bcuc
British Columbia
Utilities Commission

Suite 410, 900 Howe Street
Vancouver, BC Canada V6Z 2N3
bcuc.com

P: 604.660.4700
TF: 1.800.663.1385
F: 604.660.1102

British Columbia Hydro and Power Authority

Application for Certificates of Public Convenience and Necessity for the Bridge River Projects: Bridge River 1 Units 1 to 4 Generator Replacement Project

---

Decision
and Order C-6-22

October 11, 2022

Before:
R. I. Mason, Panel Chair
C. M. Brewer, Commissioner
A. C. Dennier, Commissioner

TABLE OF CONTENTS

Page no.

Executive summary

On July 23, 2021, British Columbia Hydro and Power Authority (BC Hydro) filed an application with the British Columbia Utilities Commission (BCUC) for a Certificate of Public Convenience and Necessity (CPCN) pursuant to sections 45 and 46 of the *Utilities Commission Act* (UCA) for the Bridge River 1 Units 1 to 4 Generator Replacement Project (BR1 Project) and a CPCN for the Bridge River Transmission Project (BRT Project) (together, Application).[1]

In its decision on BC Hydro's Fiscal 2020 to Fiscal 2021 Revenue Requirements Application, the BCUC directed BC Hydro to file a joint CPCN application so that the BR1 and BRT Projects would be reviewed together and stated that effective scrutiny of any investment in the Bridge River System requires a view of the entire system.[2]

In this Decision, the Panel addresses BC Hydro's application for a CPCN for the BR1 Project. For the reasons laid out below, this Decision does not address BC Hydro's application for a CPCN for the BRT Project, which is subject to further process.

The Panel finds that BC Hydro has established the need for the BR1 Project for the following reasons:

- To provide clean energy and capacity to meet the growing electricity needs and peak demand in BC and in particular in the Lower Mainland;
- To manage water flows in the Lower Bridge River system to comply with legal and contractual obligations; and
- To mitigate the growing risk of aging equipment failure that would result in potentially significant damages from environmental and other harms.

The Panel finds that there is no justification to delay the BR1 Project because the project is needed urgently**.** Based on the current BR1 Project schedule, the last of the new units will be in-service in 2030. The Panel gives considerable weight to BC Hydro's 2017 engineering report which assessed that generating units 1, 3 and 4 have "a high risk of failure within five years," i.e. before 2030. Any premature equipment failure or further deratings would incur additional cost, safety risk at the plant and negative impacts to water flow management until the BR1 Project is complete.

BC Hydro presented three feasible alternatives it considered for the BR1 Project: to replace the Units 1 to 4 generators, exciters and control systems (Replace); to refurbish the Units 1 to 4 generators and replace the existing governors, exciters and control systems (Refurbish); and to replace the windings in the stationary parts of the Units 1 to 4 generator stators and replace or refurbish other generator components as needed to maintain the original 50 MVA rating (Rewind).

The Panel is persuaded that BC Hydro's preferred Replace alternative is the best alternative to meet the needs of the BR1 Project. The Panel finds that BC Hydro appropriately screened out unfeasible alternatives when

[1] Exhibit B-1.
[2] Directive 29 of BCUC Decision and Order G-246-20 on BC Hydro's Fiscal 2020 to Fiscal 2021 Revenue Requirements Application, p. 100.

selecting feasible alternatives for more detailed analysis. Of the three feasible alternatives, the Panel finds that the Replace alternative is superior to the Refurbish and Rewind alternatives, for the following reasons:

- The Replace alternative provides better unit reliability than the other two feasible alternatives, due to mostly new components having longer remaining service life than refurbished parts. The improved unit reliability associated with the Replace alternative also leads to better outcomes with respect to minimizing environmental impacts and improving relations with St'át'imc, both of which are needs of the BR1 Project, because of the improved reliability of water flows in the Lower Bridge River.
- Economically, the Replace alternative is also superior to the other two feasible alternatives. Replacing the BR1 generators has a lower Net Present Value (NPV) cost than the Rewind alternative ($58.7 million versus $92.9 million)[3] due to the value of the increased energy and capacity associated with the 60 MVA replacement generators. While the Replace alternative has a similar NPV of cost to the Refurbish alternative ($58.7 million versus $57.0 million), refurbishing the generators has a higher risk of cost increases due to the possibility of "as found" conditions being worse than anticipated.
- The Replace alternative has a lower safety risk than the other two feasible alternatives. Refurbishing the generators would have higher exposure to construction hazards due to the constrained working space, and either rewinding or refurbishing them would expose BC Hydro to higher ongoing maintenance safety hazards compared to replacing the generators with new equipment.

The Panel accepts BC Hydro's methodology for analysing the feasible alternatives for the following reasons:

- The structured decision-making approach appropriately identifies project objectives, and criteria and measures for assessing alternatives' compliance with those objectives.
- The five objectives selected by BC Hydro are consistent with the needs for the BR1 Project, and the Panel does not identify any significant needs for the project not incorporated in the objectives.
- Class 5 cost estimates for the alternatives analysis are acceptable in this instance because the Panel is satisfied that Class 4 cost estimates would not have materially impacted the evaluation of costs, and the Replace alternative is superior to the other feasible alternatives with respect to all the objectives used in the analysis.

Notwithstanding the foregoing, the Panel is not entirely satisfied with BC Hydro's analysis of the alternatives because:

- It does not appear to be possible to make trade offs between the feasible alternatives with respect to the environmental impact and St'át'imc relations objectives independently of the unit reliability objective. The environmental impact and St'át'imc relations objectives are in fact consequences of unit reliability, and an alternative's ranked scoring will always be the same for all three objectives. A consequence of this lack of independence between the objectives is that unit reliability is, in effect, being "triple counted."
- The Panel would have preferred BC Hydro to provide a quantifiable measure of unit reliability rather than merely a qualitative assessment. Using a rating of high, medium and low failure rate to measure

[3] Exhibit B-1, p. 4-6.

unit reliability gives the Panel insufficient information to appreciate the differences in unit reliability between the feasible alternatives.

- BC Hydro did not provide quantified weightings for each objective relative to the other objectives. This deficiency, noted by the CEC in particular with respect to possible over-valuation of the safety objective, would have limited the Panel's ability to assess any trade-offs between the feasible alternatives, had this been necessary.
- The Panel does not accept BC Hydro's method of quantifying the cost risk, which was to add 100 per cent to the cost estimate of the Rewind and Refurbish alternatives and add 75 per cent to the cost estimate of its preferred Replace alternative, without providing a specific and quantified rationale for the difference between these two additions.

The Panel finds that BC Hydro's engagement and consultation to date with the First Nations affected by the BR1 Project has been adequate.

The Panel finds that BC Hydro's consultation to date with local governments, stakeholders, and the public has been adequate.

The Panel acknowledges SCC's concerns with the cultural, social, and environmental impacts that the BR1 Project could have during construction, and as a result imposes the following conditions on the CPCN for the BR1 Project:

> Consistent with BC Hydro commitments to the St'át'imc Nation, with respect to in-season flow management decisions to facilitate the construction of the BR1 Project, BC Hydro shall work with the Joint Planning Forum consistent with the mutually agreed to Terms of Reference established between BC Hydro and the St'át'imc Authority and give due consideration to water level and flow impacts and water needs related to: Fish and fish habitat; Wildlife and wildlife habitat; Soil erosion; St'át'imc use of the land and resources in the area; and St'át'imc cultural activities in the area.
>
> Consistent with BC Hydro's commitments to the St'át'imc Nation, BC Hydro, in collaboration with the Tsal'alh and SCC, will make best efforts to ensure compliance, monitoring and enforcement of the Bridge River Contract Worker Conduct Requirements and the Bridge River Internal Review Procedure for Code of Conduct Violations.

The Panel finds that the BR1 Project cost estimate is reasonable.

The Panel finds that the BR1 Project is consistent with British Columbia's energy objectives.

The Panel finds that it is appropriate to make a decision on the BR1 Project in advance of making a decision on the BRT Project, for the following reasons:

- The need for the BR1 Project exists independently of any aspect of the BRT Project. Neither the cost or alternatives for the BRT Project, nor whether or not the BRT Project proceeds, would change the need for the BR1 Project.
- The selection of the preferred Replace alternative from the three feasible alternatives to meet the need for the BR1 Project would not change regardless of which alternative is chosen for the BRT Project or whether the BRT Project proceeds.

- In the Panel's view, the only relevant difference between the three feasible alternatives for the BR1 Project is that the preferred Replace alternative and the second-ranked Refurbish alternative provide 21 MW more generation than the Rewind alternative. Even if the additional 21 MW generation from BR1 were the only driver for the thermal upgrade to the 2L90 line, the BR1 Project would still be worth pursuing on its own merits.
- The Panel is satisfied that there are no outcomes to the BRT Project analysis that would make an alternative for the BR1 Project that was rejected by BC Hydro as infeasible superior to the preferred Replace alternative.

The Panel further finds that it is appropriate to evaluate the costs and benefits of the BR1 Project in the absence of a Class 3 estimate and a preferred alternative for the BRT Project. There is no evidence that the cost estimate for the three feasible alternatives for the BR1 Project would change based on the selection of the preferred alternative for the BRT Project or whether the BRT Project proceeds.

Notwithstanding the above findings, the Panel finds that it was beneficial to review the BR1 and BRT Projects together, even allowing for their differing stages of development, to ensure that the need and alternatives for the BR1 Project were properly considered.

The Panel finds that the BR1 Project is in the public interest and that the public convenience and necessity require that the BR1 Project proceeds. The Panel grants BC Hydro a CPCN for the BR1 Project as described in section 5 of the Application.

The Panel makes various directives to BC Hydro with regards to reporting related to the BR1 Project.

The Panel makes the following directives with respect to BC Hydro's intention of providing an evidentiary update for the BRT Project (Evidentiary Update):

The Panel directs BC Hydro to include in its Evidentiary Update an AACE Class 3 cost estimate for the BRT Project and AACE Class 4 cost estimates for the project alternatives, or to provide an explanation of why this degree of accuracy is not required in this instance.

The Panel further directs BC Hydro to provide a fulsome analysis of alternatives to the BRT Project which addresses the inadequacies of the alternatives analysis for the BR1 Project. In particular, objectives against which the alternatives are measured should be independent of each other, and measures used to score alternatives against those objectives should be quantified where possible.

1.0 Introduction

On July 23, 2021, British Columbia Hydro and Power Authority (BC Hydro) filed an application with the British Columbia Utilities Commission (BCUC) for a Certificate of Public Convenience and Necessity (CPCN) pursuant to sections 45 and 46 of the *Utilities Commission Act* (UCA) for the Bridge River 1 Units 1 to 4 Generator Replacement Project (BR1 Project) and a CPCN for the Bridge River Transmission Project (BRT Project) (together, Application).[4]

BC Hydro is a Crown Corporation established in 1962 under the *Hydro and Power Authority Act*. BC Hydro is mandated to generate, distribute and sell electricity; upgrade its power sites; and purchase power from, or sell power to, a firm or person. BC Hydro is the largest electric utility in British Columbia, serving approximately 95 percent of the population. BC Hydro is charged with the responsibility of, among other things, owning and safely operating the generation and storage Heritage Assets set out in Schedule 1 of the *Clean Energy Act* (CEA).[5]

BC Hydro has been financing the development of its electrical facilities since its inception in 1962. Currently, BC Hydro finances the development of those facilities, including upgrades of existing facilities, by borrowing funds from the Government of British Columbia under the applicable provisions of the *Hydro and Power Authority Act* and the *Financial Administration Act*, and by funds generated internally through the operation of its business. Further, BC Hydro has been responsible for the planning, design and construction of generation, transmission, and distribution facilities since 1962.[6]

According to BC Hydro, the BR1 Project is needed to address the deteriorating condition of the aging generators, governors, exciters and control systems at the Bridge River 1 Generating Station, both to improve reliability and to improve water flow management in Lower Bridge River to help avoid negative impacts to fish and fish habitat and St'át'imc values.[7]

BC Hydro asserts that the BRT Project is required to address system constraints on the Bridge River Transmission System to accommodate existing and future generation, and to address asset health issues and clearance defects to improve the reliability and safety of the 2L90 transmission circuit.[8]

In its decision on BC Hydro's Fiscal 2020 to Fiscal 2021 Revenue Requirements Application, the BCUC directed BC Hydro to file a joint CPCN application so that the BR1 and BRT Projects would be reviewed together and stated that effective scrutiny of any investment in the Bridge River System requires a view of the entire system.[9]

In this Decision, the Panel addresses BC Hydro's application for a CPCN for the BR1 Project. This Decision does not address BC Hydro's application for a CPCN for the BRT Project, which is subject to further process.

[4] Exhibit B-1.
[5] Ibid., p. 1-21; Clean Energy Act https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/10022_01
[6] Ibid., p. 1-21.
[7] Ibid., p. 1-1.
[8] Ibid., p. 1-1.
[9] Directive 29 of BCUC Decision and Order No. G-246-20 on BC Hydro's Fiscal 2020 to Fiscal 2021 Revenue Requirements Application, p. 100.

1.1 Approvals Sought

BC Hydro, pursuant to sections 45 and 46 of the UCA, seeks the following approvals:[10]

- Granting a CPCN for the BR1 Project as described in Chapter 5 of the Application; and
- Granting a CPCN for the BRT Project as described in Chapter 10 of the Application.

If granted, BC Hydro proposes to provide the following reports:

- Directing BC Hydro to file semi-annual progress reports with the BCUC on the BR1 Project's scope, cost, schedule, risks, and ongoing consultation and mitigation plans;
- Directing BC Hydro to file semi-annual progress reports with the BCUC on the BRT Project's scope, cost, schedule, risks, and ongoing consultation and mitigation plans;
- Directing BC Hydro to file a Project Completion and Evaluation Report (PCER) for the BR1 Project three months after receiving approval of the PCER from BC Hydro's Board of Directors; and
- Directing BC Hydro to file a PCER for the BRT Project three months after receiving approval of the PCER from BC Hydro's Board of Directors.

BC Hydro requests that certain information in the Application and several Appendices be held confidential due to the commercially sensitive nature of the information, in accordance with Part IV of the BCUC's Rules of Practice and Procedure.[11]

1.2 Regulatory Process

On August 26, 2021, the BCUC established a regulatory timetable for a review of the Application, which included intervener registration and two rounds of Information Requests (IRs).[12] The regulatory timetable was subsequently amended to provide for extensions to deadlines for IRs responses, along with submissions on further process.[13]

On April 6, 2022, the BCUC issued a further regulatory timetable, which included a third round of IRs and submissions on further process.[14]

On May 18, 2022, the BCUC issued a further regulatory timetable which included, among other things, Panel IR No. 1 on the BR1 Project, final and reply arguments from BC Hydro and interveners on the BR1 Project.[15] Further process on the BRT Project will continue in this proceeding.

The following intervener groups registered to participate in the proceeding:

- British Columbia Old Age Pensioners' Organization et al. (BCOAPO);
- BC Sustainable Energy Association (BCSEA);

[10] Exhibit B-1, p. 1-23.
[11] BCUC Order G-15-19.
[12] BCUC Order G-253-21.
[13] BCUC Orders G-291-21, G-319-21, G-38-22.
[14] BCUC Order G-94-22.
[15] BCUC Order G-137-22 with reasons for decision.

- BC Solar and Storage Industries Association (BCSSIA);
- Commercial Energy Consumers Association of British Columbia (the CEC);
- Residential Consumer Intervener Association (RCIA); and
- St'át'imc Chiefs Council (SCC).

No interested parties registered and the BCUC did not receive any letters of comment.

1.3 Legal and Regulatory Framework

Sections 45 and 46 of the UCA set out the legislative framework for the BCUC review of CPCN applications. Section 45(1) of the UCA states that except as otherwise provided, after September 11, 1980, a person must not begin the construction or operation of a public utility plant or system, or an extension of either, without first obtaining from the BCUC a certificate that public convenience and necessity require, or will require, the construction or operation of the plant or system.[16]

Section 46(3) of the UCA states that the BCUC may issue or refuse to issue a CPCN or may issue a CPCN for the construction or operation of only a part of the proposed facility, line, plant, system or extension, and may attach terms and conditions to the CPCN.

In addition to considering the interests of persons in the province who receive or may receive service from BC Hydro, section 46(3.3) of the UCA requires that the BCUC consider the following in determining whether to issue a CPCN to BC Hydro:

a) British Columbia's energy objectives;[17]

b) the most recent of the following documents:

   i. an integrated resource plan approved under section 4 of the *Clean Energy Act* before the repeal of that section;

   ii. a long-term resource plan filed by BC Hydro under section 44.1 of the UCA; and

c) the extent to which the application for the CPCN is consistent with the applicable requirements under section 19 of the *Clean Energy Act*.

The BCUC's CPCN Guidelines provide general guidance regarding the information that should be included in a CPCN application and the flexibility for an application to reflect the specific circumstances of the applicant, the size and nature of the project and the issues raised by the application.[18]

[16] *Utilities Commission Act*, RSBC 1996, c. 473, Section 45(1).
[17] BC's energy objectives are defined in section 2 of the *Clean Energy Act*.
[18] BCUC Order G-20-15, 2015 Certificate of Public Convenience and Necessity Application Guidelines.

1.4 Decision Framework

The structure of this Decision largely follows that of the CPCN Application and the BCUC's CPCN Guidelines. Relevant evidence submitted by BC Hydro and interveners is summarized in each section.

Section 2.0 addresses the BR1 Project need and its justification.

Section 3.0 discusses the alternatives that BC Hydro considered that are capable of meeting the overall BR1 Project objectives, as well as alternatives considered and dismissed. This section also describes the BR1 Project alternatives evaluation and selection of the preferred alternative for the BR1 Project.

Section 4.0 contains a description of the BR1 Project, including its scope, approach, impacts, schedule and risks.

Sections 5.0 and 6.0 address stakeholder and First Nations consultation and engagement, environmental permitting.

Section 7.0 outlines BR1 Project costs, accounting treatment, and rate impact.

Section 8.0 addresses the alignment with British Columbia's energy objectives and BC Hydro's integrated long-term resource planning.

Section 9.0 outlines the BR1 Project and the BRT Project Interdependence.

The Panel's overall CPCN determinations for the BR1 Project are provided in Section 10.0, as well as the Panel directives relating to detailed reporting requirements for the BR1 Project as set out in Appendix A to this Decision.

Section 11.0 provides the Panel's directions to BC Hydro with respect to the BRT Project Evidentiary Update.

1.5 Bridge River Generation System Background

The Bridge River Generation System is located in southern British Columbia, northeast of Pemberton and west of Lillooet. It was constructed between 1948 and 1960 and is a cascading system that includes three facilities:[19]

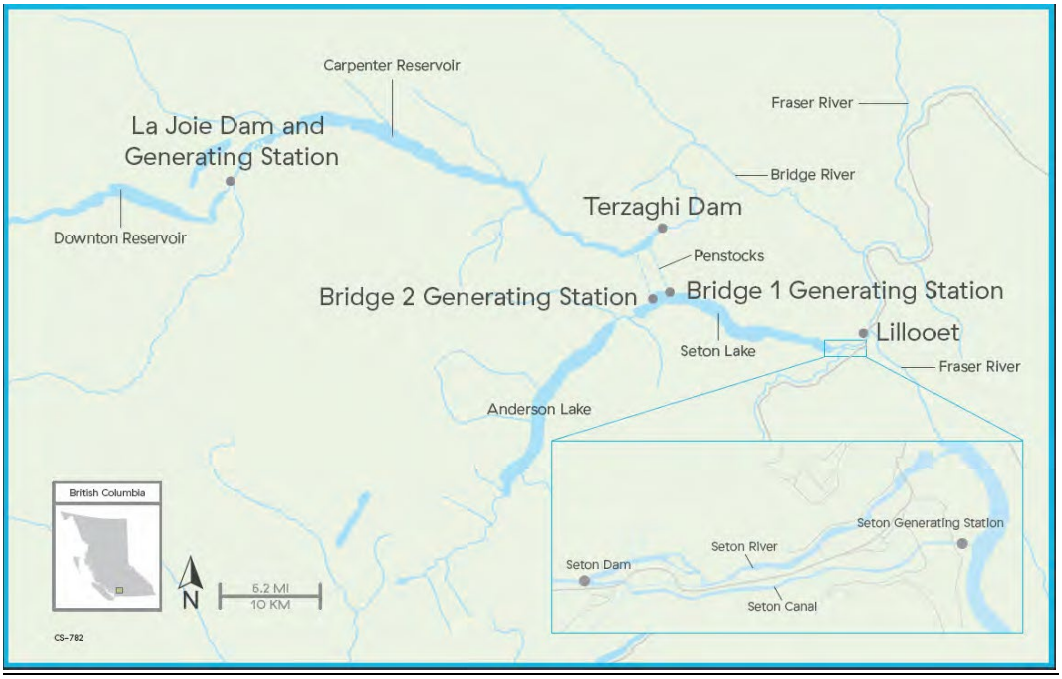
- La Joie Facility consisting of La Joie Dam, Downton Reservoir, and La Joie Generating Station;
- Bridge River Facility consisting of Terzaghi Dam, Carpenter Reservoir, Bridge River 1 Generating Station and Bridge River 2 Generating Station; and
- Seton Facility consisting of Seton Dam, Seton Lake, and Seton Generating Station.

The Bridge River Generating System contributes, on average, approximately 5 percent of BC Hydro's total annual hydroelectric generation.[20] It is located close to the load centre in the Lower Mainland and provides benefits to

[19] Exhibit B-1, p. 2-2.
[20] Ibid.

the operation of the integrated system which improves BC Hydro's export capability.[21] Figure 1 below shows a map of the Bridge River Generation System.[22]

Figure 1: Map of the Bridge River Generation System



The Bridge River Facility supplies approximately four percent of BC Hydro's total generating capacity and enough electricity to power the equivalent of approximately 230,000 homes annually.[23] The Bridge River 1 and Bridge River 2 Generating Stations are often used as peaking plants, operating during the day in times of high demand and backed off at night in periods of low demand.[24]The Bridge River 1 Generating Station consists of four 50 MVA generators.[25]

2.0 BR1 Project Need and Justification

The objective of the BR1 Project is to address the deteriorating condition of the generating equipment at the Bridge River 1 Generating Station. The Bridge River 1 Generating Station was commissioned in 1954[26] and the associated generating equipment has largely exceeded its industry life expectancy or is no longer supported by the manufacturer.[27] The de-rating of the Unit 4 generator at the Bridge River 1 Generating Station in 2011 has led to a loss of flow capacity, constraining water management in the Bridge River System and resulting in adverse impacts to fish and fish habitat in Lower Bridge River.[28] BC Hydro's most recent assessment for the Bridge River Facility has indicated that the age and condition of the generating equipment at the Bridge River 1

[21] Exhibit B-5, BCUC IR 1.2.4.
[22] Exhibit B-1, Figure 2-1, p. 2-3.
[23] Ibid., p. 3-2.
[24] Ibid., p. 2-3.
[25] Ibid., p. 3-7.
[26] Ibid., p. 2-23.
[27] Ibid., p. 3-10.
[28] Ibid., p. 3-5.

Generating Station increase the likelihood of equipment failure,[29] which can cause forced outages and de-rating of generating equipment.[30]

BC Hydro submits that the proposed BR1 Project is necessary to:

- Continue to provide energy and capacity at the system level which is forecast to experience an energy shortfall in F2024 and a capacity shortfall in F2031; and to the South Coast region which is forecast to experience a capacity shortfall in F2026.[31]
- Mitigate the risk of equipment failure as well as the potential for forced outages and further de-rating of the generating equipment; and
- Improve BC Hydro's ability to manage water flows in the Bridge River System to comply with the Water Use Plan ("WUP") Order target flow schedule, meet its commitments in the 2011 Agreements and 2019 High Flow Settlement Agreements with the St'át'imc Nation and maintain fish and fish habitat in Lower Bridge River. [32]

BC Hydro asserts that "the Bridge River 1 Generating Station is economic, and investments to continue operation of the generating station and transmission of its power to load represent positive value to ratepayers."[33]

2.1 Need for Energy

BC Hydro states that if the Bridge River 1 Generating Station was unavailable, based on the Load Resource Balance with existing and committed resources provided in BC Hydro's 2021 Integrated Resource Plan (2021 IRP), BC Hydro would experience: [34]

- An energy shortfall starting in fiscal 2024 and a capacity shortfall starting in fiscal 2031; and
- For the South Coast region (which includes the Lower Mainland and Vancouver Island), a capacity shortfall starting in fiscal 2026.

In the 2021 IRP Application, BC Hydro submits it will have a need for additional energy in fiscal 2029 and capacity in fiscal 2032 in addition to its base resources, including an operational Bridge River 1 Generating Station. In the South Coast region, the need for additional capacity occurs in fiscal 2027.[35]

BC Hydro's planned schedule for the BR1 Project predicts an in-service date of July 2030. [36]

BC Hydro's forward-looking economic analysis of the Bridge River System (2020 Economic Analysis) indicates the overall system has a net present value of $1,180 million when planned investments and operating costs are

[29] Ibid., p. 3-11.
[30] Ibid., p. 3-26.
[31] Exhibit B-10, RCIA IR 43.1.
[32] Exhibit B-1, p. 3-1.
[33] Ibid., p. 2-27.
[34] Exhibit B-10, RCIA IR 2.43.1.
[35] BCH 2021 Integrated Resource Plan, Exhibit B-1, Appendix B pp. 12-13, 15. Reference load forecast after E&C and DSM savings.
[36] Exhibit B-1, p. 5-21.

considered and under energy market assumptions consistent with the draft 2021 IRP.[37] BC Hydro's analysis indicates the Bridge River 1 Generating Station has a positive value of $680 million on a stand-alone basis.[38]

BC Hydro provided the table below showing the Net Present Value (NPV) of the Bridge River 1 Generating Station under various sensitivity scenarios:

Table 1: Scenario Analysis: Bridge River 1 Generating Station Valuation[39]

	Net Present Value ($ million)				
Sensitivity Scenario	**Energy**	**Capacity**	**Capital**	**Operating**	**Facility Value**
0: Reference Scenario	1,030	340	(420)	(270)	680
1: Small Load Resource Balance Gap	1,030	-	(420)	(270)	340
2: Large Load Resource Balance Gap	1,030	380	(420)	(270)	720
3: Low Market Price	640	330	(420)	(270)	280
4: High Market Price	1,350	350	(420)	(270)	1,010
5: Low Capacity Value	1,030	-	(420)	(270)	340
6: High Capacity Value	1,030	370	(420)	(270)	710

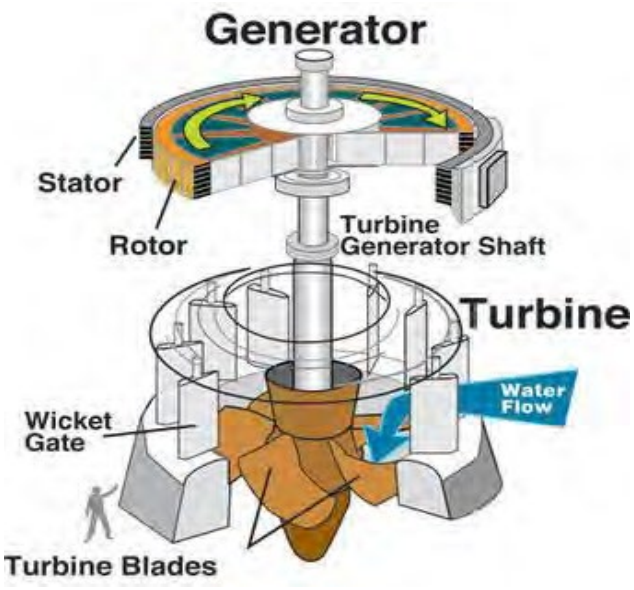
BC Hydro asserts that "the Bridge River 1 Generating Station is economic, and investments to continue operation of the generating station and transmission of its power to load represent positive value to ratepayers."[40]

2.2 Generating Equipment at the Bridge River 1 Generating Station

The Bridge River 1 Generating Station converts the potential energy of the water in the Carpenter Reservoir to kinetic energy as it flows through four turbines into Seton Lake. Each of the four turbines is connected to a 50 MVA generator[41] by a single rotating shaft, and the kinetic energy is converted into electrical energy by the generators. Water flow available for power generation at the Bridge River 1 Generating Station is limited to 65 cubic metres per second (m^3/s) by the three existing water licenses.[42] Figure 2 below shows a cutaway view of typical hydroelectric generating equipment:[43]

[37] Exhibit B-1, pp. 2-34 - 2-35.
[38] Ibid., p. 2-36.
[39] Ibid., Table 2-7, p. 2-36.
[40] Ibid., p. 2-27.
[41] Ibid., p. 3-7.
[42] Ibid., p. 3-9.
[43] Ibid., Figure 3-6, p. 3-9.

