

Chris Sandve
Chief Regulatory Officer
Phone: 604-623-3726
Fax: 604-623-4407
bchydroregulatorygroup@bchydro.com

February 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. 1599245
British Columbia Utilities Commission (BCUC)
British Columbia Hydro and Power Authority (BC Hydro)
Bridge River 1 Units 1 to 4 Generator Replacement Project
PUBLIC Semi-Annual Progress Report No. 1
July 1, 2022 to December 31, 2022 (Semi-Annual Report)**

BC Hydro writes in compliance with BCUC Order Nos. C-6-22 and G-310-22 to provide its public Semi-Annual Report for the Project. Commercially sensitive and contractor-specific information has been redacted pursuant to section 42 of the *Administrative Tribunals Act* and Part 4 of the Commission's Rules of Practice and Procedure.

A confidential version of the Report is being filed with the Commission only under separate cover.

For further information, please contact Joe Maloney at 604-623-4348 or by email at bchydroregulatorygroup@bchydro.com.

Yours sincerely,



Chris Sandve
Chief Regulatory Officer

bm/rh

Enclosure

**BC Hydro Bridge River 1 Units 1 to 4
Generator Replacement Project**

Semi-Annual Progress Report No. 1

F2023 Six Month Period

July 2022 to December 2022

PUBLIC

Table of Contents

1	Background	1
1.1	Project Overview	1
1.2	BCUC Application and Decision	1
2	Project Status	3
2.1	General Project Status	3
2.2	Major Accomplishments and Work Completed	4
2.2.1	Procurement Activities	4
2.2.2	Contract Management Activities	5
2.2.3	Engineering and Design	5
2.2.4	Construction Activities	6
2.2.5	Environment and Archaeology	6
2.2.6	First Nations	6
2.2.7	Public Engagement	7
2.2.8	Regulatory, Permits, and Authorizations	7
2.3	Project Challenges	7
2.4	Plans for Next Six Months	8
3	Scope Change Summary	8
4	Project Schedule	9
4.1	Schedule Variance Explanation for Forecast as of June 30, 2022	10
5	Project Cost	10
5.1	Project Cost Summary as of December 31, 2022	10
5.1.1	Project Cost Variance Explanation	12
5.2	Summary of Individual Contracts Exceeding \$3.0 million	13
6	Project Risks	13

List of Tables

Table 1	Project Status Dashboard	4
Table 2	Project Major Milestones as of December 31, 2022	9
Table 3	Schedule Variance Explanation for Forecast as of December 31, 2022	10
Table 4	Project Expenditure Summary – Application, Forecast and Actual Cost as of December 31, 2022	11
Table 5	Cost Variance Explanation for Forecast as of December 31, 2022	12
Table 6	Summary of Material Project Risks and Treatments	14

1 Background

1.1 Project Overview

The Bridge River Generation System is located in the Coast Mountains of southern British Columbia, northeast of Pemberton and west of Lillooet. It was built between 1948 and 1960 and is a cascading system that includes three facilities: the La Joie Facility, the Bridge River Facility, and the Seton Facility, which collectively contribute approximately five per cent of BC Hydro's total annual hydroelectric generation. The Bridge River Facility is the largest of the facilities in the Bridge River Generation System and consists of Terzaghi Dam, Carpenter Reservoir, Bridge River 1 Generating Station (**BR1**) and Bridge River 2 Generating Station (**BR2**).

At BR1, the generators and governors are in unsatisfactory and poor condition respectively, the exciters are approaching end-of-life and the control systems are obsolete. These Bridge River generating units are the primary means for BC Hydro to manage water flows in Lower Bridge River. The generating units at the Bridge River Facility have been de-rated and the reduced elevation of the Downton reservoir has challenged BC Hydro's ability to manage flows within the WUP Order target flow schedule. Failure to manage water flows within the 2011 Bridge River – Seton WUP Order target flow schedule can impact fish, fish habitat and the St'át'imc Nation's values.

The BR1 Project (the **Project**) will replace the Unit 1 to 4 generators, governors, exciters, and control systems. The Project will improve the reliability of generating Units 1 to 4, improve BC Hydro's ability to manage water flows to comply with the WUP Order target flow schedule, and meet commitments in the 2011 Agreements and the 2019 High Flow Settlement Agreement with the St'át'imc Nation.

1.2 BCUC Application and Decision

On July 23, 2021, British Columbia Hydro and Power Authority (**BC Hydro**) filed an application with the British Columbia Utilities Commission (**BCUC**) seeking a

1 Certificate of Public Convenience and Necessity (**CPCN**) for the Project
2 (**Application**).¹ At the time of the Application, the Project had a total cost estimate
3 range of \$207.1 million to \$326.3 million, with an expected in-service date of
4 July 2030.

