British Columbia Utilities Commission

Sixth Floor, 900 Howe Street
Vancouver, BC Canada V6Z 2N3
TEL: (604) 660-4700
BC Toll Free: 1-800-663-1385
FAX: (604) 660-1102

ORDER NUMBER
C-1-17

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

and

FortisBC Inc.
Application for a Certificate of Public Convenience and Necessity
for the Corra Linn Dam Spillway Gate Replacement Project

BEFORE:
D. A. Cote, Panel Chair/Commissioner
M. Kresivo, QC, Commissioner
B. A. Magnan, Commissioner

on February 7, 2017

CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY

WHEREAS:

A. On June 29, 2016, FortisBC Inc. (FBC) submitted an Application for a Certificate of Public Convenience and Necessity (Application) to the British Columbia Utilities Commission (Commission) under sections 45 and 46 of the *Utilities Commission Act* (UCA) for the construction and operation of 14 replacement spillway gates and upgrades to the associated structures at the Corra Linn Dam (the Project). FBC requested the Commission hold specified information within the Application confidential both during the proceeding and following completion of the regulatory process;

B. The Project scope, as described by FBC, encompasses the design, construction and commissioning of the Project components, including:

   1. Replacement of the 14 existing spillway gates at the Corra Linn Dam;
   2. Reinforcement of the existing towers and bridges;
   3. Refurbishment of the existing gate hoists; and
   4. Replacement of the existing embedded parts (gate guides, sill etc.);

C. FBC estimates capital cost for the Project in as-spent dollars to be $62.694 million;

D. FBC plans to complete the Project in phases with the last spillway gate scheduled to be in-service by December 2020 and contractor demobilization and site restoration to occur in early 2021;

E. On July 8, 2016, the Commission issued Order G-107-16 establishing a written hearing process for the review of the Application. The following parties registered as interveners in the hearing: Commercial Energy Consumers of British Columbia (CEC), British Columbia Old Age Pensioners’ Organization *et al.* (BCOAPO) and Norman Gabana. The hearing process included two rounds of information requests followed by final and reply submissions;

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F. On December 12, 2017, FBC filed its reply submission concluding the hearing of the Application; and

G. The Commission has considered the evidence and submissions and finds the Corra Linn Dam Spillway Gate Replacement Project is in the public interest.

NOW THEREFORE for the reasons attached as Appendix A to this order, the British Columbia Utilities Commission (Commission) orders as follows:

1. Pursuant to sections 45 and 46 of the *Utilities Commission Act*, a Certificate of Public Convenience and Necessity is granted to FortisBC Inc. (FBC) to design, construct and operate the Corra Linn Dam Spillway Gate Replacement Project.

2. FBC is directed to file with the Commission the following reports, the form of which is detailed in Section 6.0 of the Reasons for Decision attached as Appendix A:
   - Within 30 days of the finalization of the construction contract, a Contract Finalization Report;
   - Within 30 days of the end of each quarterly reporting period, starting after the submission of the Contract Finalization Report and ending upon the filing of the Final Report, Quarterly Progress Reports;
   - As soon as practicable but no longer than 30 days upon the identification of a material change including any significant delays or material cost variances, a Material Change Report (may be filed as part of the Quarterly Progress Report where time permits); and
   - Within six months of the final in-service date, a Final Report.

3. FBC is directed to prepare a review and analysis of the effectiveness of the ECI contracting model as applied to this project and include it as part of FBC's Final Report filed in accordance with directive 2.

4. FBC is directed to report on any First Nations consultations and studies related to the project as part of the project reporting filed in accordance with directive 2.

5. The Commission will continue to hold the 12 appendices listed in the Application cover letter as confidential.

DATED at the City of Vancouver, in the Province of British Columbia, this 7th day of February 2017.

BY ORDER

Original signed by:

D. A. Cote
Commissioner

Attachment

British Columbia Utilities Commission

IN THE MATTER OF

**FortisBC Inc.
Application for a Certificate of Public Convenience and Necessity
for the Corra Linn Dam Spillway Gate Replacement Project**

REASONS FOR DECISION

February 7, 2017

**Before:
D. A. Cote, Commissioner/Panel Chair
M. Kresivo, QC, Commissioner
B. A. Magnan, Commissioner**

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1.0 INTRODUCTION

FortisBC Inc. (FBC or the Company) submitted an application (the Application) for a Certificate of Public Convenience and Necessity (CPCN) to the British Columbia Utilities Commission (BCUC or Commission) under sections 45 and 46 of the *Utilities Commission Act* (UCA) for the construction and operation of fourteen replacement spillway gates and upgrades to the associated structures at the Corra Linn Dam (the Project).

The Corra Linn Dam is located on the Kootenay River approximately 15 kilometers downstream of the city of Nelson. The total estimated expenditure for the Project in as-spent dollars is $62.694 million. Construction on the Project is scheduled to begin in the second quarter of 2018 and is planned to be completed by December 2020. Contractor demobilization and site restoration is scheduled for early 2021.

1.1 Background

The Corra Linn Dam was commissioned in 1932 to generate power and to create upstream storage capacity by raising the water level of Kootenay Lake. The Dam has a spillway which is comprised of 14 vertical lifted spillway gates that control the release of flows from Kootenay Lake through the Dam, into the Kootenay River.[1] Being 84 years old, the 14 steel gates are approaching the end of their expected useful life of 100 years.[2] The gates provide the only means for the controlled release of water not used for electricity production from Kootenay Lake and thus perform an important role in flood protection, controlling the level of Kootenay Lake and the water flow in the Kootenay River.[3]

The Corra Linn Dam now meets the criteria of the newly created classification of an “extreme” consequence dam pursuant to the *BC Dam Safety Regulations* (BCDSR) based on the expectation that failure of the dam would place more than 100 people at risk.[4] This classification results in specific regulatory requirements concerning flood and earthquake withstand capabilities further outlined in Section 2.2 of these Reasons for Decision.

