------|
| 1                              | <ul style="list-style-type: none"> <li>• <u>Progress Report No. 1</u>: \$█ million decrease due to Definition phase contingency not being spent/utilized, and engineering design underspent. Reflected in updated preliminary design estimate of September 16, 2022;</li> <li>• <u>Progress Report No. 2</u>: \$█ million decrease due to further Definition phase engineering design underspent; and</li> <li>• <u>Progress Report No. 3</u>: \$█ million increase due to (1) \$█ million of resin impregnated paper bus (row 3) for Stage 1 (Design) was advanced as part of pre-Implementation (row 1), (2) \$█ million of gas insulated switchgear (row 6) for Stage 1 (Design) was advanced as part of pre-Implementation (row 1), (3) \$█ million decrease due to forecasting Partial Implementation phase engineering design underspend, and (4) \$█ million increase due to other miscellaneous trailing pre-Implementation costs being greater than expected.</li> </ul> | █                             |
| 2                              | [REDACTED]  | █                             |

<sup>16</sup> Due to the use of rounded numbers, totals may not calculate precisely to the numbers provided.

| Row in<br><a href="#">Table 4</a> | Explanation <sup>16</sup> | Variance to<br>Application<br>(\$M) |
|-----------------------------------|---------------------------|-------------------------------------|
| 3                                 | [REDACTED]                | [REDACTED]                          |
| 5                                 | [REDACTED]                | [REDACTED]                          |

<sup>17</sup> BC Hydro recently completed the installation of new gas insulated switchgear feeders at Barnard substation in Burnaby. The gas insulated switchgear building types for the Barnard project and the Mainwaring project are similar.

| Row in<br><a href="#">Table 4</a> | Explanation <sup>16</sup>   | Variance to<br>Application<br>(\$M) |
|-----------------------------------|---|-------------------------------------|
| 6                                 | [REDACTED]  | [REDACTED]                          |
| 8                                 |   | [REDACTED]                          |
| 9                                 |   | [REDACTED]                          |
| 10                                |   | [REDACTED]                          |
| 16                                | <ul style="list-style-type: none"> <li>Progress Report No. 3: \$[REDACTED] million decrease due to contingency draws for some of the increases to direct construction costs.</li> </ul> | [REDACTED]                          |

| Row in<br><a href="#">Table 4</a> | Explanation <sup>16</sup>  | Variance to<br>Application<br>(\$M) |
|-----------------------------------|--|-------------------------------------|
| 17                                | <ul style="list-style-type: none"> <li>• <u>Progress Report No. 1</u>: \$█ million decrease due to Project progression, primarily: refined cash flow for Implementation phase, elimination of escalation for Definition phase as it is now complete, and reduction in contingency. Reflected in updated preliminary design estimate of September 16, 2022;</li> <li>• <u>Progress Report No. 2</u>: \$█ million decrease due to reallocation to contingency (row 16) and \$█ million decrease due to reduced forecast, and</li> <li>• <u>Progress Report No. 3</u>: \$█ million decrease due to realization of escalation to implementation costs (rows 3, 4, 5, 6, 8, and 13 due to contract awards.</li> </ul> | █                                   |
| 19                                | <ul style="list-style-type: none"> <li>• <u>Progress Report No. 1</u>: \$█ million increase due to increased implementation costs before contingency and loadings (line 15), extended in-service date, and increased interest during construction rates;</li> <li>• <u>Progress Report No. 2</u>: \$█ million decrease due to decrease in forecast Expected Amount; and</li> <li>• <u>Progress Report No. 3</u>: \$█ million decrease due to decrease in forecast Expected Amount.</li> </ul>  | █                                   |
| 21                                | <ul style="list-style-type: none"> <li>• <u>Progress Report No. 1</u>: \$█ million decrease due to Project progression resulting in a decrease in the P90-P50 estimate. Partially offset by a \$█ million increase due to the addition of a special reserve for price escalation risk; and</li> <li>• <u>Progress Report Nos. 2 through 3</u>: No change.</li> </ul>   | █                                   |

## 5.2 Summary of Individual Contracts Exceeding \$3.0 million

As noted in section [2.2.2](#), BC Hydro awarded the site preparation and gas insulated switchgear feeder building construction to Graham Infrastructure Ltd. during the Reporting Period. Accordingly, Graham Infrastructure Inc. has been added to [Table 6](#) below.