Figure 2: Cutaway View of Typical Hydroelectric Generating Equipment



The generating equipment at the Bridge River 1 Generating Station includes:[44]

- The Unit 1 to 4 generators made up of two main parts: the rotor and the stator. The rotor is a large circular electromagnet connected to the turbine shaft. The stator is a stationary coil of electrical conductors wound tightly around a metal core, which encircles the rotor.
- The Unit 1 to 4 exciters that inject current into the rotor coils, creating the electromagnetic field on the rotors and turning them into large electromagnets.
- The Unit 1 to 4 governors that regulate the water flow through the turbines to keep the speed constant and to control the power output.
- The control system that monitors the operation of the governors and regulates the speed of the turbines. Also present are protection, control, alarm and metering components that work to automatically or manually eliminate faults and provide information on the generator parameters.

2.2.1 Industry Life Expectancy of Generating Equipment

BC Hydro states that the generating equipment at the Bridge River 1 Generating Station has largely exceeded its industry life expectancy or is no longer technically supported.[45] Specifically:

- The Unit 1 to 4 generators have an industry life expectancy of 50 years and have each been in service for more than 65 years;
- The Unit 1 to 4 governors have an industry life expectancy of 40 years and have each been in service for more than 65 years;
- The Unit 1 to 4 exciters have an industry life expectancy of 30 years and have been in service for more than 25 years. While the exciters are still within their industry life expectancy, they are no longer technically supported, spare parts are not available, and their design lacks standard key features in

[44] Ibid., p. 3-10.
[45] Ibid.

newer designs which are required to meet North American Electric Reliability Corporation (NERC) Standard VAR-002-4 R3; and

- The Unit 1 to 4 control systems are largely original electro-mechanical components, which are now exceeding their industry life expectancy of 30 years, although some components, such as the synchronizers, have been replaced and, in the late 1980s, additional components were added when the station became automated.

2.2.2 BC Hydro's Assessment of Generating Equipment Condition

The need for the BR1 Project is founded on BC Hydro's health assessment of the generating equipment at the Bridge River 1 Generating Station as of fiscal 2020. The health assessment evaluated the reliability risk associated with each piece of equipment based primarily on maintenance test and inspection data and considered factors including: safety and environmental issues, reliability, design deficiencies, asset age, industry expected life, availability of spare parts and technical expertise. Each health assessment resulted in an Equipment Health Rating of Good, Fair, Poor, or Unsatisfactory, which was subsequently used to determine capital investment priorities.[46] BC Hydro's heath assessment concluded that as of fiscal 2020:[47]

- The Unit 1 to 4 generators are in Unsatisfactory condition with an increasing probability of in-service failure within five years;
- The Unit 1 to 4 governors are in Poor condition with an increasing probability of failure in the next five to 10 years; and
- The Unit 1 to 4 exciters are in Fair condition with the potential to be in Poor condition by fiscal 2025.

BC Hydro states that the control systems were not assigned an Equipment Health Rating as they were assessed using a different methodology based on their obsolescence and the lack of availability of spare parts.[48]

BC Hydro explains that the generating equipment at the Bridge River 1 Generating Station now requires replacement because it has reached end-of-life and will be unable to continue to perform reliably. BC Hydro states that when an asset reaches end-of-life, a component-by-component replacement is generally the least costly and most efficient option. [49]

2.3 Bridge River System Water Flows

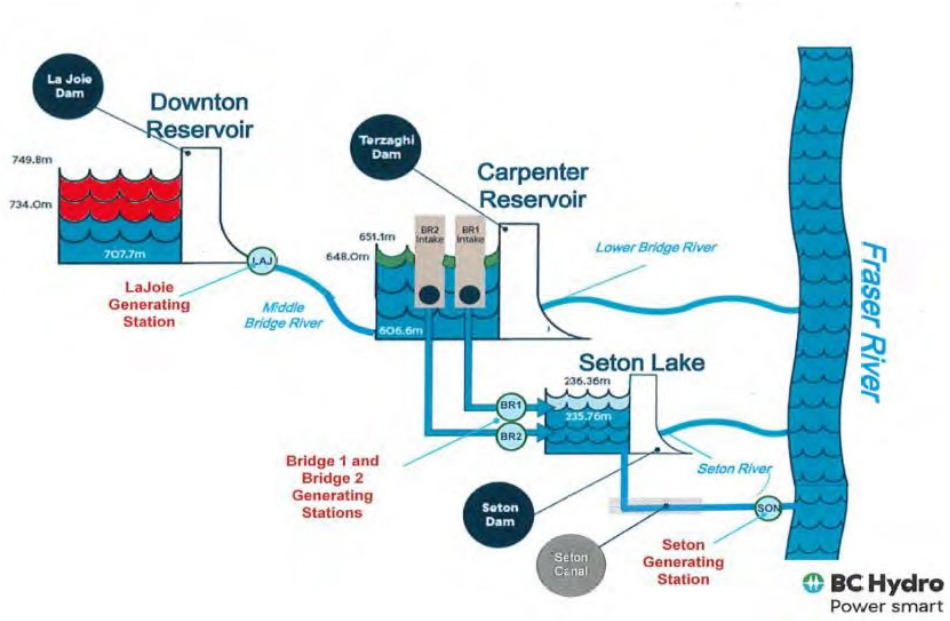
The Bridge River Generation System diverts water from the Bridge River watershed to the Seton River watershed. As illustrated in Figure 3 below, the Bridge River is divided into:[50]

- Upper Bridge River, which extends from the glaciers to Downton Reservoir, which is impounded by the La Joie Dam;
- Middle Bridge River, which extends from downstream of the La Joie Dam and Generating Station to Carpenter Reservoir, which is impounded by Terzaghi Dam; and

[46] Exhibit B-1, p. 3-12.
[47] Ibid., pp. 3-12 – 3-19.
[48] Ibid., p. 3-12.
[49] Ibid., p. 3-11.
[50] Ibid., p. 2-5.

- Lower Bridge River, which extends downstream from Terzaghi Dam to Fraser River.

Figure 3: Flow of Water through the Bridge River Generation System



BC Hydro states it must operate the Bridge River Generation System in accordance with the Water Use Plan (WUP) Order issued by the Comptroller of Water Rights and the 2011 Agreements and 2019 High Flow Settlement Agreement with the St'át'imc Nation.[51] The WUP Order outlines operating constraints, physical works and monitoring programs for the entire Bridge River System. [52]

BC Hydro states it can manage Bridge River system flows in accordance with the WUP Order, 2011 Agreements and 2019 High Flow Settlement Agreement when the reservoirs are able to be operated at the maximum licensed storage levels and both Bridge River Generating Stations are capable of operating at their total licensed flow capacity.[53]

In 2011, the Unit 4 generator at the Bridge River 1 Generating Station was derated from 50 MVA to 40 MVA, after it failed a routine maintenance test.[54] As a result, the Bridge River 1 Generating Station is currently operating at less than its plant maximum rating, consequently reducing the total flow from Carpenter Reservoir to Seton Lake through the Bridge River 1 Generating Station by 3.2 m^3/s or by approximately five percent.[55]

In addition, in 2015, the Downton Reservoir upper operating elevation was lowered to mitigate dam seismic risks, reducing the effective storage of Downton Reservoir by approximately 47 per cent (shown in red in the Figure 3 above).[56]

[51] Ibid., p. 2-4; Exhibit B-1-1, Appendix A-6-1.
[52] Ibid., p. 3-20; Exhibit B-1-2, Appendix B-1.
[53] BC Hydro Final Argument, paras 50 - 53.
[54] Exhibit B-1, p. 3-23.
[55] Exhibit B-5, BCUC IR 1.6.1.
[56] Exhibit B-1, p. 2-6.

BC Hydro states that the combined loss of flow capacity through the Bridge River 1 Generating Station and reduced Downton Reservoir storage has impacted its ability to manage water flows resulting in adverse impacts to fish and fish habitat.[57] BC Hydro describes the types of environmental harm that have already occurred and may occur again in the Lower Bridge River due to higher flows and the St'át'imc Nation's deep concern regarding these impacts.[58] BC Hydro explains that "generating units at the Bridge River 1 and Bridge River 2 Generating Stations are BC Hydro's primary tool to meet the water flow targets in the WUP Order and to meet commitments set out in the 2011 Agreements with the St'át'imc Nation."[59]

2.3.1 WUP Order and the 2011 Agreements with the St'át'imc Nation

The WUP Order outlines operating constraints, physical works, and monitoring programs for the entire Bridge River System.[60] BC Hydro describes the nature of the consultation process that resulted in the WUP Order as follows:

> The WUP Order was the product of an extensive consultation process with the St'át'imc Nation and other interested parties and reflects a balancing of interests and reflects the recommendation of the Bridge River WUP Consultative Committee, including representatives from various levels of government, the St'át'imc Nation, local residents, and environmental groups, as well as the recommendations of the St'át'imc Nation in 2009 and 2010.[61]

Under the WUP Order and the 2011 Agreements with the St'át'imc Nation, BC Hydro is required to work with the Comptroller of Water Rights and the St'át'imc Nation to establish a long-term flow release strategy. BC Hydro states its objective is "to adhere to the intent of the WUP and to meet the approach set out in the WUP Order for a target flow schedule, wherever possible, as it continues to establish a long-term flow strategy."[62]

The WUP Order target flow schedule does not specify a maximum number of days that BC Hydro is allowed to exceed the target flow schedule for Lower Bridge and Seton Rivers. However, BC Hydro is required to seek a variance if it cannot comply with the parameters in the WUP Order. BC Hydro had sought variances in the past to facilitate unit outages for capital project implementation, particularly in years of high inflow.[63] BC Hydro states that while it has been able to seek variances to target flows in the WUP Order, it is uncertain whether it will continue to obtain variances over the long-term since the regulatory process is not entirely within its control.[64]

2.3.2 Downton Reservoir and La Joie Dam Upgrade Project

Downton Reservoir makes up forty percent of the Bridge River System storage capacity and is a critical component of managing water flows in the Bridge River System.[65] The reduced Downton Reservoir storage capacity results in higher discharges from the La Joie Dam into Carpenter Reservoir during late spring and

[57] Exhibit B-1, p. 3-5.
[58] Ibid., pp. 3-24 – 3-25; Exhibit B-6, CEC 1.31.1; Exhibit B-9, BCUC IR 2.45.2.
[59] Ibid., p. 2-4.
[60] Ibid., p. 3-20.
[61] Ibid.
[62] Exhibit B-9, BCUC IR 2.45.2.
[63] Exhibit B-5, BCUC IR 1.7.2.1.
[64] Exhibit B-9, BCUC IR 2.45.2.
[65] Exhibit B-6, BCSSIA IR 1.2.7.

summer and increases the reliance on the generating units at the Bridge River 1 and Bridge River 2 Generating Stations to pass flows out of Carpenter reservoir. BC Hydro explains:

> Flows from Downton and Carpenter Reservoirs must be either diverted to Seton Lake, through the Bridge River 1 and Bridge River 2 Generating Stations or discharged from Terzaghi Dam to Lower Bridge River. If generating units at the Bridge River 1 and Bridge River 2 Generating Stations are not producing energy or Carpenter Reservoir is reaching capacity, flows must be released at Terzaghi Dam down Lower Bridge River. This increases the risk of exceeding the Lower Bridge River water flow targets set by the WUP Order, especially during freshet. [66]

BC Hydro states that the reduced Downton Reservoir level is a temporary mitigation measure until seismic risks are addressed through the planned La Joie Dam Upgrade Project, which BC Hydro expects to implement in approximately 10 years.[67] BC Hydro adds that the planned investments at the La Joie facility "appear to be uneconomic,"[68] and as a result, BC Hydro's La Joie Dam Upgrade project team is exploring various alternatives to rehabilitation of the La Joie Dam, including decommissioning La Joie Dam or a reduced Downton Reservoir,[69] as well as the availability of means to reduce discharge from Terzaghi Dam to Lower Bridge River under those scenarios.[70] BC Hydro describes the impact of decommissioning La Joie Dam on system water flows as follows:

> If the La Joie Dam is decommissioned and the storage of Downton Reservoir is no longer available, this would increase the dependence on the Bridge River 1 and Bridge River 2 Generating Stations to operate reliably and there would be more days of discharge into the Lower Bridge River which exceed the Water Use Plan Order target flows.[71]

BC Hydro states that La Joie Dam Upgrade project team is engaging St'át'imc Nation in exploring the alternatives, ranging from decommissioning to upgrades that would allow full restoration of the Downton Reservoir's capacity, and the degree to which they address St'át'imc Nation values and concerns regarding the river system.[72]

BC Hydro states that the Bridge River 1 and Bridge River 2 units are the primary mechanism for BC Hydro to manage water flows, however this is due principally to the derating of the La Joie Dam.[73] As previously stated, BC Hydro is currently planning the seismic upgrade of the La Joie Dam, which would take approximately 10 years to implement.[74]

2.3.3 Effects of Available Bridge River 1 Generating Units on Water Flows

BC Hydro asserts that the deteriorating condition of the generating equipment at the Bridge River 1 Generating Station means that there is a heightened risk of further limitations on BC Hydro's ability to divert water from Carpenter Reservoir to Seton Lake. BC Hydro explains that "the condition of the generating equipment increases the likelihood of equipment failures, which could lead to further de-rating, or total failure of the Bridge River 1 generating units."[75]

[66] Exhibit B-1, p. 2-6.
[67] Ibid., p. 2-13.
[68] Exhibit B-6, Attachment 1 to BCSSIA IR 1.3.1, p. 2.
[69] Ibid., BCOAPO IR 1.11.5.
[70] Ibid., Attachment 1 to BCSSIA IR 1.3.1, p. 2.
[71] Exhibit B-5, BCUC IR 1.5.3.
[72] Exhibit B-6, Attachment 1 to BCSSIA IR 1.3.1, p. 2.
[73] Exhibit B-1, p. 2-4.
[74] Ibid., p. 2-13, Exhibit B-6, BCOAPO IR 1.11.5.
[75] Exhibit B-1, p. 3-26.

BC Hydro states that the BR1 Project is not expected to improve flow management capabilities in Seton River.[76] BC Hydro undertook a flow modelling study to evaluate effects of available Bridge River 1 generating units on water flows in Lower Bridge and Seton Rivers, relative to the WUP Order target flow schedule. The modelling included 53 years of inflow data and calculated the number of days where a WUP Order target flow exceedance would occur with zero, one, two, three or four available generating units for service.[77]

Figure 4 below shows that as the number of available Bridge River 1 generating units decreases from additional derated or failed generators, there is a corresponding increase in WUP Order target flow exceedance for Lower Bridge River.[78]

Figure 4: Number of Days Exceeding the Lower Bridge WUP Order Target Flow Schedule in 53 years With Available Generating Units 1 to 4

2.4 Legislative and Contractual Requirements

2.4.1 *The Clean Energy Act*

BC Hydro states that, due to the requirements for electricity self-sufficiency as set out is subsection 6(2) of the CEA, market purchases are not a long-term supply option available to replace the Bridge River System. BC Hydro explains that "it is required to achieve electricity self-sufficiency by holding the rights to an amount of electricity that meets its electricity supply obligations under average water conditions from its Heritage Assets that are hydroelectric facilities, taking into account Demand Side Management and electricity solely from electricity generating facilities within the Province."[79]

In addition to the need to be electrically self-sufficient, several of the British Columbia's energy objective from section 2 the CEA are relevant to assessing the need for the BR1 Project including, among others:[80]

> (c) to generate at least 93% of the electricity in British Columbia from clean or renewable resources and to build the infrastructure necessary to transmit that electricity;

[76] Ibid., p. 3-26.
[77] Ibid.
[78] Ibid., Figure 3-11, p. 3-27.
[79] Exhibit B-5, BCUC IR 1.2.3.
[80] Exhibit B-1, Table 1-7, pp. 1-49 – 1-50.

(e) to ensure the authority's ratepayers receive the benefits of the heritage assets and to ensure the benefits of the heritage contract under the BC Hydro Public Power Legacy and Heritage Contract Act continue to accrue to the authority's ratepayers; and

(m) to maximize the value, including the incremental value of the resources being clean or renewable resources, of British Columbia's generation and transmission assets for the benefit of British Columbia.

Section 14 of Part 3 of the CEA provides that the sale or disposition of Heritage Assets is prohibited, with exceptions:

(1) The authority must not sell or otherwise dispose of the heritage assets.

(2) Nothing in subsection (1) prevents the authority from disposing of heritage assets if the assets disposed of are no longer used or useful for their intended purpose, or they are to be replaced with one or more assets that will perform similar functions.[81]

2.4.2 Compliance with Water Use Plan and St'át'imc Agreements

BC Hydro has a license to operate under the *Water Sustainability Act*:

Under the Act, the Comptroller of Water Rights or other designated authority may regulate the storage, diversion, or use of water, as authorized by a water licence. The need to regulate is influenced by various flow conditions, from high-water levels to temporary water shortages or drought conditions. This regulatory authority is exercised so as to protect the prior rights of other licensees, and to provide for the protection of environmental values (e.g., fishery flows and habitat) and other provincial interests (e.g., flood protection or recreational benefits).[82]

As described in Section 2.3 above, BC Hydro operates the Bridge River 1 Generating Station under the WUP Order issued in 2011. A key target of the WUP Order is maintaining an annual average outflow between 3 m^3/s and 6 m^3/s on the Lower Bridge River.[83] BC Hydro is required to seek a variance if it cannot comply with the parameters in the WUP Order. BC Hydro is currently operating under a variance to its WUP Order.[84]

Further, as described in Section 2.3.1 above, BC Hydro must operate in accordance with its obligations under the 2011 Agreements and 2019 High Flow Settlement Agreement with the St'át'imc Nation. Among other obligations, the 2011 Agreements stipulate that "unless otherwise agreed to by BC Hydro and St'át'imc or lawfully ordered by the Comptroller, BC Hydro and St'át'imc agree that the flow release from Terzaghi Dam will simulate a naturalized hydro graph that will not be less than an annual average water budget of 3 m^3 /s (+/- 5% of 3 m^3/s) and will not exceed an annual average water budget of 6 m^3 /s (+/- 5% of 6 m^3 /s)."[85]

BC Hydro states it is not currently able to operate the Bridge River 1 Generating Station to its total licensed flow capacity and the reduced upper operating elevation of Downton Reservoir has resulted in higher discharges

[81] *Clean Energy Act* https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/10022_01#part3
[82] Water Use Plan Guidelines, Appendix A. https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/water-planning/water_use_plan_guidelines.pdf
[83] Exhibit B-1, p. 3-20.
[84] Exhibit B-5, BCUC IR 1.7.2.1.
[85] Exhibit B-1, p. 3-21.

from the La Joie Dam into Carpenter Reservoir during late spring and summer, hampering BC Hydro's ability to manage Bridge River system water flows.[86]

Positions of the Parties

BC Hydro submits that the Bridge River System is a "highly valuable and difficult to replace asset" and that it requires the energy and capacity from the system to serve customer demand.[87]

BC Hydro asserts that the Bridge River System provides 4 percent of its total generating capacity and about 5 percent of its total hydroelectric generation, is located relatively close to its load centre in the Lower Mainland, and provides "significant benefits" to the operation of its integrated system, including voltage control to the Kelly Lake Substation, which improves BC Hydro export capability.[88]

BC Hydro estimates that if the energy and capacity that Bridge River System would otherwise provide were to be replaced with wind resources in the Peace River region, the cost would be in the range of $4,600 million to $6,400 million. Alternatively, the cost of wind resources in the Peace River region for energy and grid-scale batteries for capacity would cost in the range of $2,070 million to $3,870 million. BC Hydro adds that market purchases are not a long-term option to replace the Bridge River System because market imports would not meet the requirements to be self-sufficient as set out in section 6(2) of the CEA.[89]

With respect to reliability, BC Hydro submits that health of the Unit 1 to 4 generators has been assessed as "unsatisfactory" with "an increasing probability of in-service failure within five years." BC Hydro explains that the Units 1 to 4 generators have each been in service for more than 65 years, "significantly exceeding" their life expectancy of 50 years, the Unit 4 generator has been de-rated, and there are issues with the stator windings, stator cores, field windings and generator shafts. [90] BC Hydro submits that the primary impacts of a generator failure would be a forced outage and possible de-rating of the generating equipment, the cost of repairs to the generator and of replacement capacity and energy, negative impacts to water quality and fish and fish habitat, and a negative effect on St'át'imc values and BC Hydro's ability to meet its commitments to St'át'imc Nation.[91]

As noted in Section 2.3 above, BC Hydro submits the BR1 Project is equally needed to improve its ability to manage water flows in the Bridge River System.[92]

BC Hydro also submits that a reduction of the Downton Reservoir capacity of approximately 47 percent to mitigate seismic risks has increased its dependence on the Bridge River generating units to manage flows in the Lower Bridge River. As a result, BC Hydro submits that the increased likelihood of equipment failures due to the condition of the Bridge River 1 generating equipment increases the likelihood of flows that exceed the WUP Order target flow and the average annual flows contemplated in the 2011 and 2019 High Flow Settlement Agreements with the St'át'imc Nation. [93]

[86] Ibid., p. 3-23.
[87] BC Hydro Final Argument, p. 6.
[88] Ibid., p.7.
[89] Ibid., p. 9.
[90] Ibid., p. 15.
[91] Ibid., p. 16.
[92] Ibid., p. 19.
[93] Ibid., pp. 22-25.

As described in Section 2.3.1 above, BC Hydro submits that it could seek variances to target flows in the WUP Order, but that this regulatory process is not under its control as the legal authority to grant variances and determine the specific terms of the variances remains with the Comptroller of Water Rights under the *Water Sustainability Act*. Further, even if it were granted variances from the WUP Order target flow schedules, the BR1 Project is still required because continuing to exceed the WUP Order target flow schedules has the potential to harm fish and fish habitat which is not acceptable to the St'át'imc Nation and could harm their way of life.[94]

BC Hydro submits that the BR1 Project "needs to proceed at the earliest opportunity" to address the deteriorating condition of the assets, which are "past the point where increased maintenance will have a material impact on their remaining service life." BC Hydro adds that it needs a decision on the BR1 Project by September 20, 2022 to maintain the BR1 Project schedule, following its delay in issuing the Request for Proposal (RFP) for the replacement generators. BC Hydro explains that a delay to the BR1 Project would likely increase costs, reliability risk and environmental risk relating to water management. [95]

BCOAPO submits that "BC Hydro has presented sufficient evidence of a sufficiently pressing reliability issue with the BR1 Units 1 to 4 requiring action and that the risks are such that it should be addressed at this point in time rather than deferred until later."[96]

The CEC submits that BC Hydro has adequately established an immediate need to address the risks associated with the Bridge River System.[97]

BCSEA submits that the BR1 Project is in the public interest and supports issuance of a CPCN.[98]

RCIA submits that BC Hydro, in its final argument, "came out with a new ground to justify the BR1 Project, namely BC Hydro now claims that the BR1 Project is also necessary to meet recently forecasted energy and capacity gaps." RCIA submits that this "new ground" has not been adequately tested in the proceeding because it was "not part of the original justification for the BR1 Project."[99]

In reply, BC Hydro submits that it "has neither changed its justification for the BR1 Project, nor introduced any new evidence in its Final Submission." BC Hydro refers to multiple examples in the evidence referring to the need for energy and capacity, including section 2.6.1 of the Application which "includes the NPV of BR1 in various scenarios related to the value of energy and capacity" and its response to RCIA IR 2.43.1 where it provided "the energy and capacity shortfall BC Hydro would experience without the Bridge River Generation System, based on its draft 2021 IRP." BC Hydro submits that RCIA has had "numerous opportunities to ask IRs on the economic valuation of the Bridge River System and BR1 alone, and had the opportunity to request further process for the review of the BR1 Project if it considered it was warranted."[100]

[94] Ibid., pp. 25-27.
[95] Ibid., pp. 61-62.
[96] BCOAPO Final Argument, p. 13.
[97] CEC Final Argument, p. 15.
[98] BCSEA Final Argument, p. 3
[99] RCIA Final Argument, p. 6.
[100] BC Hydro Reply Argument, pp. 6-8.

RCIA submits that it accepts the premise that an asset investment is required to achieve BC Hydro's water management needs.[101] However, RCIA submits that "the evidence that improving the reliability of all four generators is required to meet BC Hydro's water management objectives is not compelling because of the independence of generator failures and the requirement for those independent failures to occur during the wettest parts of wetter years." RCIA notes BC Hydro's evidence that it is not until three or four BR1 generating units are out of service that water flow exceedances occur regularly, and concludes that most flow exceedances occur in "particularly wet, high flow years and are not representative of typical years."[102]

In reply, BC Hydro submits that RCIA's opinion that BC Hydro does not need four generators to meet water management objectives should not be accepted. BC Hydro explains that RCIA's opinion is based on "RCIA's judgement regarding the probability of flow exceedances without any consideration of the consequences to the environment, the St'át'imc Nation, BC Hydro or other stakeholders, and BC Hydro's obligations under the WUP Order and its agreements with the St'át'imc Nation." BC Hydro submits that RCIA offers no evidence or argument to explain why the risk of environmental harm should be disregarded, or how BC Hydro could be released from its obligations under the WUP Order and 2011 Agreements and 2019 High Flow Settlement Agreement with the St'át'imc Nation.[103]

BC Hydro further submits that RCIA's submission regarding BC Hydro's water flow exceedances is misleading. BC Hydro explains that it can manage Bridge River System water flows in accordance with the WUP Order, 2011 Agreements and 2019 High Flow Settlement Agreement with the St'át'imc Nation when the reservoirs are able to be operated at the maximum licensed storage levels and both generating stations are capable of operating at their total licensed flow capacity. BC Hydro submits that the first step to improve water flow management is to restore the licenced flow capacity of Bridge River 1 Generating Station through the BR1 Project, which still leaves the reduced elevation at Downton reservoir which accounts for the continued risk of exceedances with four generators. BC Hydro's view is that this heightens the need for the BR1 Project to restore the capacity of the four generators and improve their reliability so that BC Hydro can manage the water flows from Terzaghi Dam to Lower Bridge River.[104]

RCIA submits that BC Hydro's elevation of deteriorating asset condition as a primary need in its final argument impairs its decision making by imposing "an asset oriented lens rather than a functional outcome for ratepayer lens" on BCUC decision making. RCIA submits that "BC Hydro's asset management purpose appears to be maintaining assets in as good a condition as the [BCUC] will allow, whereas the purpose of asset management from a ratepayer and [BCUC] perspective is to select investments that deliver adequate utility service to ratepayers at lowest cost and risk." In the RCIA's view, maintaining better asset condition keeps assets in continued service, but does not necessarily guarantee alignment with ratepayer and environmental objectives at the lowest cost and risk.[105]

In reply, BC Hydro disagrees with RCIA's "dichotomy between asset-oriented and functionally-oriented decision making," and considers that these can be better characterized as representing different levels of analysis. BC Hydro submits that it has based the justification for the BR1 Project on "functional outcomes," specifically improved reliability of the generating units and improved management of water flows, and that its "asset

[101] RCIA Final Argument, p. 13.
[102] Ibid., p. 17.
[103] BC Hydro Reply Argument, pp. 13-15.
[104] Ibid, p. 15.
[105] Ibid., pp. 11-12.

management purpose" is not "maintaining assets in as good a condition as the [BCUC] will allow." BC Hydro further submits that while the lowest cost alternative is preferrable, increased cost may be justified to achieve benefits or avoid risks. [106]

RCIA accepts the "universal truth" that the Bridge River 1 Generation Station asset condition is decreasing over time and that the likelihood of equipment failure is increasing over time. However, RCIA submits that the assets are currently functioning and meeting BC Hydro's current needs otherwise BC Hydro would not be acting prudently today.[107]

In reply, BC Hydro highlighted the evidence presented in its Application and responses to IRs "that it was economic to continue investing in the Bridge River System and in Bridge River 1 in particular,"[108] and submits that evidence related to the value of the capacity and energy provided by the Bridge River System and the Bridge River 1 alone was a part of that calculation. BC Hydro submits that its evidence supports the need for having all four generators operating in Bridge River 1 to meet its water management objectives and reduce the potential for harm to the St'át'imc Nation, BC Hydro or other stakeholders, including BC Hydro ratepayers.[109]

BCSSIA's position is that there is no urgent need to approve the BR1 Project, noting that BC Hydro has an energy and capacity surplus to the end of the decade, even with further de-rating or total failure of one of the Bridge River 1 generating units. BCSSIA submits that none of the consequences of a delay to the BR1 project "appears to be dire, and all should be manageable." Specifically, BCSSIA submits that any increased cost to the BR1 Project as a result of a delay "should be relatively minor" in the context of a project costing over $300 million and "which would trigger a cascade of other projects, potentially costing $1 billion in total."[110]

In reply, BC Hydro submits that BCSSIA's argument that there is no urgent need for the BR1 Project "is not supported by the evidence and is without merit." In reply to BCSSIA's statement that BC Hydro has an energy and capacity surplus to the end of the decade, BC Hydro submits that the BR1 Project is needed to improve water management in addition to the reliability of the generators, noting also that the BR1 Project is not scheduled to be complete until July 2030. [111]

BCSSIA submits that the potential consequences of delaying approval of the BR1 Project do not appear to be "dire, and all should be manageable." BCSSIA submits that potential adverse impacts on BC Hydro's relationship with the St'at'imc First Nation should be addressed by "immediately opening discussions with the First Nation's to obtain their view on allowing more water into the Bridge River." BCSSIA suggests the BCUC should "direct BC Hydro to advise the First Nation of the situation and find out exactly what their preferences are with respect to the increased water flows that could occur should it prove necessary to delay the upgrading of BR1, or should it prove optimal to lower or remove the La Joie Dam, as the best means to eliminate the potential seismic risk to that structure."[112]

[106] BC Hydro Reply Argument, pp. 11-13.
[107] RCIA Final Argument pp. 9, 13.
[108] BC Hydro Reply Argument, p. 7.
[109] Ibid., p. 13.
[110] BCSSIA Final Argument, p. 6.
[111] BC Hydro Reply Argument, p. 16.
[112] BCSSIA Final Argument, pp. 6-7.