1.2 The Applicant

FBC is an integrated electric utility engaged in the business of generation, transmission, distribution and bulk sales in the southern interior of British Columbia serving approximately 167,500 customers. FBC is a subsidiary of FortisBC Pacific Holdings Inc. and is regulated by the Commission as a public utility pursuant to the UCA.[5] FBC employs approximately 500 people and its assets include four hydroelectric generating plants with an aggregate capacity of 225 megawatts, and approximately 7,200 kilometres of transmission and distribution power lines.[6]

1.3 Approvals sought

FBC is seeking approval, pursuant to sections 45 and 46 of the UCA, for a CPCN for the construction and operation of 14 replacement spillway gates and upgrades to the associated structures at the Corra Linn Dam as further described in Section 4.0 of these Reasons for Decision.[7]

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[1] Exhibit B-1, pp. 1–2.
[2] Ibid., p. 36; Exhibit B-3, BCUC 4.1, 4.2.
[3] Exhibit B-1, p.10.
[4] Ibid., p. 18.
[5] Ibid., p. 8.
[6] Ibid., p. 8.
[7] Ibid., p.1.

1.4 Statutory framework

Pursuant to section 45(8) of the UCA, the Commission must not approve an application for a CPCN, "unless it determines that the privilege, concession or franchise proposed is necessary for the public convenience and properly conserves the public interest." Section 46 (3.1) of the UCA requires the Commission to consider the following in determining whether to issue a CPCN:

(a) the applicable of British Columbia's energy objectives, which are defined in the *Clean Energy Act*;

(b) FBC's most recent long-term resource plan filed with the Commission;

(c) the extent to which the Application is consistent with the applicable requirements under sections 6 and 19 of the *Clean Energy Act*.

FBC submits that the Corra Linn Spillway Gate replacement Project (the Project) was identified as a major capital project in section 2.5.1.5 of FBC's 2012 Long-Term Capital Plan which was filed alongside FBC's 2012 Long-Term Resource Plan which were accepted by the Commission in Order G-110-12.[8]

Panel discussion

The Panel finds that the Project was identified in and consistent with FBC's most recent long-term resource plan. The Panel also finds the Application and the Project are consistent with British Columbia's energy objectives and sections 6 and 19 of the *Clean Energy Act* since the Project enables the continued long-term operation of the Corra Linn Dam generating facilities and BC Hydro's Kootenay Canal plant which are renewable sources of electricity generation. BC Hydro's Kootenay Canal plant is also a heritage asset as defined in section 1 of the *Clean Energy Act*.

1.5 Regulatory process

By Order G-107-16 on June 29, 2016, the Commission established a written hearing process with two rounds of information requests followed by final and reply submissions. The proceeding was concluded on December 12, 2016 when FBC filled its Reply Submission. The following three parties registered as interveners in the proceeding:

- Commercial Energy Consumers of British Columbia (CEC);
- British Columbia Old Age Pensioners' Organization *et. al.* (BCOAPO); and
- Norman Gabana.

Norman Gabana participated in the first round of information requests. CEC and BCOAPO participated in the full hearing process.

1.6 Confidentiality request

As part of its Application, FBC requests confidential treatment for 12 of its Appendices noting that such information should remain confidential even after the regulatory process for this Application is completed. FBC has indicated that it has "no objection to providing confidential information to its customary and routine intervener groups representing customer interests."[9] By Order G-107-16, the Commission agreed to hold the

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[8] FBC Final Submission, p. 7.
[9] Exhibit B-1, cover letter.

requested information confidential until the Commission had time to fully consider the request. By letter of August 25, 2016, FBC explained that it was concerned that public disclosure of technical and engineering asset information that was contained in the Confidential Appendices would increase the risk of potential harm potentially resulting in damage to its assets or impair its operation. In addition, FBC states that financial information contained in certain of its Appendices could be used by contractors to inform their bids for services or materials.

Commission determination

The Panel grants FBC's request to keep confidential the list of 12 Appendices provided in its Application cover letter. Given the sensitive nature of the material contained in these Appendices, the Panel is persuaded that making them public would potentially raise the level of risk to FBC's assets and provide bidding contractors with information that could "coach" their bids. Further, the requirements of this proceeding for access to appropriate information have been met as FBC has provided access to this information to interveners who requested it and signed the Declaration and Undertaking form in accordance with the Commission's Rules of Practice and Procedure.

2.0 PROJECT JUSTIFICATION

2.1 Description of the proposed project

The spillway section of the Corra Linn Dam is comprised of 14 identical spillway gates, each approximately ten metres wide and ten metres high. The gates are supported by a steel superstructure, which consists of 16 bridges and 17 towers. The spillway gates are raised and lowered using two electrically operated travelling screw hoists.[10]

FBC states that there are two major drivers for this Project:[11]

1. Changes in applicable standards and regulations and their impact on the dam failure consequence classification[12] of the Dam. FBC conducted a dam safety review which considered the impact of the new standards and regulations and states that changes and upgrades to the spillway are required; and
2. The spillway gates are currently 84 years old and approaching end of life.

Both of these drivers are reviewed below.

2.2 Change in dam safety industry standards and regulation

2.2.1 <u>Canadian Dam Association</u>

There are both industry standards and regulations that apply to dams within British Columbia and provide for generally accepted and required performance of a dam.