**Table 6 Summary of Contracts Exceeding \$3.0 million<sup>18</sup>**

| Description of Supplier and Scope of Work  | Initial Contract Value <sup>19</sup> (\$M) |                                      |       | Expected Equitable Adjustment <sup>20</sup> (\$M) | Expected Forecast Contract Cost (\$M) | Actuals to End of Reporting Period (\$M) |
|--|--|--------------------------------------|-------|---|---------------------------------------|--|
|  | Stage 1 (Design)                           | Stage 2 (Supply and/or Installation) | Total |   |                                       |  |
| Hyundai Electric Energy System Co c/o Hyundai Electric America Corp.<br>Power Transformer                              |  |                                      |       |   |                                       |  |
| ABB Inc.<br>Medium Voltage Gas-Insulated Switchgear  |  |                                      |       |   |                                       |  |
| MindCore Technologies Inc.<br>25kV Resin Impregnated Paper Bus   |  |                                      |       |   |                                       |  |
| Graham Infrastructure Inc.<br>Site Preparation and Gas Insulated Switchgear Feeder Building Construction <sup>21</sup> |  |                                      |       |   |                                       |  |
| <b>Total</b>   |  |                                      |       |   |                                       |  |

<sup>18</sup> Numbers may not add up due to rounding.

<sup>19</sup> Estimated value at the time the contract was awarded.

<sup>20</sup> While preparing this Report, we noticed that prior progress reports erroneously reported values for Expected Equitable Adjustment that matched the Expected Forecast Contract Cost. In this report, we have corrected the Expected Equitable Adjustment to be the difference between the Initial Contract Value and the Expected Forecast Contract Cost.

<sup>21</sup> This contractor is referred to as the civil general contractor.

## 6 Project Risks

This section describes the material Project risks that have potential to impact the Project.<sup>22</sup> Over the life of the Project, risks and associated risk treatments are and will be identified, analyzed, monitored, and reviewed, in accordance with BC Hydro's project management practices and procedures.

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<sup>22</sup> BC Hydro defines "material" in this case to be any risk with a pre-treatment risk level in the Executive Risk zone, as identified in the Project Delivery Risk Matrix, which was provided in Appendix O of the Application.

**Table 7 Summary of Material Project Risks and Treatments**

| From Application dated Nov 5, 2021 |                           |   |                  |  |  | Updated for Reporting Period ending June 30, 2023 |  |                       |  |
|------------------------------------|---------------------------|---|------------------|--|--|---|--|-----------------------|--|
| 1                                  | 2                         | 3   | 4                | 5  | 6  | 7   | 8  | 9                     | 10   |
| Section in Application             | Risk Status <sup>23</sup> | Description of Risk Event and Consequence   | Consequence Type | Risk Level   | Residual Risk Level  | Risk Status                                       | Risk Treatments (Identified in the Application or New)                                       | Treatment Status      | Residual Risk Level  |
| 6.3.1                              | Identified                | <b>Risk of this Regulatory Proceeding Impacting the Project Schedule</b><br>BC Hydro expects to proceed to the Implementation phase of the Project by October 2022 in order to meet the PCB removal timeline. BC Hydro is requesting a decision from the BCUC on whether to grant a CPCN for the Project no later than August 2022. | Financial Loss   | 10<br><b>Probability:</b><br>Possible (L6)<br><b>Severity:</b><br>\$10M to \$100M (S4)         | 8<br><b>Probability:</b><br>Very Unlikely (L4)<br><b>Severity:</b><br>\$10M to \$100M (S4)         | Closed  | Comprehensive Application.   | Complete              | 8<br><b>Probability:</b><br>Very Unlikely (L4)<br><b>Severity:</b><br>\$10M to \$100M (S4)         |
|                                    |                           |   |                  |  |  |   | Regulatory schedule allows for a decision by August 2022.                                    | Complete              |  |
|                                    |                           |   |                  |  |  |   | Include a three-month contingency to mitigate impact from the regulatory proceeding.         | Complete              |  |
|                                    |                           |   |                  |  |  |   | Prepare contingency plan to remove PCB-containing equipment to meet the regulatory timeline  | Complete              |  |
| 6.3.2                              | Identified                | <b>Risk of Transformer Failure</b><br>Due to the age and condition of the T1 and T3 power transformers, there is a risk of failure and loss of equipment redundancy, resulting in an increased risk of service loss.  | Reliability      | 10<br><b>Probability:</b><br>Possible (L6)<br><b>Severity:</b><br>Localized load shedding (S4) | 8<br><b>Probability:</b><br>Very Unlikely (L4)<br><b>Severity:</b><br>Localized load shedding (S4) | Identified  | <del>Install the new T5 transformer on a temporary pad prior to putting T4 in service.</del> | Removed <sup>24</sup> | 8<br><b>Probability:</b><br>Very Unlikely (L4)<br><b>Severity:</b><br>Localized load shedding (S4) |
|                                    |                           |   |                  |  |  |   | Advance design of the transformers from the Implementation phase to the Definition phase.    | Complete              |  |
|                                    |                           |   |                  |  |  |   | New: Implement preventive maintenance for early warning                                      | In Progress           |  |