BCSSIA further submits that "the biological health of the Bridge River, and possibly also benefits to First Nations, should only improve from having more water in the river, as long as the flows are managed properly to correspond to the natural hydrograph of the Bridge River." BCSSIA notes that BC Hydro negotiated such an agreement with First Nations in 2017 when it wanted to discharge more water from the Terzaghi Dam. BCSSIA adds that with proper reservoir and generation management, "the possibility of damaging fish or fish habitat should be avoidable."[113]

BCSSIA submits that based on BC Hydro's evidence, "on average, 3 of the 8 [Bridge River generating] units could be shut down totally, or at least derated, and the generation shifted to the remaining good units," assuming that the Downton and Carpenter reservoir levels "can be managed accordingly." BCSSIA adds that temporary energy dissipation devices are a "viable low-cost option to manage water flows" and "should be sufficient to manage average water flows." [114]

In reply to BCSSIA's claims that the consequences of deferring the BR1 Project "should be manageable," BC Hydro submits that these claims "are without merit and should be rejected."[115] As examples, BC Hydro points to an engineering report indicating that generating units 1, 3 and 4 have a "high risk of failure within five years," and that delaying the BR1 Project would increase the risk of costly emergency repairs, further derating of equipment and further degradation of water flow management capabilities. BC Hydro adds that continuing to exceed the WUP Order target flow schedule for the Lower Bridge River "has the potential to harm fish and fish habitat in the Lower Bridge River and this is not acceptable to BC Hydro or the St'at'imc Nation."[116]

Panel Determination

The Panel finds that BC Hydro has established the need for the BR1 Project to continue to provide clean energy and capacity, to mitigate the risk of equipment failure and to improve BC Hydro's ability to manage water flows in the Bridge River System. Further, the Panel finds that there is no justification to delay this project.

The Panel finds there is a need for the Bridge River 1 Generating Station to provide clean energy and capacity in British Columbia. The Bridge River 1 Generating Station is a significant contributor to meeting British Columbia's electricity demand, with the Bridge River System providing five percent of British Columbia's annual generation and four percent of British Columbia's capacity. The Bridge River 1 Generating Station is also located close to the Lower Mainland, British Columbia's largest source of electricity demand, and is often used as a peaking facility to satisfy periods of high electricity demand.[117] If the Bridge River 1 Generating Station were unavailable, there would be a province-wide need for energy in fiscal 2024 and capacity in fiscal 2031.

The Panel does not agree with RCIA's position that BC Hydro's need for energy and capacity from the Bridge River 1 Generating Station is "new ground" in this proceeding.[118] BC Hydro identified the contribution made by the Bridge River 1 Generating Station to British Columbia's energy needs in the Application, including

[113] Ibid., pp. 7-8.
[114] Ibid., pp. 9-10.
[115] BC Hydro Reply Argument, pp. 16-19.
[116] Ibid., pp. 16-17.
[117] Exhibit B-1, pp. 2-2 – 2-3.
[118] RCIA Final Argument, p. 6.

subsections 2.2 and 2.6. RCIA has had sufficient opportunity to test BC Hydro's evidence through multiple rounds of IRs in this proceeding.

The Panel finds that there is a need to effectively control the flow of water into the Lower Bridge River. Water flows into the Lower Bridge River and the impacts on fish and environment are a key concern to the St'át'imc Nation, as represented in the 2011 and 2019 Agreements. BC Hydro also has obligations under its WUP Order to manage water flows in the Lower Bridge River. Currently, BC Hydro is operating under a variance to its WUP Order and is at risk of further water flow management challenges in the event of additional unit deratings, outages or failures at the Bridge River 1 Generating Station.

The Panel disagrees with RCIA's position that not all four generators are required to manage flows and BCSSIA's submission that deferring the BR1 Project and allowing increased risk of exceeding the designated water flows in the WUP should be manageable. It may be true that not all four generators are needed all year round and at all rates of water flow to meet BC Hydro's water flow management needs. However, the evidence shows that BC Hydro requires a solution to manage the water flows to fully meet its commitments to the St'át'imc Nation under the 2011 Agreements and 2019 High Flow Settlement Agreement and its obligations under the WUP Order, and to prevent environmental harm in the Lower Bridge River. The Panel will consider in Section 3 below which alternative best meets this need.

The Panel finds that there is a need to improve the reliability of the BR1 generating units due to the deteriorated condition of the equipment at the Bridge River 1 Generating Station. The Bridge River 1 Generating Station equipment has exceeded its life expectancy, resulting in an increased risk of failures which could in turn result in costly emergency repairs, further de-rating of equipment, risk to the environment due to reduced water management capabilities, harm to the fish and fish habitat in the Lower Bridge River and disputes with the St'át'imc Nation under BC Hydro's 2011 Agreements and the 2019 High Flow Settlement Agreement.

The Panel disagrees with RCIA's submission that BC Hydro has imposed "an asset oriented lens rather than a functional outcome for ratepayer lens" and that the BR1 Project has been devised to maintain assets in "as good a condition as the [BCUC] will allow." In the Panel's view, the deteriorating condition of the Bridge River 1 Generating Station assets may not alone be sufficient to justify the BR1 Project, but when considered in the context of BC Hydro's need for clean energy and additional capacity, as well as the need to manage water flows for the reasons set out above, the BR1 Project is justified.

The Panel finds that there is no justification to delay the BR1 Project, which has been suggested by RCIA[119] and BCSSIA,[120] as the BR1 Project is needed urgently. Based on the current BR1 Project schedule, the last of the new units will be in-service in 2030. The Panel gives considerable weight to BC Hydro's 2017 engineering report which assessed that generating units 1, 3 and 4 have "a high risk of failure within five years," i.e. before 2030. Any premature equipment failure or further deratings would incur additional cost, safety risk at the plant and negative impacts to water flow management until the Project is complete.

Having the BR1 Project complete by 2030 will support British Columbia's energy and capacity needs as well as regional energy demands in a timely manner. The Panel disagrees with BCSSIA's submission that the energy and capacity provided by the BR1 Project are not needed until the end of the decade and the project is not urgent.

[119] Ibid., p. 28.
[120] BCSSIA Final Argument, p. 20.

The Panel gives weight to BC Hydro's evidence that in the absence of the Bridge River 1 Generating Station, there would be a need for energy in fiscal 2024 and a capacity need in fiscal 2031. The Panel disagrees with BCSSIA's submissions that deferring the BR1 Project should result in manageable costs and risks. Delaying the BR1 Project could result in costly emergency repairs, further derating of equipment and further degradation of water flow management capabilities which is detrimental to the commitments made between BC Hydro and the St'át'imc Nation and maintaining fish and fish habitat in the Lower Bridge River.

Although BC Hydro did not specifically identify economic value as a need for the BR1 Project, the continued investment in the Bridge River System represents a value to ratepayers because both the system as a whole and the BR1 Project have a positive NPV.

3.0 Description and Evaluation of Alternatives for the BR1 Project

BC Hydro states that it identified three feasible alternatives for the BR1 Project and evaluated those alternatives through a structured decision-making approach. The three alternatives were: Replace, Refurbish and Rewind.[121] Based on the results of its evaluation, BC Hydro selected Replace as the preferred alternative, which entails replacing Units 1 to 4 generators, governors, exciters and control systems.[122]

BC Hydro considered other alternatives in addition to the three listed above, such as extending the life of existing equipment or deferring investment, however these were dismissed as they were deemed to be not feasible.[123] In addition to the alternatives as presented in the Application, BC Hydro in IR responses provided detail on the feasibility of two further alternatives involving the bypass of water flow around the BR1 generating units.[124]

3.1 Description of Alternatives

In its Application, BC Hydro identified three feasible alternatives to address the condition of Units 1 to 4 at the Bridge River 1 Generating Station. In BC Hydro's view, extending the life of the existing governors, exciters and control systems is not feasible, thus all three feasible alternatives include new governors which are expected to have a 40-year service life and new exciters and control systems which are expected to have a 30-year service life.[125]

The three feasible alternatives are:

i. **Replace:** BC Hydro would replace the Units 1 to 4 generators, exciters and control systems. The new generators would have a capacity rating of up to 65 MVA to complement the previously upgraded 58.5 MW turbines and an expected service life of 50 years. They would also include an extended design warranty from the manufacturer.

ii. **Refurbish:** BC Hydro would refurbish the Units 1 to 4 generators and replace the existing governors, exciters and control systems. Some additional components, such as the generator stators would need to

[121] Exhibit B-1, pp. 4-1, 4-4.
[122] Ibid., p. 4-1.
[123] Ibid., pp. 4-2 – 4-3.
[124] Exhibit B-5, BCUC IR 3.1.
[125] Exhibit B-1, pp. 4-2 – 4-4.

be replaced under this alternative. The refurbished units would have capacity rating of up to 65 MVA to complement the previously upgraded 58.5 MW turbines and an expected service life of 40 years.

iii. **Rewind:** BC Hydro would replace the windings in the stationary parts of the Units 1 to 4 generator stators and replace or refurbish other generator components as needed to maintain the original 50 MVA rating. The governors, exciters and control systems would also be replaced under this alternative. The rewound generators would have an expected service life of 20 years.[126]

A fourth feasible option, a like-for-like replacement, was also brought into evidence through BCUC IRs:

i. **Like for Like Replace:** BC Hydro would replace the Units 1 to 4 generators, exciters and control systems. The new generators would have a capacity rating of up to 50 MVA, like the currently existing generator nameplate capacity, and an expected service life of 50 years. They would also include an extended design warranty from the manufacturer.

Through BCUC IRs, BC Hydro also provided details about two bypass alternatives that would potentially allow for management of water flows while removing the need for capital investment in the BR1 facility. These alternatives were considered in the conceptual phase but were ultimately dismissed by BC Hydro:

i. **Additional Outlet:** BC Hydro would commission an additional outlet through the use of an abandoned tunnel that could conceptually be recommissioned as a penstock. This alternative would require energy dissipation devices in order limit the discharge velocities and would require significant geotechnical, civil and mechanical works.

ii. **Bifurcation of Penstock:** BC Hydro would bifurcate one of the existing penstocks as a means to bypass the units. This alternative would require energy dissipation devices in order to limit discharge velocities, and would require significant geotechnical, civil and mechanical works.[127]

Two further alternatives were explored by BC Hydro and deemed infeasible in the conceptual stage of the BR1 Project for the following reasons: [128]

- **Extending the service life of governors, excitors and control systems**: Excessive mechanical wear, corrosion, unavailability of spare parts and obsolete design make this alternative unsuitable for present-day operation and control requirements.
- **Deferral of the BR1 Project**: There is a high likelihood that multiple generators would fail before they are replaced, leading to loss of generation capability, increased risk of negative environmental impacts on fish and fish habitat, inability to address concerns in the agreements with the St'át'imc Nation, and possible expensive emergency repairs.

[126] Exhibit B-1, p. 4-4.
[127] Exhibit B-5, BCUC IR 3.1.
[128] Exhibit B-1, pp. 4-2 – 4-3.

3.2 BR1 Project Objectives and Considerations

In order to assess alternatives and obtain a preferred alternative, BC Hydro developed a set of objectives for the BR1 Project. The BR1 Project objectives are described below as:[129]

- Maximize generating unit reliability, with the lowest likelihood of leading to unit failures;
- Minimize environmental impact by restoring water flow capacity, increasing operating flexibility and managing flows from Terzaghi Dam to Lower Bridge River within the WUP Order flow targets to maintain fish and fish habitat in Lower Bridge River;
- Help to meet the expectations of the St'át'imc Nation by supporting BC Hydro's ability to meet the commitments in the 2011 Agreements and 2019 High Flow Settlement Agreement with the St'át'imc Nation;
- Minimize cost risk with the lowest likelihood of an increase in scope and schedule delays due to unknown conditions, without a material difference in cost; and
- Minimize maintenance hazards and exposure to construction hazards.

These objectives are intended to guide BC Hydro's structured decision-making process by evaluating the feasible alternatives against each of the objectives, criteria and measures, discussed further in the following section.[130]

Further, when evaluating potential alternatives, BC Hydro must consider sections 2(c), 6(2) and 19 of the CEA, which state:[131]

> **2** The following comprise British Columbia's energy objective
>
> […]
>
> (c) to generate at least 93% of the electricity in British Columbia from clean or renewable resources and to build the infrastructure necessary to transmit that electricity;
>
> **6** (2) The authority must achieve electricity self-sufficiency by holding, by the year 2016 and each year after that, the rights to an amount of electricity that meets the electricity supply obligations solely from electricity generating facilities within the Province,
>
> (a) assuming no more in each year than the heritage energy capability, and
>
> (b) relying on Burrard Thermal for no energy and no capacity, except as authorized by regulation
>
> **19** (1) To facilitate the achievement of British Columbia's energy objective set out in section 2 (c), a person to whom this subsection applies
>
> (a) must pursue actions to meet the prescribed targets in relation to clean or renewable resources, and
>
> (b) must use the prescribed guidelines in planning for
>
> (i.) the construction or extension of generation facilities, and

[129] Ibid., pp. 4-5 – 4-6.
[130] Ibid., pp. 4-4 – 4-5
[131] Ibid., pp. 1-49 – 1-52, *Clean Energy Act*, Sections 2, 6, 19.

(ii.) energy purchases.

(2) Subsection (1) applies to

(a) the authority, and

(b) a prescribed public utility, if any, and a public utility in a class of prescribed public utilities, if any.

When submitting a CPCN Application to the BCUC, applicants are generally expected to comply with the BCUC's CPCN Guidelines. Regarding alternatives, the BCUC's CPCN Guidelines include:

(ii) A comparison of the costs, benefits and associated risks of the project and feasible alternatives, including estimates of the value of all of the costs and benefits of each alternative or, where these costs and benefits are not quantifiable, identification of the cost area or benefit that cannot be quantified. Cost estimates used in the economic comparison should have, at a minimum, a Class 4[3] degree of accuracy as defined in the most recent revision of the applicable AACE International Cost Estimate Classification System Recommended Practices.

[…]

(iii) A schedule calculating the net present values of the incremental cost and benefit cash flows of the project and feasible alternatives, and justification of the length of the term and discount rate used for the calculation;

[3] Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. They are typically used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval.

3.3 BR1 Project Alternatives Evaluation Methodology

BC Hydro explains in detail its structured decision-making approach taken for the BR1 Project review and approval. Once the preferred alternative for the BR1 Project is identified, the BR1 Project moves through various phases and gate approvals and becomes further defined. As the BR1 Project becomes more defined, the certainty of cost estimating improves. The BR1 Project's alternatives analysis and related decisions are continually reviewed throughout the project's lifecycle as it passes from conceptual design to feasibility design and then to preliminary design.[132]

In order to evaluate the three feasible alternatives and identify a preferred alternative, BC Hydro set out five objectives with accompanying criteria and measures as shown in the Table 2 below:

[132] Exhibit B-5, BCUC IR 8.1.1.

Table 2: Objectives, Criteria, and Measures [133]

Objectives	Criteria	Measures[81]
Maximize Unit Reliability	Likelihood of Unit Failure / Forced Outages	Failure Rate (High/Medium/**Low**)
Minimize Environmental Impacts	Impacts to Fish, Wildlife and Riparian Habitat	Negative/Same as Current/**Positive**
Improve Relations with St'át'imc	Meeting St'át'imc Expectations	**Better than Base/**Same as Base/Worse than Base[82]
Minimize Net Present Value of Cost and Cost Risks	Net Present Value of Cost	$ million
	Likelihood of Scope Increase Due to As Found Conditions	High/Medium/**Low**
Minimize Safety Risks	Ability to Reduce Maintenance Hazards	Low/Medium/**High**
	Exposure to Construction Hazards	High/Medium/**Low**

81 The preferred direction of the measure for the criteria is indicated in **bold** typeface.

BC Hydro explains that its structured decision-making approach is a simple-form qualitative trade-off analysis that reviews a consequence table and identifies what is being gained and given up by choosing the recommended alternative over others. BC Hydro is of the view that the structured decision-making approach is superior to a cost-benefit analysis (CBA) approach, which monetizes all trade-offs in terms of $/unit of non-financial impact and collapses the decision into a single dimension of dollars. BC Hydro states that it is not always possible or appropriate to have quantitative data for all criteria and in some instances, qualitative data can be superior as it incorporates the wider knowledge of a subject matter expert.[134]

Further, BC Hydro states the structured decision-making approach includes advances in behavioural economics that reduce bias, provides a scalable framework for including non-financial aspects, allows for deeper engagement with stakeholders, can improve dynamics and efficiencies when working through participatory deliberative processes and has the ability of improving overall decision quality by leveraging diversity of values through all stages of the decision process. This ensures that intangible benefits are weighed appropriately against the cost and risks associated with each alternative.[135] BC Hydro submits that the structured decision-making approach aligns with the Project Management Institute (PMI) best practices and in 2021 BC Hydro received a 100% Maturity Rating on the PMI Organizational Project Management Maturity Model Project Management review.[136]

3.4 Selection of Preferred Alternative for the BR1 Project

In its evaluation of the alternatives, BC Hydro limited its assessment to the alternatives deemed feasible: the Rewind, Refurbish and Replace alternatives. Infeasible alternatives and bypass alternatives were not part of the structured decision-making approach in the alternative analysis as they were dismissed by BC Hydro as being uneconomic or impractical.[137] In applying the structured decision-making approach in its evaluation, BC Hydro determined that the Replace alternative is the preferred alternative. The following consequence table was submitted by BC Hydro to illustrate the performance of each alternative compared to the Replace alternative:

[133] Exhibit B-1, p. 4-5.
[134] Exhibit B-5, BCUC IR 8.6.1.
[135] Exhibit B-9, BCUC IR 49.1.
[136] Ibid., BCUC IR 50.1.
[137] Exhibit B-5, BCUC IR 3.1, IR 51.3.

Table 3: Consequence Table: Alternatives Analysis Results [138]

Objective	Criteria	Measure	Alternatives		
			Rewind	Refurbish	Replace
Maximize Unit Reliability	Likelihood of Unit Failure / Forced Outages	Failure Rate (High/ Medium/ **Low**)	High	Medium	Low
Minimize Environment Impacts	Impacts to Fish, Wildlife and Riparian Habitat	Negative/ Same as Current/ **Positive**	Same as Current	Positive	Positive
Improve Relations with St'át'imc	Meeting St'át'imc Relationship Expectations	**Better than Base**/ Same as Base/ Worse than Base[83]	Worse	Same	Same
Minimize Cost and Cost Risk	Net Present Value of Cost	$ million	($92.9)	($57.0)	($58.7)
	Likelihood of Scope Increase Due to As Found Conditions	High/ Medium/ **Low**	High	Medium	Low
Minimize Safety Risks	Ability to Reduce Maintenance Hazards	Low/ Medium/ **High**	Low	Medium	High
	Exposure to Construction Hazards	High/ Medium/ **Low**	Low	High	Low
Ranking			**3**	**2**	**1**

BC Hydro submits that the Replace alternative scored better for each objective and as such, ensured that no trade-offs amongst objectives were needed, nor were weightings required for each objective.[139]

3.4.1 Maximizing Unit Reliability

BC Hydro concluded through its assessment that the Replace alternative would provide the highest unit reliability based on the fact that the generators would be new and would reflect current design standards. The Refurbish alternative was rated as a medium failure rate due to there being a mix of old and new components, whereby re-used components would increase the likelihood of a unit failure. The Rewind alternative was rated by BC Hydro as a high failure rate due to the high likelihood that unaddressed deficiencies with the stator core would result in in-service failure.[140]

3.4.2 Minimizing Environmental Impacts

Under the objective of minimizing environmental impacts, BC Hydro's aim is to increase operating flexibility and managing flows from Terzaghi Dam to Lower Bridge River within flow targets to maintain fish and fish habitat in the Lower Bridge River. Both the Replace and Refurbish alternatives were rated as having a positive impact under this objective as they would both provide reliable water conveyance, have the greatest potential to maintain the WUP Order target flow schedule and avoid negative environmental impacts on fish and fish habitat; albeit to a lesser extent under the Refurbish alternative as it would provide less reliable water conveyance due to lower reliability of the refurbished units. The Rewind alternative was assessed to be the "same as current" as it would provide less reliable water conveyance compared to the Replace and Rewind alternatives and would incur a higher risk of negative environmental impacts.[141]

BC Hydro states that it did not consider the environmental impact in the disposal of generating or other equipment as a part of its alternative analysis. Waste disposal was not included as the associated environmental

[138] Exhibit B-1, Table 4-2, pp. 4-5 – 4-6.
[139] BC Hydro Final Arguments, p. 39.
[140] Exhibit B-1, p. 4-7.
[141] Ibid., p. 4-9.

impacts will be mitigated and would not have affected the decisions outcome regarding the Preferred alternative.[142]

3.4.3 Improving Relations with the St'át'imc Nation

The evaluation of alternatives regarding the objective of improving relations with the St'át'imc Nation was based on the Replace alternative as the base case scenario. It demonstrates a commitment to addressing aging assets that could impact flow management and improves the reliability of the generating units to meet the WUP Order target flow and the average annual flow targets as contemplated in the 2011 Agreements and the 2019 High Flow Settlement Agreements to maintain fish and fish habitat in the Lower Bridge River. The Refurbish alternative was rated the same as the Replace alternative. The Rewind alternative was rated to be "worse" than the other two alternatives as BC Hydro would not be taking prudent and proactive stems to address key concerns outlined in its agreements with the St'át'imc Nation.[143]

3.4.4 Minimizing Net Present Value of Cost

Class 5 estimates were used to determine the NPV of cost for each alternative. BC Hydro explains that, in its experience, Class 5 estimates are appropriate in determining a leading alternative at the conceptual stage. This approach saves cost, time and resources to prepare more detailed Class 4 estimates for alternatives that will not be pursued. It states that Class 4 estimates would not change the cost or disadvantages of the other alternatives.[144]

The NPV of costs for feasible alternatives were presented by BC Hydro in the following table:

Table 4: Net Present Value of Cost for Alternatives ($million)[145]

No.	Present Value of Cost and Incremental Benefits	Rewind	Refurbish	Replace
1	Service Life Units 1 to 4 Generators (years)	20	40	50
2	Conceptual Cost Estimate Estimating Accuracy Range	+100% / -35%	+100% / -35%	+75% / -35%
3	Total Present Value of Costs	(106.6)	(111.1)	(120.7)
4	Total Present Value of Incremental Benefits	13.7	54.1	62.0
5	**Net Present Value of Cost**	**(92.9)**	**(57.0)**	**(58.7)**
6	**Net Present Value of Cost if Cost Risk is Materialized**	**(203.8)**	**(165.8)**	**(143.7)**

The NPV of Cost (Row 5 in Table 4 above) is calculated by summing the present value of costs (Row 3) and the present value of incremental benefits (Row 4). More information on the present value of incremental benefits is described in Section 3.4.4.1 of this Decision. For all three alternatives, the NPV of Cost including materialized risk (Row 6, Table 4) was calculated by taking the upper end of the estimating range while keeping all other inputs the same.[146]

[142] Exhibit B-6, CEC IR 41.2.
[143] Exhibit B-1, pp. 4-9 – 4-10.
[144] BC Hydro Final Arguments, pp. 39-40.
[145] Exhibit B-1, p. 4-12, Table 4-3.
[146] Ibid., p. 4-13.

Based on its assessment, BC Hydro concludes that the Replace alternative is the preferred alternative considering both NPV of cost and the potential to minimize cost risk. The higher present value (PV) of cost is mostly offset by the higher positive PV of the incremental benefits. As seen in Row 5 (Table 4 above), there is no material difference between the Refurbish and Replace options with respect to NPV of Cost. The Replace alternative was given a narrower estimating accuracy range (Row 2, Table 4) due to the likelihood of fewer unknown conditions which could result in unplanned scope increases and delays. This resulted in a lower NPV of Cost for the Replace alternative when including materialized risk (Row 6, Table 4).[147]

In its evaluation, BC Hydro found that refurbishing the generators does not present a material cost saving opportunity over full replacement but does present additional risk in potential scope and schedule increase due to any as-found conditions. In its view, refurbishing the generators is also inferior from the perspective of maximizing unit reliability as there is a higher likelihood of unit failures as not all key components would be replaced, and re-used components would continue to age. Furthermore, the Refurbish alternative would introduce the probability of greater construction hazards thereby rendering the option inferior from a safety perspective.[148]

For the Rewind alternative, BC Hydro states that the further likelihood of scope increase due to as-found conditions is higher than the other alternatives. Under its scenario analysis, it surmises that the potential increase in scope and schedule risk due to the as-found conditions could be as high as $203.8 million, which is not directly captured in the NPV analysis.[149]

3.4.4.1 Net Present Value of Benefits

In order to present a fulsome view of net project costs for each alternative, BC Hydro calculated the NPV of the incremental benefits and netted them against project cost in order to obtain a net NPV (Table 4 above). The inputs to this analysis were determined by modelling the incremental benefits for each alternative in a study as described in Appendix B-5 of the Application.[150]

3.4.4.2 Estimating Accuracy Class

The BCUC's CPCN Guidelines state that for feasible alternatives, costs estimates in the economic comparison, should have at a minimum, a Class 4 degree of accuracy as defined by AACE International Cost Estimate Classification System Recommended Practices.[151] In the Application, BC Hydro provides Class 5 estimates for all three alternatives.[152] BC Hydro states that it did not complete Class 4 cost estimates as its project development process allowed it to identify a leading alternative based on Class 5 cost estimates and other criteria.

As part of its project development process, BC Hydro assesses project alternatives in its conceptual design stage. The alternatives are refined to eliminate those that do not meet the project objectives and to identify a leading alternative that is technically and economically feasible and should be considered further. Conceptual design level estimates are prepared with an estimating accuracy range of +100%/-35%, equivalent to a Class 5 estimate. As selecting the leading alternative requires consideration of more than costs estimates, BC Hydro will only

[147] Ibid., pp. 4-12 – 4-13.
[148] Exhibit B-5, BCUC IR 10.3.
[149] Ibid.
[150] Exhibit B-2-2, Confidential Appendix B-6.
[151] BCUC Order G-20-15, 2015 Certificate of Public Convenience and Necessity Application Guidelines, p. 4.
[152] Exhibit B-1, p. 4-11.

develop Class 4 estimates for multiple viable alternatives if they are required to identify a leading alternative. It is in the feasibility design stage that BC Hydro develops a Class 4 estimate in order to confirm that the leading alternative should be selected as the preferred alternative. Preparing Class 4 estimates requires feasibility design work to be completed for each alternative and BC Hydro does not typically prepare a Class 4 estimate for alternatives that are not being pursued.[153]

BC Hydro states that a Class 5 estimate was sufficient for it to determine a leading alternative and a Class 4 estimate would not change the cost or disadvantages of the other alternatives for the following reasons:[154]

Rewind Alternative

- The NPV of the Rewind alternative (Table 4 above) is materially worse than the other two alternatives;
- The likelihood of scope increase due to as-found conditions is higher for the Rewind alternative; and
- The Rewind alternative scored worse on the other objective measures.

Refurbish Alternative

- There is no material difference in Class 5 estimates between the Replace and Refurbish alternatives due to their similarity in scope, therefore Class 4 estimates would most likely have shown no material difference in costs;
- Refurbishing the generators does not present a material cost saving opportunity;
- Developing a Class 4 project estimate would not remove the cost risk resulting from the risk of scope increases due to as-found conditions;
- The Refurbish alternative is inferior from the perspective of Maximizing Unit Reliability; and
- The Refurbish alternative is inferior from the perspective of safety.

BC Hydro claims that Class 5 estimating accuracy is consistent with its project development process in the conceptual stage, however it has not taken a consistent approach to its recent CPCN applications with the BCUC. In the John Hart Generating Station Replacement Project Application, BC Hydro submitted Class 4 estimates for the viable decommissioning alternatives, consistent with its feasibility phase estimates.[155]

Although the BCUC CPCN Guidelines suggest the economic comparisons should have, at a minimum, a Class 4 degree of accuracy, it does not necessarily preclude the BCUC from accepting estimates of lower accuracy. Footnote 3 in the BCUC CPCN Guidelines also state, "Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. They are typically used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval."[156]

[153] Exhibit B-5, BCUC IR 10.3.
[154] Ibid.
[155] John Hart Generation Station Replacement Project Application, Exhibit B-1, p. 3-19.
[156] BCUC Order G-20-15, 2015 Certificate of Public Convenience and Necessity Application Guidelines p. 4.