[10] Ibid., p. 13.
[11] Ibid., p. 2-3.
[12] The consequence classification of a dam is used to determine design criteria in the Canadian Dam Safety Guidelines and the frequency of safety activities (surveillance, inspection etc.) pursuant to Schedule 2 of the *BC Dam Safety Regulations*. Note that change in the probability of failure of a dam does not change its consequence classification.

The generally accepted industry standards for dams in Canada are set out by the Canadian Dam Association (CDA). Although the CDA is not a statutory or regulatory organization, it produces guidelines and technical bulletins on topics related to dams and sets industry standards.[13] It produces the Canadian Dam Safety Guidelines (CDSG) which set out the generally accepted engineering practice and performance expectations for dams and has been utilized in developing the BCDSR.

The CDSG sets out a Dam Consequence Classification, which is a system for classifying dams into categories, based on the severity of the possible consequences of a dam failure. Prior to 2007, the Dam Consequence Classification had a range of four classifications: "Low," "Significant," "High," and "Very High." The Dam Consequence Classification is based on the possible incremental consequences of a dam failure. The criteria for consequences include an assessment of the potential for:

- loss of life;
- loss or deterioration of critical fish or wildlife habitat, rare or endangered species, unique landscapes or sites of cultural significance; and
- Economic losses affecting infrastructure, public transportation or services, commercial facilities or destruction or damage to residential areas.[14]

For each consequence classification, the CDSG defines a "design flood" and a "design earthquake," which is a measure of the severity of hazards that each classification of dam is required to withstand. Design earthquake values are specific to each facility and the design flood values are specific to a particular river and the associated watershed.

In 2007 the CDSG was updated to change the classification system to add an "Extreme" category and to update the "withstand capacity" for a dam with a classification of "Extreme." FBC states that as per the CDSG recommendation "an Extreme dam and associated structures must remain stable in the event of a design flood with the maximum design flood load condition of the Probable Maximum Flood (PMF) or in the event of a design earthquake with the seismic load condition of either the 1/10,000 year event" or the Maximum Credible Earthquake (MCE).[15]

2.2.2 BC Dam Safety Regulation

The Corra Linn Dam is licensed and regulated under the *Water Sustainability Act*. FBC, as the dam owner, is required to meet the requirements under the BCDSR.

The BCDSR incorporates the Dam Consequence Classification scale of the CDSG and Corra Linn Dam was previously rated as "Very High" under this scale. The BCDSR was amended in 2011 when the new consequence classification of "Extreme" was added to the BCDSR to align with the current CDSG. The BCDSR defines the "Extreme" category and sets out the factors determining the Extreme classification. The factors focus on:

- Loss of life of more than 100;
- Major loss or deterioration of critical fisheries habitat or critical wildlife habitat, rate or endangered species, or unique landscapes or sites having significant cultural value and reparation or compensation in kind is impossible; and

[13] Ibid., p. 15.
[14] Ibid., p. 16.
[15] Ibid., pp. 16–17.

- Extremely high economic losses affecting critical infrastructure, public transportation or services or commercial facilities, or some destruction of some severe damage to residential areas.[16]

2.3 Dam safety review and stability studies

As a result of the updates and changes to both the CSDG and the BCDSR, FBC was required to evaluate the consequence classification of the Corra Linn Dam. Specifically, FBC was required to undertake a Dam Safety Review to determine compliance with the applicable legislation and guidelines using guiding principles in the CDA Dam Safety Guidelines and associated technical bulletins.[17]

The BCDSR requires a dam owner to determine the consequence classification of its dam. In 2012 FBC engaged Knight Piesold Ltd (KPL) to undertake a Dam Safety Review (2012 DSR) to determine if the Corra Linn Dam met the requirements of the BCDSR and the CDSG. KPL concluded that although the Corra Linn Dam previously fell within the “Very High” rating on the BCDSR, it now fell within the “Extreme” consequence category. The change was made as a result of KPL’s application of the new classification system and its determination that there would be a potential loss of life in excess of 100 persons if the dam were to fail. The study also included recommendations to reassess the seismic stability of the Corra Linn Dam as a result of the updated design earthquake and the seismic withstand capacity of the spillway gates, gantry and hoists.[18]

As a result of the recommendations of the 2012 DSR, FBC engaged KPL to perform a Dam Stability Study to reassess the structural stability of the Corra Linn Dam. This assessment was focussed on the structure of the Dam itself and did not include the spillway gates and associated equipment. KPL concluded that the Corra Linn Dam concrete structure is expected to perform satisfactorily under the design earthquake and flood events prescribed by the CDSG.[19]

As an additional follow up to the 2012 DSR, FBC retained the services of a spillway gate contractor HMI Construction Inc. (HMI) to perform a gate withstand study to assess the seismic withstand capability of the spillway gates, towers, bridges and hoists. HMI concluded that the gates required either replacement or significant refurbishment of the existing gate frame and skin plate. In addition, the towers and bridges of the superstructure required reinforcement.[20]

2.4 End of life assessment

In January of 2016 FBC performed various inspections and retained consultants to assess the condition of the gates. There were inspections of three spillway gates as a representative sample of the 14 gates, the steel superstructure supporting the spillway gate hoists and the spillway gate hoists. The inspections included visual inspection, non-destructive testing, electrical testing and metallurgical testing. These inspections indicate the spillway gates are in “fair to poor condition” and FBC concluded the gates are approaching end of life unless significant rehabilitation is performed.