<sup>23</sup> Instances of “Active” risk status in the Application were errors because “Active” means that the risk event had occurred, and the consequence may or may not have occurred. The correct risk status is “Identified” because the risk event had been identified and had not occurred and treatment plans may still have been in development.

<sup>24</sup> As noted in BC Hydro’s response to BCUC IR 1.19.1, the updated construction staging plan no longer requires the temporary installation of T5 to maintain redundancy of supply during construction. Instead, BC Hydro will maintain redundancy of supply to all customers throughout the Project construction period by planning transformer outages during off peak seasons and using the transfer capacity available on the distribution system during those seasons.

| From Application dated Nov 5, 2021 |                           |   |                  |  |   | Updated for Reporting Period ending June 30, 2023 |  |                  |   |
|------------------------------------|---------------------------|---|------------------|--|---|---|--|------------------|---|
| 1                                  | 2                         | 3   | 4                | 5  | 6   | 7   | 8  | 9                | 10  |
| Section in Application             | Risk Status <sup>23</sup> | Description of Risk Event and Consequence   | Consequence Type | Risk Level   | Residual Risk Level   | Risk Status                                       | Risk Treatments (Identified in the Application or New)   | Treatment Status | Residual Risk Level   |
|                                    |                           |   |                  |  |   |   | signals of any incipient fault until the transformers are replaced.  |                  |   |
|                                    |                           |   |                  |  |   |   | New: If findings from preventative maintenance indicate any increased risk of failure of T1 or T3 prior to the completion of the project, implement enhanced surveillance. <sup>25</sup> | Planned          |   |
| 6.3.3                              | Identified                | <p><b>Risk of Sunk Costs Associated with Early Equipment Procurement</b></p> <p>In order to meet the PCB removal deadline, BC Hydro will place orders for long lead time equipment prior to BCUC's decision on whether to grant a CPCN for the Project and prior to approval from BC Hydro's Board of Directors of Full Implementation Funding. This could result in sunk costs for this equipment.</p> | Financial Loss   | 10<br><b>Probability:</b> Possible (L6)<br><b>Severity:</b> \$10M to \$100M (S4) | 8<br><b>Probability:</b> Remote (L5)<br><b>Severity:</b> \$1M to \$10M (S3) | Closed  | <p>Stage the award of the long lead time equipment contracts.</p> <ul style="list-style-type: none"> <li>• Include an exit clause in the Stage 1 contract.</li> </ul>                    | Complete         | 8<br><b>Probability:</b> Remote (L5)<br><b>Severity:</b> \$1M to \$10M (S3) |

<sup>25</sup> This update has been added to reflect BC Hydro's responses to BCUC Staff Information Request No.1, that was filed on April 11, 2023.