3.4.5 Minimizing Safety Risk

Under the objective of minimizing safety risk, BC Hydro evaluated how well each alternative could reduce maintenance hazards and to what extent each alternative would increase exposure to construction hazards. Minimizing safety risks is included as an objective as the selected alternative will have an impact on BC Hydro's ability to manage safety risks during and post-construction. Replacing old equipment with new equipment reduces the need for concurrent construction activities which require additional space where space at the BR1 facility is constrained. BC Hydro provides the following rationale for its assessment:[157]

- The Replace Alternative was assessed to be "low" for exposure to construction hazards, requiring less laydown area as old equipment would be removed after dismantling, and "high" for reducing maintenance hazards, as safety by design and human factors would be conserved in the design of new equipment.
- The Refurbish Alternative was assessed to be "high" for exposure to construction hazards as it would need the largest assembly area of all the alternatives due to the need to accommodate both new and used components. It was assessed to be "medium" for reducing maintenance hazards as there would be a greater number of new generator components.
- The Rewind Alternative was assessed to be "low" for exposure to construction hazards as the primary work of replacing the windings would not be intensive. For reducing maintenance hazards, the Rewind Alternative was assessed as "low" as the alternative would require ongoing maintenance on aging generators and generator components.

Positions of the Parties

BC Hydro submits that its preferred alternative for the BR1 Project is the Replace alternative, which would replace the Units 1 to 4 generators, governors, exciters and control systems.[158]

BC Hydro submits that it screened out a number of unfeasible alternatives:[159]

- Extending the service life of governors, excitors and control systems;
- Deferral of the BR1 Project or not completing the BR1 Project; and
- Bypassing the Bridge River Generating Station.

BC Hydro submits that extending the service life of governors, excitors and control systems is not feasible because aging and wear and tear of certain components cannot be addressed through maintenance, and equipment obsolescence can result in lack of spare parts and lead to reduced performance and extended forced outages.[160]

BC Hydro submits that deferring the BR1 Project, or not completing it and incurring the cost of emergency repairs if the need arises, is also not feasible. BC Hydro submits that in the case of the Bridge River 1 Generating

[157] Exhibit B-1, pp. 4-13 – 4-14.
[158] BC Hydro Final Argument, p. 28.
[159] Ibid., pp. 29-35.
[160] BC Hydro Final Argument, p. 29.

Station, the risks associated with in-service failure of the four generating units "far outweigh any potential benefit of deferring investment." BC Hydro submits that these risks include: [161]

- Supply risks stemming from unpredictable outages;
- Safety risks to operators;
- Costs associated with damage to equipment and the need to perform repairs on an expedited basis;
- Continued exceedances of the WUP Order target flows;
- Environmental harm to fish and fish habitat; and
- Failure to comply with the agreements with the St'át'imc Nation.

BC Hydro further submits that deferring the BR1 Project would result in higher costs because it would trigger the need for emergency repairs and the need to replace the four generating units, which would incur the cost of the emergency repairs as well as the cost of the Replace alternative.[162]

BC Hydro submits that bypassing the Bridge River Generating Station would not be economic or prudent because:[163]

- Both the Bridge River System as a whole and the Bridge River 1 Generating Station have a high NPV;
- The costs of bypassing the generating station would be significantly higher than the Replace alternative and the other feasible alternatives;
- Electricity import purchases are not a long-term alternative to replace the Bridge River System because market imports would not meet the self-sufficiency requirements set out in subsection 6(2) of the CEA, and the cost of import energy and capacity are "very high;"
- BC Hydro would incur costs to repair and maintain the BR1 generating units while the bypass was constructed; and
- BC Hydro cannot confirm that bypassing all four generating units is possible, because it only examined bypassing one generating unit and BC Hydro cannot determine whether the Comptroller of Water Rights would issue water licences for bypassing water without generation.

BC Hydro submits it has no intention to decommission the Bridge River System, and that an order-of-magnitude estimate indicates that the cost could be "multiple billions of dollars" and that the work would take decades to complete. While the precise impact of decommissioning is unknown, BC Hydro submits that "the directional impact is clear"; rates would increase due to the increased cost of replacement energy and capacity, the decommissioning cost, and the write-off of the value of the Bridge River System assets, which would be around $400 million. BC Hydro adds that decommissioning the Bridge River System would result in "significant short-term watershed-scale disturbance to ecosystems" and necessitate the need for additional transmission capacity to transfer replacement energy to the areas currently served by the Bridge River System.[164]

[161] Ibid., pp. 30-32.
[162] Ibid., p. 33.
[163] Ibid., pp. 34-35.
[164] Ibid., pp. 10-12.

BC Hydro submits that there are three feasible alternatives; Replace, Refurbish and Rewind, and that since extending the life of the existing governors, exciters and control systems is not feasible, all three feasible alternatives involve replacing these components.[165]

BC Hydro states that it undertook a "robust structured decision-making approach" to evaluate the feasible alternatives. BC Hydro identified a set of objectives for the BR1 Project, considering the need for the BR1 Project as well as the potential risks, impacts and benefits of carrying out each alternative. For each objective BC Hydro identified one or more criteria for assessing whether the objective has been achieved as well as measures to assess the degree to which each alternative meets the objectives.[166]

BC Hydro submits that the Replace alternative "maximizes unit reliability, minimizes environmental impact, helps to meet the expectations of the St'át'imc Nation, minimizes cost risks and minimizes overall safety risks."[167] BC Hydro submits that the Replace alternative scored as well or better than each of the other alternatives on each objective, and that therefore, no trade-offs amongst objectives were needed and weightings were not applied.[168]

BC Hydro submits that it identified the Replace alternative as the leading alternative using the equivalent of a Class 5 cost estimate. BC Hydro submits that this approach "saves the cost, time and resources to prepare a Class 4 estimate for alternatives that are not being pursued," and that it can re-evaluate the alternatives if the cost estimate for the leading alternative increases significantly during further investigations. BC Hydro states that in the case of the BR1 Project, Class 5 cost estimates were sufficient to identify a leading alternative because preparing Class 4 estimates would not change the cost or disadvantages of the other alternatives.[169]

BCOAPO accepts BC Hydro's dismissal of infeasible and other alternatives:

- BCOAPO accepts BC Hydro's conclusion that extending the life of the existing governors, exciters and control systems is not feasible based on equipment age, obsolescence and lack of vendor support.[170]
- BCOAPO notes that BC Hydro did not formally evaluate the defer alternative. However, in BCOAPO's view, while the defer alternative may be technically feasible, it is neither a practical nor an economic solution.[171]
- BCOAPO accepts BC Hydro's elimination of a partial upgrade as a practical alternative based on BC Hydro's need to operate all four units to meet its water flow targets.[172]
- BCOAPO accepts BC Hydro's elimination of the use of energy dissipation devices as a feasible long-term solution and notes BC Hydro's need for energy would remain unaddressed.[173]

[165] Ibid., p. 36.
[166] Ibid., p. 37.
[167] Ibid., p. 28.
[168] Ibid., pp. 37-38.
[169] BC Hydro Final Argument, pp. 39-41.
[170] BCOAPO Final Argument, p.14.
[171] Ibid.
[172] Ibid., p.16.
[173] Ibid.

- Regarding the bypass options, BCOAPO notes either one would incur significant costs to install, take as long to implement as the BR1 Project and generate no electricity and accepts BC Hydro's dismissal of this alternatives.[174]
- BCOAPO concludes decommissioning the Bridge River 1 Generating Station is without merit due to economic reasons and regulatory issues and delays associated with decommissioning.[175]

Regarding the feasible alternatives evaluated by BC Hydro, overall BCOAPO submits the BCUC should accept BC Hydro's choice of the Replace alternative. While the Replace alternative has a slightly higher NPV cost, it has an estimating accuracy with a smaller range and, therefore, a lower cost risk.[176] BCOAPO also considered the increase in the station's capacity rating as a result of the proposed 60 MVA replacement generators to match the turbines upgraded in 2003. BCOAPO concludes while there would be a cost savings of roughly $1 million per unit of using 50 MVA generators, the incremental benefits associated with the increase in capacity more than offset the cost.[177]

BCOAPO notes BC Hydro submitted only Class 5 project cost estimates in its alternatives analysis. Although the Refurbish and Replace alternatives were close in cost, due to the similarity in scope between the two alternatives, BC Hydro submits Class 4 project cost estimates would not be likely to show a material difference in costs between these alternatives. BCOAPO submits that, in this particular instance, it is reasonable for the BCUC to accept an evaluation of the alternatives based on Class 5 project cost estimates. However, in BCOAPO's view, for those applications where Class 4 estimates have not been used in the economic comparison of alternatives, a detailed explanation as to why Class 4 estimates are not required to confirm the preferred alternative should be provided as part of the Application.[178]

BCSEA supports the Replace alternative, BC Hydro's preferred alternative. In BCSEA's view, BC Hydro's identified objectives for analyzing the project alternatives were reasonable. BCSEA does not take issue with the fact that the alternatives analysis was based on Class 5 cost estimates rather than Class 3 cost estimates. BCSEA agrees with BC Hydro that neither extending the service life of some generating equipment nor deferring the BR1 Project and "running to failure" is a feasible alternative. In BCSEA's view shutting down the BR1 units or bypassing the units would be uneconomic.[179]

The CEC considers that BC Hydro's decision to screen out the infeasible alternatives was reasonable. [180]

The CEC submits that it does not oppose the use of a structured decision-making approach and that the objectives, criteria and measures used by BC Hydro to evaluate the feasible alternatives are acceptable. However, the CEC is concerned that there is "no apparent weighting, prioritization, or trade-off discussion of these objectives nor fulsome consideration given to Objectives that may have been deemed to be less important." The CEC's opinion is that this approach is overly simplistic for "a quarter of a billion dollar project that is funded by ratepayers," and that objectives can lend themselves to double-counting or over-valuation

[174] Ibid., p. 17.
[175] Ibid., pp. 17-18.
[176] Ibid., pp. 19, 22.
[177] Ibid., pp. 21-22.
[178] Ibid., p. 20.
[179] BCSEA Final Argument, pp. 15-16.
[180] CEC Final Argument, pp. 17-18.

when they are not clearly distinguished. In particular, the CEC submits that the safety objective could be over-valued because it is likely that there is a "relatively low value of 'residual risk' that is not accounted for in the NPV analysis."[181]

In reply, BC Hydro submits that weighing, prioritization and trade-off were not required for the alternatives analysis for the BR1 Project because the Replace alternative "performed better than or the same as all of the alternatives," and there was no alternative that would have scored better than the Replace alternative "no matter what weighting or prioritization method had been applied."[182]

BC Hydro further submits that the CEC has not substantiated its concerns about double-counting. BC Hydro explains that the implementation of safety risk mitigation is observed as an increase in the NPV and a decrease in residual risk, and for this reason these objectives do not represent a double counting of the risk. [183]

The CEC submits that the process of picking the Replace alternative as the leading alternative at the outset of the analysis is unsatisfactory because it fails to identify and value at the outset all the considerations that should be weighed. [184]

The CEC further submits that when a leading alternative is "essentially selected" and other alternatives are rated only against it, it is "easy to permit pre-selection bias to enter the decision-making." The CEC's view is that it would be preferable and "considerably more precise" to provide a thorough quantitative assessment for each measure, in each alternative. The CEC submits that BC Hydro's alternatives analysis is "inappropriately shallow, particularly in regard to the issues not incorporated into the economic analysis," for a project the size and scope of the BR1 Project.[185]

In reply, BC Hydro submits that the CEC does not accurately describe BC Hydro's practice. BC Hydro submits that it evaluates the alternatives, then selects a preferred alternative based on that evaluation, and that its consequence table "simply presents the results of that evaluation, showing how alternatives compare to the preferred alternative."[186]

BC Hydro further submits that it uses numerical measures for its alternatives analyses when appropriate, but that "it is not always possible, or appropriate, to have quantitative data for all criteria," and that in some instances, "qualitative data can be superior as it incorporates the wider knowledge of a subject matter expert." BC Hydro cites the example of its "extensive project experience" that indicated that there are higher costs associated with both the Rewind and Refurbish alternatives "due to the unknown condition of components visible only after the unit is disassembled."[187]

In the CEC's view, all differential costs and benefits associated with the alternatives should have been analyzed in order to select the preferred alternative. The CEC cites the example of "minimize environmental impacts" objectives, for which both the Replace and Refurbish alternatives are assessed by BC Hydro as positive. The CEC

[181] CEC Final Argument, pp. 16, 20-21.
[182] BC Hydro Reply Argument, pp. 27-28.
[183] Ibid., p. 28.
[184] CEC Final Argument, p.22.
[185] Ibid., p. 23.
[186] BC Hydro Reply Argument, p. 27.
[187] Ibid., pp. 28-29.

submits it expects that the Replace and Refurbish alternatives are "almost certainly different…when considering the impacts of disposal," and that such a finding is not possible in the BC Hydro approach which only has the one option, "Positive."[188]

BC Hydro submits that it did not consider the environmental impacts of disposal of generating or other equipment in its alternatives analysis because "the environmental impacts associated with waste disposal will be mitigated and would not have affected the decision outcome regarding the Preferred alternative."[189]

The CEC submits that it does expect the Replace alternative would be the preferred alternative, "based on the evidence before the [BCUC] with its deficiencies" and that given the "relatively minor" difference between the NPV of costs of the Replace and Refurbish alternatives, the "assessments relative to the issues involved in different Objectives may well have been relevant to the Commission's assessment of its approval decision."[190]

The CEC is satisfied with the lack of Class 4 cost estimates for the alternatives in this instance, and that this has potentially created some savings for ratepayers. However, the CEC would not like to see BC Hydro "adopt a policy of non-compliance" with the BCUC's CPCN Guidelines.[191]

While the CEC "does not disagree" that the Replace alternative is acceptable, it considers that "more robust analysis is required in the future for similar projects and the issues not evaluated in the economic analysis."[192]

In reply, BC Hydro submits that its alternatives analysis was suitable for the analysis of the alternatives of the BR1 Project and was sufficient to identify the preferred alternative for the Project.[193]

RCIA submits that BC Hydro has not provided evidence that bypassing one generator is uneconomic or uneconomic compared to the BR1 Project, and that BC Hydro has "summarily dismissed alternatives that are potentially better candidates than the alternatives considered in more depth." RCIA submits that BC Hydro did not explore "in any meaningful manner" the alternative of bypassing a single generator, even though "there is evidence that it may have been among the best alternatives to consider." [194]

RCIA submits that BC Hydro's evidence that improving the reliability of all generators is required to meet its water management objectives is not compelling "because of the independence of generator failures and the requirement for those independent failure to occur during the wettest parts of wetter years."[195]

In reply, BC Hydro submits that it has provided "compelling evidence that bypassing even a single generator is uneconomic," and refers to its responses to BCUC IR 1.3.1 and BCUC IR 2.53.1. BC Hydro also points to evidence from its Application of the cost of the bypass being considered for the Seton Generating Station, which has a conceptual-level cost estimate range of $58 to 178 million, which BC Hydro submits demonstrates that the cost of bypassing a single generator at BR1 would incur "a significant portion of the costs of replacing all four

[188] CEC Final Argument, p. 24.
[189] BC Hydro Reply Argument, p. 28.
[190] CEC Final Argument, p. 26.
[191] Ibid., pp. 25-26.
[192] Ibid., p. 26.
[193] BC Hydro Reply Argument, p. 27.
[194] RCIA Final Argument, pp. 14-15.
[195] Ibid., p. 17.

generators through the BR1 Project," which has a total cost estimate range of $207.1 to 326.3 million. BC Hydro adds that constructing a bypass would reduce the anticipated capital costs for the BR1 Project but would add the capital costs for the construction of the bypass and, also deprive ratepayers of a portion of the value of energy and capacity that the Bridge River 1 Generating Station would otherwise provide.[196]

RCIA submits that either the use of turbine energy dissipation devices or limited generator replacements would mitigate the majority of water management risk identified by BC Hydro, and that these alternatives are "potentially feasible and better than the three alternatives submitted by BC Hydro in its Application."[197]

With respect to turbine energy dissipation devices, RCIA submits that if the functional requirement of a generating unit is water management, then its generation status is irrelevant, and that as a result BC Hydro's rationale for the BR1 Project, which was to manage water flows, is inconsistent with BC Hydro statement that turbine energy dissipation devices are not suitable because they do not generate electricity.[198]

In reply, BC Hydro submits that a turbine energy dissipation device is an inferior alternative to the BR1 Project because its use would reduce BC Hydro's water management capabilities, need continual replacement of parts, pose occupational health risk for workers, pose unknown risks due to untested long-term use, and generate no power, to the detriment of ratepayers.[199]

BC Hydro disagrees that loss of generating power is inconsistent with the justification for the BR1 Project. BC Hydro submits that its justification for the BR1 Project "was based on the need to improve both the reliability of the generators and water management," and that in BC Hydro's NPV analyses, "generating electricity has economic value that needs to be considered in determining whether an alternative is cost effective." BC Hydro submits that, as a prudent operator, it must consider any lost economic value in its analysis, and on this basis the use of a turbine energy dissipation device is not in the interest of its ratepayers. BC Hydro further submits that replacing one or more of the BR1 generators with an energy dissipation device would be inconsistent with BC's energy objective "to ensure the authority's ratepayers receive the benefits of the heritage assets."[200]

RCIA submits that BC Hydro did not undertake the "relevant and appropriate exploration" of deferring the BR1 Project, and instead replacing the least reliable generating unit and procuring one or more turbine energy dissipation devices, to be installed as a contingency should one or more of the remaining turbines fail unexpectedly. RCIA notes that replacing a single generating unit might have a unit cost 53 percent higher than replacing all four generating units, but this would be a lower cost than replacing all four generating units prematurely. RCIA submits that the likelihood of losing all four generating units during the wettest time in a wet year is very low, and that if one generating unit were to be replaced, then this likelihood becomes "even more remote."[201]

In reply, BC Hydro submits that it needs all four BR1 generators to be reliable to mitigate the risk of exceeding the WUP Order target, and that the economic cost of forgone energy and capacity and compliance with British Columbia's energy objectives must be considered. Therefore, BC Hydro submits that limited generator

[196] BC Hydro Reply Argument, pp. 20-22.
[197] RCIA Final Argument, pp. 18-20.
[198] Ibid., p. 19.
[199] BC Hydro Reply Argument, pp. 23-25.
[200] Ibid., pp. 23, 25.
[201] RCIA Final Argument, pp. 19-20.

replacement is not feasible. BC Hydro adds that not completing the BR1 Project and incurring the cost of emergency repairs is also not feasible because of "the increased supply risks stemming from unpredictable outages, safety risks to operators and plant staff who may be in the vicinity of a unit at the time of failure, and cost risks arising from the possibility that failures damage more than the particular piece of equipment that fails, as well as the need to perform repairs on an expedited basis and under time pressure." [202]

BCSSIA submits that there are reasonable alternatives to the BR1 Project other than those proposed by BC Hydro, but that these alternatives have not been explored.[203]

BCSSIA submits that the three feasible alternatives put forward by BC Hydro are "not really three distinct options" because they "all predicated on the objective of carrying on operations at BR1 on the same scale as previously, but with renewed reliability and life expectancy." BCSSIA submits that there are alternatives that would "phase down (and possibly phase out), the operation at the Bridge River 1 Generating Station in order to avoid the process that would lead to the pouring of up to $1 billion of asset investments into a site that could disappear into Seton Lake." [204]

BCSSIA submits that the Bridge River 1 Generating Station could be phased out and replaced with "one or two generators at BR2 (and also an energy dissipation bypass device, to be operated when needed)." BCSSIA adds that this alternative would free the Bridge River 1 Generating Station from "the seismic risk that could slide it into the Seton Lake" and also ensure that the water flows from Carpenter to Seton Lake could still be effectively managed to avoid excessive discharges from Terzaghi.[205]

In reply, BC Hydro submits that replacing Bridge River 1 Generating Station with only two generators at Bridge River 2 Generating Station is not feasible because of the need to manage water flow, as discussed above, and because of the loss of value of energy and capacity, which have a detrimental impact on ratepayers. BC Hydro adds that this proceeding has "facilitated a review of the Bridge River System as a whole" and that "continued investment in the Bridge River System and BR1 is highly economic, and that the BR1 Project is the most cost-effective alternative to meet the identified need to improve reliability of the generators and improve water flow management."[206]

Panel Determination

The Panel is persuaded that BC Hydro's preferred alternative, to replace the existing BR1 generators, is the best alternative to meet the needs of the BR1 Project set out in Section 2 above.

The Panel finds that BC Hydro appropriately screened out unfeasible alternatives when selecting feasible alternatives for more detailed analysis. The following alternatives were appropriately rejected as unfeasible:

- Redirecting the water flow to bypass the Bridge River 1 Generating Station and not replacing the generators, as suggested by RCIA, does not meet the need of the BR1 Project to generate electricity. In addition, the evidence shows that the cost of bypassing just one BR1 generator might cost almost as

[202] BC Hydro Reply Argument, p. 26.
[203] BCSSIA Final Argument, p. 10.
[204] Ibid., p. 11.
[205] Ibid., p. 18.
[206] BC Hydro Reply Argument, pp. 26-27.

much as replacing all four generating units, and the turbine energy dissipation devices required are untested for continuous operation.

- Extending the service life of the governors, exciters and control systems for the Bridge River 1 Generating Station, also suggested by RCIA, is not feasible due to the increasing wear and tear and equipment obsolescence. As a result of these factors, BC Hydro would face increasing safety hazards and risks of generation interruption, and the risk of costly emergency repairs.
- BCSSIA's suggestion of eliminating the La Joie dam and adding generating units at BR2 is too speculative to consider at this point. This alternative would require significant analysis, which would fail to meet the need for energy and capacity at the time they are required.

The Panel finds that the Replace alternative is superior to the other two feasible alternatives identified by BC Hydro: Refurbish and Rewind, for the following reasons.

The Replace alternative provides better unit reliability than the other two feasible alternatives, due to mostly new components having longer remaining service life than refurbished parts. The Panel accepts BC Hydro's professional judgement in assessing the relative scores for the three feasible alternatives. The improved unit reliability associated with the Replace alternative also leads to better outcomes with respect to minimizing environmental impacts and improving relations with St'át'imc, both of which are needs of the BR1 Project, because of the improved reliability of water flows in the Lower Bridge River.

Economically, the Replace alternative is also superior to the other two feasible alternatives. Replacing the BR1 generators has a lower NPV of cost than the Rewind alternative ($58.7 million versus $92.9 million)[207] due to the value of the increased energy and capacity associated with the 60 MVA replacement generators. Further, the Replace alternative has a similar NPV of cost to the Refurbish alternative ($58.7 million versus $57.0 million), but refurbishing the generators has a higher risk of cost increases due to the possibility of "as found" conditions being worse than anticipated.

The Replace alternative has a lower safety risk than the other two feasible alternatives. Refurbishing the generators would have higher exposure to construction hazards due to the constrained working space, and either rewinding or refurbishing them would expose BC Hydro to higher ongoing maintenance safety hazards compared to replacing the generators with new equipment.

The Panel accepts BC Hydro's methodology for analysing the feasible alternatives for the following reasons:

- The structured decision-making approach appropriately identifies project objectives, and criteria and measures for assessing alternatives' compliance with those objectives.
- The five objectives selected by BC Hydro are consistent with the needs for the BR1 Project, and the Panel does not identify any significant needs for the project not incorporated in the objectives.
- Class 5 cost estimates for the alternatives analysis are acceptable in this instance because the Panel is satisfied that Class 4 cost estimates would not have materially impacted the evaluation of costs, and the

[207] Exhibit B-1, p. 4-6.

Replace alternative is superior to the other feasible alternatives with respect to all the objectives used in the analysis.

- BC Hydro has used an appropriately rigorous method of quantifying benefits of each feasible alternative, using system simulations and the BC border sell price to value the incremental energy and capacity of the replacement generators.
- Qualitative assessments of the feasible alternatives with respect to the safety risk objectives are reasonable. The Panel accepts the judgement of BC Hydro's subject matter experts for this measure.

Notwithstanding the foregoing, the Panel is not entirely satisfied with BC Hydro's analysis, for the following reasons.

It does not appear to the Panel that it is possible to make trade offs between the feasible alternatives with respect to the environmental impact and St'át'imc relations objectives independently of the unit reliability objective, a concern expressed by the CEC. As BC Hydro explains, its structured decision-making methodology involves understanding the "trade-offs between the alternatives."[208] The environmental impact and St'át'imc relations objectives are in fact consequences of unit reliability, and an alternative's ranked scoring will always be the same for all three objectives.

A consequence of this lack of independence between the objectives is that unit reliability is, in effect, being "triple counted" because the ranked order of the feasible alternatives will always be the same as that of the environmental impact and St'át'imc relations objectives. To avoid this concern, the Panel has not considered environmental impact and St'át'imc relations as separate objectives in its consideration of the alternatives analysis, while continuing to recognize that these are important needs of the BR1 Project.

The Panel would have preferred BC Hydro to provide a quantifiable measure of unit reliability rather than merely a qualitative assessment. Using a rating of high, medium and low failure rate to measure unit reliability gives the Panel insufficient information to appreciate the differences in unit reliability between the feasible alternatives. In this instance, the Panel is willing to accept BC Hydro's analysis because the Replace alternative was superior on all three independent measures (unit reliability, NPV cost and safety risk), therefore there were no trade-offs to make.

For the same reason, the Panel is willing in this instance to accept that BC Hydro did not provide quantified weightings for each objective relative to the other objectives. However, this deficiency, noted by the CEC in particular with respect to possible over-valuation of the safety objective, would have limited the Panel's ability to assess any trade-offs between the feasible alternatives, had this been necessary.

The Panel does not accept BC Hydro's method of quantifying the cost risk. BC Hydro quantifies the cost risk by adding 100 per cent to the cost estimate of the Rewind and Refurbish alternatives and adding 75 per cent to the cost estimate of BC Hydro's preferred Replace alternative. Although BC Hydro did not provide a specific and quantified rationale for setting the top end of the estimating range for the Replace alternative to be only 75 percent higher than the cost estimate, the Panel does accept that the Replace option has a lower cost risk than

[208] Exhibit B-1, p. 4-1.

the other feasible alternatives because, as noted above, the risk of "as found" conditions being worse than expected is lower.

4.0 BR1 Project Description

The BR1 Project consists of replacing the Unit 1 to 4 generators, governors, exciters and control systems within the existing Bridge River 1 Generating Station. Specifically, the BR1 Project consists of replacing the following components:

- Unit 1 to 4 generators, which include the stator, rotor, generator terminal connection equipment, and all other generator components above the turbines;
- Unit 1 to 4 governors, which include the mechanical and control components required to regulate the speed of the existing turbines;
- Unit 1 to 4 exciters, which include the transformer, and excitation and control modules required to regulate the generators' voltage; and
- Unit 1 to 4 control systems, which include replacement of protection, control, alarm and metering equipment for each generating unit as well as the replacement of the supervisory control and data acquisition (SCADA) and telecom equipment required to remotely operate the Bridge River 1 Generating Station.[209]

The turbines were replaced in 2002 to 2003 and are in fair to good condition; the turbines are not part of the scope of the BR1 Project.[210] Additional BR1 Project activities include installation of a fire protection system above the generator floor and refurbishment of miscellaneous generator and turbine components.[211]

BC Hydro also plans to install a turbine energy dissipation device (TEDD) to allow for water conveyance without power generation to mitigate the risk of high water flows in the event more than one unit is unavailable. At the time of the Application, BC Hydro has not yet made a final decision on whether to include the TEDD in the project implementation plan.[212] The TEDD could be installed and re-installed on any of the four units at the Bridge River 1 Generating Station.[213]

The following table shows the specifications of the Bridge River 1 Generating Station originally, and through the years until completion of the BR1 Project:

[209] Exhibit B-1, p. 5-2.
[210] Exhibit B-6, RCIA IR 1.18.1 Attachment 1.
[211] Ibid.
[212] Exhibit B-1, p, 5-30.
[213] Exhibit B-10, RCIA IR 2.62.1.

Table 5: BR1 Generating Station Plant Ratings and Total Licence Flow Capacity[214]

	Plant Total Maximum MW Rating	Plant Total Maximum MVA Rating	Total Licenced Flow Capacity (m^3/s)
Original - 1954	180	200	62.3
After Turbines Units 1 - 4 Replacement - 2003	200	200	62.3
Water license issued[21] - 2011	200	200	65
After Generator Unit 4 De-rating - 2011	190	190	65
Current - 2021	190	190	65
Post BR1 Project – 2030	230	230 - 260[22]	65

In the following sections, we review the evidence related to the development of the BR1 Project scope and conclude with our determinations on the BR1 Project scope.

4.1 BR1 Project Components

The table below provides a breakdown of the generating equipment or components included in the Implementation phase scope of the BR1 Project:

[214] Exhibit B-1, Table 1-1, p. 1-8.