5 On October 11, 2022, the BCUC issued Decision and Order No. C-6-22, granting
6 BC Hydro a CPCN for the Project subject to the following conditions:

- 7 a. Consistent with BC Hydro commitments to the St’át’imc
8 Nation, with respect to in-season flow management
9 decisions to facilitate the construction of the BR1 Project,
10 BC Hydro shall work with the Joint Planning Forum
11 consistent with the mutually agreed to Terms of Reference
12 established between BC Hydro and the St’át’imc Authority
13 and give due consideration to water level and flow impacts
14 and water needs related to: Fish and fish habitat; Wildlife
15 and wildlife habitat; Soil erosion; St’át’imc use of the land
16 and resources in the area; and St’át’imc cultural activities in
17 the area; and
- 18 b. Consistent with BC Hydro’s commitments to the St’át’imc
19 Nation, BC Hydro, in collaboration with the Tsal’alh and
20 SCC, will make best efforts to ensure compliance, monitoring
21 and enforcement of the Bridge River Contract Worker
22 Conduct Requirements and the Bridge River Internal Review
23 Procedure for Code of Conduct Violations.

24 In Appendix A to Decision and Order No. C-6-22, the BCUC directed BC Hydro to
25 file: semi-annual progress reports and also a Material Change report in the event of
26 a change to BC Hydro’s plan as set out in the Application that would reasonably be
27 expected to have a significant impact on the Project (i.e., a schedule delay of greater
28 than six months, the total Project cost exceeding 10% of the estimated Project cost,
29 or a change to the Project scope).

¹ The Application was a joint application for the Project and for the Bridge River Transmission Project pursuant to Order G-246-20. Order C-6-22 discussed here is for the Project only. The review and decision for the Bridge River Transmission Project is subject to further process.

1 BC Hydro files Progress Report No. 1 (**Report**), which provides an update on the
2 Project covering the period ending December 31, 2022 (**Reporting Period**). The
3 Report complies with project reporting requirements for semi-annual progress
4 reports and will include the Project's scope, cost, schedule, risks and ongoing
5 consultation and mitigation plans.

6 **2 Project Status**

7 **2.1 General Project Status**

8 [Table 1](#) provides a high-level status update for the Project.

1 **Table 1 Project Status Dashboard²**

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

Status as of:		December 31, 2022
Project Status	G	The Project is currently in Definition phase. The Project is on track to complete Definition phase activities at the forecasted date of July 2023.
Safety	G	There were no safety incidents during this Reporting Period.
Scope	G	There were no material changes in Project scope during this Reporting Period.
Schedule	G	The public Request for Proposals for the replacement Unit 1 to 4 generators is forecasted to close by mid-February 2023. This is 11 months later than previously forecasted as explained in section 4.1. Completion of all Definition phase deliverables and endorsement from the BC Hydro Gate Board, and approval from the BC Hydro Board of Directors to proceed to Implementation phase, is forecasted to be delayed from April 2023 to July 2023. The schedule status is green as the Project remains on track to complete the Definition phase at the forecasted date, and to achieve the first unit In-Service Date of May 2027.
Cost	G	The cost estimate continues to be within the range presented in the CPCN for the Project.
First Nations	G	Engagement continues with the St’át’imc Nation on procurement opportunities, as well as the Bridge River Industrial Workers Accommodations and Access Assessment (this study is for all projects on the Bridge River system). to develop recommendations for worker accommodation and transportation of equipment and materials to and from the site.
Stakeholder Engagement	G	There were no new issues identified during this reporting period. Regular contact is maintained with external stakeholders through meetings, presentations, open houses, semi-annual newsletters and delegations to local governments.
Environment	G	There were no new issues identified during this Reporting Period.

3 **2.2 Major Accomplishments and Work Completed**

4 **2.2.1 Procurement Activities**

5 BC Hydro initiated procurement for the design, and supply and installation of the
6 replacement Unit 1 to 4 generators in Definition phase. The public Request for

² 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.

1 Proposals (**RFP**) for the replacement Unit 1 to 4 generators was issued to BC Bid in
2 August 2022 and is scheduled to close in mid-February 2023.

3 BC Hydro has not commenced any other procurement activities for the Project in this
4 Reporting Period.

5 **2.2.2 Contract Management Activities**

6 There has been no equipment supply or site construction contracts awarded to date.
7 Two small engineering services contracts were awarded.