| From Application dated Nov 5, 2021 |                           |  |                  |   |  | Updated for Reporting Period ending June 30, 2023 |  |                  |   |
|------------------------------------|---------------------------|--|------------------|---|--|---|--|------------------|---|
| 1                                  | 2                         | 3  | 4                | 5   | 6  | 7   | 8  | 9                | 10  |
| Section in Application             | Risk Status <sup>23</sup> | Description of Risk Event and Consequence  | Consequence Type | Risk Level  | Residual Risk Level  | Risk Status                                       | Risk Treatments (Identified in the Application or New)   | Treatment Status | Residual Risk Level   |
| 6.4.1                              | Identified                | <b>Risk of Missing PCB Deadline due to Schedule Delays</b><br>There is a risk that equipment containing PCBs will not be removed by the deadline of December 31, 2025, resulting in non-compliance with PCB Regulations and fines.   | Reputational     | <b>11</b><br><b>Probability:</b> Possible (L6)<br><b>Severity:</b> Loss of trust (S5) | <b>10</b><br><b>Probability:</b> Remote (L5)<br><b>Severity:</b> Loss of trust (S5)  | Identified  | <ul style="list-style-type: none"> <li>Complete critical Implementation phase work in the Definition phase.</li> </ul>   | Complete         | <b>9</b><br><b>Probability:</b> Very Unlikely (L4)<br><b>Severity:</b> Loss of trust (S5) |
|                                    |                           |  |                  |   |  |   | <ul style="list-style-type: none"> <li>Procure long lead time equipment early.</li> </ul>  | Complete         |   |
|                                    |                           |  |                  |   |  |   | <ul style="list-style-type: none"> <li>Prioritize construction work for PCB removal; <u>schedule replacement of PCB-contaminated power transformer T1 in 2024.</u><sup>26</sup></li> </ul> | Complete         |   |
|                                    |                           |  |                  |   |  |   | <ul style="list-style-type: none"> <li>Prepare a contingency plan for removal of PCB-containing equipment to meet the regulatory timeline.</li> </ul>                                      | In Progress      |   |
| 6.4.2                              | Identified                | <b>Risk of Worker Injury in an Energized Substation</b><br>There is a risk of a worker or equipment violating the Limits of Approach requirements while working in the energized substation, resulting in worker injury or fatality. | Safety - Worker  | <b>10</b><br><b>Probability:</b> Remote (L5)<br><b>Severity:</b> Fatality (S5)        | <b>9</b><br><b>Probability:</b> Very Unlikely (L4)<br><b>Severity:</b> Fatality (S5) | Identified  | <ul style="list-style-type: none"> <li>BC Hydro maintains role of Prime Contractor.</li> </ul>   | In Progress      | <b>9</b><br><b>Probability:</b> Very Unlikely (L4)<br><b>Severity:</b> Fatality (S5)      |
|                                    |                           |  |                  |   |  |   | <ul style="list-style-type: none"> <li>Require mandatory Power System Safety Protection and local component training for workers working within the substation.</li> </ul>                 | In Progress      |   |
|                                    |                           |  |                  |   |  |   | <ul style="list-style-type: none"> <li>Provide workers with the proper training and work methods.</li> </ul>   | In Progress      |   |

<sup>26</sup> For more information about the decision to replace PCB-contaminated power transformer T1 in 2024, please refer to section [2.3](#).

| From Application dated Nov 5, 2021 |                           |   |                  |            |                     | Updated for Reporting Period ending June 30, 2023 |   |   |                     |
|------------------------------------|---------------------------|---|------------------|------------|---------------------|---|---|---|---------------------|
| 1                                  | 2                         | 3   | 4                | 5          | 6                   | 7   | 8   | 9   | 10                  |
| Section in Application             | Risk Status <sup>23</sup> | Description of Risk Event and Consequence | Consequence Type | Risk Level | Residual Risk Level | Risk Status                                       | Risk Treatments (Identified in the Application or New)  | Treatment Status  | Residual Risk Level |
|                                    |                           |   |                  |            |                     |   | <ul style="list-style-type: none"> <li>• Use mostly BC Hydro internal resources for high-risk work within the energized substation.</li> <li>• Review contractor's safety management plan to ensure robust safe work procedures.</li> <li>• Coordinate the sequencing of construction tasks to reduce the overlap of activities that may be hazardous.</li> <li>• Use physical barriers, warning tapes and signage to isolate live equipment and only allow work in designated areas.</li> <li>• Use a safety watcher to oversee work where unqualified workers distance cannot be maintained.</li> </ul> | In Progress<br><br>In Progress<br><br>In Progress<br><br>Planned<br><br>Planned |                     |