Table 6: Generating Equipment Components to be Replace or Refurbished[215]

Generating Equipment or Component	Service Life (Years)	Description
Equipment or Components to be Replaced		
Generator Rotors	50	The rotor is a large circular electromagnet connected to the turbine shaft.
Generator Stators	50	The stator is a stationary coil of electrical conductors wound tightly around a metal core. Rotor poles generate voltage in the stator coils.
Generator Frame	50	The stator core is installed in the stator frame which is secured to the powerhouse floor via the generator soleplates.
Generator Bearings	80	Generator bearings support the rotating parts of the generator.
Generator Support Brackets	80	Support brackets support the weight of the generating equipment.
Generator Brush Gears	50	Brush gears transfer excitation currents from the excitation system to the rotor poles.
Generator Terminal Equipment	50	Terminal equipment is comprised of current transformers, voltage transformers, and surge protection devices that are used for unit protection and metering.
Governors and components	40	Governors regulate the water flow through the turbine to keep the turbine speed constant and to manage power output.
Exciters and components	30	Exciters inject current into the rotor coils turning them into large electromagnets.
Control Systems Components	30	Protection, control, alarm, and metering components work to automatically or manually eliminate faults and provide information on the generator parameters.
SCADA and Telecom Equipment	30	SCADA and telecom equipment collate and communicate information.
Equipment or Components to be Refurbished		
Generator Soleplates	80	The metal support plate at the base of the generator. The generator frame is attached to the soleplates.
Turbine Guide Bearings	80	Turbine guide bearings reduce wear, maintain alignment, and minimize friction of moving parts.
Turbine Needles and Bushings	50	Turbine needles enable variable adjustments to accommodate changes in water flow. Bushings are thin tubes that reduce friction between the rotating shafts.
New Equipment or Components to be Supplied or Installed		
Generator Floor Fire Protection System	30	The fire protection system will include unpressurized dry piping and sprinkler heads to extinguish fire in the generator floor area once a fire is detected.
Turbine Energy Dissipation Device	50	This device would be used during an extended forced outage when a turbine and generator are out of service. It would dissipate the energy normally captured by the turbine. This will allow water to bypass the generating unit, assisting with overall system water conveyance. For further discussion, refer to section 5.8.2.3 below.

BC Hydro states the generators will be designed to fulfil the operating conditions of the Bridge River 1 Generating Station as determined by the power system requirements, to withstand the ambient conditions and meet the technical requirements. The design of the generators will incorporate Safety by Design principles and

[215] Exhibit B-1, Table 5-1, pp. 5-3 – 5-4.

provide ease of access and equipment isolation capability to support inspection, maintenance, and repair. The four generators will be of identical design and installation to support spare part inventories, operation and maintenance efficiencies. The design of the generators will not contribute to detrimental outcomes in the dynamic behaviour and/or structural strength of the existing turbine and its components. All required civil modifications will follow the current applicable codes and industry practices. The generators will comply with the relevant North American Electric Reliability Corporation (NERC) requirements and meet current BC Hydro standards.[216]

The generator configuration BC Hydro proposes for the BR1 Project is 4 units rated at 57 MW each. The MVA rating for each generator will be finalized during the Detailed Design stage of the Implementation Phase and will align with the nameplate rating of the existing Unit 1 to 4 turbines, to a maximum of 65 MVA each.[217]

The performance of the governors and exciters will align with the needs of the new generators and existing turbines. The governors, exciters and protection and control system will comply with the relevant NERC requirements and meet current BC Hydro standards.[218]

4.2 Procurement Approach

BC Hydro states it will undertake a public competitive process for the design, supply, installation and commissioning of the generators and will use existing, competitively sourced blanket contracts to purchase the replacement governors, exciters, and control systems, which will be installed by internal BC Hydro resources. The BR1 Project's procurement strategy will target opportunities for BC Hydro to meet its commitments to the St'át'imc Nation as reflected in the 2011 Agreements and the 2019 High Flow Settlement Agreement.[219]

During the Definition phase, BC Hydro will initiate a public procurement process for the replacement generators and identify a preferred proponent. The contract for the supply and installation of the generators will be awarded after the BR1 Project receives approval from the Board of Directors to proceed into the Implementation phase. In the Implementation phase, contracts will be awarded for the replacement of the governors, exciters, control systems, and other scope elements.[220] The procurement approach for each of the BR1 Project components is summarized in the table below:

Table 7: Summary of BR1 Project Procurement Approach

Contract Packages	Project Delivery Methodology	Sourcing Strategy
Generator Replacement	Design-Build	Public Request for Proposal
Governor Replacement	Design-Bid-Build	Select Competition among two pre-qualified suppliers and In House
Exciter Replacement	Design-Bid-Build	Blanket Order and In House
Control System Replacement	Design-Bid-Build	Blanket Order and In House
Fire Protection System Replacement	Design-Build	Select Competition among four pre-qualified suppliers

[216] Exhibit B-1, pp. 5-4 – 5-5.
[217] Exhibit B-6, BCSEA IR 1.12.2.
[218] Exhibit B-1, pp. 5-5 – 5-6.
[219] Ibid., p. 1-9.
[220] Ibid., p. 5-9.

BC Hydro states that due to the nature of the equipment and the work, and the availability of technical expertise, it is not technically or economically efficient to use the same Project Delivery Methodology for each contract package. BC Hydro explains:[221]

> Key drivers for the selection of the Design-Build delivery method are: availability of the internal technical expertise; ensuring that the equipment is fit for purpose; and retaining warranty for the design and installation. BC Hydro will produce performance specifications and then review and accept the design developed by the successful Design-Build suppliers.
>
> Design-Bid-Build will be used where BC Hydro has technical expertise available internally to perform the design and where suppliers are readily available to supply the specified equipment.

4.3 Water Flow Impacts

4.3.1 Water Flow Impacts During Construction

The BR1 Project anticipates one planned outage per year starting in late summer and lasting for approximately eight months. During each planned outage, the flow of water through the Bridge River 1 Generating Station will be reduced, resulting in potential impacts to water quantity, fish and fish habitat in Lower Bridge River and Seton River. To reduce the potential impacts, the generator replacements will be sequenced, starting with the unit in the poorest condition. The approach to managing water flows during construction was informed by consultation with the St'át'imc regarding water flows over the past several years.[222]

To understand the environmental effects of generating unit planned outages, BC Hydro undertook a flow modelling study to determine the likelihood of flows into Lower Bridge River and Seton River exceeding the WUP Order target flow schedule. Modelling results indicated that for planned outages of eight, 10 or 12 months, exceeding the WUP Order target flow schedule for Lower Bridge River would occur in 0.2 to 0.9 per cent of 53 modelled years.[223]

4.3.2 Water Flow Impacts on Completion of the BR1 Project

As explained in Section 2.4.2 above on BR1 Project need, BC Hydro is currently operating under a variance to its WUP with respect to water flows in the Lower Bridge River.

Upon conclusion of the BR1 Project, BC Hydro's capability to manage water flows in the Lower Bridge River will be improved.[224] BC Hydro states:[225]

> While the BR1 Project will substantially reduce the potential need for seeking a variance to Lower Bridge Water Use Plan Order target flows, there are other factors which could result in the requirement for a variance such as the number of Bridge River 1 and 2 units available for generation, reduced storage available with a lowered Downton operating level, Seton unit reliability, transmission related issues and elevated inflows. At this time, we do not know whether BC Hydro will seek variances in the future.

[221] Exhibit B-6, CEC IR 1.42.1.
[222] Exhibit B-1, p. 5-27.
[223] Ibid., p. 5-28.
[224] Exhibit B-5, BCUC IR 1.7.2.
[225] Exhibit B-9, BCUC IR 2.45.3.

Further, BC Hydro's permitted total licenced flow from Bridge River 1 is not changing and an increase in licenced flow capacity is not required to achieve the benefit of the additional generating capacity. For clarity, due to the total licence flow capacity limit, after the BR1 Project BC Hydro will be unable to simultaneously operate all four Bridge River 1 turbines up to their maximum ratings as this would discharge water at a rate greater than the total licensed flow. BC Hydro has the ability to control the operation of the generating units so as not to exceed the total licenced flow.[226]

BC Hydro states: "the expected maximum energy output of the BR1 generating station is 221 MW if all four units are operated at maximum capacity, if the reservoir is at maximum expected head, and respecting the WUP Order."[227]

4.4 BR1 Project Schedule

The preliminary BR1 Project schedule is based on receiving BCUC BR1 Project approval by July 2022. A detailed BR1 Project schedule Gantt chart was provided in Appendix B-12 to the Application. BC Hydro states the BR1 Project will be executed following BC Hydro's staged project lifecycle approach for large and more complex capital projects, consisting of:[228]

1. Initiation;
2. Identification;
3. Definition; and
4. Implementation phases.

BC Hydro states that approvals occur at various points where key Project information is used to seek approval to continue with the BR1 Project:

- Identification of the Leading Alternative at the end of Conceptual Design Stage;
- Confirmation of the Preferred Alternative at the end of Feasibility Design Stage;
- Regulatory Approval(s) at the end of the Regulatory Approvals Stage, if required. Approval of First Full Funding occurs at the end of the Definition Phase;
- Achievement of the In-Service Date at the end of the Commissioning and Acceptance Stage; and
- Project Completion at the end of Completion Stage.[229]

BC Hydro provides the details of its BR1 Project schedule in the table below:

[226] Exhibit B-6, RCIA IR 1.27.1; Exhibit B-9, BCUC IR 2.52.1.1.
[227] Exhibit B-15, BCUC IR 3.64.3.
[228] Exhibit B-1, p. 5-7.
[229] Exhibit B-6, BCOAPO IR 1.1.2.1; Exhibit B-5, BCUC IR 1.8.1.1. Attachment 1.

Table 8: BR1 Project Major Milestones[230]

Description of Milestone	Estimated Date
BC Hydro files BR1 Project Application	July 2021
Public Procurement Bidding for Generators Closed	March 2022
Expected BCUC Decision Date	July 2022
Implementation Phase Funding Approval	April 2023
Award Contract for Generator Replacement	July 2023
First Generating Unit Asset In-Service Date	May 2027
Second Generating Unit Asset In-Service Date	May 2028
Third Generating Unit Asset In-Service Date	May 2029
Fourth Generating Unit Asset In-Service Date	May 2030
BR1 Project In-Service Date	July 2030
BR1 Project Complete	May 2031

4.5 BR1 Project Risks

BC Hydro's project management practices and procedures dictate risks and associated risk treatments are and will be identified, analyzed, and continuously monitored and reviewed over the course of the BR1 Project. BC Hydro states it has identified three material risks in the Definition phase of the BR1 Project, 10 material risks for the Implementation phase of the BR1 Project and four material operational risks at the Bridge River 1 Generating Station that will be retained following the implementation of the BR1 Project.[231]

BC Hydro states it has incorporated lessons learned from 10 major projects similar to the BR1 Project which it completed over the past 15 years. These projects each involved major generator replacements, refurbishments or additions in existing operating facilities, totaling 25 generators, ranging in size from 70 MW to 500 MW.[232]

Definition phase risk management focuses on the risks with the potential to impact BC Hydro's ability to advance the BR1 Project into the Implementation phase. BC Hydro has three active material risks for the Definition phase.[233] After BC Hydro's planned mitigation efforts, the definition phase residual risk ratings range from remote to possibly likely.[234]

Implementation phase risk management focuses on the risks that may potentially impact BC Hydro's ability to deliver the BR1 Project on time, on budget, and with no serious safety incidents or preventable priority environmental incidents.[235]

After BC Hydro's planned mitigation efforts, the risk of limited accommodation availability for workforce is the only risk remaining at a level of "fairly likely" or higher. BC Hydro explains: "There is a potential for the workforce 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

[230] Exhibit B-1, Table 5-5, p. 5-21.
[231] Ibid., p. 7-1.
[232] Ibid., p. 7-2.
[233] Ibid., p. 7-5.
[234] Ibid., Tables 7-1, pp. 7-2 – 7-3.
[235] Ibid., pp. 7-9 – 7-10.

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."[236] BC Hydro has identified and will be implementing the following risk treatments:[237]

- Prioritizing local accommodations for primary workers most likely to impact the schedule;
- Securing accommodations at hotels in Lillooet for supplementary workers and visitors;
- Assisting contractors with accommodation management and local vacancy listings; and
- As required, entering into a pre-arranged commercial agreement for reserved use of the local Lil'tem Hotel operated by the Tsah'alh Development Corporation.

The remaining implementation phase residual risk ratings range from remote to possibly likely.[238]

BC Hydro explains the seismic risks related to the Bridge River 1 powerhouse foundation soils as follows:

> Bridge River 1 powerhouse is situated on a soil foundation underlain by an artesian aquifer. Artesian pressures can cause the powerhouse to move and settle. This was discovered during construction and limited the size of the Bridge River 1 powerhouse. Further development was limited until ten years later when Bridge River 2 powerhouse was constructed on solid rock.
>
> There is a risk the Bridge River 1 powerhouse could slide into Seton Lake Reservoir or move enough to rupture the penstocks or disrupt the generators to a point where they no longer function. To mitigate these risks, a tailrace berm (the island) was constructed to stabilize the foundation under static conditions, and bleeder wells were placed in the foundation to manage the artesian pressure. In 2018 an instrumentation project was completed to monitor the movement of the powerhouse. The Bridge River System Study recommended replacing the BR1 powerhouse as the only long-term solution to mitigate this risk. However, this recommendation was ranked last on the priority list of dominant risks to address in the Bridge River System and is not proposed in the next forty years[239]

BC Hydro explains that the mitigation measures put in place to remediate risks with the foundation stability have been successful in stabilizing the powerhouse since the last ground cracking event occurred in 1974.[240] BC Hydro has also completed projects such as the Penstock Leak Detection System, completed in 2013 and 2015, to minimize the risk of major damage after a leak or rupture of a penstock.[241]

Further, BC Hydro's future planned projects for the Bridge River System include seismic and other dam safety upgrades including a project to improve slope drainage and stability and a project to refurbish the penstock concrete foundations, among others.[242]

[236] Exhibit B-1, Table 7-9, p. 7-16.
[237] Ibid., pp. 7-16 – 7-17.
[238] Exhibit B-1, Tables 7-4, 7-5, 7-6, 7-7, 7-8, 7-9, 7-10, 7-11, 7-12, 7-13.
[239] Exhibit B-1-2, Appendix B-3, p. 29.
[240] Exhibit B-6, BCSSIA IR 15.1.
[241] Ibid., BCSSIA IR 14.4.
[242] Exhibit B-10, BCSSIA IR 30.1 series.

BC Hydro states that there will be retained operational risks at the Bridge River 1 Generating Station after the BR1 Project is completed. BC Hydro has identified four material retained operational risks:[243]

- The foundation stability of the Bridge River 1 Generating Station;
- The seismic performance of the Bridge River 1 Generating Station powerhouse;
- The seismic withstand of the Bridge River 1 Generating Station penstocks; and
- The potential for slope failure at the Santa Clause Mountain.

BC Hydro states these operational risks can only be avoided by moving the Bridge River 1 Generating Station. Accordingly, BC Hydro has chosen to retain these operational risks. [244]

BC Hydro states that the Bridge River 1 Generating Station powerhouse would likely experience damage in a 1:1000 year event. The National Building Code of Canada design requirement has increased the seismic requirement from an exceedance frequency of 1:475 to an exceedance frequency of 1:2475 since 1999, but that there is no requirement to upgrade existing structures to meet this increased design requirement.[245]

BC Hydro explains its seismic risks at Bridge River compared to its other dam sites as follows: "ranking BC Hydro's thirty hydroelectric generating facilities according to earthquake design ground motions at an annual exceedance frequency of 1:2475 places Bridge River 1 and 2 Generating Stations at 15th highest, La Joie Generating Station at 17th highest, and Seton Generating Station at 18th highest."[246] BC Hydro characterizes its treatment of seismic risks at its facilities as "different but consistent."[247]

Positions of the Parties

BC Hydro submits that it has "reasonably and cost-effectively" defined the BR1 Project scope to install generators with a nominal rating of 60 MVA. BC Hydro explains that these match the existing rating of the current turbines and provide BC Hydro with additional operational flexibility to manage water flows, yielding a total rating of the BR1 plant of 230 MW.[248]

BC Hydro submits that installing generators with the same nominal 50 MVA rating as the current generators would represent a reduction in the historical operating capacity of the plant because the existing generators were "regularly operated above 50 MVA prior to NERC Mandatory Reliability Standard FAC-008-3." BC Hydro adds that while installing generators with a nominal rating of 50 MVA would reduce the cost by approximately $1 million for each of the four generators, the loss of generating capacity compared to the 60 MVA alternative would increase the NPV cost from negative $58.7 million to negative $84.5 million. Therefore, BC Hydro submits that the proposed 60 MVA generators will provide "significant value to ratepayers and benefits for water flow management." [249]

[243] Exhibit B-1, pp. 7-20 – 7-21.
[244] Ibid., p. 7-21 – 7-24.
[245] Ibid., p. 7-22.
[246] Exhibit B-6, BCSSIA IR 1.14.2.
[247] Ibid., BCSSIA IR 1.14.4.
[248] BC Hydro Final Argument, pp. 43-44.
[249] Ibid., pp. 44-45.

BCOAPO submits that the BCUC should "accept BC Hydro's choice of the Replace alternative," noting BC Hydro's evidence of the benefits of the 60 MVA generators.[250]

RCIA submits that if BC Hydro is authorized to proceed with the BR1 Project, then the choice of 60 MVA generators is reasonable because it makes more efficient use of the available water. However, RCIA disagrees with BC Hydro's claim that upgrading all four generators to 60 MVA increases BC Hydro's flexibility to manage water flows. RCIA submits that the transmission constraints "imposed by BRT" are increased with the increased total generating capacity.[251]

In reply, BC Hydro submits that the RCIA's analysis is mistaken, as the incremental capacity provided by the BR1 Project is immaterial to the transmission constraints driving the BRT Project, and in the event of transmission constraints, BC Hydro would not curtail BR1 due to the need to manage water flows.[252]

BCSSIA notes the seismic risk identified by BC Hydro in the Application, with the consequence that a seismic event "may result in minor injuries, disability or a fatality to workers, contractors, and/or the public in or near the generating station." BCSSIA submits that "BR1 including penstocks should not have been constructed in its existing location" due to seismic risks, and that this risk "will be off loaded onto the BCUC" if the BR1 Project is approved. As a result, BCSSIA questions whether the BR1 Project should be approved, whether BC Hydro should be allowed to "ignore the seismic and slide risk," and whether Bridge River 1 Generating Station should ultimately be decommissioned and some or all of the generators be relocated to the Bridge River 2 Generating Station.[253]

BCSSIA submits that "BC Hydro's sole decision to retain the operational seismic and slide risk for the next forty years in relation to BR1" is not consistent with its position with respect to the former powerhouse at the John Hart facility, which had "very similar safety deficiencies" and which was replaced.[254]

In reply, BC Hydro submits that its decision to retain some operational risks at the Bridge River 1 Generating Station after the BR1 Project is completed "was made with the benefit of consideration and analysis, and is reasonable." BC Hydro submits that the seismic issues in the early years of BR1 have been successfully addressed, for example by controlling the uplift and rotational forces on the generating station that arise under conditions of exceptionally high artesian pressures, and as a result the powerhouse has been stable since the last ground cracking event in 1974. [255]

BC Hydro adds that it has not "simply accepted" the seismic risk, but has completed projects and is advancing additional projects to address the risk, such as the penstock leak detection system to minimize the risk of major damage after a leak or rupture of a penstock and active projects to improve slope drainage and stability.
BC Hydro submits that moving the Bridge River 1 Generating Station is not reasonably practical at this time due to the long duration of such a project and its disproportionate costs.[256]

[250] BCOAPO Final Argument, pp. 21-22.
[251] RCIA Final Argument, p. 21.
[252] BC Hydro Reply Argument, p. 30.
[253] BCSSIA Final Argument, pp. 24-25.
[254] Ibid., pp. 27-29.
[255] BC Hydro Reply Argument, pp. 30-31.
[256] Ibid., pp. 31-32.

BC Hydro submits that it is "managing risk using principles that are being consistently applied" to its John Hart, Jordan River and Bridge River facilities. [257]

The CEC submits that the choice of 60 MVA generators is appropriate because the value of the incremental benefits exceeds the incremental cost and BC Hydro will have increased flexibility to manage water flows. The CEC notes that BC Hydro's plans for the Bridge River system "would not change if it were to address the seismic risks." The CEC takes the view that BC Hydro's proposed organization structure and governance demonstrates "an appropriate structure, expertise and high level of authority overseeing the BR1 Project" and that BC Hydro has "appropriately planned the BR1 Project and accounted for the various issues that may arise."[258]

BCSEA accepts BC Hydro's argument that the choice of 60 MVA generators is reasonable and cost effective, and "does not take issue" with BC Hydro's evidence regarding the BR1 Project description. BCSEA submits that BC Hydro's approach of identifying, analyzing, and continuously monitoring and reviewing risks and associated risk treatments is appropriate.[259]

Panel Determination

The Panel finds that the BR1 Project as proposed by BC Hydro is reasonable and meets the needs for the project.

The Panel finds that BC Hydro's proposal to install generators of 60 MVA rather than 50 MVA, the nominal capacity of the current generators, is reasonable because the economic value of the additional generation capacity exceeds the additional cost. The Panel does not accept RCIA's position that upgrading all four generators to 60 MVA, which increases their total generating capacity by 21 MW, would reduce BC Hydro's flexibility to manage water flows because of the limits of the transmission system. The Panel accepts BC Hydro's explanation that in the event of transmission constraints it would not curtail the BR1 generators due to the need to manage water flows.

The Panel is satisfied with BC Hydro's assessment of the seismic risks of the BR1 Project and the Bridge River 1 Generating Station and how BC Hydro plans to mitigate those risks. BC Hydro's evidence demonstrates that the powerhouse has been stable since 1974 as a result of its mitigation and monitoring activities to date. Further, BC Hydro has a series of current and planned projects to address seismic and slope stability risks pertinent to the Bridge River system, including slope drainage and stability improvements and a penstock leak detection system.

The Panel disagrees with BCSSIA's position that approving the BR1 Project would allow BC Hydro to "ignore the seismic and slide risk." BC Hydro is demonstrably not ignoring these risks, as the Panel explains above.

With respect to the BCSSIA's comment that the seismic risks associated with the Bridge River system will be "offloaded onto the BCUC," the Panel notes that while the role of the BCUC in public utility safety regulation is currently under review in the BCUC's Inquiry into the Regulation of Safety, dam safety in BC is regulated under the *Water Sustainability Act* and the Dam Safety Regulation by the Comptroller of Water Rights.

[257] BC Hydro Reply Argument, p. 31.
[258] CEC Final Argument, pp. 27, 31.
[259] BCSEA Final Argument, pp. 17-18.

The Panel makes no determination with respect to BCSSIA's view that BR1 should ultimately be decommissioned as a result of the seismic and safety risks and the generation capacity relocated to BR2 or another location. This question is more appropriately addressed in a long-term resource plan when BC Hydro's entire generation capabilities can be reviewed holistically and appropriate trade-offs made between need, cost and risk.

5.0 BR1 Project Consultation and Engagement

Section 3 of the BCUC's CPCN Guidelines outlines the information expected from an applicant regarding consultation with First Nations and engagement with the public, which includes: a description of consultation activities; issues and concerns raised; the applicant's assessment of the sufficiency of the consultation process; and a statement of planned future consultation.[260] Crown utilities are also required to provide the information set out in the BCUC's First Nations Information Filing Guidelines for Crown Utilities.

The following subsections provide an overview of BC Hydro's consultation activities with stakeholders such as Indigenous communities as described in Section 6.2 of the Application and local governments, stakeholders and the public as described in Section 6.3 of the Application.

5.1 Indigenous Consultation and Engagement

The First Nations Information Filing Guidelines set out the information which should be provided to the BCUC including: identification of the First Nations potentially affected by the Application; assessment of the scope of the duty to consult; consultation process followed; and a conclusion as to the adequacy of consultation to the point of the BCUC's decision. [261]

The table below provides the Indigenous Nations, communities and other governing organizations identified by the provincial Consultative Areas Database in relation to the BR1 Project. Only Indigenous Nations represented by the St'át'imc Nation or Tŝilhqot'in National Government were identified:

[260] BCUC Order G-20-15, 2015 Certificate of Public Convenience and Necessity Application Guidelines, Section 3, pp. 5-7.
[261] Appendix A to Order G-51-10.

Table 9: Indigenous Nations and Consulting Organization[262]

Indigenous Nations, Nation-level Organizations and Governments Identified by Provincial CAD	Indigenous Organization Responsible for Consultation
N'Quatqua First Nation	St'át'imc Authority / St'át'imc Government Services
Sekw'el'was First Nation	
T'it'q'et Administration/ P'egp'ig7lha Council	
Tsal'álh First Nation	
Xwísten First Nation	
St'át'imc Chiefs Council	
Lillooet Tribal Council[107] (includes six of the St'át'imc member nations: Sekw'el'was, T'it'q'et / P'egp'ig7lha, Tsal'álh, Ts'kw'aylaxw, Xaxli'p, Xwísten)	
Toosey Indian Band	Tŝilhqot'in National Government
Tŝilhqot'in National Government	

The BR1 Project will take place within St'át'imc Territory and within Engagement Zone A as defined within the Tŝilhqot'in Stewardship Agreement among the Tŝilhqot'in National Government, Tŝilhqot'in Nation and the Government of British Columbia. [263]

BC Hydro describes how the scope and content of consultation can be shaped by agreement between an Indigenous Nation and the Crown.[264] In the case of the St'át'imc Nation, the scope and content of the duty to consult have been defined by the 2011 Agreements and 2019 High Flow Settlement Agreement, as described in section 6.2.3.2 of the Application. In the case of the Tŝilhqot'in Nation, the scope and content of the duty to consult have been defined by the Tŝilhqot'in Stewardship Agreement, as outlined in section 6.2.3.3 of the Application.[265]

BC Hydro has been working with the St'át'imc Nation and the St'át'imc communities for several decades regarding their interests and concerns with the Bridge River Generation and Transmission System. The construction and operation of BC Hydro's facilities in the Bridge River System caused significant impacts to the environment and way of life, culture, heritage and values of the St'át'imc in their Territory.[266] Under the 2011 Agreements and the 2019 High Flow Settlement Agreement, BC Hydro and the St'át'imc Nation have mutually agreed to the processes through which the Crown's duty to consult and accommodate would be satisfied in respect of the Bridge River System facilities, including the BR1 Project.[267] The mandate of the Joint Planning Forum includes (amongst other things) reviewing the planned timing, duration and scope of capital and maintenance projects at the Bridge River System facilities that significantly impact water management, as well

[262] Exhibit B-1, Table 6-1, pp. 6-4 – 6-5.
[263] Ibid., p. 6-1.
[264] A description of the 2011 Agreements and 2019 High Flow Settlement Agreement is provided in Appendix A-6-1 of the Application. The agreements themselves are provided in Confidential Appendices A-6-2 to A-6-5.
[265] Ibid., p. 6-9.
[266] Ibid., p. 6-1; Exhibit B-10, CEC 84.1.
[267] Ibid., pp. 6-9 to 6-13.

as updates as work progresses.[268] The terms of the Joint Planning Forum are set out in Schedule A of the 2019 High Flow Settlement Agreement. [269]

BC Hydro has shared information on the scope and schedule for the BR1 Project, alternatives considered, workforce planning and potential impacts to the environment and water flows. This information has been shared through the previously established relationship forums, including Annual Operations Updates dating back to 2015 and, more recently, engagement through the Quarterly Capital Planning Meetings and Joint Planning Forum. In addition to these forums, BC Hydro shared information with St'át'imc through letters, fact sheets and additional briefings.[270] BC Hydro provided a summary of engagement activities completed to date with the St'át'imc, including topics and key themes discussed.[271]

According to BC Hydro, areas of concern raised by St'át'imc related to construction activities outside of the generating station include:

- Potential temporary impacts to water flows in the Bridge-Seton Watershed related to the unit outages required for the BR1 Project and the potential impacts to fish, fish habitat and cultural uses in the rivers as a result of the outages; and
- Potential local community impacts associated with influx of temporary workers, including impacts to cultural safety and wellbeing (e.g., culturally offensive and racist behaviour) as well as impacts to the safety of road users related to increased traffic volumes.[272]

In addition to these concerns, BC Hydro notes St'át'imc have also expressed interest in benefits from the BR1 Project, including potential contracting opportunities for St'át'imc businesses.[273] St'át'imc raised concerns with BC Hydro about the socio-economic analysis and that additional detail is required to assess potential socio-economic impacts as it relates to St'át'imc values. Additional steps required to address this concern will be detailed in a communications and engagement plan jointly developed by St'át'imc and BC Hydro.[274]

Since the Application was submitted, St'át'imc, through the St'át'imc Chief's Council (SCC), has written letters to BC Hydro outlining concerns related to the BR1 and BRT Projects and the Application. These concerns include:

- Environmental and archaeological impacts, including impacts to St'át'imc culture and way of life, and meaningful process to address such impacts;
- BC Hydro's consultation and engagement with Tŝilhqot'in Nation/Tŝilhqot'in National Government; and
- BC Hydro's description of the 2011 Agreements in the Application not aligning with St'át'imc's view. [275]

On October 28, 2021, in their roles as Principals in the 2011 Agreements, BC Hydro's Senior Vice President of Capital Infrastructure Project Delivery and the Chair of the SCC, discussed the contents of these letters, and re-confirmed mutual commitments to address concerns through the forums and processes set out in the 2011

[268] Ibid., p. 6-11.
[269] Confidential Exhibit B2-1, Appendix A-6-5, Schedule A.
[270] Exhibit B-1, p. 6-14.
[271] Ibid., Table 6-2, pp. 6-15 – 6-18; Exhibit B-1-1, Appendix A-6-6; Exhibit B-5, BCUC IR 19.1.1 Attachment 1
[272] Exhibit B-1, p. 6-18.
[273] Ibid., p. 6-18; Table 6-3, pp. 6-19 – 6-21.
[274] Exhibit B-5, BCUC IR 1.20.4.
[275] Ibid., BCUC IR 1.20.5.