8 **2.2.3 Engineering and Design**

9 During the Reporting Period, the following engineering work was advanced:

- 10 • A Safety by Design review at site to be included as input to the engineering
11 specifications and other Project documents, the mechanical, electrical,
12 protections and controls, and civil aspects of the generator design;
- 13 • Finalized the engineering specifications including the generator specifications,
14 site conditions and construction requirements, generator deluge fire protection
15 system specification, general engineering information and Quality Assurance
16 requirements. These items were included in the replacement generators RFP
17 documents;
- 18 • Engineering support during the replacement generators RFP process. This
19 includes the site visit held with the RFP proponents and providing responses to
20 submitted questions;
- 21 • Additional engineering review of the Energy Dissipation Device (**EDD**)
22 application was completed based on inflows to the Bridge River system and
23 modelling information; and
- 24 • Engineering issued the Definition phase Preliminary Design Report.

1 **2.2.4 Construction Activities**

2 There have been no construction activities undertaken to date.

3 **2.2.5 Environment and Archaeology**

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

6 A summary of environmental activities and issues at the end of this Reporting Period
7 are:

- 8 • Outages required for replacement of BR1 generating units were reviewed and
9 endorsed by the Joint Planning Forum;³
- 10 • The BR1 generating station equipment has insulating oil containing PCBs,
11 management and disposal of hazardous waste including PCBs, Lead, Silica,
12 and Asbestos will be required during the Implementation phase;
- 13 • An archaeological overview assessment has been completed for the Project
14 area, which confirms the Project is situated on terrain with high archaeological
15 potential. An Archaeological Impact Assessment will be required in advance of
16 any ground disturbance activities such as for access roads or laydown areas;
17 and
- 18 • An Environmental Management Plan (**EMP**) has been drafted. The EMP will be
19 reviewed by the St'at'imc Nation before it is finalized.

20 **2.2.6 First Nations**

21 Engagement continues with the St'at'imc Nation on procurement opportunities.

22 Additionally, BC Hydro is working with the St'at'imc Nation to complete an access

³ The Joint Planning Forum reviews the plans for capital and maintenance projects in the Bridge River System. BC Hydro and St'at'imc each have three representatives on the forum.

1 and accommodation study that will lead to recommendations for worker
2 accommodation and transportation of equipment and materials to and from the site.

3 The RFP for the Units 1-4 generator replacement was posted in August 2022 and
4 included a minimum set aside amount to be awarded to the St'át'imc Nation
5 Designated Businesses. The St'át'imc Nation representatives have been involved in
6 site visits and vendor information sessions related to the RFP.

7 **2.2.7 Public Engagement**

8 No new issues were identified during the Reporting Period.

9 Regular contact is maintained with the Squamish Lillooet Regional District, District of
10 Lillooet, both the Bridge River and Lillooet Economic Advisory Committees and other
11 external stakeholders through semi-annual newsletters and delegations to local
12 governments to discuss both the Project and the overall capital project work on the
13 Bridge River System. During this reporting period, a delegation took place in
14 December 2022 and no questions were raised directly relating to this Project.
15 Additionally, there was a meeting with the Lillooet Chamber of Commerce in
16 October 2022 and there were questions regarding worker accommodation and the
17 potential economic benefit resulting from all Bridge River Capital projects. Public
18 stakeholders in proximity to the Project site were notified through email that a CPCN
19 for the Project was granted by the BCUC in October 2022.

20 Planning is underway for the next phase of public engagement leading up to
21 construction, which includes possible site tours for local officials, an open house,
22 and construction notifications.

23 **2.2.8 Regulatory, Permits, and Authorizations**

24 There were no permitting or authorization requirements during the Reporting Period.

25 **2.3 Project Challenges**

26 There have been no material project challenges during the Reporting Period.

2.4 Plans for Next Six Months

The Project plans to undertake the following activities in the next reporting period:

- Complete all preliminary design activities for the replacement Unit 1 to 4 generators, governors, exciters, and control systems;
- Identify and negotiate with a preferred proponent for the replacement Unit 1 to 4 generators (note that the contract will not be awarded until funding is approved);
- Develop an updated Preliminary Design Estimate that will include contract pricing for the replacement Unit 1 to 4 generators; and
- Complete all Definition phase deliverables and obtain endorsement from the BC Hydro Gate Board and approval, including Implementation Phase funding, from the BC Hydro Board of Directors to proceed to the Implementation phase.

3 Scope Change Summary

There was no approved change in scope during this Reporting Period. As discussed in section [2.2.3](#), an additional engineering review of the turbine Energy Dissipation Device was undertaken in this Reporting Period. The recommendation from this engineering review may result in a decision to not include the turbine Energy Dissipation Device described in Table 5-1 in section 5.2.1 of the Application, in the project implementation plan. The recommendation will be reviewed by the Joint Planning Forum.

Once any changes to the Project scope and any impacts on Project cost and schedule is confirmed and approved, BC Hydro will file a Material Change Report either in the next progress report or within 30 days of the change being approved by the appropriate authority within BC Hydro, whichever is earlier.

4 Project Schedule

[Table 2](#) below provides the forecast dates for the Project major milestones as of December 31, 2022, and a comparison to the Project Major Milestones provided in Table 5-5 of the Application. Variances are explained in section [4.1](#).