FBC states that it wanted to conduct an inspection of the embedded parts of the spillway gates, but it was not possible due to the Corra Linn Dam’s design, which makes it challenging to isolate and de-water the spillway

[16] Ibid., pp. 17–18.
[17] Ibid., s. 3.2.1.2.1.
[18] Ibid., p. 20.
[19] Ibid., p. 21.
[20] Ibid., pp. 21–22.

gates. In order to assess the extent and type of rehabilitation required, FBC used the results from an inspection of the embedded parts of the spillway gates at another plant FBC considers to be comparable to the Corra Linn Dam. This site was a similar age and spillway gates were of a similar size and design. The site was chosen because maintenance was underway and one of the gates was fully isolated, making a detailed inspection of the embedded parts possible. The inspection revealed there was heavy corrosion in most areas in contact with water. Therefore, noting that the dam used as a proxy for the embedded parts inspection is approximately 12 years newer that the Corra Linn Dam, FBC suggests that more corrosion may exist on the embedded parts at the Corra Linn Dam.[21]

On the basis of these conclusions, FBC determined that the gates were in “poor to fair” condition and approaching “end of life.” Although the detailed inspection was performed on only three of the 14 gates, FBC submits the three gates are representative of all 14. All 14 spillway gates were designed, built and installed at the same time and have been subjected to the same operating environment and FBC concludes there is a need to replace or significantly refurbish the spillway gates and reinforce the towers and bridges of the superstructure.[22]

Position of the parties

BCOAPO and CEC filed submissions with respect to the Application. In both, the interveners endorsed the need for the Project based on the requirement to deal with the new regulatory requirements and the concern about the Corra Linn Dam spillway gates approaching end of life. No party opposed the Project, questioned the need or proposed another option.

Panel discussion

The Panel acknowledges that industry standards and regulation with respect to dam safety have changed since 2007. Changes to both the CDSG and the BCDR have provided for a new category of dam risk, “Extreme” risk. FBC engaged KPL to complete a dam safety study and a dam stability study to determine the risk category and seismic stability of the Corra Linn Dam concrete structure. The dam safety study concluded the Corra Linn Dam should now properly be characterized as an extreme risk dam. The dam stability study concluded the concrete structure would perform satisfactorily. The Panel accepts that the studies FBC commissioned indicate the Corra Linn Dam is now an extreme dam and there is no contrary evidence presented regarding this issue.

FBC engaged HMI to perform a gate withstand study which concluded the gates required replacement or, in the alternative, significant refurbishment of the existing gate frame and skin plate and reinforcement of the towers and bridges. The Panel accepts that the HMI report has determined that replacement or significant refurbishment is required. No contrary evidence was presented regarding this issue.

The Corra Linn Dam has been in service for 84 years. To do an assessment of the gates, FBC did a detailed inspection of three of the gates and examined similar gates in service at a similar site that could be fully examined. FBC advises that both reveal significant corrosion. There is no evidence to the contrary.

Given this, the Panel accepts there is a need to replace or significantly refurbish the spillway gates and reinforce the towers and bridges of the superstructure.

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[21] Ibid., pp. 23–24.
[22] Ibid., p. 24.

3.0 REVIEW OF ALTERNATIVES

3.1 Potential alternatives and evaluation criteria

FBC has identified four alternatives that it considered for the Project. They are as follows:

Alternative 1 – Do Nothing

Under this alternative the Corra Linn Dam would remain in its current condition and continue to have exposure to those risk conditions which were identified in the 2012 DSR and Preliminary Engineering Report.

Alternative 2 – Postpone Taking Action

Under this alternative the Corra Linn Dam would also remain exposed to risk conditions until such time as action was taken to correct them.

Alternative 3 – Refurbish the Gates

Refurbishment of gates would involve a number of activities including the following; refurbishing spillway gates structure and spillway gate hoists, reinforcement of supportive towers and bridges, and upgrades to the spillway gate power distribution and control systems. Under this alternative much of the spillway gate structure would be retained with each gate being examined to determine the level of damage and the work required. The required amount of work would vary from gate to gate.

Alternative 4 – Replace the Gates

This alternative would involve the construction of 14 brand new gates that would be manufactured to present day requirements in an offsite factory environment. FBC explains that existing embedded parts would be inspected, repaired or upgraded to support the new spillway gates as required and the supportive towers and bridges reinforced. Spillway gate hoists would be inspected and necessary repairs or upgrades done to meet current day requirements. Further, any required upgrades to the spillway hoists' power distribution and control systems would be done.[23]

FBC has established five criteria for evaluation purposes; four are technical in nature while one is financial. The criteria are as follows:

1. Ability to withstand design flood and earthquake events;
2. Ability of spillway gates to remain operational following an earthquake event;
3. Ability of the alternative to minimize risks such as safety and environmental;
4. Ongoing reliability of gates and related equipment; and
5. Minimize financial impacts.

In addition, FBC states the chosen alternative "should seek to minimize life-cycle capital, and operating and maintenance costs."[24]

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[23] Ibid., pp. 26–27.
[24] Ibid., p. 25.