Agreements and the 2019 High Flow Settlement Agreement.[276] The SCC registered as an intervener in this proceeding on November 19, 2021.

BC Hydro informed the Tŝilhqot'in National Government of the BR1 Project and that no significant impacts are expected. The Tŝilhqot'in National Government informed BC Hydro that they have no concerns with the BR1 Project moving forward, and no additional concerns have been raised during this proceeding.[277] The BR1 Project is not taking place on Tŝilhqot'in Aboriginal Title Lands.[278]

Consultation and engagement on the BR1 Project with the St'át'imc will be ongoing throughout the life of the BR1 Project and will include the Joint Planning Forum, Environmental Management Plan, Quarterly Capital Planning Meetings, Community Impacts and Safety, in accordance with the 2011 Agreements and 2019 High Flow Settlement Agreement.[279] BC Hydro will continue to consult with Tŝilhqot'in under the Tŝilhqot'in Stewardship Agreement.[280]

Positions of the Parties

BC Hydro submits that it has carried out its consultation and engagement activities "in accordance with the applicable agreements and that its consultation has been sufficient to date" and it "will continue to consult and engage with St'át'imc Nation and the Tŝilhqot'in over the life of the BR1 Project." [281]

The SCC submits it does not oppose the approval of the BR1 Project, but that it is engaged with and will continue to engage with BC Hydro on the issues about which it is concerned.[282]

BCOAPO submits that BC Hydro consultation activities to date, including its responses to concerns raised, and its commitment to continue to engage regarding outstanding concerns, have been adequate. BCOAPO recommends that the BCUC direct BC Hydro to file information with respect to its ongoing Indigenous engagement activities with the St'át'imc Nation, feedback received and related project outcomes, as part of semi-annual progress reports.[283]

In reply, BC Hydro submits that this is already addressed through BC Hydro's proposal to file semi-annual progress reports with the BCUC, and that the proposed reporting scope would include reporting with regard to engagement activities with the St'át'imc Nation.[284]

The CEC notes BC Hydro's history of working with the St'át'imc Nation and communities, and is of the view that BC Hydro has provided substantial evidence that it is continuing to engage consistently and in good faith with this community. The CEC finds BC Hydro's evidence regarding its communications with St'át'imc Nation to be extensive and apparently well-informed in identifying key issues that are outstanding. In the CEC's view the consultation has been adequate and consistent with the requirements, and the CEC would expect BC Hydro to

[276] Ibid.
[277] Exhibit B-1, p. 6-1; Exhibit B-5, BCUC IR 1.19.1.2.
[278] Ibid., p. 6-8.
[279] Ibid., pp. 6-21 – 6-22, 6-24.
[280] Ibid., p. 6-24.
[281] BC Hydro Final Argument, p. 52.
[282] SCC Final Argument, p. 3.
[283] BCOAPO Final Argument, p. 26.
[284] BC Hydro Reply Argument, p. 35.

continue to work with St'át'imc Nation to ensure its issues are appropriately resolved. The CEC recommends that the BCUC find the Consultation has been adequate and direct BC Hydro to provide ongoing reporting to the BCUC "as to the status of unresolved issues and the fulfillment of any opportunities for the St'át'imc Nation businesses and community to participate in potential benefits from the BR1 Project."[285]

BCSEA takes no position on the legal adequacy of the Crown's consultation with the Tŝilhqot'in Nation and the St'át'imc Nation regarding the BR1 Project. BCSEA does not take issue with BC Hydro's explanation "that it has not conducted consultation regarding decommissioning the Bridge River Generation System because it has no intention to decommission the Bridge River Generation System."[286]

RCIA states it has reviewed the materials pertaining to Indigenous consultation and engagement, and public consultation, and has no submissions in respect of BC Hydro's evidence regarding indigenous consultation and engagement and public consultation.[287]

Panel Determination

The Panel finds that BC Hydro's engagement and consultation to date with the First Nations affected by the BR1 Project has been adequate. The Panel is satisfied that BC Hydro has identified the potentially affected Indigenous Nations, communities and other governing organizations from the Province's Consultative Areas Database and has made adequate effort to contact, consult and engage with St'át'imc Nation and the Tŝilhqot'in over the life of the BR1 Project.

The Panel acknowledges the St'át'imc concerns as described by BC Hydro, and the potential impacts of the project on aboriginal rights and potential disruption to the community raised directly by the SCC during this proceeding. The Panel addresses these concerns in Section 6 below.

5.2 Public Consultation

BC Hydro identified a need to engage with the following groups, based on BC Hydro's experience with past project consultation activities in the region:

- Chamber of Commerce: District of Lillooet;
- Municipal and Regional District Governments: District of Lillooet, Regional District Squamish-Lillooet;
- Members of the Legislative Assembly: Fraser-Nicola;
- Bridge River Valley Community Association;
- News and media organizations; and
- General public.[288]

As the BR1 Project will largely take place within the existing Bridge River 1 Generating Station, engagement activities focused on keeping stakeholders informed of the BR1 Project and the BR1 Project's timeline and

[285] CEC Final Argument, pp. 38-39.
[286] BCSEA Final Argument, pp. 18-19.
[287] RCIA Final Argument, p. 22.
[288] Exhibit B-1, pp. 6-25 – 6-26.

activities as work progresses. Engagement also includes identifying and mitigating potential stakeholder impacts (e.g., traffic, worker accommodation and water management) from the BR1 Project outside of the facility as required. [289]

Engagement began in December 2017 with bi-annual updates on the capital plan for the region, including the BR1 Project, to the Squamish-Lillooet Regional District and the District of Lillooet; two meetings with the Lillooet Chamber of Commerce; a public open house; updates in the Bridge River System newsletter; and a capital plan update for the region shared with the District of Lillooet Economic Advisory Committee in May 2021.[290] BC Hydro provided an engagement activity log including topics raised and notes on the responses given.[291] Engagement activities will continue as the BR1 Project progresses.[292]

BC Hydro states that ongoing engagement activities have resulted in limited feedback, mostly in-person, and few questions with respect to the BR1 Project. Questions received about the BR1 Project have been predominantly related to the benefits of installing the new equipment and any increases in capacity, operation of the equipment, related infrastructure, the BR1 Project planning process, potential economic benefits of the BR1 Project and community safety (e.g., BC Hydro's plans to mitigate the risk of transmission of COVID-19 during the construction stage).[293] No concerns have been raised about the BR1 project during the public engagement process to date,[294] and there are no outstanding questions that require follow-up.[295]

Positions of the Parties

BC Hydro submits that it has engaged in public consultation with local governments, stakeholders and the public and that there are no outstanding questions that require follow up and no concerns have been raised during the public engagement process to date. BC Hydro confirms that it will continue to fulfill the commitment to continue to provide updates to identified stakeholders as the BR1 Project progresses.[296]

BCSEA submits it is satisfied that BC Hydro's public consultation regarding the BR1 Project has been reasonable, and is not aware of any outstanding complaints. BCSEA noted BC Hydro's statement that it will comply with its commitments to continue to provide updates to identified stakeholders as the BR1 Project moves forward.[297]

In BCOAPO's view BC Hydro's level of public engagement with respect to the BR1 Project has been adequate.[298]

Panel Determination

The Panel finds that BC Hydro's consultation to date with local governments, stakeholders, and the public has been adequate. BC Hydro has made appropriate efforts to date on public consultation and has committed to continue to work on providing updates to the identified stakeholders as the BR1 Project moves forward.

---

[289] Ibid., p. 6-26.
[290] Ibid., p. 6-28.
[291] Exhibit B-5, BCUC IR 1.21.1 Attachment 1.
[292] Exhibit B-1, p. 6-29.
[293] Ibid., pp. 6-24; 6-29.
[294] Exhibit B-5, BCUC IR 1.21.3.
[295] Ibid., BCUC IR 1.21.4.1.
[296] BC Hydro Final Argument, p. 59.
[297] BCSEA Final Argument, p. 19; BC Hydro Final Argument, para. 141.
[298] BCOAPO Final Argument, p. 26.

6.0 BR1 Project Environment and Permitting

The BR1 Project's scope is confined within the existing Bridge River 1 Generating Station and is therefore expected to have minimal potential negative environmental effects.

BC Hydro engaged Hemmera Environchem Inc. (Hemmera) to conduct an Environmental Impact Statement (EIS) to assess the BR1 Project's impact on the bio-physical environment, identify effects and develop measures to mitigate potential adverse effects. Specifically, the EIS considered and assessed effects on water quantity, fish and fish habitat. The EIS did not assess heritage resources, water quality, wildlife and wildlife habitat and vegetation because the BR1 Project activities are not expected to affect these components. [299] The EIS concluded "negative environmental impacts associated with the BR1 Project construction are negligible, localized, short-term, reversible and not measurable."[300]

BC Hydro states construction activities will be planned to minimize potential negative effects and the BR1 Project's Environmental Management Plan (EMP) will address construction related environmental impacts. Pursuant to commitments in the 2011 Agreements and 2019 High Flow Settlement Agreement outlined above in Section 5, BC Hydro will share the BR1 Project EMP with St'át'imc for review and comment.[301]

BC Hydro acknowledges that St'át'imc's concern for potential impacts to fish and fish habitat remains; this is an important core interest that will remain at the forefront of the relationship between BC Hydro and St'át'imc as long as the facilities are operating. The relationship established through the 2011 Agreements, and enhanced through the 2019 High Flow Settlement Agreement, provides the framework for consent-based processes to be developed and adapted over time to jointly identify and address risk to St'át'imc's values from BC Hydro operations, maintenance and capital work.[302] The construction outages required for the BR1 Project have been identified as a source of temporary risk to managing flows, given that the flow of water through the Bridge River 1 Generating Station will be reduced. It is within the mandate of the Joint Planning Forum to address this issue, and the preliminary plan for the BR1 Project outages was presented to, and accepted by, the Joint Planning Forum in October 2020.[303]

BC Hydro states the BR1 Project does not trigger a review under the Federal assessment process of the *Federal Impact Assessment Act* because "it does not result in an expansion of a hydroelectric facility resulting in an increase in production capacity of 50 per cent or more and a total production capacity of 200 MW or more."[304] Further, the BR1 Project does not trigger a review under the *BC Environmental Assessment Act* because "modifications of an existing facility, such as the replacement of generators or turbines, are not reviewable."[305]

Details of BC Hydro's water licenses pertaining to the Bridge River 1 Generating Station are provided in the table below:

[299] Exhibit B-1, p. 5-25; Exhibit B-1-2, Appendix B-13.
[300] Ibid., p. 5-26.
[301] Ibid.
[302] Exhibit B-5, BCUC IR 20.1
[303] Ibid., Confidential Attachment 3 provides redacted materials presented to the Joint Planning Forum and associated meeting minutes.
[304] Exhibit B-1, p. 5-22.
[305] Ibid.

Table 10: Water License Details[306]

Licence No.	Purpose	Licence Amount (m^3/s)
Final Water Licence 126287	Diversion from Carpenter Reservoir to Bridge River Generating Station 1	42.5
Final Water Licence 126288	Diversion from Carpenter Reservoir to Bridge River Generating Station 1	19.8
Final Water Licence 126080	Diversion from Carpenter Reservoir to Bridge River Generating Station 1	2.7

BC Hydro states it applied to renew the term of all three Final Water Licenses in November 2018 and no amendments are required based on the scope of the Project.[307] As explained in Section 2.4.2 above, BC Hydro is currently operating under the WUP Order variance to its water license.

The BR1 Project is expected to result in reduced environmental risk once complete. The new generating equipment will enable improvements in water flow management within the WUP Order target and maintain fish and fish habitat in the Lower Bridge River.[308]

No municipal regulatory requirements are anticipated for the Project, as BC Hydro is exempt from such under section 32(1) of the *Hydro and Power Authority Act*. No provincial permits or authorizations are anticipated to be required as construction activities are within the existing Bridge River 1 Generating Station.[309]

Positions of the Parties

BC Hydro submits that it has identified potential socio-economic and environmental impacts of the BR1 Project and is taking steps to mitigate those impacts, in particular with respect to water flows and worker conduct.[310]

BC Hydro submits that the construction outages required for the BR1 Project are a temporary risk to managing water flows because the flow of water through the Bridge River 1 Generating Station will be reduced. Based on its modelling, BC Hydro does not anticipate changes in water quantity that would impact water quality, wildlife, wildlife habitat or vegetation. However, the detailed timing of planned outages can only be determined "in-season for the year in which construction will be undertaken." BC Hydro submits it will address the issue through the BC Hydro-St'át'imc Joint Planning Forum to select the outage timing that aligns best with water use plan flow targets and to identify potential impacts and, if necessary, mitigation measures.[311]

BC Hydro further submits that it has developed the Bridge River Contract Worker Conduct Requirements, which will apply to the BR1 Project, based on its experience and feedback from the St'át'imc. New workers arriving at Bridge River receive orientation from BC Hydro construction management which includes a copy of the Bridge

[306] Exhibit B-1, Table 5-6, p. 5-23.
[307] Ibid.
[308] Exhibit B-1, p. 5-26.
[309] Ibid., p. 5-24.
[310] BC Hydro Final Argument, p. 47.
[311] Ibid., pp. 47-48.

River Contract Worker Conduct Requirements. BC Hydro submits it has a well-established process for handling complaints about worker conduct in the community.[312]

The CEC submits that BC Hydro's evidence related to impact mitigation is satisfactory.[313]

BCSEA submits that it considers BC Hydro's approach to mitigation of the potential impact of construction outages on water flows to be reasonable.[314]

The SCC submits it does not oppose the approval of the BR1 Project but "continues to have several concerns with the project, primarily relating to the construction phase. SCC is engaged with BC Hydro and will continue to engage with BC Hydro on these issues but raises them in this regulatory process for completeness. The SCC asks that BC Hydro communicate and negotiate openly and directly with SCC and its member communities consistent with the 2011 Settlement Agreements, the 2019 High Flow Settlement Agreement, and the Declaration Act."[315]

The SCC submits it is concerned about the effects on water flows of the 8-month long outages for the replacement of each of the four generators, and how these outages may impact fish and fish habitat, wildlife and wildlife habitat, St'át'imc traditional land and resource use, and St'át'imc cultural activities. The SCC submits that the following condition be included in any potential approval of the BR1 Project:[316]

> In-season flow decisions by the Joint Planning Forum will balance system constraints with water level and flow impacts and water needs related to:
>
> - fish and fish habitat;
> - wildlife and wildlife habitat;
> - St'át'imc traditional land and resource use; and
> - St'át'imc cultural activities.

The SCC is also concerned about the conduct and behaviour of workers on the BR1 Project. The SCC submits that large construction projects, including BC Hydro projects in the past, have involved conflict and issues from contract workers in St'át'imc territory, and that it is very important that both the letter and spirit of the Bridge River Contract Worker Requirements document are followed, and compliance and enforcement taken seriously. The SCC submits that the following condition be included in any potential approval of the BR1 Project:[317]

> BC Hydro, in collaboration with the Tsal'alh and SCC, will make best efforts to ensure compliance, monitoring and enforcement of the Bridge River Contract Worker Conduct Requirements and the Bridge River Internal Review Procedure for Code of Conduct Violations.

In reply, BC Hydro confirms that it is "committed to continue working with the BC Hydro – St'at'imc Joint Planning Forum regarding in-season flow management decisions, and ensuring compliance, monitoring and

[312] BC Hydro Final Argument, pp. 48-50.
[313] CEC Final Argument, p. 35.
[314] BCSEA Final Argument, p. 17.
[315] SCC Final Argument, p. 3.
[316] Ibid., pp. 2-3.
[317] Ibid.

enforcement of the Bridge River Contract Worker Conduct Requirements and the Bridge River Internal Review Procedure for Code of Conduct Violations."[318]

BC Hydro is agreeable to SCC's proposal that conditions be placed on the CPCN for the BR1 Project regarding in-season flow management decisions and worker conduct requirements. However, BC Hydro proposes the following condition be placed on the CPCN with respect to managing water flows:[319]

> Consistent with BC Hydro commitments to the St'át'imc Nation, with respect to in-season flow management decisions to facilitate the construction of the BR1 Project, BC Hydro shall work with the Joint Planning Forum consistent with the mutually agreed to Terms of Reference established between BC Hydro and the St'át'imc Authority and give due consideration to water level and flow impacts and water needs related to:
>
> - Fish and fish habitat;
> - Wildlife and wildlife habitat;
> - Soil erosion;
> - St'át'imc use of the land and resources in the area; and
> - St'át'imc cultural activities in the area.

BC Hydro further proposes the following condition be placed on the CPCN with respect to worker conduct:[320]

> Consistent with BC Hydro's commitments to the St'át'imc Nation, BC Hydro, in collaboration with the Tsal'alh and SCC, will make best efforts to ensure compliance, monitoring and enforcement of the Bridge River Contract Worker Conduct Requirements and the Bridge River Internal Review Procedure for Code of Conduct Violations. [Emphasized text added by BC Hydro to SCC's proposed text]

Panel Determination

The Panel acknowledges SCC's concerns with the cultural, social, and environmental impacts that the BR1 Project could have during construction. The Panel recognizes that BC Hydro has demonstrated its commitment to work with the BC Hydro – St'át'imc Joint Planning Forum regarding in-season flow management decisions, and ensuring compliance, monitoring and enforcement of the Bridge River Contract Worker Conduct Requirements and the Bridge River Internal Review Procedure for Code of Conduct Violations.

As a result of BC Hydro's consultation with the St'át'imc, the latter has proposed that conditions be imposed by the BCUC on any CPCN for the BR1 Project, one addressing water management decisions to be made during the construction of the BR1 Project (Water Management Condition), the other addressing contract worker conduct requirements (Contract Worker Conduct Requirements Condition) (together the Proposed CPCN Conditions). The Panel agrees that the Proposed CPCN Conditions are reasonable, and note that BC Hydro is in agreement.

However, the Panel has been presented with two alternative versions for the Proposed CPCN Conditions, one version from the SCC on behalf of the St'át'imc and another, in reply, from BC Hydro. Both appear to the Panel

[318] BC Hydro Reply Argument, p. 34.
[319] Ibid.
[320] Ibid.

to have the same objective, namely ensuring that BC Hydro addresses the two concerns raised by the St'át'imc during consultation on the BR1 Project. The differences between the two versions are:

1. BC Hydro adds references to the Joint Planning Forum established between BC Hydro and the St'át'imc and its mutually agreed terms of reference to the Water Management Condition, and
2. BC Hydro adds the qualifier "Consistent with BC Hydro commitments to the St'át'imc Nation" to both Proposed CPCN Conditions.

The Panel finds that both changes to the Proposed CPCN Conditions proposed by BC Hydro are reasonable.

The first change, to the Water Management Condition, limits the consideration of water management issues to the Joint Planning Forum, which has the mandate to address the issue. Since both BC Hydro and the St'át'imc have agreed to the terms of reference for this forum, it is appropriate that the Water Management Condition be limited in this way to prevent uncertainty surrounding the governance of these decisions.

The second change, to both Proposed CPCN Conditions, limits the Proposed CPCN Conditions to consistency with commitments made by BC Hydro to the St'át'imc. This limitation provides some certainty to the Proposed CPCN Conditions by excluding the possibility that the CPCN is conditional on other commitments that one party or the other might wish to impose without mutual consent after the CPCN is granted.

For the foregoing reasons, and pursuant to section 45 (9) (b) of the UCA, the Panel imposes the following conditions on the CPCN for the BR1 Project:

> **Consistent with BC Hydro commitments to the St'át'imc Nation, with respect to in-season flow management decisions to facilitate the construction of the BR1 Project, BC Hydro shall work with the Joint Planning Forum consistent with the mutually agreed to Terms of Reference established between BC Hydro and the St'át'imc Authority and give due consideration to water level and flow impacts and water needs related to: Fish and fish habitat; Wildlife and wildlife habitat; Soil erosion; St'át'imc use of the land and resources in the area; and St'át'imc cultural activities in the area.**
>
> **Consistent with BC Hydro's commitments to the St'át'imc Nation, BC Hydro, in collaboration with the Tsal'alh and SCC, will make best efforts to ensure compliance, monitoring and enforcement of the Bridge River Contract Worker Conduct Requirements and the Bridge River Internal Review Procedure for Code of Conduct Violations.**

The Panel reminds both parties that the UCA provides the ability for the BCUC to resolve complaints in the event of a dispute in interpretation of CPCN conditions.

7.0 BR1 Project Costs, Accounting Treatment and Rate Impact

7.1 Project Costs

The expected cost of the BR1 Project is $243.4 million (Expected Cost) with a cost estimate range of $207.1 million to $326.3 million.[321] The Expected Cost estimate conforms to Association for the Advancement of Cost Engineering International (AACE) Class 3 cost estimate requirements[322] with an estimating accuracy range of +21 per cent to -16 per cent.[323] The BR1 Project Cost Range includes life-to-date costs and forecasted direct construction costs, indirect construction costs, contingency and reserves, escalation, interest during construction, and capital overhead,[324] the details of which were submitted confidentially in Exhibit B-2.

A summary of the total estimated project costs is provided in the table below:

Table 11: Project Cost ($Million)[325]

Row No.	Description	Preliminary Cost Estimate ($ millions)
18	**Implementation Costs**	
	Before Contingency and Loadings	[redacted]
19	Contingency	
20	Capital Overhead	
21	Interest During Construction	
22	**BC Hydro Expected Amount**	**243.4**
23	Project Reserve	82.9
24	**BC Hydro Authorised Amount**	**326.3**
25	**BR1 Project Cost Range (+21%/-16%)[95]**	**326.3 – 207.1**

The authorized cost of $326.3 million (Authorized Cost) includes a Project Reserve of $82.9 million, which accounts for the additional financial impact of known risks to the BR1 Project and includes the special reserves.[326] Special reserves include known specific risks, which have not been assigned a probability of occurrence but may be realized by the BR1 Project including risk pertaining to the competitive bidding process for the generators and the risk of higher flows requiring additional environmental monitoring and mitigation.[327]

Base Cost Estimate

- Direct Construction Costs: The direct construction costs include estimates for the designing, manufacturing, assembling, dismantling, installing, testing, and commissioning of the Unit 1 to 4 generators, governors, exciters, and other scope elements as well as the manufacturing, dismantling, installing, testing, and commissioning of the control systems.[328]

[321] Exhibit B-1, p. 5-13.
[322] Ibid.
[323] Ibid.
[324] Ibid.
[325] Ibid., Table 5-3, pp. 5-14 - 5-15.
[326] Ibid., pp. 5-13, 5-18.
[327] Ibid.
[328] Ibid., p. 5-15.

- The estimates for construction management, construction safety, contract management and station field operation resources are also included in the direct construction costs.[329] The direct construction cost estimate is based on the anticipated range of bid prices for the generators, recent historical costs and worker productivity from other similar projects. [330]

- Indirect Construction Costs: The indirect construction costs include estimates for project management, engineering and design, procurement and quality management, environmental monitoring, Indigenous relations, as well as other indirect costs associated with implementing the project. The estimates for these costs were prepared by Work Package Managers, who are full-time BC Hydro employees, based on their specific knowledge of the work and deliverables and were correlated with other recently completed generator replacement projects.[331]

- Escalation, Overhead, Interest During Construction: Escalation is applied to the total direct construction costs and is based on economic trends, advice from independent economists on appropriate inflation rates for the construction sector and data from Statistics Canada. Capital overhead is calculated and applied on the total direct construction costs. Interest during construction is an estimate of the interest incurred over the life of a project. Interest is applied only to capital costs and will vary over the life of the BR1 Project with changes in the total forecast capital cost.[332]

- Contingency amount: A project (P_{50})[333] contingency amount is included to account for cost risks that cannot be specifically identified and captured in the direct or indirect construction costs.[334] BC Hydro estimated the amount for the BR1 Project using Quantitative Risk Analysis methods, applying a Monte-Carlo simulation to obtain a probabilistic distribution so that contingency and reserve amounts could be determined. BC Hydro adds that specifically identified risks are included in the base cost, prior to the calculation of contingency, whereas the expected contingency accounts for cost risks not specifically identified but which could occur during the BR1 Project.[335]

- Asset retirement costs for assets such as the unit generators, governors, exciters, and other electrical and protection and control equipment that are necessary for the BR1 Project are included in the cost estimate. Decommissioning, dismantling, and removing the Bridge River 1 Generating Station at end-of-life was not included in the BR1 Project cost estimate.[336] The end-of-life asset retirement costs for the Bridge River 1 Generating Station were not included in the BR1 Project cost estimate as BC Hydro will be retaining the existing Bridge River 1 Generating Station assets such as the powerhouse, numerous existing powerhouse systems, and associated equipment and assets such as the penstocks and switchyard.[337]

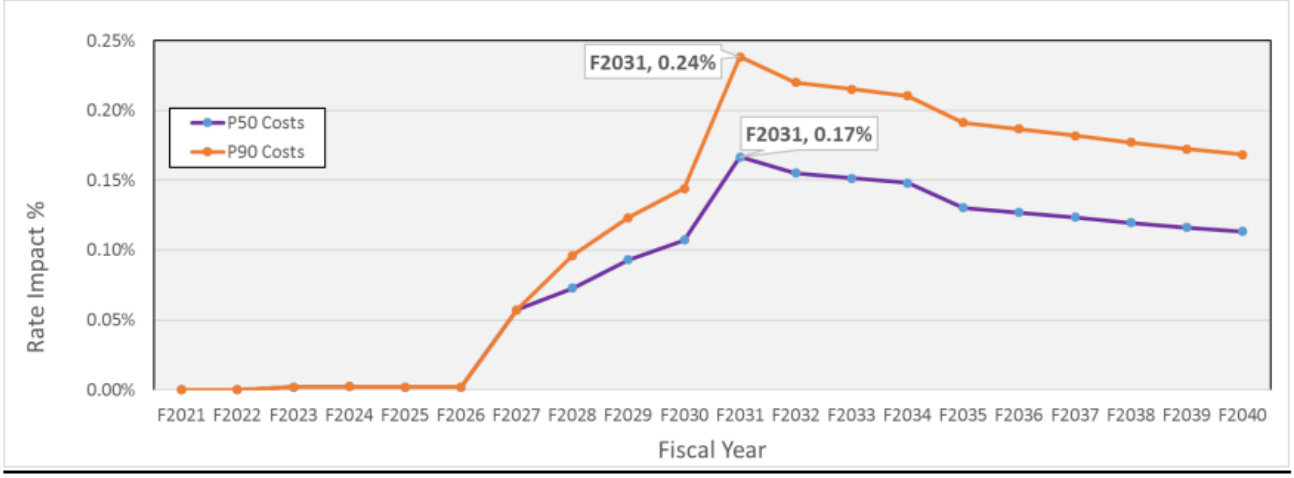
[329] Ibid.
[330] Ibid.
[331] Ibid., p. 5-16; Exhibit B-1-1, Appendix A-4, p.3.
[332] Ibid., p. 5-17.
[333] P50 is defined as the final project cost that will not exceed the cost estimate 50% of the time. This is also defined as the Expected Cost estimate.
[334] Exhibit B-1, p. 5-16.
[335] Ibid.
[336] Exhibit B-5, BCUC IR 1.13.2.
[337] Ibid., BCUC IR 1.13.2.1.

BC Hydro expects to file semi-annual project progress reports with the BCUC and will file the updated AACE Class 3 cost estimate for the BR1 Project in the first semi-annual progress report, after BC Hydro's Board of Directors approval of full funding at the end of the Definition phase.[338]

7.2 Rate Impact

The BR1 Project will affect elements of BC Hydro's revenue requirements including cost of energy, amortization and finance charges.[339] BC Hydro performed a rate impact analysis and estimates a rate impact of 0.17 percent in fiscal 2031.[340] BC Hydro provides the following figure illustrating the rate impact analysis.