Table 2 Project Major Milestones as of December 31, 2022

Row No.	Description of Major Milestone	Estimated Date in Application	Actual Current Forecast	Status and Comments
1	BC Hydro files BR1 Project Application	Jul 2021	Jul 2021	Completed
2	Public Procurement Bidding for Generators Closed	Mar 2022	Feb 2023	Delayed
3	Expected BCUC Decision Date	Jul 2022	Oct 2022	Completed
4	Implementation Phase Funding Approval	Apr 2023	Jul 2023	Delayed
5	Award Contract for Generator Replacement	Jul 2023	Jul 2023	On Track
6	First Generating Unit Asset In-Service Date	May 2027	May 2027	On Track
7	Second Generating Unit Asset In-Service Date	May 2028	May 2028	On Track
8	Third Generating Unit Asset In-Service Date	May 2029	May 2029	On Track
9	Fourth Generating Unit Asset In-Service Date	May 2030	May 2030	On Track
10	BR1 Project In-Service Date	Jul 2030	Jul 2030	On Track
11	BR1 Project Complete	May 2031	May 2031	On Track

1 **4.1 Schedule Variance Explanation for Forecast as of**
2 **June 30, 2022**

3 **Table 3 Schedule Variance Explanation for**
4 **Forecast as of December 31, 2022**

	Explanation	Variance
2	Completion of a public Request for Information (RFI) and finalization of the technical specifications for the replacement Unit 1 to 4 generators were delayed, which impacts the schedule for issuance and closure of the public Request for Proposals (RFP). The internal and external work effort required for these activities was more than originally anticipated.	11 months
4	The RFP was delayed as BC Hydro decided not to proceed with the RFP until a CPCN was granted for the Project. Closure of the public RFP for the replacement Unit 1 to 4 generators was delayed as noted in the row above. Eight months of the delay is being accommodated within schedule contingency. An additional three months is required to complete activities to receive funding approval to advance to the Implementation phase.	3 months

5 **5 Project Cost**

6 **5.1 Project Cost Summary as of December 31, 2022**

7 [Table 4](#) provides the actual costs incurred to the end of the Reporting Period
8 (December 31, 2022). The table also provides the Project’s forecasted Expected
9 Amount and Authorized Amount as of December 31, 2022, and a comparison to the
10 Project Cost Range Breakdown provided in Table 5-3 of the Application.

11 Variances greater than \$1.0 million between the Project Cost Range Breakdown
12 provided in Table 5-3 of the Application (Table 4, column A) and the Project’s
13 forecast as of December 31, 2022 (Table 4, column B) are explained in
14 section [5.1.1](#).

1
2
3

Table 4 Project Expenditure Summary – Application, Forecast and Actual Cost as of December 31, 2022

Row No.	Description	Forecast Cost Analysis				Actual Cost Analysis		
		A	B	C	D	E	F	G
		Project Cost Range in Application dated July 23, 2021 (\$M)	Current Forecast as of Dec. 31, 2022 (\$M)	Variance (\$M) [B-A]	Variance (%) [C/A]	Actual to Dec. 31, 2022 (\$M)	% of Current Forecast [E/B]	% of Cost in Application [E/A]
1	Pre-Implementation Phase Costs							
	Excluding Interest During Construction and Capital Overhead							
	Implementation Phase Costs							
	Direct Construction Costs							
2	Generator 1st Unit							
3	Generator 2nd Unit							
4	Generator 3rd Unit							
5	Generator 4th Unit							
6	Governor (all units)							
7	Exciter (all units)							
8	Controls (all units)							
9	Balance of Plant (all)							
10	Total Direct Construction Costs							
	Indirect Construction Costs							
11	Project Management							
12	Engineering & Design							
13	Indigenous Relations							
14	Environment, Stakeholders & Properties							
15	Procurement and Quality Assurance							
16	Legal Costs							
17	Total Indirect Construction Costs							
18	Implementation Costs							

Row No.	Description	Forecast Cost Analysis				Actual Cost Analysis		
		A	B	C	D	E	F	G
		Project Cost Range in Application dated July 23, 2021 (\$M)	Current Forecast as of Dec. 31, 2022 (\$M)	Variance (\$M) [B-A]	Variance (%) [C/A]	Actual to Dec. 31, 2022 (\$M)	% of Current Forecast [E/B]	% of Cost in Application [E/A]
	Before Contingency & Loadings							
19	Contingency							
20	Capital Overhead							
21	Interest During Construction							
22	BC Hydro Expected Amount	243.4	248.6	5.2	2.1	12.5	5.0	5.1
23	Project Reserve	82.9	82.9	0.0	0.0	0.0	0.0	0.0
24	BC Hydro Authorized Amount	326.3	331.5	5.2	1.6	12.5	3.7	3.8

1 **5.1.1 Project Cost Variance Explanation**

2 [Table 5](#) below provides the reasons for the variances between the costs submitted in
3 the Application dated July 23, 2021, and the forecast costs as of
4 December 31, 2022.