3.2 Evaluation of alternatives

3.2.1 Technical evaluation

Alternatives 1 and 2 are similar in nature and FBC is unable to identify any technical advantages to undertaking either of these alternatives. However, FBC noted numerous disadvantages pointing out that in a design earthquake event, the spillway would be unable or unsafe to operate or discharge water in a controlled manner and there would be the potential for significant loss of life as well as significant economic and environmental impacts. In addition, these alternatives are not accepted long-term operating practice for management of potential safety risk to the public given the safety risks affecting FBC personnel and the public as well as to its plant and property. FBC also asserts that if either of these two alternatives were chosen, it may not be able to meet the International Joint Commission (IJC) flood curve requirement as dictated under its Kootenay River water license. Further, FBC states that both of these alternatives fail to address concerns related to reliability, safety or regulation of an unacceptable spillway gate condition and "may eventually result in an inability to maintain reservoir control, prevent the occurrence of a "potential safety hazard," or prevent development of a "hazardous condition." Given these reasons, both Alternative 1 and 2 were not considered feasible and deemed unacceptable by FBC.[25]

Alternative 3 has a number of advantages in that refurbishment would allow the structure to withstand the design flood and remain operable following the initial impact of a design earthquake event thereby satisfying Criteria 1 and 2. This alternative would also minimize the risk of failure by replacing obsolete and aging equipment thereby satisfying Criteria 4 and installing low maintenance equipment would simplify the maintenance process. However, if Alternative 3 is pursued, there is the potential for latent defects to remain following refurbishment. Moreover, the project risks concerning unexpected conditions are greatest for this alternative, further counterbalancing the noted advantages. The list of these project risks includes the following:

- The complexity of the construction method due to the work being undertaken in the field;
- There is a potential for greater scope variation once the actual extent of the refurbishment work is known;
- Environmental mitigation measures would be required to control the impact of lead paint removal, repainting and millwork close to or immediately above the water; and
- Increased safety risk to workers as the work is performed in not easily accessible areas and is in close proximity to water.

An additional disadvantage of Alternative 3 from a technical standpoint lies in the fact the expected life of the existing gates would extend the life of the existing gate by 11-25 years and replacement of spillway gates would require consideration within the next 15-year period.

In spite of failing to meet the criteria related to the minimization of project risks, FBC nonetheless considers Alternative 3 to be a feasible alternative noting that it satisfies three of the four project technical criteria.[26]

Alternative 4 involving the replacement of gates offers all of the advantages of Alternative 3 and in addition, has the maximum lifetime extension of the four alternatives. An advantage of this option is that it provides the most reliable flow system control of any of the alternatives and is expected to be implemented in a shorter time.

[25] Ibid., pp. 28–30.
[26] Ibid., pp. 30–31.

Moreover, replacing spillway gates significantly reduces the risk of future spillway gate failures thereby satisfying Criteria 4. Specifically, installing new spillway gates would allow FBC to take advantage of 85 years of engineering development that has occurred since initial construction (such as rollers with new anti-friction bearings with a centralized lubrication system) and allows for ease of operation, increased reliability and reduced operational disruption. In addition, this option significantly reduces risks to people, plant and property. FBC was unable to identify a disadvantage of spillway gate replacement from a technical standpoint.[27]

Table 1 summarizes the four Alternatives and depicts an assessment of the criteria that is met by each.

Table 1 Corra Linn Dam Spillway Gate Project Alternatives Comparison[28]

		Project Technical Criteria (Notes 1 and 2)				
Alternative		1 Ability to Withstand the Design Flood and Design Earthquake Events	2 Ability of the Spillway Gates to Remain Operational Post-Earthquake	3 Minimize Project Risks	4 Reliability of Gates and Associated Equipment	Overall Assessment
1	Do Nothing	Does not meet Criterion	Does not meet Criterion	Does not meet Criterion	Does not meet Criterion	Not Feasible
2	Deferral	Does not meet Criterion	Does not meet Criterion	Does not meet Criterion	Does not meet Criterion	Not Feasible
3	Gate Refurbishment	Meets Criterion	Meets Criterion	Does not meet Criterion	Meets Criterion	Feasible
4	Gate Replacement	Meets Criterion	Meets Criterion	Meets Criterion	Meets Criterion	Feasible

(green)	Meets the Project Technical Criteria
(red)	Does not Meet the Project Technical Criteria

As noted previously, Alternatives 3 and 4 are both assessed to be feasible from a technical standpoint but only Alternative 4 meets all of FBC's criteria.[29]

3.2.2 Financial evaluation

The overall project costs of Alternatives 3 and 4 are quite similar with as-spent dollars for Alternative 3 totalling $59.794 million and for Alternative 4 totalling $62.694 million or a difference of $2.9 million. Based on this, the anticipated increase in rates is estimated at 1.41 percent for Alternative 3 and 1.49 percent for Alternative 4 in 2022.

FBC reports that the US Army Corps of Engineers considers the recommended design life of new spillway gates to be 100 years given appropriate care and repairs. FBC states that the existing gates were put in place in 1932 and considering there is limited access to them, it can be deduced that new replacement gates will be required when these gates reach 100 years in 2032 or 11 years from the in-service date of this project in 2021. FBC

[27] Ibid., pp. 32–33.
[28] Ibid., p. 34.
[29] Exhibit B-1, pp. 33–34.

estimates the capital cost of installing new gates in 2032 will amount to $33.723 million in as spent dollars with an additional $7.729 million to remove the existing gates. If these incremental capital expenditures are undertaken in the estimated time frame, the net present value (NPV) of the incremental revenue requirement over a 70-year period (based on the FBC 2014 Depreciation Study conducted by Gannett Fleming) would total $105.808 million or $21 million more for Alternative 3 than the $85.018 million for Alternative 4 where additional new gates will not be required over the 70-year period. This will result in a levelized rate impact over 70 years of 1.81 percent for Alternative 3 and 1.46 percent for Alternative 4. FBC also states that even if the gates did not require replacement for another 25 years from the in-service date, the NPV would still be $94.897 million or $10 million greater than Alternative 4.