Figure 5: Rate Impact[341]



The rate impact analysis only considers the benefit of the incremental capacity increase and does not include the benefits of continued operations and the generation life extension of the full Bridge River 1 Generating Station capacity to operate at its total licenced water flow capacity, which is dependent on the implementation of the BR1 Project. [342]

With both the Expected Cost estimate and Authorized Cost estimate, there is an initial increase in BC Hydro's revenue requirements in the early years as the generating units are placed in service. [343] The incremental rate impact declines after fiscal 2031 because of the addition of incremental energy and capacity associated with restoring the full flow capacity of the generating station, a reduction in the costs associated with forced outages and emergency repairs and lower finance charges as amortization recovered from ratepayers is used to pay down the debt over time.[344]

[338] BC Hydro Final Argument, p. 46.
[339] Exhibit B-1, p. 5-19.
[340] Exhibit B-1A, Errata No. 1 to B-1.
[341] Exhibit B-1A, Errata No. 1 to B-1.
[342] Exhibit B-5, BCUC IR 1.18.1.
[343] Exhibit B-1, p. 5-19.
[344] Ibid.; Exhibit B-1A Errata No. 1 to B-1.

Positions of the Parties

BC Hydro submits it has reasonably estimated the total costs for the BR1 Project as being between $207.1 million and $326.3 million, incorporating an estimating accuracy range of +21 per cent to -16 per cent, and prepared in conformance with the AACE Class 3 cost estimate requirements. BC Hydro further submits that it will update the cost estimate using "the most recent interest during construction rates" prior to the BC Hydro Board's approval of full funding and will provide updates to the cost estimate in its semi-annual project progress reports to the BCUC.[345]

BCOAPO submits that it has no issues with BC Hydro's cost estimates for the BR1 Project. However, BCOAPO notes that the upper end of the cost estimate range is more than 20 percent higher than the expected cost. BCOAPO suggests that BC Hydro be directed to explain in its semi-annual project reporting any variances between the Authorized Amount approved by BC Hydro's board at the end of the Definition phase and the Authorized Cost of $326.3 million presented in the Application.[346]

The CEC submits that BC Hydro has used a "standard and appropriate methodology" to estimate the Project's costs, that the costs analysis is "thoroughly developed, addresses likely risks, and takes reasonable approaches to spending," and recommends that the BCUC find the cost analysis to be reliable. [347]

BCSEA submits that BC Hydro has provided "reasonable costs estimates" for the BR1 Project.[348]

Panel Determination

The Panel finds that the BR1 Project cost estimate is reasonable.

The Panel is satisfied that BC Hydro has prepared the cost estimate to the AACE Class 3 requirements, which meets the BCUC's CPCN Guidelines and provides a sufficiently robust estimated range of costs for the purpose of evaluating a CPCN.

The Panel is also satisfied with the methodology BC Hydro used to create the cost estimate, including the comprehensiveness of the direct construction cost elements, the inclusion of indirect construction costs, and the approach to estimating the contingency.

The Panel agrees with BCOAPO's suggestion regarding the reporting and explanation of variances between the Authorized Cost of $326.3 million for the BR1 Project filed in the Application and the amount approved by BC Hydro's board of directors, and includes this in its direction to BC Hydro in Section 10 of this Decision.

[345] BC Hydro Final Argument, pp. 45-46.
[346] BCOAPO Final Argument, pp. 22-24.
[347] CEC Final Argument, pp. 33-34.
[348] BCSEA Final Argument, p. 17.

8.0 Provincial Government Energy Objectives and Long-Term Resource Plan

Section 46 (3.3) of the UCA requires that the BCUC consider British Columbia's energy objectives,[349] the most recent long-term resource plan filed by BC Hydro and the extent to which the Application is consistent with the applicable requirements under section 19 of the CEA.[350]

BC Hydro states that the BR1 Project is consistent with the following British Columbia energy objectives, which BC Hydro states are the energy objectives that have "some relevance" to the BR1 Project:[351]

- (c) to generate at least 93% of the electricity in British Columbia, other than electricity to serve demand from facilities that liquefy natural gas for export by ship, from clean or renewable resources and to build the infrastructure necessary to transmit that electricity;
- (e) to ensure the authority's ratepayers receive the benefits of the heritage assets and to ensure the benefits of the heritage contract under the BC Hydro Public Power Legacy and Heritage Contract Act[36] continue to accrue to the authority's ratepayers;
- (f) to ensure the authority's rates remain among the most competitive of rates charged by public utilities in North America;
- (k) to encourage economic development and the creation and retention of jobs;
- (m) to maximize the value, including the incremental value of the resources being clean or renewable resources, of British Columbia's generation and transmission assets for the benefit of British Columbia; and
- (o) to achieve British Columbia's energy objectives without the use of nuclear power.

[36 There is no longer a heritage contract under the Hydro Public Power Legacy and Heritage Contract Act]

Further, BC Hydro states: [352]

> At this time, there are no prescribed targets or guidelines under section 19 of the *Clean Energy Act*… The BR1 Project and BRT Project are consistent with and will aid BC Hydro in continuing to achieve British Columbia's energy objective set out in section 2(c) of the *Clean Energy Act*.

BC Hydro states that on December 21, 2021, it filed its 2021 IRP with the BCUC. BC Hydro states that its need for new energy resources in fiscal 2029 and for new capacity resources in fiscal 2032 aligns with the restoration of generating capacity in the BR1 Project.[353]

Panel Determination

The Panel finds that the BR1 Project is consistent with British Columbia's energy objectives.

The Panel considers that objectives (c), (e), (f), (k), (m) and (o) are relevant to the BR1 Project, as BC Hydro has stated. The Panel considers that the following energy objectives are also relevant to the BR1 Project:

[349] BC's energy objectives are defined in section 2 of the *Clean Energy Act*.
[350] *Utilities Commission Act*, RSBC 1996, c. 473., sections 46 (3.3)
[351] Exhibit B-1, Table 1-7, pp. 1-49 – 1-50.
[352] Ibid.
[353] Ibid., pp. 1-50 to 1-52.

- (a) – electricity self-sufficiency;
- (g) – reduce BC greenhouse gas emissions;
- (h) – encourage switching to fuels that decrease BC greenhouse gas emissions; and
- (n) – to be a net exporter of electricity from clean or renewable resources.

The Panel is satisfied that the BR1 Project is consistent with all ten of the above noted British Columbia's energy objectives because it contributes to providing clean and renewable electricity that can be used in BC, including for the purpose of switching customers to electricity and reducing their greenhouse gas emissions, and for export.

The Panel finds that the BR1 Project is consistent with the 2021 IRP. The BR1 Project is intended to ensure that the Bridge River system continues to provide the energy and capacity that is required to meet the demand set out in the 2021 IRP.

The Panel finds that section 19 of the CEA is not relevant in the consideration of this Application because there are no targets or guidelines prescribed in the manner set out in section 19 of the CEA.

9.0 BR1 Project and BRT Project Interdependence

In the BC Hydro Fiscal 2020-2021 Revenue Requirement Application decision, the BCUC determined thus:[354]

> The Panel finds that the BR1 U1-4 Project and the Bridge River Transmission Project are sufficiently related to warrant a joint CPCN filing. BC Hydro acknowledges that the Bridge River Transmission Project will be timed to meet the higher generation of the Bridge River system once units 1-4 have been replaced, and that a benefit of the Bridge River Transmission Project is to have the increased capacity needed to meet the higher generation needs of the system. To the Panel, this demonstrates that the need for the Bridge River Transmission Project is at least in part dependent on the BR1 U1-4 Project, and that without the latter there may be insufficient need for the former. Thus, it makes sense that the two initiatives are reviewed together.
>
> The Panel considers that, for the effective scrutiny of any investment in the Bridge River system, the BCUC should ideally have a view of the entire system. If project alternatives are only considered at the facility level, or even at the lower level of a component within a facility, there is a risk that there will be inadequate consideration of alternatives for the system itself. The proper place to review the Bridge River system and its alternatives is the IRP. However, BC Hydro has not filed an IRP with the BCUC since 2008, and will not do so again until at least February 28, 2021. In the absence of a current IRP, considering the two projects together will allow the BCUC at least a somewhat more complete consideration of the Bridge River system than reviewing the two projects separately.

The BCUC's CPCN Guidelines provide the following guidance with respect to the cost estimate included in a CPCN application:[355]

[354] BCUC Decision and Order G-246-20 on BC Hydro's Fiscal 2020 to Fiscal 2021 Revenue Requirements Application, pp. 99-100.
[355] BCUC Order G-20-15, 2015 Certificate of Public Convenience and Necessity Application Guidelines, p. 8.

> The cost estimate should be stated in nominal as well as real dollars, identify an expected accuracy range with stated confidence level and have, at a minimum, a Class 3 degree of accuracy as defined in the latest revision of the AACE International Recommended Practices.

In footnote 5, the BCUC's CPCN Guidelines add:

> Class 3 estimates are typically prepared to support full project funding requests, and become the first project phase "control estimate" against which all actual costs and resources will be monitored for variations to the budget. They are used as the project budget until replaced by more detailed estimates

The Panel requested parties to address, in their final submissions, the following questions:[356]

1. Whether it is appropriate for the BCUC to make a decision on the BR1 Project in advance of making a decision on the BRT Project, or whether the combined cost, interdependencies and other considerations of the two projects warrant delaying a decision on the BR1 Project in order to evaluate the projects together.
2. How the BCUC should evaluate the costs and benefits of the BR1 Project in the absence of a Class 3 cost estimate and preferred alternative for the BRT Project, including but not limited to whether the cost of BR1 and BRT Projects should be combined for comparison purposes.

In this section, the Panel addresses the parties' response to these two questions.

9.1 BRT Project

BC Hydro states that the BRT Project has an AACE Class 5 cost estimate of $66.2 million, with an expected accuracy range of +100 percent and -35 percent. This results in an estimated cost range of $43.0 million to $132.4 million with a confidence interval of 80 percent.[357]

BC Hydro explains that the scope of the BRT Project includes "sustainment work that is required to address asset health issues with the 2L90 circuit" (Sustainment Work) and "work that is required to increase its current carrying capacity" (Thermal Upgrade). BC Hydro's estimates the cost of the Sustainment Work to be $57.7 million and the cost of the Thermal Upgrade to be $8.5 million.[358]

BC Hydro describes the need for the BRT Project as follows:[359]

- The need for the BRT Project is driven by both the additional Independent Power Producer (IPP) generation in the area as well as the restoration of the generating capacity of the Bridge River Facility, as a result of both the BR1 Project and the replacements of Units 5, 6, 7 and 8 at the Bridge River 2 Generating Station.
- BC Hydro has been able to use limited operational measures to manage the 2L90 circuit within its existing capacity as new IPP generation has been added to the system. However, operational

[356] Exhibit A-17, questions 1 and 3.
[357] Exhibit B-1, p. 10-12.
[358] Exhibit B-15, BCUC IR 3.63.3.
[359] Exhibit B-6, BCSEA IR1.1.4, 1.1.2.

curtailment measures at the Bridge River Facility are no longer viable due to the water management issues.

- In the absence of the BR1 Project, BC Hydro would continue to maintain the generating units at the Bridge River 1 Generating Station to meet its flow commitments. If the units were to fail, BC Hydro would replace the units, as failure occurs, so that flow commitments could be maintained. The BRT Project would continue to be required to address system constraints to accommodate generation from the Bridge River Generation System and IPPs, and to address asset health issues and clearance defects to improve the reliability and safety of the 2L90 circuit.
- In a hypothetical scenario where the units were to fail and not be replaced, the 2L90 circuit would continue to operate and transmit generation from the Bridge River Generation System and IPPs and the BRT Project would still be required to address asset health issues and clearance defects to improve the reliability and safety of the 2L90 circuit. However, the scope of the BRT Project to increase the maximum capacity of 2L90 to address system constraints would not be required as the existing capacity of the Bridge River Transmission System would be sufficient.

BC Hydro states that the merits of the BR1 Project would not be diminished if the BRT Project was not completed. BC Hydro explains that the BRT Project is not required to achieve the objectives of the BR1 Project, which are to address the deteriorating condition of the aging generators, governors, exciters and control systems at the Bridge River 1 Generating Station.[360]

However, if the BRT Project is not completed, BC Hydro states that it would have to use its existing rights to curtail IPP generation during freshet and summer months, and that these rights are not sufficient to address the existing capacity constraints on the Bridge River Transmission System. BC Hydro adds that due to the need to move water through Bridge River 1 and 2 Generating Stations to Seton Lake, it cannot rely on curtailments to Bridge River 1 and 2 Generating Stations to assist with the transmission constraint. [361]

Therefore, BC Hydro concludes that without increasing of the maximum capacity scope of the BRT Project, it would have to negotiate amendments to existing Electricity Purchase Agreements with IPPs to secure expanded rights to curtail generation from Independent Power Producers during freshet and summer months so that the 2L90 circuit does not exceed its maximum capacity.

BC Hydro states that in the absence of the BR1 Project, the project drivers for the BRT Project will continue to have the same costs and benefits: [362]

- The BRT Project would still be required to mitigate the thermal constraint on 2L90 during normal system operating conditions in the summertime. The difference in loading on 2L90 would not be sufficient to change the maximum capacity needs of the circuit and does not result in any change to the project; and
- The sustainment portion of the BRT Project would still be required to address defects and aging infrastructure, to ensure continued safe and reliable operation.

[360] Exhibit B-6, BCSEA IR1.1.1.
[361] Ibid.
[362] Exhibit B-9, BCUC IR 2.43.3.

BC Hydro states that it identified three feasible alternatives to meet the need to address constraints on the Bridge River Transmission System and to address asset health issues and clearance defects on the 2L90 circuit. The scope of work to refurbish the 2L90 circuit to address asset health issues and clearance defects is the same in all three feasible alternatives. The three feasible alternatives are:[363]

- Alternative 1: Increase the maximum capacity of the 2L90 circuit, along Regional Path 1, from 585 A (233 MVA) to 1014 A (404 MVA);
- Alternative 2: Increase the capacity of the Rosedale T1 Transformer, along Regional Path 2, from 450 MVA to 600 MVA; and
- Alternative 3: Curtail generation from IPPs to balance the supply of energy within the constraints of the Bridge River Transmission System.

BC Hydro completed a structured decision-making approach to its evaluation of the feasible alternatives. The leading alternative is Alternative 1: Increase the maximum capacity of the 2L90 circuit along Regional Path 1 from 585A to 1014A and to refurbish the 2L90 circuit. Based on the analysis that BC Hydro has completed to-date, BC Hydro states that when appropriate mitigation measures are in place, this alternative minimizes total costs without a material increase in expected environmental and archaeological impacts.[364]

BC Hydro proposes to file an evidentiary update on the BRT Project at the end of the feasibility design stage of the project. At this stage, the preferred alternative will be confirmed and an AACE Class 4 cost estimate will be available. BC Hydro plans to file the evidentiary update by December 22, 2022, after receiving board approval to move the BRT Project to the preliminary design stage in November 2022.[365]

If the BCUC will not make a determination on the BRT Project without a Class 3 estimate, then BC Hydro submits that the BCUC should direct BC Hydro to file its evidentiary update towards the end of the preliminary design stage of the BRT Project, when a Class 3 estimate will be available. Given the resources required to prepare the evidentiary update and for regulatory efficiency, BC Hydro submits that it would be preferable to avoid two evidentiary updates on the BRT Project in this proceeding.[366] BC Hydro estimates that an AACE Class 3 cost estimate for the BRT Project will be available in the summer or fall 2023.[367]

Positions of the Parties

BC Hydro submits that the BR1 Project "can and should be approved in advance of a decision on the BRT Project" because there are no combined costs, interdependencies or other considerations that warrant delaying the BR1 Project to evaluate the projects together. BC Hydro provides two key points in support of this position:[368]

- The BR1 Project is more advanced than the BRT Project and needs to proceed at the earliest opportunity; and

[363] Exhibit B-1, p. 9-4.
[364] Ibid., p 9-1.
[365] Exhibit B-12, p. 9.
[366] Exhibit B-13, p. 5.
[367] Exhibit B-15, BCUC IR 65.2.1.
[368] BC Hydro Final Argument, p. 60.

- The BCUC can and should make a decision on the BR1 Project prior to the BRT Project as the need and alternatives of the two projects are independent.

BC Hydro submits that the BR1 Project is at the end of the preliminary design stage, when BC Hydro would typically file for BCUC approval. In contrast, the BRT Project is currently in the feasibility design stage, during which BC Hydro will determine its preferred alternative with which to proceed to the definition phase.[369]

Based on the needs and urgency set out in its Application, and summarized in Section 2 of this Decision, BC Hydro's view is that the BCUC must approve the BR1 Project by September 2022 to allow it to maintain the BR1 Project schedule. [370]

BC Hydro further submits that the BCUC can make a decision on the BR1 Project without having a Class 3 cost estimate or a preferred alternative for the BRT Project because the need and alternatives for the BR1 Project are "independent of the need for, estimated costs and benefits of, and preferred alternative for the BRT Project."[371]

BC Hydro explains that the need for the BR1 Project is "driven by the condition of the equipment in the Bridge River 1 Generating Station and has no relationship with the BRT Project." BC Hydro also submits that the benefits of the BR1 Project can be achieved and would not change in the absence of the BRT Project, and that the incremental 21 MW of generation is not a driver of the BR1 Project but, in any case, is primarily a winter benefit and so is not affected by the summer constraints on the 2L90 line.[372]

BC Hydro submits that the alternatives for the BR1 Project can be appropriately considered independently from the BRT Project because BC Hydro's assessment of the benefits of the BR1 Project assumed no transmission restrictions and thus did not assume a particular BRT Project alternative. BC Hydro considers this appropriate because "the incremental system benefits attributed to the different BR1 Project alternatives are not dependent on which BRT Project alternative is implemented, and the BR1 Project Alternatives have no impact on the scope or cost of the BRT Project alternatives."[373]

BC Hydro argues that the 21 MW difference in generation capacity between the Rewind alternative and Replace/Refurbish alternatives is not material to the BRT Project alternatives. BC Hydro submits there is no feasible alternative for the BRT Project that requires less work due to having 21 MW less generation capacity in the Bridge River System. BC Hydro adds that the thermal upgrade portion of the leading alternative for the BRT Project "would still be required in the absence of the incremental capacity created by the BR1 Project" because the additional 21 MW generation makes an immaterial difference to the sag of the 2L90 line during the summer and the required height of the structures to meet the minimum clearance.[374]

Similarly, BC Hydro argues that the BR1 Project has no impact on the cost, benefits, need or alternatives of the BRT Project. BC Hydro explains that the sustainment work on line 2L90 would still be required to address asset health issues even if the Bridge River 1 Generating Station generated no energy at all, and the thermal upgrade

[369] Ibid., p. 61.
[370] Ibid., p. 62.
[371] Ibid.
[372] Ibid., p. 63.
[373] Ibid., pp. 63-64.
[374] Ibid., p. 64.

to increase the carrying capacity of line 2L90 is not materially affected by the 21 MW increase in capacity due to the BR1 Project.[375]

BC Hydro submits that the question of whether the bypassing of the Bridge River 1 Generating Station would have an impact on the costs and benefits of the BRT Project is "irrelevant and inconsequential." BC Hydro explains that bypassing the Bridge River 1 Generating Station would not be economic and is therefore not contemplated by BC Hydro, and that in any case bypassing the Bridge River 1 Generating Station would only avoid the $8.5 million cost of the thermal upgrade to line 2L90, which is immaterial compared to the cost of a bypass.

BCOAPO submits that, overall, "there are no interdependencies between the BR1 Project and the BRT Project that would warrant delaying a decision on the BR1 project in order to evaluate the projects together." [376] BCOAPO submits that both the BR1 Project alternatives and their evaluation "can be considered to be independent of the outcome of the BRT Project."[377]

BCOAPO's view is that the management of water flows in the Bridge River System is "independent of and has no relationship with the BRT Project." BCOAPO adds that the ultimate decision regarding the BRT Project "will not negate the positive economic value of the Bridge River System" and that the need for the BR1 Project "can be considered separately from consideration of the BRT Project." [378]

BCOAPO submits that there is no need to make any allowance in the evaluation of the BR1 alternatives for "potential impacts on either the incremental benefits or IPP generation costs due to the ultimate decision regarding the BRT [Project]." [379]

BCOAPO further submits that the need for the BRT Project is not dependent on the outcome for the BR1 Project.[380]

RCIA submits that the evidence does not support the BC Hydro's claim of independence between the BR1 Project and the BRT Project. [381]

RCIA submits that if the BRT Project were not approved by the BCUC, then other alternatives for the BR1 Project that were not evaluated by BC Hydro would become more relevant because the ability to evacuate the electricity generated by the BR1 Project becomes more constrained. [382]

RCIA submits that the BR1 Project and BRT Project are also interdependent because a change in capacity of the Bridge River Generating station may have a material impact on the BRT Project requirements. Specifically, RCIA points to BC Hydro's claim that the incremental 21 MW of generation provided by the BR1 Project is "primarily a winter capacity benefit, and so is not affected by the summer constraints on 2L90." However, RCIA submits that

[375] Ibid., pp. 65-66.
[376] BCOAPO Final Argument, p. 30.
[377] Ibid., p. 29.
[378] Ibid., p. 27.
[379] Ibid., p. 28.
[380] Ibid., p. 30.
[381] RCIA Final Argument, p. 23.
[382] Ibid., p. 24.

the "must-run season consistently occur[s] in the late-freshet/summer season to manage water flows" and therefore peak generation is a summer as well as a winter phenomenon, which would further constrain the 2L90 available capacity.[383]

RCIA also submits that if the alternative of a turbine energy dissipation device were considered for the BR1 Project, the reduction in generating capacity compared to the proposed alternative for the BR1 Project would be almost 3.5 times as large an impact on the BRT Project as the difference between the rewind and the replace/refurbish alternatives. [384]

RCIA submits that the evidence does not support BC Hydro's claim that the work required to increase the current carrying capacity of 2L90 has no effect on the BR1 Project decision.[385] According to RCIA, BC Hydro concedes that the BR1 Project could potentially impact a portion of the BRT Project by restoring the capacity of the generating station. RCIA submits that BC Hydro's claim that only a "small portion" of the overall BRT Project scope is affected is irrelevant, because BC Hydro has clearly demonstrated the interdependence between the BR1 and BRT Projects.[386]

RCIA also submits that BC Hydro has also conceded that the BR1 and BRT Projects are interdependent by acknowledging that by bypassing generating units the thermal upgrade portion of the BRT Project may be avoided. RCIA submits that the possible cost saving of $8.5 million, over 11 percent of the expected BRT Project cost, is not negligible and is worthy of consideration by the BCUC.[387]

In reply to RCIA, BC Hydro submits that "RCIA's argument that changing the capacity of BR1 may have a material impact on the BRT Project requirements is without merit." BC Hydro submits that neither the difference in generation capacity between the Rewind alternative and Replace/Refurbish alternatives, nor the impact of not doing the BR1 Project at all, would be material to the BRT Project alternatives. [388]

BC Hydro further submits that the incremental capacity from the BR1 Project makes "an immaterial difference" to the sag of the 2L90 line during the summer, and that BC Hydro would not curtail BR1 generation due to constraints on 2L90. Thus, BC Hydro submits that in the absence of the BRT Project, it "would have to negotiate amendments to existing Electricity Purchase Agreements with IPPs to secure expanded rights to curtail generation from IPPs during freshet and summer months so that the 2L90 circuit does not exceed its maximum capacity." BC Hydro adds that the use of a turbine energy dissipation device would not be economic and is "clearly inferior" to the Replace alternative. [389]

BC Hydro submits it did not concede that the thermal upgrade work is impacted by the BR1 Project, but "was indicating that the only potential for impact was to the thermal upgrade portion of the work" [Emphasis in original]. BC Hydro submits it has shown why even the thermal upgrade portion of the work would not in fact be

[383] Ibid., p. 25.
[384] Ibid., p. 25.
[385] Ibid., p. 26.
[386] Ibid.
[387] RCIA Final Argument, pp. 26-27.
[388] BC Hydro Reply Argument, p. 37.
[389] Ibid., p. 37.

impacted by the incremental increase in capacity from the BR1 Project due to the immaterial sag of the 2L90 line during the summer and the required height of the structures to meet the minimum clearance.[390]

BC Hydro submits that RCIA's argument regarding bypassing one or more BR1 generators is based on its "incorrect and unsupported view that limited bypass scenarios are feasible." BC Hydro submits that such bypass scenarios are not economic or in the interests of ratepayers.[391]

BCSSIA submits that the BR1 and BRT Projects should be reviewed together and "urges the BCUC to maintain the integrity of this proceeding and not allow it to revert to the piece-meal approach that has been used in previous applications of a similar kind." BCSSIA adds that the BCUC should also consider "the many other projects that will be involved in the future of the total Bridge River System" and that all such projects should be considered together. BCSSIA submits that once the BCUC approves the BR1 Project, it will then be "locked in to granting approval for a cascade of future projects," which BCSSIA submits "could total over $800 million," not including the cost of the BRT Project. [392]

BCSSIA submits that the potential consequences of delaying the approval of the BR1 Project do not appear to be dire, and "all should be manageable."[393]

BCSSIA submits in summary that there is no urgent need to approve the BR1 Project and "certainly not until all the required material for BRT is filed and considered."[394]

In reply to BCSSIA, BC Hydro submits that a review of all future projects related to the Bridge River System together is "not feasible and based on the false premise that the approval of the BR1 project will lock in the approval of future projects," and notes that its future projects related to the Bridge River System will be subject to review and approval or acceptance by the BCUC in accordance with the UCA. BC Hydro also submits that it has never justified a project, and to the best of its knowledge the BCUC has never approved a project, on the basis of costs incurred previous to the project in question. [395]

BC Hydro further submits that the current proceeding has included a "robust process by which the BCUC has reviewed the BR1 Project within the context of the Bridge River System as a whole and in relation to the BRT Project." [396]

The CEC submits that it is "reasonable and appropriate for the [BCUC] to make a decision on the BR1 Project prior to making a decision on the BRT Project in that both Projects are considered to be justified, viable and designed and implemented independently of the other project, such that the existence or absence of either would not change the project proposals."[397] Further, the CEC does not believe that a Class 3 estimate of the costs of the BRT Project is required for the BCUC to evaluate and approve the BR1 Project.[398]

[390] Ibid., p. 38.
[391] Ibid.
[392] BCSSIA Final Argument, pp. 2, 4-5.
[393] Ibid., p. 6.
[394] Ibid., p. 10.
[395] BC Hydro Reply Argument, p. 36.
[396] Ibid., p. 37.
[397] CEC Final Argument, p. 39.
[398] Ibid., p. 42.

BCSEA submits that "it is appropriate for the BCUC to make a decision on the BR1 Project in advance of making a decision on the BRT Project" because the merits of the BR1 Project "would not be diminished if the BRT Project was not completed" and consideration of the BRT Project "does not warrant delaying a decision on the BR1 project in order to evaluate the two projects together."[399]

BCSEA further submits that the BCUC "can and should evaluate the costs and benefits of the BR1 Project despite the absence of a Class 3 cost estimate and preferred alternative for the BRT Project."[400] BCSEA accepts BC Hydro's evidence that the merits of the BR1 Project "would not be diminished if the BRT Project was not completed."[401]

Panel Determination

The Panel finds that it is appropriate to make a decision on the BR1 Project in advance of making a decision on the BRT Project.

The need for the BR1 Project, to improve management of the water flows of the Bridge River System and to contribute to the energy and capacity demands of BC Hydro's customers in particular in the South Coast region, exists independently of any aspect of the BRT Project. Neither the cost or alternatives for the BRT Project, nor whether or not the BRT Project proceeds, would change the need for the BR1 Project.

The selection of the preferred Replace alternative from the three feasible alternatives to meet the need for the BR1 Project would not change regardless of which alternative is chosen for the BRT Project or whether the BRT Project proceeds. The Panel has established the benefits of replacing the generators rather than rewinding or refurbishing them.

In the Panel's view, the only relevant difference between the three feasible alternatives for the BR1 Project is that the preferred Replace alternative and the second-ranked Refurbish alternative provide 21 MW more generation than the Rewind alternative. It is true that implementing 50 MVA generators instead of 60 MVA would reduce the generating capacity by 21 MW, and therefore reduce the likelihood of needing the thermal upgrade portion of the BRT Project. However, BC Hydro has demonstrated that the decision to implement 60 MVA generators is cost effective. The additional 21 MW generation might make it more likely that the thermal upgrade for the BRT Project is needed. But the thermal upgrade is only $8.5 million of the BRT estimated cost. Even if the additional 21 MW generation from BR1 were the only driver for the thermal upgrade to the 2L90 line, the BR1 Project would still be worth pursuing on its own merits.

The Panel is satisfied that there are no outcomes to the BRT Project analysis that would make an alternative for the BR1 Project that was rejected by BC Hydro as infeasible superior to the preferred Replace alternative. RCIA submits that bypassing the BR1 generating units or using turbine energy dissipation units might reduce the need for the BRT Project. As noted above, this might be true, but these alternatives would not satisfy the need for the BR1 Project nor are they economic. Even if the BRT Project were not to go ahead, BC Hydro states it would not curtail generation from BR1 on the occasions when transmission capacity were constrained but would instead curtail generation from independent power producers if required.

[399] BCSEA Final Argument, p. 3.
[400] Ibid., p. 4.
[401] BCSEA Final Argument, pp. 8-9.