5 **Table 5 Cost Variance Explanation for Forecast**
6 **as of December 31, 2022**

Row in Table 4	Explanation	Total Variance (\$ million)
14	<ul style="list-style-type: none"> Progress Report No. 1: Increase in Environment, Stakeholders and Properties due to inflation 	1.0
20	<ul style="list-style-type: none"> Progress Report No. 1: Increase in the Capital Overhead rate applied on the total direct construction costs. 	2.0
21	<ul style="list-style-type: none"> Progress Report No. 1: Increase in the interest rates used to estimate the interest that will be incurred over the life of a project. 	1.5

1 **5.2 Summary of Individual Contracts Exceeding \$3.0 million**

2 The public Request for Proposals (**RFP**) for the replacement Unit 1 to 4 generators
3 is scheduled to close in mid-February 2023. No other material contracts have been
4 awarded by the end of the Reporting Period.

5 **6 Project Risks**

6 This section describes the material⁴ Project risks that have the potential to impact
7 the Project and provides an update on the status of the risk and treatments provided
8 in sections 7.3 to 7.5 of the Application, where applicable.

9 Over the life of the Project, risks and associated risk treatments are and will be
10 identified, analyzed, monitored, and reviewed, in accordance with BC Hydro's
11 project management practices and procedures.

⁴ 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.

1 **Table 6 Summary of Material Project Risks and Treatments**

From Application dated July 23, 2021						Updated for Reporting Period ending December 31, 2022			
1	2	3	4	5	6	7	8	9	10
Section in Application	Risk Status	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
7.3.1	Active	Regulatory proceeding impacting the Project schedule. A BCUC Order being issued later than expected or a BCUC Order declining to issue a CPCN for the BR1 Project. BC Hydro is requesting a decision from the BCUC on whether to grant a CPCN for the Project by no later than July 2022.	Financial Loss	10 Probability: Possible (L6) Severity: \$10 M to \$100 M (S4)	9 Probability: Remote (L5) Severity: \$10 M to \$100 M (S4)	Closed	<ul style="list-style-type: none"> Comprehensive Application Overall system view and the economic value of the Bridge River System Regulatory schedule that allows for a decision by July 2022 Including a three-month schedule contingency to mitigate impact from the regulatory proceeding 	<ul style="list-style-type: none"> Complete Complete Complete Complete 	Not Applicable
7.3.2	Active	Bid Price Uncertainty from a Changing Generator Supply Market The public procurement process for generators will seek bids from	Financial Loss	11 Probability: Likely (L7) Severity: \$10 M to \$100 M (S4)	9 Probability: Possible (L6) Severity: \$1 M to \$10 M (S3)	Active	<ul style="list-style-type: none"> Estimating analysis of the anticipated range for the replacement generator contract pricing and assigning a special reserve for market risks 	<ul style="list-style-type: none"> Complete 	9 Probability: Possible (L6) Severity: \$1 M to \$10 M (S3)

**BC Hydro Bridge River 1 Units 1 to 4
Generator Replacement Project**

From Application dated July 23, 2021					Updated for Reporting Period ending December 31, 2022				
		<p>multiple generator suppliers.</p> <p>Due to the changing generator supply market, including fluctuations in commodity pricing for steel and copper, as well as the remoteness of the Bridge River area, there is a risk that bidding suppliers may not accurately estimate the scope and risks associated with the generator replacement work.</p>				<ul style="list-style-type: none"> Notify the market of the opportunity so that bids are received from a range of proponents, leading to competitive prices Market sounding activities (RFI) in advance of the request for proposal process Site visits for bidders to ensure the location remoteness will be accounted in bid pricing Familiarizing proponents with BC Hydro's practices and performance expectations through a Request for Information Comprehensive criteria for bid pricing evaluation Bid period for the public procurement process in the Definition so that 	<ul style="list-style-type: none"> Complete Complete Complete Complete In Progress In Progress 		