Based on the fact that Alternative 4 is the only one that fully meets all of the technical criteria and is the most effective long term cost effective solution resulting in the lowest levelized rate impact on a life cycle basis, FBC recommends moving ahead with Alternative 4.[30]

Positions of the parties

CEC submits it is important and reasonable to consider the longer-term financial impact. It also submits the analysis prepared by FBC is a correct methodology for evaluation. In CEC's view Alternative 4 is preferable to Alternative 3 even if the long term financial did not support it noting that any rate impact differential is outweighed by the technical advantages of replacement over refurbishment and minimizes the project risks and provides the most reliable flow control. CEC submits "the choice between the two proffered alternatives is straightforward based on the evidence" and accepts FBC's proposal of Alternative 4 as the preferred option.[31]

BCOAPO states that the possible alternatives have been properly identified, FBC's evaluation criteria are reasonable and FBC's recommendation of Alternative 4 is a fair application of the criteria.[32]

Panel discussion

The Panel agrees with FBC and considers a "do nothing" approach as suggested by Alternatives 1 and 2 to be an unacceptable alternative even for a short period of time. The risks to people and property associated with either deferring or indefinitely putting off taking action on the Corra Linn spillway gates is simply too great. Therefore, the Panel supports FBC's decision to reject these alternatives outright.

The Panel agrees with the parties and finds that the most appropriate alternative for the Corra Linn Dam spillway gates is to replace the gates as outlined in Alternative 4 rather than refurbish them. As the evidence demonstrates, Alternative 4 is more technically sound due to the fact that it satisfies all of the criteria while Alternative 3 has a number of inherent risks and there is no guarantee there will be no latent defects following refurbishment. In addition, when viewed from the life cycle perspective, Alternative 4 has the lowest impact on rates and is only marginally more expensive to ratepayers from a short-term perspective.

[30] Exhibit B-1, pp. 34–38.
[31] CEC Final Submission, pp. 8–9.
[32] BCOAPO Final Submission, p. 7.

4.0 PROJECT DESCRIPTION

4.1 Key project components and description of work

The Project scope is inclusive of the design, construction and commissioning of the following components:

- Full replacement of the 14 spillway gates and reinforcement of existing towers and bridges; and
- Refurbishment of existing hoists and replacement of the existing embedded parts.

FBC reports that new gates will be machined to provide superior sealing and equipped with anti-friction roller bearings connected to a centralized lubrication system and six pairs of rollers. The use of anti-friction bearings lowers gate-lifting loads thereby ensuring that the existing hoists have the capacity to raise the gates. The new gates will be shipped in sections and then field joints will be bolted and welded together to facilitate spillway gate installation. On the upstream side, new gates will be equipped with bronze bars and rubber seals at the bottom to minimize leakage.

HMI's Preliminary Engineering Report confirms that tower reinforcement is required to achieve the necessary strength to support the spillway gates. The scope of work on the towers will include sandblasting and tower painting in addition to the required welding of reinforcements. The concrete/grout under the tower base plates will also be inspected and the need for repairs assessed.

The HMI preliminary Engineering Report also confirms the need to reinforce each bridge section with stiffeners at the two suspended beams of the bridge sections in the flow direction. The scope of work also includes sandblasting and painting of the bridges and bridge structure. Because the replacement gates are heavier than the existing gates, it is anticipated that additional work on the two travelling hoists may be required. This work is expected to encompass the installation of new motors, hoist brake and minor electrical upgrades along with the refurbishment of the existing rotor and installation of larger gearbox thruster bearings.

FBC also reports that the sills at the Corra Linn Dam will likely need replacement while acknowledging that embedded parts like the sills and lateral guides could not be physically inspected. It bases its assertion on an inspection done on a similar dam. The required work will include the removal of the existing sill and adjacent concrete prior to installation of the new sill beam, concrete replacement and sandblasting and painting of the lateral embedded guide. The scope of work will be confirmed when the gate is dewatered and further inspection completed.

To complete the rehabilitation work isolation and lifting equipment will be required. FBC plans to use floating bulkheads to isolate the spillway gates from the water and a lifting barge to load/unload gate sections as well as a service barge with trailer, cranes and container located near the working area.[33]

4.2 Proposed contracting model

4.2.1 <u>Description of the early contractor involvement model</u>

Because of the specialized nature of the project FBC has been evaluating whether an alliance agreement with a contractor is more appropriate in this instance than relying upon what FBC refers to as a Design Build Tender (more often referred to as Design Bid Build). FBC describes this more fully in response to BCUC information

[33] Exhibit B-1, pp. 39–43.

request (IR) 2.3 where it stated that a "more accurate characterization of the contracting model being contemplated…is an Early Contractor Involvement (ECI) model, not an alliance model or solely one of the traditional project delivery methods such as Design Build Tender."[34]

FBC describes the ECI model as one that seeks to balance risk, price and control of a project and, in the strictest sense, is a hybrid of the Open Book pricing system and the Design Build project delivery method. FBC explains that the ECI model has evolved as a useful project delivery model for unique types of projects and is well suited for a one of a kind project with site conditions with unique challenges best addressed by a knowledgeable contractor in the early stages. Further, because of its collaborative nature, use of the ECI model creates less likelihood for an adversarial relationship resulting in an efficient and lower overall cost solution. FBC describes the following main advantages of an ECI model for use in this Project:

- It allows the company to select a specialized design/construction firm based on its qualifications, experience and reputation in the early project stages allowing FBC to leverage knowledge from the outset.
- There is input from the entire project delivery team as design and planning services are performed collaboratively.
- ECI provides the Company an opportunity at an early stage to test design, cost and risk and schedule assumptions.
- The Open Book pricing system which is part of the model dictates that the contractor operates with the FBC team in an open, transparent and collaborative manner and both the contractor and FBC must agree with the target price and risk allocation determinations from the Open Book Phase (OBP) before the Design Build Phase (DBP) is agreed upon.
- Savings are shared and both parties participate in gains and losses which eliminates the need for a penalty/incentive mechanism.
- The collaborative nature of the model leaves less room for dispute resulting in improved communication and less risk of contractual disputes.[35]