The Panel further finds that it is appropriate to evaluate the costs and benefits of the BR1 Project in the absence of a Class 3 estimate and a preferred alternative for the BRT Project. There is no evidence that the cost estimate for the three feasible alternatives for the BR1 Project would change based on the selection of the preferred alternative for the BRT Project or whether the BRT Project proceeds.

Notwithstanding the above findings, the Panel finds that it was beneficial to review the BR1 and BRT Projects together, even allowing for their differing stages of development, to ensure that the need and alternatives for the BR1 Project were properly considered.

10.0 CPCN Determination for the BR1 Project

Section 45(1) of the UCA[402] stipulates that a person must not begin the construction or operation of a public utility plant or system, without first obtaining from the BCUC a certificate that public convenience and necessity require, or will require, the construction or operation of the plant or system.

Sections 46(1) and (3) of the UCA state that:[403]

> An applicant for a certificate of public convenience and necessity must file with the commission information, material, evidence and documents that the commission prescribes.
>
> …
>
> (3) … the commission may, by order, issue or refuse to issue the certificate… and may attach to the exercise of the right or privilege granted by the certificate, terms, including conditions about the duration of the right or privilege under this Act as, in its judgment, the public convenience or necessity may require.

Positions of the Parties

BC Hydro submits that the BR1 Project is in the public interest and requests that the BCUC grant a CPCN for the project on the following conditions:[404]

> BC Hydro is directed to file the following reports:
>
> (i) Semi-annual progress reports on the BR1 Project's scope, cost, schedule, risks, and ongoing consultation and mitigation plans; and
>
> (ii) A Project Completion and Evaluation Report (PCER) for the BR1 Project three months after receiving approval of the PCER from BC Hydro's Board of Directors.

BCOAPO, the CEC and BCSEA submit that the BCUC should grant a CPCN for the BR1 Project.[405] The SCC "does not oppose the approval of the BR1 Project."[406]

[402] *Utilities Commission Act*, RSBC 1996, c. 473.
[403] UCA, s.46(3).
[404] BC Hydro Final Argument, p. 69; Exhibit B-1-1, Appendix A-2, p. 5.
[405] BCOAPO Final Argument, p. 31; CEC Final Argument, p. 43; BCSEA Final Argument, p. 19.
[406] SCC Final Argument, p. 3.

RCIA asks the BCUC not to accept the Application, but to allow BC Hydro to address the "evidentiary deficiencies" brought up by RCIA and summarized in Section 2 of this Decision.[407]

BCSSIA recommends delaying approval of the BR1 Project "until its cost is more accurately estimated, it is compared with other alternatives, and the review of the BRT [Project] is completed."[408]

BC Hydro's replies to RCIA and BCSSIA are set out in Sections 2 and 3 above.

Panel Determination

The Panel finds that the BR1 Project is in the public interest and that the public convenience and necessity require that the BR1 Project proceeds.

The Panel has found that BC Hydro has established the need for the BR1 Project, and that BC Hydro's proposed alternative is reasonable. The Panel has also found that there is an urgent need to pursue the BR1 Project, and has rejected the suggestions from RCIA and BCSSIA to delay the project.

The Panel has also found that BC Hydro's consultation to date, including consultation with Indigenous groups, has been adequate. The Panel has accepted the two concerns raised by the SCC, and agrees that conditions be added to the CPCN to address these concerns.

For the foregoing reasons, the Panel grants BC Hydro a CPCN to BC Hydro for the BR1 Project, as described in section 5 of the Application, subject to the following conditions:

> **Consistent with BC Hydro commitments to the St'át'imc Nation, with respect to in-season flow management decisions to facilitate the construction of the BR1 Project, BC Hydro shall work with the Joint Planning Forum consistent with the mutually agreed to Terms of Reference established between BC Hydro and the St'át'imc Authority and give due consideration to water level and flow impacts and water needs related to: Fish and fish habitat; Wildlife and wildlife habitat; Soil erosion; St'át'imc use of the land and resources in the area; and St'át'imc cultural activities in the area.**
>
> **Consistent with BC Hydro's commitments to the St'át'imc Nation, BC Hydro, in collaboration with the Tsal'alh and SCC, will make best efforts to ensure compliance, monitoring and enforcement of the Bridge River Contract Worker Conduct Requirements and the Bridge River Internal Review Procedure for Code of Conduct Violations.**

The Panel directs BC Hydro to file the following with the BCUC:

(i) A report explaining any variances between the Authorized Cost of $326.3 million for the BR1 Project filed in the Application and the amount approved by BC Hydro's Board of Directors, within 30 days of final approval of the BR1 Project; and

(ii) Ongoing reporting to the BCUC for the duration of the BR1 Project, as detailed in Appendix A of this Decision.

[407] RCIA Final Argument, p. 28.
[408] BCSSIA Final Argument, p. 20.

11.0 BRT Project Evidentiary Update

The BCUC's CPCN Guidelines state that a project cost estimate should be prepared to an AACE Class 3 estimate. Class 3 estimates are typically prepared to support full project funding requests, and become the first project phase "control estimate" against which all actual costs and resources will be monitored for variations to the budget. They are used as the project budget until replaced by more detailed estimates.[409]. The BCUC's Guidelines also state that cost estimates for alternatives to proposed projects should be prepared to at least an AACE Class 4 level of accuracy. Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. They are typically used for project screening, determination of feasibility, concept evaluations and preliminary budget approval.[410]

As explained in Section 9.1 of this Decision above, BC Hydro has identified three feasible alternatives for the BRT Project and provides information on the costs of each in the Application. Similar to the BR1 Project, BC Hydro states it undertook a structured decision-making approach to evaluate the alternatives. Among the stated project objectives is an objective to "minimize total costs."[411] BC Hydro's preferred alternative for the BRT Project has an NPV of cost of $75.1 million, with an estimating accuracy range of +100 percent to -30 percent. The other feasible project alternatives range in cost from $79.8 million to $107.9 million.[412]

BC Hydro proposes to file an evidentiary update (Evidentiary Update) for the BRT Project in December 2022 for the BCUC to continue its review of that project.[413] BC Hydro states that the Evidentiary Update will be filed at the end of the feasibility design stage of the BRT Project,[414] at which point the costs will be estimated to an AACE Class 4 level of accuracy with an expected accuracy range of +50 percent / -15 percent.[415]

BC Hydro considers that an AACE Class 4 estimate will be sufficient for the BCUC's review of the BRT Project, and that an AACE Class 3 estimate is not required to confirm the preferred alternative, because BC Hydro will have "a robust understanding of project impacts and risks that will help inform the Class 4 project estimate".[416]

BC Hydro also states that it does not expect to provide AACE Class 4 estimates for the BRT Project alternatives in the Evidentiary Update, because it has identified a leading alternative for the BRT Project using AACE Class 5 cost estimates and other criteria, which provides "sufficient information on the relative cost of the alternatives to identify the Leading Alternative."[417]

Panel Determination

The Panel directs BC Hydro to include in its Evidentiary Update an AACE Class 3 cost estimate for the BRT Project and AACE Class 4 cost estimates for the project alternatives, or to provide an explanation of why this degree of accuracy is not required in this instance.

[409] The BCUC's CPCN Guidelines, p. 8.
[410] Ibid., p. 4.
[411] Exhibit B-1, Table 9-1, pp. 9-11 – 9-12.
[412] Ibid., Table 9-2, p. 9-14.
[413] Exhibit B-12, p. 9.
[414] Ibid., p. 10-12.
[415] Ibid., p. 10-2.
[416] Exhibit B-5, BCUC IR 1.33.5.
[417] Ibid., BCUC IR 1.33.2.1.

The BCUC's CPCN Guidelines set out the expectation that utilities prepare project cost estimates to an AACE Class 3 level of accuracy. This is to enable the BCUC to evaluate the utility's proposed investment with a reasonable degree of confidence as to the costs that would be incurred by ratepayers if the investment were approved. While the BCUC's CPCN Guidelines do not establish the AACE Class 3 cost estimate as a requirement for approval of a CPCN, the onus is on BC Hydro to justify why the Panel should accept the BRT Project CPCN application in the absence of such information.

The cost estimates for the BRT Project currently range from $75.1 million (for the leading alternative) to $107.9million, all cost estimates having an uncertainty band of +100 percent to -30 percent. Since the estimates all lie within the same band of uncertainty, the Panel considers it reasonable to assess the BRT Project once the more rigorous standards set in the BCUC's CPCN Guidelines, an AACE Class 3 cost estimate for the preferred alternative and AACE Class 4 cost estimates for the project alternatives, have been achieved**.**

BC Hydro states that it does not plan to provide an AACE Class 3 level of accuracy in its Evidentiary Update for the BRT Project, despite having done so for the BR1 Project, but adds that if the Panel requires an AACE Class 3 estimate for the BRT Project, then it would be more efficient to file its Evidentiary Update when the AACE Class 3 estimate is available rather than filing two evidentiary updates. [418] The Panel agrees, and recommends that BC Hydro file one evidentiary update for the BRT Project when the AACE Class 3 estimate is available, which the Panel understands is currently expected to be in the summer or fall of 2023.

The Panel further directs BC Hydro to provide a fulsome analysis of alternatives to the BRT Project which addresses the inadequacies of the alternatives analysis for the BR1 Project, which the Panel set out in its determination in Section 3 above. In particular, objectives against which the alternatives are measured should be independent of each other, and measures used to score alternatives against those objectives should be quantified where possible.

DATED at the City of Vancouver, in the Province of British Columbia, this 11th day of October 2022.

Original signed by:

R. I. Mason
Panel Chair / Commissioner

Original signed by:

C. M. Brewer
Commissioner

Original signed by:

A. C. Dennier
Commissioner

[418] Exhibit B-13, p. 5.

bcuc
British Columbia
Utilities Commission

Suite 410, 900 Howe Street
Vancouver, BC Canada V6Z 2N3
bcuc.com

P: 604.660.4700
TF: 1.800.663.1385
F: 604.660.1102

ORDER NUMBER
C-6-22

IN THE MATTER OF
the *Utilities Commission Act*, RSBC 1996, Chapter 473

and

British Columbia Hydro and Power Authority
Application for Certificates of Public Convenience and Necessity for the Bridge River Projects:
Bridge River 1 Units 1 to 4 Generator Replacement Project

BEFORE:
R. I. Mason, Panel Chair
C. M. Brewer, Commissioner
A. C. Dennier, Commissioner

on October 11, 2022

CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY

WHEREAS:

A. On July 23, 2021, British Columbia Hydro and Power Authority (BC Hydro) filed an application with the British Columbia Utilities Commission (BCUC) for a Certificate of Public Convenience and Necessity (CPCN) pursuant to sections 45 and 46 of the *Utilities Commission Act* (UCA) for the Bridge River 1 Units 1 to 4 Generator Replacement Project (BR1 Project) and a CPCN for the Bridge River Transmission Project (BRT Project) (together, Application);

B. In the Application, BC Hydro requests approval for:

   a. The BR1 Project to replace aging generating equipment within the Bridge River 1 Generating Station; and

   b. The BRT Project to increase the maximum capacity of the 2L90 circuit and to refurbish existing circuit infrastructure;

C. In the Application, BC Hydro requests that certain information in the Application and several Appendices be held confidential due to the commercially sensitive nature of the information, in accordance with Part IV of the BCUC's Rules of Practice and Procedure. BC Hydro requests confidentiality for errata to the Application and certain confidential Appendices, along with responses to confidential Information Requests (IRs) (together, Confidential Information);

D. By Orders G-253-21, G-291-21, G-319-21, G-38-22, G-94-22 and G-137-22, the BCUC established and amended the regulatory timetable for the review of the Application, which included, among other things, public notice, three rounds of IRs, submissions on further process, one round of Panel IRs and final and reply arguments;

E. By January 7, 2022, British Columbia Old Age Pensioners' Organization et al., BC Sustainable Energy Association, BC Solar and Storage Industries Association, Commercial Energy Consumers Association of British Columbia, Residential Consumer Intervener Association and St'át'imc Chiefs Council registered as interveners in the proceeding; and

F. The BCUC has considered the Application, evidence and submissions in this proceeding and finds that public convenience and necessity require that the BR1 Project proceed and the following determinations to be warranted.

NOW THEREFORE pursuant to sections 45 to 46 of the *Utilities Commission Act* and for the reasons set out in the Decision issued concurrently with this order, the BCUC orders as follows:

1. A CPCN is granted to BC Hydro for the BR1 Project subject to the following conditions:

    a. Consistent with BC Hydro commitments to the St'át'imc Nation, with respect to in-season flow management decisions to facilitate the construction of the BR1 Project, BC Hydro shall work with the Joint Planning Forum consistent with the mutually agreed to Terms of Reference established between BC Hydro and the St'át'imc Authority and give due consideration to water level and flow impacts and water needs related to: Fish and fish habitat; Wildlife and wildlife habitat; Soil erosion; St'át'imc use of the land and resources in the area; and St'át'imc cultural activities in the area; and

    b. Consistent with BC Hydro's commitments to the St'át'imc Nation, BC Hydro, in collaboration with the Tsal'alh and SCC, will make best efforts to ensure compliance, monitoring and enforcement of the Bridge River Contract Worker Conduct Requirements and the Bridge River Internal Review Procedure for Code of Conduct Violations.

2. BC Hydro is directed to file BR1 Project reports as outlined in Appendix A to the Decision.

3. BC Hydro is directed to comply with all the directives outlined in the Decision issued concurrently with this order.

4. The Confidential Information will be held confidential until the BCUC determines otherwise.

5. Further process for the BRT Project to be determined.

DATED at the City of Vancouver, in the Province of British Columbia, this 11th day of October 2022.

BY ORDER

Original signed by:

R. I. Mason
Commissioner

British Columbia Hydro and Power Authority
Application for Certificates of Public Convenience and Necessity for the Bridge River Projects:
Bridge River 1 Units 1 to 4 Generator Replacement Project

Bridge River 1 PROJECT REPORTING

The scope of the Bridge River 1 (BR1) Project reporting for the duration of the BR1 Project will comprise the following:

1 Semi-annual Progress Reports

Each report is required to detail:

- Actual costs incurred to date compared to the BR1 Project cost breakdown table estimate provided in Table 5-3 of the Application, highlighting variances with an explanation of significant variances;
- Updated forecast of costs, highlighting the reasons for significant changes in Project costs anticipated to be incurred; and
- The status of identified risks noted in Chapter 7 of the Application, highlighting the status of identified risks, changes in and additions to risks, the options available to address the risks, the actions that BC Hydro is taking to deal with the risks and the likely impact on the Project's schedule and cost.

BC Hydro must file semi-annual progress reports within 30 days of the end of each semi-annual reporting period, with the first report covering the period ending December 31, 2022. Each report must provide the information set out above.

2 Material Change Reports

A material change (Material Change) is a change in BC Hydro's plan for the BR1 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 5-5 of the Application;
- The total Project cost exceeds 10 percent of the estimated Project cost provided in Table 5-3 of the Application; or
- There is a change to the BR1 Project scope detailed in section 5.2 of the Application.

In the event of a Material Change, BC Hydro must file a Material Change report with the BCUC explaining the reasons for the Material Change, BC Hydro's consideration of the BR1 Project risk and the options available, and actions BC Hydro is taking to address the Material Change. BC Hydro must file the Material Change report as soon as practicable and in any event within 30 days of the date on which the Material Change occurs.

3. Final Report

A Final Report within three months of substantial completion or the in-service date of the BR1 Project, whichever is earlier. The report is to include:

- The final cost of the BR1 Project, including a breakdown of the final costs;
- A comparison of the final costs to the estimates provided in Table 5-3 of the Application; and
- An explanation and justification for any material cost variances that exceed 10 percent for any of the cost items provided in Table 5-3 of the Application.

British Columbia Hydro and Power Authority
Application for Certificates of Public Convenience and Necessity for the Bridge River Projects:
Bridge River 1 Units 1 to 4 Generator Replacement Project

GLOSSARY AND ACRONYMS

ACRONYM / GLOSSARY	DESCRIPTION
AACEI	The Association for the Advancement of Cost Engineering International
Application	Application for Certificates of Public Convenience and Necessity (CPCN) for the Bridge River 1 Units 1 to 4 Generator Replacement Project (BR1 Project) and a CPCN for the Bridge River Transmission Project (BRT Project)
BC Hydro	British Columbia Hydro and Power Authority
BCOAPO	British Columbia Old Age Pensioners' Organization et al.
BCSEA	BC Sustainable Energy Association
BCUC	British Columbia Utilities Commission
BR1 Project	Bridge River 1 Units 1 to 4 Generator Replacement Project
BRT Project	CPCN for the Bridge River Transmission Project
CBA	Cost-Benefit Analysis
CEA	*Clean Energy Act*
CEC	Commercial Energy Consumers Association of British Columbia
CPCN	Certificate of Public Convenience and Necessity
EIS	Environment Impact Statement
EMP	Environmental Management Plan
Hemmera	Hemmera Environchem Inc.
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IRs	Information Requests
MVA	Megavolt amperes

ACRONYM / GLOSSARY	DESCRIPTION
MW	Megawatt
NERC	North American Electric Reliability Corporation
NPV	Net Present Value
PCER	Project Completion and Evaluation Report
PMI	Project Management Institute
RCIA	Residential Consumer Intervener Association
RFP	Request for Proposal
SCADA	Supervisory Control and Data Acquisition
SCC	Stát'imc Chiefs Council
TEDD	Turbine Energy Dissipation Device
UCA	*Utilities Commission Act*
WUP	Water Use Plans

British Columbia Hydro and Power Authority
Bridge River Projects – Certificates of Public Convenience and Necessity

EXHIBIT LIST

Exhibit No.	Description
COMMISSION DOCUMENTS	
A-1	Letter dated August 23, 2021 – BCUC Panel Appointment for the review of the BC Hydro Bridge River Projects – Certificates of Public Convenience and Necessity Application
A-2	Letter dated August 26, 2021 – BCUC Order G-253-21 establishing a regulatory timetable
A-3	Letter dated October 5, 2021 – BCUC Information Request No. 1 to BC Hydro
A-4	**CONFIDENTIAL** Letter dated October 5, 2021 – BCUC Confidential Information Request No. 1 to BC Hydro
A-5	Letter dated October 8, 2021 – BCUC Order G-291-21 amending the regulatory timetable
A-6	Letter dated October 13, 2021 – BCUC notice to parties regarding the amended regulatory timetable
A-7	Letter dated November 4, 2021 – BCUC Order G-319-21 amending the regulatory timetable
A-8	Letter dated January 18, 2022 – BCUC Information Request No. 2 to BC Hydro
A-9	**CONFIDENTIAL** Letter dated January 18, 2022 – BCUC Confidential Information Request No. 2 to BC Hydro
A-10	Letter dated February 22, 2022 – BCUC Order G-38-22 amending the regulatory timetable
A-11	Letter dated April 6, 2022 – BCUC Order G-94-22 establishing a further regulatory timetable
A-12	Letter dated April 14, 2022 – BCUC providing clarification on Scope for Information Request No. 3
A-13	Letter dated April 19, 2022 – BCUC Information Request No. 3 to BC Hydro
A-14	**CONFIDENTIAL** Letter dated April 19, 2022 – BCUC Confidential Information Request No. 3 to BC Hydro
A-15	Letter dated May 18, 2022 – BCUC Order G-137-22 establishing a further regulatory timetable
A-16	Letter dated May 18, 2022 – Panel Information Request No. 1 to BC Hydro

A-17	Letter dated May 18, 2022 – BCUC providing Clarification of Scope for BC Hydro Final Argument on BR1 Project
A-18	Letter dated May 24, 2022 – BCUC Order G-143-22 establishing a further regulatory timetable

APPLICANT DOCUMENTS

B-1	**PUBLIC** - **BRITISH COLUMBIA HYDRO AND POWER AUTHORITY (BC HYDRO)** – Bridge River Projects – Certificates of Public Convenience and Necessity (CPCN) Application dated July 23, 2021
B-1A	Letter dated December 7, 2021 – BC Hydro submitting Errata No. 1 to the application
B-1-1	Letter dated July 23, 2021 – BC Hydro submitting public Appendix A to the application
B-1-1A	Letter dated December 7, 2021 – BC Hydro submitting Errata No. 1 to public Appendix A to the application
B-1-2	Letter dated July 23, 2021 – BC Hydro submitting public Appendix B-BR1 to the application
B-1-2A	Letter dated December 7, 2021 – BC Hydro submitting Errata No. 1 to public Appendix B-BR1 to the application
B-1-2B	Letter dated February 22, 2022 – BC Hydro submitting Errata No. 2 to Appendix B-2-2
B-1-3	Letter dated July 23, 2021 – BC Hydro submitting public Appendix C-BRT to the application
B-2	**CONFIDENTIAL** – **BC HYDRO** – Bridge River Projects – Certificates of Public Convenience and Necessity (CPCN) Application dated July 23, 2021
B-2A	**CONFIDENTIAL** - Letter dated December 7, 2021 – BC Hydro submitting Confidential Errata No. 1 to the application
B-2-1	**CONFIDENTIAL** – Letter dated July 23, 2021 – BC Hydro submitting confidential Appendix A to the application
B-2-2	**CONFIDENTIAL** – Letter dated July 23, 2021 – BC Hydro submitting confidential Appendix B-BR1 to the application
B-2-2A	**CONFIDENTIAL** – Letter dated December 7, 2021 – BC Hydro submitting confidential Errata No. 1 to confidential Appendix B-BR1 to the application
B-2-2B	**CONFIDENTIAL** – Letter dated February 22, 2022 – BC Hydro submitting confidential Errata No. 2 to confidential Appendix B-2-2
B-2-3	**CONFIDENTIAL** – Letter dated July 23, 2021 – BC Hydro submitting confidential Appendix C-BRT to the application
B-3	Letter dated September 22, 2021 – BC Hydro submitting compliance with Order G-253-21 Directives 2, 3 and 4

B-4	Letter dated November 2, 2021 – BC Hydro submitting extension request to file Information Request No. 1 responses
B-5	Letter dated December 7, 2021 – BC Hydro submitting responses to BCUC Information Request No. 1
B-5-1	**CONFIDENTIAL** – Letter dated December 7, 2021 – BC Hydro submitting confidential responses to BCUC Information Request No. 1
B-6	Letter dated December 7, 2021 – BC Hydro submitting responses to Intervener Information Requests No. 1
B-6-1	**CONFIDENTIAL** – Letter dated December 7, 2021 – BC Hydro submitting confidential responses to Intervener Information Requests No. 1
B-6-2	Letter dated May 6, 2022 – BC Hydro submitting revised response to Intervener Information Request No. 1 RCIA 1.18.3
B-7	**CONFIDENTIAL** - Letter dated December 7, 2021 – BC Hydro submitting confidential responses to BCUC confidential Information Request No. 1
B-7-1	**CONFIDENTIAL** - Letter dated February 22, 2022 – BC Hydro submitting revised confidential responses to BCUC Information Request No. 1.4.1
B-8	Letter dated February 16, 2022 – BC Hydro submitting extension request to file response to SCC Information Request No. 2
B-9	Letter dated February 22, 2022 – BC Hydro submitting responses to BCUC Information Requests No. 2
B-9-1	**CONFIDENTIAL** - Letter dated February 22, 2022 – BC Hydro submitting confidential responses to BCUC Information Requests No. 2
B-9-2	Letter dated May 6, 2022 – BC Hydro submitting revised responses to BCUC Information Requests No. 2 Questions 2.58.2.2 and 2.52.3
B-10	Letter dated February 22, 2022 – BC Hydro submitting responses to Intervener Information Requests No. 2
B-10-1	**CONFIDENTIAL** - Letter dated February 22, 2022 – BC Hydro submitting confidential responses to Intervener Information Requests No. 2
B-10-2	Letter dated March 3, 2022 – BC Hydro submitting responses to SCC Information Requests No. 2
B-11	**CONFIDENTIAL** - Letter dated February 22, 2022 – BC Hydro submitting responses to confidential BCUC Information Requests No. 2
B-12	Letter dated March 11, 2022 – BC Hydro submitting response on further process

B-13	Letter dated April 1, 2022 – BC Hydro submitting reply submission on further process
B-14	Letter dated April 11, 2022 – BC Hydro submitting request for further information on scope regarding third round information requests
B-15	Letter dated May 6, 2022 – BC Hydro submitting responses to BCUC Information Requests No. 3
B-15-1	**CONFIDENTIAL** - Letter dated May 6, 2022 – BC Hydro submitting confidential responses to BCUC Information Requests No. 3
B-16	Letter dated May 6, 2022 – BC Hydro submitting responses to Interveners Information Requests No. 3
B-17	**CONFIDENTIAL** - Letter dated May 6, 2022 – BC Hydro submitting confidential responses to BCUC Confidential Information Request No. 3
B-17-1	Letter dated May 6, 2022 – BC Hydro submitting public responses to BCUC Confidential Information Requests No. 3
B-18	Letter dated May 20, 2022 – BC Hydro submitting extension request to file responses to BCUC Panel Information Request No. 1 and Final Argument on BR1 Project
B-19	Letter dated May 30, 2022 – BC Hydro submitting responses to BCUC Panel Information Request No. 1
B-19-1	**CONFIDENTIAL** - Letter dated May 30, 2022 – BC Hydro submitting confidential responses to BCUC Panel Information Request No. 1

INTERVENER DOCUMENTS

C1-1	**BC SUSTAINABLE ENERGY ASSOCIATION (BCSEA) –** Letter dated August 24, 2021 submitting request to intervene by William Andrews
C1-2	Letter dated October 19, 2021 - BCSEA submitting Information Request No. 1 to BC Hydro
C1-3	Letter dated January 18, 2022 - BCSEA submitting Information Request No. 2 to BC Hydro
C1-4	Letter dated March 15, 2022 – BCSEA submitting response on further process
C1-5	Letter dated April 22, 2022 - BCSEA submitting No Information Request
C2-1	**BRITISH COLUMBIA OLD AGE PENSIONERS' ORGANIZATION, ACTIVE SUPPORT AGAINST POVERTY, DISABILITY ALLIANCE BC, COUNCIL OF SENIOR CITIZENS' ORGANIZATIONS OF BC, TENANTS RESOURCE AND ADVISORY CENTRE, AND TOGETHER AGAINST POVERTY SOCIETY (BCOAPO) –** Letter dated September 28, 2021 submitting request to intervene by Kristin Barham
C2-2	Letter dated October 19, 2021 - BCOAPO submitting Information Request No. 1 to BC Hydro

C2-3	Letter dated January 18, 2022 - BCOAPO submitting Information Request No. 2 to BC Hydro
C2-4	Letter dated March 24, 2022 – BCOAPO submitting response on further process
C2-5	Letter dated April 22, 2022 - BCOAPO submitting Information Request No. 3 to BC Hydro
C3-1	**RESIDENTIAL CONSUMER INTERVENER ASSOCIATION (RCIA) –** Letter dated September 28, 2021 submitting request to intervene by Fredrik Ambrosson
C3-2	Letter dated October 19, 2021 - RCIA submitting Information Request No. 1 to BC Hydro
C3-3	Letter dated October 25, 2021 - RCIA submitting Confidentiality Declaration and Undertakings
C3-4	Letter dated January 18, 2022 - RCIA submitting Information Request No. 2 to BC Hydro
C3-5	Letter dated March 25, 2022 – RCIA submitting response on further process
C3-6	Letter dated April 22, 2022 - RCIA submitting Information Request No. 3 to BC Hydro
C4-1	**COMMERCIAL ENERGY CONSUMERS ASSOCIATION OF BRITISH COLUMBIA (CEC)** – Letter dated September 28, 2021 submitting request to intervene by Chris Weafer
C4-2	Letter dated October 8, 2021 – CEC submitting extension request to file Information Requests No. 1
C4-3	Letter dated October 19, 2021 – CEC submitting Information Request No. 1 to BC Hydro
C4-4	Letter dated October 18, 2021 – CEC submitting Confidentiality Declaration and Undertakings
C4-5	Letter dated January 18, 2022 – CEC submitting Information Request No. 2 to BC Hydro
C4-6	Letter dated March 24, 2022 – CEC submitting response on further process
C5-1	**BC SOLAR AND STORAGE INDUSTRIES ASSOCIATION (BCSSIA)** – Letter dated September 28, 2021 submitting request to intervene by Steve Davis
C5-2	Letter dated October 19, 2021 - BCSSIA submitting Information Request No. 1 to BC Hydro
C5-3	Letter dated January 18, 2022 - BCSSIA submitting Information Request No. 2 to BC Hydro
C5-4	Letter dated March 25, 2022 – BCSSIA submitting response on further process
C5-5	Letter dated April 22, 2022 - BCSSIA submitting Information Request No. 3 to BC Hydro
C6-1	**ST'ÁT'IMC CHIEFS COUNCIL (SCC)** – Letter dated November 19, 2021 submitting request to intervene by Art Adolph
C6-2	Letter dated January 18, 2022 – SCC submitting Information Request No. 2 to BC Hydro

C6-3	Letter dated January 13, 2022 – SCC submitting Confidentiality Declarations and Undertaking Forms
C6-4	Letter dated March 25, 2022 – SCC submitting response on further process