From Application dated July 23, 2021					Updated for Reporting Period ending December 31, 2022				
							competitive market pricing for the replacement generators can be available at the same time as the preliminary cost estimate		
7.3.3	Active	<p>Project Resources Contracting or Transmitting COVID 19</p> <p>There is a diminishing risk that a resource or resources working on the Project contracts and/or transmits COVID-19.</p> <p>This could have negative impact on the health of workers or contractors assigned to the BR1 Project. Sick or isolating workers may result in a delay in completing critical BR1 Project activities.</p>	Safety	<p>10 Probability: Likely (L7) Severity: Temporary Disability (S3)</p>	<p>8 Probability: Remote (L5) Severity: Temporary Disability (S3)</p>	Active	<ul style="list-style-type: none"> Following BC Hydro's Pandemic Response Plan which complies with the Government of B.C and Government of Canada guidelines and requirements Sharing BC Hydro's Pandemic Response Plan with the St'át'imc Nation, local governments, stakeholders and the public Proactively keeping Project resources, the St'át'imc Nation, local governments, stakeholders and the public informed about 	<ul style="list-style-type: none"> In Progress In Progress In Progress 	<p>8 Probability: Remote (L5) Severity: Temporary Disability (S3)</p>

From Application dated July 23, 2021						Updated for Reporting Period ending December 31, 2022			
						BC Hydro's response to the pandemic and plans for critical and supporting functions			
7.4.1	Identified	<p>Extension of Duration of Planned Outages</p> <p>There is a risk that contractor performance, construction delays or unanticipated events extend the required duration of planned outages, which may lead to higher flows down Lower Bridge River that exceed the WUP Order flow targets and impact fish and fish habitat.</p>	Reputational	<p>11.5</p> <p>Probability: Fairly Likely (L6.5)</p> <p>Severity: Loss of trust - regulator and/or shareholder (S5)</p>	<p>11</p> <p>Probability: Possible (L6)</p> <p>Severity: Loss of trust - regulator and/or shareholder (S5)</p>	<ul style="list-style-type: none"> Completing an outage impacts analysis and share with the St'at'imc Nation, Comptroller of Water Rights and public stakeholders Schedule planned outages after the break in period for the newly replaced generators at BR2 Schedule one planned outage per year to avoid outage overlap Start planned outages in late spring / early summer, after the spring freshet Perform constructability, staging reviews, and pre-assembly prior to 	<ul style="list-style-type: none"> Planned Planned Planned Planned 		

From Application dated July 23, 2021						Updated for Reporting Period ending December 31, 2022			
							<ul style="list-style-type: none"> starting the planned outages • Include commercial terms in supply and installation contracts • Assign a special reserve to account for supplementary environmental mitigation and monitoring costs 	<ul style="list-style-type: none"> • Planned • Planned 	
7.4.2	Identified	<p>Fire Occurring in Work Area</p> <p>There is a risk that a fire may occur in the work area as a result of construction activities involving exposed flames as the space does not have automatic fire suppression.</p>	Safety	<p>11</p> <p>Probability: Possible (L6)</p> <p>Severity: Fatality (S5)</p>	<p>7</p> <p>Probability: Remote (L5)</p> <p>Severity: Treatment by Medical Professional (S2)</p>		<ul style="list-style-type: none"> • Installing an automatic fire suppression system to protect the area of the generating station where construction activities will be carried out. Installation will be completed prior to starting construction activities; and • Requiring that all hot work procedures (e.g., welding, brazing, etc.) be completed in compliance with approved hot work permits. A 	<ul style="list-style-type: none"> • Planned • Planned 	

From Application dated July 23, 2021						Updated for Reporting Period ending December 31, 2022			
							hot work permit will require workers to have a fire watch monitoring safety hazard during these higher risk activities.		
7.4.3	Identified	<p>Increased Safety Incidents due to Constrained Layout</p> <p>The Bridge River 1 Generating Station has a constrained layout and a small assembly space. The station building also includes offices for the workers that operate and maintain the generating station which will be in use throughout the Implementation phase as at least three of the generating units will be operating regularly. There is a risk of increased safety incidents that may result in worker injury, disability or a fatality from having workers and contractors performing operating, maintenance, and construction activities</p>	Safety	<p>11</p> <p>Probability: Possible (L6)</p> <p>Severity: Fatality (S5)</p>	<p>8</p> <p>Probability: Possible (L6)</p> <p>Severity: Fatality (S5)</p>		<ul style="list-style-type: none"> BC Hydro assuming the role of Prime Contractor and assigning a BC Hydro 6 Site Safety Coordinator to set the tone and culture for site safety and to 7 maintain overall co-ordination and control of the site Contractually requiring each contractor to develop Safety Management Plans, 9 Safe Work Procedures and Emergency Response Plans before starting site 10 work activities; Conducting daily safety meetings, safe work observations and 	<ul style="list-style-type: none"> Planned Planned Planned 	