| From Application dated Nov 5, 2021 |                           |   |                  |   |   | Updated for Reporting Period ending June 30, 2023 |   |                  |   |
|------------------------------------|---------------------------|---|------------------|---|---|---|---|------------------|---|
| 1                                  | 2                         | 3   | 4                | 5   | 6   | 7   | 8   | 9                | 10  |
| Section in Application             | Risk Status <sup>23</sup> | Description of Risk Event and Consequence   | Consequence Type | Risk Level  | Residual Risk Level   | Risk Status                                       | Risk Treatments (Identified in the Application or New)  | Treatment Status | Residual Risk Level   |
| 6.4.3                              | Identified                | <b>Risk of Noise Level Exceeding City Bylaw Limits</b><br>There is a risk that the noise level will be above 45 dBA after installation of the new transformers resulting in complaints from the community.  | Reputational     | <b>11</b><br><b>Probability:</b> Possible (L6)<br><b>Severity:</b> Loss of trust (S5) | <b>7</b><br><b>Probability:</b> Possible (L6)<br><b>Severity:</b> Limited Complaints to Company or Shareholder (S1) | Identified  | <ul style="list-style-type: none"> <li>Specify and order low noise level (70/72 dBA) transformers.</li> </ul>   | Complete         | <b>7</b><br><b>Probability:</b> Possible (L6)<br><b>Severity:</b> Limited Complaints to Company or Shareholder (S1) |
|                                    |                           |   |                  |   |   |   | <ul style="list-style-type: none"> <li>Make provision for total tank sound enclosure.<sup>27</sup></li> </ul>   | Complete         |   |
|                                    |                           |   |                  |   |   |   | <ul style="list-style-type: none"> <li>If after installation, noise levels exceed the bylaw noise threshold, BC Hydro will install the total tank sound enclosure to further reduce the noise level at the substation property line.</li> </ul> | Planned          |   |
| Added in Progress Report No. 2     |                           | <b>Risk of Increased Distribution Material and Installation Effort</b><br>Due to the results of more detailed design studies during the Reporting Period, there is a risk of needing additional duct banks and inspection holes. This increase in distribution material and effort may result in increased cost and schedule. | Financial Loss   | <b>9</b><br><b>Probability:</b> Likely (L7)<br><b>Severity:</b> \$100K to \$1M (S2)   |   | Active  | <ul style="list-style-type: none"> <li>Estimate cost and schedule impact.</li> </ul>  | Complete         | <b>6</b><br><b>Probability:</b> Very Unlikely (L4)<br><b>Severity:</b> \$100K to \$1M (S2)                          |
|                                    |                           |   |                  |   |   |   | <ul style="list-style-type: none"> <li>Review assumptions of detailed design studies.</li> </ul>  | Complete         |   |
|                                    |                           |   |                  |   |   |   | <ul style="list-style-type: none"> <li>Assess options to reduce severity.</li> </ul>  | Complete         |   |

<sup>27</sup> The cost of the total tank sound enclosure is included as part of the Project contingency, consistent with BC Hydro's response to RCIA IR 1.22.2.1.3.

# **BC Hydro Mainwaring Substation Upgrade Project**

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## **Appendix A**

### **Record of Material Changes**

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This Appendix provides a summary record of the material changes that have been reported to the BCUC.

### **BC Hydro Directed to File Material Change Reports**

On August 16, 2022, the BCUC issued Order No. C-4-22 granting a CPCN to BC Hydro for the Project. In the Order, the BCUC directed BC Hydro to file a Material Change report in the event of a change to BC Hydro's plan for the Project that would reasonably be expected to have a significant impact on the schedule, cost, or scope, such that:

- There is a schedule delay of greater than six months compared to the schedule provided in Table 4-4 of the Application;
- The total Project cost exceeds 10% of the estimated Project cost provided in Table 4-2 of the Application; or
- There is a change to the Project scope provided in Chapter 4 of the Application.

BC Hydro must file a Material Change report as soon as practicable and in any event within 30 days of the date on which the material change occurs.

BC Hydro will seek changes to the above directive in its Request to Amend Major Capital Projects Filing Guidelines proceeding. This includes proposed changes to the reporting structure, which will be more aligned with BC Hydro's internal project management change control procedures (e.g., reporting to the BCUC changes to a project schedule, cost, and scope that are also required to be reported to BC Hydro's Board of Directors).

### **Record of Material Changes**

This section provides a summary record of the material changes that have been filed in Material Change reports.

## Record of Material Changes Due to Schedule Delay

**Table A-1** Reported Material Changes Due to Schedule Delay

| Row in <a href="#">Table 2</a> | Description of Major Milestone                          | No. and Date of Material Change Report                      | Reported Forecast Date  | Variance to Application |
|--------------------------------|---|---|-------------------------|-------------------------|
| 5                              | Gas Insulated Switchgear Feeder Building Contract Award | Material Change Report filed August 11, 2023                | May 2023                | 7 months                |
| 8                              | Asset In-Service Date - T4 Transformer                  | Material Change Report filed August 11, 2023                | October 2025            | 13 months               |
| 9                              | PCB Equipment Removal Complete                          | Material Change Report filed October 14, 2022 <sup>28</sup> | July 2025 <sup>29</sup> | 6 months                |
| 10                             | Asset In-Service Date - T5 Transformer                  | Material Change Report filed October 14, 2022 <sup>28</sup> | October 2025            | 7 months                |
| 12                             | Project Complete  | Material Change Report filed October 14, 2022 <sup>28</sup> | June 2028               | 8 months                |