FBC also asserts the involvement of a contractor in the early stages of a project is a major advantage as it allows "the Company to leverage the experience of a knowledgeable contractor during the early stages of the Project, to reduce variations in the schedule and costs of the project, and to address the unique challenges posed by the Project…."[36]

The two distinct phases of an ECI model project are the OBP and the DBP with the following five activities having been identified for each: Project Management, Engineering and Schedule, Procurement/Fabrication/Delivery, Construction and Commissioning/Start-up.[37]

<u>Open Book Phase</u>

The contractor and the owner jointly develop the Project scope, deliverables, costs and risks in a collaborative and transparent manner in the OBP. Sufficient engineering and technical specifications are developed within this

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[34] Ibid., p. 45; Exhibit B-3, BCUC IR 2.3.
[35] Exhibit B-3, BCUC IR 2.3.
[36] FBC Final Submissions, p. 27.
[37] Exhibit B-3, BCUC IR 2.3.

process to allow for the tendering of labour and material contracts ensuring a competitive market price. FBC states that approximately 70 percent of the estimated contractor cost would be for subcontracted works and materials competitively tendered. Once received, FBC and the contractor will jointly select the successful tenders. This differs substantially from the more traditional design build contract where the utility would have no input into the methodology for contractor selection or the type of procurement delivery.

For the 70 percent of total contractor costs related to the subcontracted works and materials procurement, the contractor and FBC will jointly develop work packages and a short list of potential qualified suppliers for the competitive bid process. The bids received are then evaluated jointly by the two parties with the owner having the final acceptance and, as a result, “the market price for the construction cost for each scope item in the Project is established at the onset of the Project.” For the remaining 30 percent of the total contract price not competitively tendered FBC plans to engage a third party to provide engineering services for review of items such as engineering design and work packages, construction support and assistance in the evaluation, validation and confirmation of the reasonableness of the negotiated contractors project costs. To validate these project costs related to the main construction contract (the 30 percent of total contractor costs) FBC explains “the parties agree on the deliverables, schedule, key performance guarantees, design guarantees and the organizational chart required for the Project execution. For each activity, the contractor will supply the current market rates for labour, estimated labour productivity, site conditions, loadings and any relevant information of sufficient detail for the owner to review. The parties then agree on a total price to perform the services for each activity during project implementation.” FBC notes that the use of the Open Book process provides the owner the opportunity for verification and validation of the contractor price per activity and independently determine whether it is fair market value prior to contract agreement.[38]

While there are certain advantages to using ECI, FBC also outlined the disadvantages of the ECI model but provided what it suggested were effective remedies. These included:

- Increased owner participation during the OBP and an additional draw on resources to evaluate non-competitively tendered items. FBC has dealt with this by engaging an Owner’s Engineer to assist with the review and provide recommendations to the FBC project Team on items not tendered.
- The engineer designer role would normally advocate on behalf of the owner. Under ECI this is eliminated but FBC points out that the Owner’s Engineer will be engaged to assist FBC with technical specification and design issues.[39]

Following the OBP process, the parties will agree on a fixed price and project implementation plan for the DBP where the contractor will be held to all of the risks assigned to it during the OBP.

FBC explains that the handling of risk under the ECI model is different than under a fixed price contracting method where the cost of risk is built into the contract price and the company pays for those costs regardless of whether they manifest. Under ECI both the owner and the contractor identify and value project risks and allocate individual risks to the party that is best able to control or manage that particular risk. Once quantified, the risk is built into the contract contingency. However, unlike a fixed price contracting method, if the risk does not manifest and costs are not incurred, the contingency amount is not charged to FBC.[40]

[38] Ibid.
[39] Exhibit B-11, CEC IR 25.1.
[40] Exhibit B-3, BCUC IR 2.3.

FBC notes that while not widely used in Canada, the ECI model has in the last 5-10 years been adopted for larger oil, gas and hydro industry projects. BC Hydro has completed three projects using the ECI model including one involving gate replacements in 2009.[41]

Positions of the parties

CEC submits that the ECI model should be given consideration noting that BC Hydro was apparently satisfied with both the model and the limited number of contractor options. CEC considers the tendering of 70 percent of subcontracted works and materials to be significant and appropriate as it is the largest portion of the costs and ensures the process has been adequately competitive. Moreover, it considers owner involvement in the tender selection and its option to request competitive quotes to be advantageous in that it ensures quality and cost are properly balanced.

CEC also submits that having competition and involving the owner during the OBP is important in providing reassurance the ECI contractor is unlikely to benefit from windfall benefits accruing to it. In addition, with reference to risk, CEC submits that “the sharing of risk has the theoretical advantage of incenting the utility to manage and control risks that are assigned to it, and has the added benefit that it does not pay a premium for a transfer of those risks even if they do not materialize.” CEC also notes that FBC has engaged an Owner’s Engineer and submits the functions he will perform will provide reasonable and adequate remedies to the disadvantages with ECI that were highlighted.