From Application dated July 23, 2021					Updated for Reporting Period ending December 31, 2022				
		in adjoining or overlapping work areas.					ongoing safety 12 audits of each contractor to ensure compliance with WorkSafeBC regulations, 13 the contractor's safety management system and other agreed standards and 14 controls for occupational health and safety systems		
							<ul style="list-style-type: none"> Developing an Owner's Safety Plan and Occupational Health Identification Risk 16 Assessment that will manage expectations related to known safety hazards. 	<ul style="list-style-type: none"> Planned 	
7.4.4	Identified	Project In-Service Date Delayed Due to scheduling constraints, multiple interdependent activities will take place concurrently. This creates a potential risk that the target Project In-	Financial Loss	10.5 Probability: Fairly Likely (L6.5) Severity: \$10 M to \$100 M (S4)	9 Probability: Possible (L6) Severity: \$1 M to \$10 M (S3)		<ul style="list-style-type: none"> Developing detailed management plans for procurement, construction, quality, environment and safety activities that clearly explain how the 	<ul style="list-style-type: none"> Planned 	

From Application dated July 23, 2021					Updated for Reporting Period ending December 31, 2022				
		<p>Service Date milestone could be missed.</p> <p>This may result in a delay in completing equipment replacements and continued exposure to the reliability issues with the existing generator equipment.</p>				<p>equipment will be manufactured, supplied, assembled, installed, commissioned and tested</p> <ul style="list-style-type: none"> • Dividing the project scope into work packages and detailed activity lists to decrease exposure to unplanned work • Structuring and sequencing work activities in a manner that ensures the critical schedule path is understood and optimized • Assigning a dedicated BR1 Project scheduler to manage progress by frequently reviewing planned versus actual progress, resolving critical schedule path issues and employing a BC Hydro resource at the 	<ul style="list-style-type: none"> • Planned • Planned • Planned 		

From Application dated July 23, 2021						Updated for Reporting Period ending December 31, 2022			
							<p>manufacturing facilities to oversee supplier's work and recovery plans, as required</p> <ul style="list-style-type: none"> • Incorporating appropriate schedule contingencies to provide insurance for schedule risks • Employing site trade resources from unions within the collective agreement between Columbia Hydro Constructors and the Allied Hydro Council, which contains a no-strike clause and provisions to address working conditions 	<ul style="list-style-type: none"> • Planned • Planned 	
7.4.5	Identified	<p>Cost Increase</p> <p>The complexity of the BR1 Project and the Bridge River System, the brownfield nature of the site, the required environmental</p>	Financial Loss	<p>10.5</p> <p>Probability: Fairly Likely (L6.5)</p> <p>Severity: \$10 M to \$100 M (S4)</p>	<p>9</p> <p>Probability Possible (L6)</p> <p>Severity: \$1 M to \$10 M (S3)</p>		<ul style="list-style-type: none"> • Incorporating recent experience gained from the replacement of Units 5, 6, 7 and 8 at the Bridge River 2 	<ul style="list-style-type: none"> • Planned 	

**BC Hydro Bridge River 1 Units 1 to 4
Generator Replacement Project**

From Application dated July 23, 2021						Updated for Reporting Period ending December 31, 2022			
		monitoring, and the public procurement process creates the potential for additional cost risk impacts beyond those included in the BR1 Project Expected Cost Estimate. Actions will be implemented to reduce the likelihood of these cost risks materializing and reserves will be included in the BR1 Project Authorized Cost Estimate to mitigate these cost risks, if realized.					<ul style="list-style-type: none"> Generating Station as well as comparable projects implemented at other BC Hydro facilities Conducting a detailed cost analysis using range estimating techniques (i.e., a Monte Carlo simulation) that consider differing levels of uncertainty for each scope item to inform the contingency in the Expected and Authorized Cost Estimates Incorporating appropriate special reserves relating to known cost risks in the BR1 Project. Special reserves will only be accessible if those specific risks materialize 	<ul style="list-style-type: none"> Planned Planned 	
7.4.6	Identified	Shortage of Accommodation There is a potential for the workforce	Financial Loss	10 Probability:	8.5 Probability Fairly Likely (L6.5)		<ul style="list-style-type: none"> Prioritizing local accommodations for primary workers most 	<ul style="list-style-type: none"> Planned 	

**BC Hydro Bridge River 1 Units 1 to 4
Generator Replacement Project**

From Application dated July 23, 2021					Updated for Reporting Period ending December 31, 2022				
		required at site during construction to exceed the available local accommodations in the Seton Portage – Shalalth area due to multiple concurrent Bridge River Generation System projects. This may result in reduced productivity associated with longer commute times to/from Lillooet, which will result in a reduction in overall productivity and cause delays in meeting schedule milestones.		Possible (L7) Severity: \$1 M to \$10 M (S3)	Severity: \$100 K to \$1 M (S2)		likely to impact the schedule		
							<ul style="list-style-type: none"> • Securing accommodations at hotels in Lillooet for supplementary workers and visitors • Assisting contractors with accommodation management and local vacancy listings • As required, entering into a pre-arranged commercial agreement for reserved use of the local Lil'item Hotel operated by the Tsah'alh Development Corporation • The Bridge River Industrial Workers Accommodations and Access Assessment for LaJoie Dam Improvement Project and other Bridge River capital projects is underway. This 	<ul style="list-style-type: none"> • Planned • Planned • Planned • Planned 	