## Record of Material Changes Due to Project Cost Increase

**Table A-2** Reported Material Changes Due to Project Cost Increases

| Description                | No. and Date of Material Change Report | Reported Authorized Cost (\$M) |
|----------------------------|--|--------------------------------|
| BC Hydro Authorized Amount | N/A                                    | None                           |

## Record of Material Changes Due to Change to the Project Scope

**Table A-3** Reported Material Changes Due to Project Cost Increases Reported

| Application Section No. and Heading | No. and Date of Material Change Report | Reported Explanation of Scope Change |
|-------------------------------------|--|--------------------------------------|
| N/A                                 | N/A                                    | None                                 |

<sup>28</sup> This Material Change Report was filed as part of Progress Report No. 1 on October 14, 2022.

<sup>29</sup> The current forecast for this milestone was advanced in this Reporting Period to June 2024, as discussed section [2.3](#) and section [4](#).

# **BC Hydro Mainwaring Substation Upgrade Project**

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## **Appendix B**

### **Site Photographs**

**Figure B-1** Temporary 2.4-meter-high metallic fence installed on south side of the property, January 2023



**Figure B-2** Temporary parking area constructed on north side of the property, January 2023





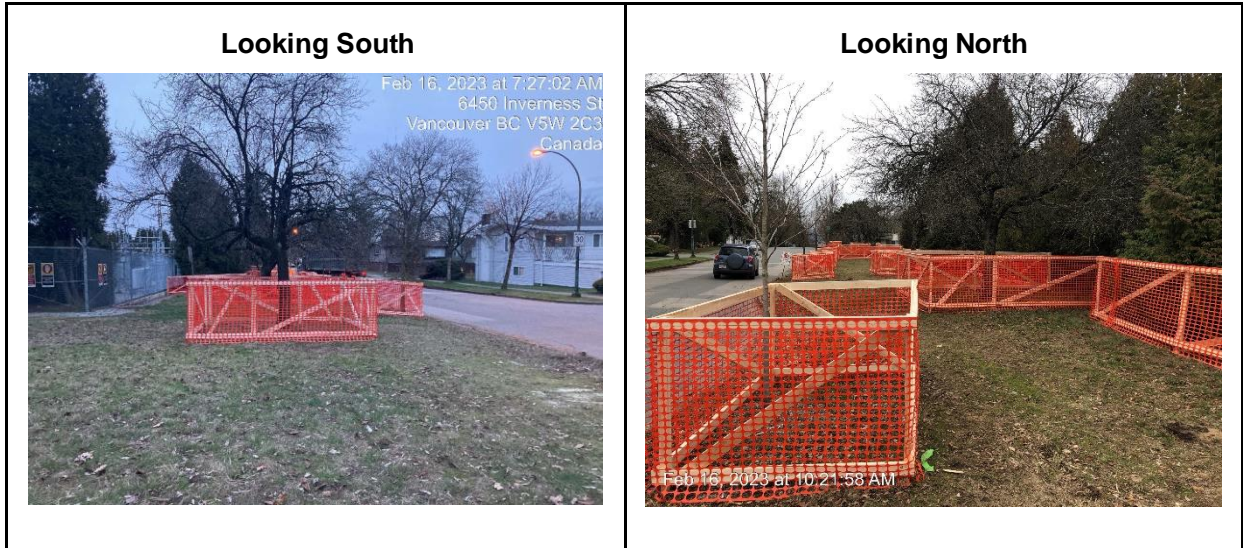
**Figure B-3** Excavator removing cut trees, south side of the property looking east, February 2023



**Figure B-4** Disturbed soil covered with straw for erosion and sediment control, south side of the property, February 2023



**Figure B-5 Tree protection fencing, west side of the property, February 2023**



**Figure B-6 Removal of the existing microwave tower, southeast corner of substation, February 2023**



**Figure B-7** Excavation of soil for the new gas insulated switchgear feeder building on the south-west side of the substation property, June 2023



**Figure B-8** Installation of new four way distribution maintenance hole, June 2023



**Figure B-9** Installation of new distribution duct bank,  
June 2023