From Application dated July 23, 2021					Updated for Reporting Period ending December 31, 2022				
						project has provided information on our estimated worker demand. This study was initiated after the application filing.			
7.4.7	Identified	<p>Space Constraints Resulting in Delays</p> <p>There is insufficient space in the Bridge River 1 Generating Station service bay to accommodate dismantling of the existing generators and the pre-assembly and / or installation of the replacement generators, in addition to required regular operating and maintenance activities.</p> <p>The space constraints may result in delays to site construction activities. These delays could cause the sequencing of activities within specific areas to be modified, leading to unproductive downtime.</p>	Financial Loss	<p>10</p> <p>Probability: Likely (L7)</p> <p>Severity: \$1 M to \$10 M (S3)</p>	<p>9</p> <p>Probability: Possible (L6)</p> <p>Severity: \$1 M to \$10 M (S3)</p>	<ul style="list-style-type: none"> Conducting an equipment pre-assembly, dismantling and installation sequence analysis to determine the best equipment staging arrangement with respect to the available floor space and the floor loading capacities Utilizing the service bay in the adjacent Bridge River 2 Generating Station for generator component pre-assembly activities 	<ul style="list-style-type: none"> Planned Planned 		

From Application dated July 23, 2021					Updated for Reporting Period ending December 31, 2022				
7.4.8	Identified	Health and Safety The influx of temporary workers and contractors in the Seton Portage – Shalalth area could lead to impacts on the health and safety of local communities.	Safety	10 Probability: Possible (L6) Severity: Temporary Disability (S4)	8 Probability: Very Unlikely (L4) Severity: Temporary Disability (S4)		<ul style="list-style-type: none"> Proactively working with the community of Tsal'alh and the Joint Steering Committee as well as Contractors and Union Halls to increase awareness of evolving temporary worker changes and to help advance planning, preparation, coordination and communication Requiring all temporary workers to comply with a Bridge River Code of Conduct so that a basic set of rules to maintain civil behavior are followed and so that conflict with local residents is reduced. Divergence from Code of Conduct behaviors will be grounds for discipline and BC Hydro may 	<ul style="list-style-type: none"> Planned Planned 	

From Application dated July 23, 2021						Updated for Reporting Period ending December 31, 2022			
							exercise its rights under the Code of Conduct to direct workers off the work site		
7.4.9	Identified	<p>Credit Failure of Contractor</p> <p>During the public procurement process, BC Hydro will seek bids from a wide range of generator suppliers. There is a potential for some of the suppliers to be under financial strain.</p> <p>There is a risk that a supplier might experience credit failure after being awarded a contract and subsequently be unable to eventually deliver on contractual obligations, which may lead to schedule delays and cost overruns.</p>	Financial Loss	<p>10</p> <p>Probability: Possible (L6)</p> <p>Severity: \$10 M to \$100 M (S4)</p>	<p>7</p> <p>Probability: Possible (L6)</p> <p>Severity: \$10 K to \$100 K (S1)</p>		<ul style="list-style-type: none"> Assessing the credit history and financial situation of suppliers prior to appointing a preferred proponent Performing assessments of a supplier's financial capacity and credit rating, where appropriate, prior to awarding any contract Requiring performance security in the form of performance and labour and materials bonds or a letter of credit and a third-party guarantee. 	<ul style="list-style-type: none"> Planned Planned Planned 	
7.4.10	Identified	Damage to Generating Station during Construction	Safety	<p>9</p> <p>Probability: Very</p>	<p>9</p> <p>Probability: Very</p>		<ul style="list-style-type: none"> Developing an Interim Dam Safety Risk Management Plan describing 	<ul style="list-style-type: none"> Planned 	

From Application dated July 23, 2021					Updated for Reporting Period ending December 31, 2022				
		<p>The nature of the existing powerhouse building foundation and the seismic performance of the Bridge River 1 Generating Station means that a seismic event could cause significant damage to the generating station.</p> <p>Significant damage to the generating station during construction stage may result in minor injuries, disability, or a fatality to workers, contractors, and/or the public in or near the generating station.</p>		<p>Unlikely (L4)</p> <p>Severity: Fatality (S5)</p>	<p>Unlikely (L4)</p> <p>Severity: Fatality (S5)</p>		<p>any surveillance and/or safety risk measures required during construction</p> <ul style="list-style-type: none"> Following the Bridge River Emergency Action Plan in the event of an earthquake. By following the Bridge River Emergency Action Plan, the consequences of an earthquake event during the BR1 Project are similar to current operational earthquake risks and are considered tolerable 	<ul style="list-style-type: none"> Planned 	