In CEC’s view, the evidence supports use of the ECI model which provides for tendering benefits, a cooperative working arrangement and shared risks. Accordingly, CEC supports the ECI model as a reasonable option for FBC to pursue for this project.[42]

BCOAPO takes no position with respect to the use of the ECI model. However, BCOAPO does point out that it could be expected that the OBP would allow for better assessment, costing and allocation of risks and consequently FBC’s total costs will be less under the ECI model. However, this is qualified by stating this result is dependent upon the effectiveness of the Owner’s Engineer and the effectiveness and transparency of the OBP.[43]

FBC reiterates many of the advantages of ECI in its Reply Submission and submits that the improved accuracy in budgeting resulting from early involvement of the contractor was both “a driver for the development of the ECI model and an advantage in its use…” FBC also points out that there are significant advantages and benefits the ECI model offers with respect to the management of risk. It disagrees with CEC’s describing these benefits as “theoretical” with reference to its statement that “… the sharing of risk has the theoretical advantage of incenting the utility to manage and control the risks that are assigned to it…” FBC points out that benefits arise because of the allocation process which is part of the ECI process and strongly disagrees with CEC suggesting that the Company will not act with a view to the best interests of its customers.[44]

Commission determination

The Panel accepts that the proposed ECI contracting model is an appropriate project delivery model for construction of the Corra Linn Dam spillway gates. The ECI methodology has had limited application in Canada

[41] Exhibit B-11; CEC IR 24.1.
[42] CEC Final Submission, pp. 10–14.
[43] BCOAPO Final Submissions, p. 9.
[44] FBC Reply Submission, pp. 3–4.

but more recently has been adopted for some large scale projects including a similar spillway gate replacement project undertaken by BC Hydro.

The Panel notes there are a number of advantages with the ECI approach which FBC has outlined in some detail. A key advantage is early contractor involvement which allows the Company to leverage the experience and knowledge of the contractor during the early stages of the Project. Moreover, the collaborative nature of the model, while demanding additional resource involvement, ensures that the Company and the contractor reach agreement on key decisions in the initial OBP prior to moving forward with an agreed upon DBP. The Panel is persuaded that these advantages are likely to result in improved communication, lower risk of contractual disputes and reduce the requirement for schedule and cost variations. The Panel acknowledges that the use of the ECI model will require additional Company resource involvement but agrees with CEC that the engagement of an Owner's Engineer will remedy this and many highlighted disadvantages of using the ECI model.

As noted use of the ECI contracting model has been limited in Canada to date. Given its limited application, the Panel considers it important that lessons learned as a result of this project are recorded in order to provide guidance in the future. **Accordingly, the Panel directs FBC to prepare a review and analysis of the effectiveness of ECI contracting model as applied to this project and include it as part of FBC's Final Report** (outlined in Section 6.0 of these Reasons for Decision).

4.2.2 ECI contractor methodology and selection

FBC engaged Brancon Project Consultants Ltd. (Brancon) to provide assistance in making a decision on the most appropriate contracting model. Brancon is reported to be an experienced engineering and project management firm with extensive knowledge on the application of alternative project delivery approaches and specific knowledge in the development and execution of projects using the ECI contracting model.[45] Brancon, based on its assessment of the project scope, contract package optimization and the need for FBC to retain third-party construction management personnel has recommended use of the ECI contracting model for this project. FBC reports that it has since accepted Brancon's recommendation and will proceed with the ECI contracting model.[46]

As discussed, FBC has engaged HMI, an experienced specialized contractor to support the development of the project cost estimate. HMI was chosen because of its unique understanding of BC construction labour, materials and equipment rates in the work they have done on similar projects with BC Hydro. HMI completed a Design Basis Memorandum and a Preliminary Engineering Report both of which form part of the cost estimate for the Project.[47]

FBC reports that it is contemplating HMI as the ECI contractor for the Project and has provided the following reasons in support of its decision:

- HMI is recognized as an industry leader in spillway gate rehabilitation projects and has recently completed projects of similar scope to this project within the province and is currently engaged by BC Hydro for its spillway gate rehabilitation program;
- HMI has the engineering, fabrication, installation and commissioning capabilities in-house and has extensive knowledge of the ECI model.[48]

[45] FBC Final Submission, p. 26.
[46] FBC Reply Submission, p. 11.
[47] Exhibit B-1, pp. 56–57.
[48] Exhibit B-9, BCUC IR 10.2.

Brancon has been engaged to assist with the selection of an ECI contractor and favourably evaluated HMI with respect to the key criteria identified by FBC and has recommended that HMI be selected as the ECI contractor for the Project. Brancon also provided FBC with guidance as to how HMI should be engaged "to best protect its commercial interests and assess competitiveness relative to other ECI processes in BC." FBC reports that it has accepted Brancon's recommendations and plans to engage HMI if it is able to successfully negotiate a number of key commercial terms. FBC states that the key terms to be negotiated include:

a) the percentage of profits and overheads to be applied to the direct costs established at the end of the OBP (the reasonableness of which will be assessed against benchmarks including those established by Brancon);

b) any exceptions that the ECI Contractor may make to the terms and conditions of FBC's standard services agreement and Design Build contracts;

c) the methodology that would be undertaken to competitively tender the construction work; and

d) the limitations and expectations for work to be self-performed by the ECI contractor.[49]

FBC states that if agreement cannot be reached on these key conditions it will send out an RFP to a larger group of contractors which would permit the ECI contractor to be in place by the end of March 2017.[50]

Positions of the parties

CEC submits that "it is important to ensure there is assured objectivity and appropriate competition in the selection of the contractor" given HMI's current involvement in the project and the CPCN application. CEC points out that FBC did not utilize a competitive tendering process in selecting HMI for the initial work as it considered that HMI had sufficient engineering experience and the necessary resources to complete the work. It acknowledges that HMI has specialized experience but there are other contractors with the requisite expertise to perform the role. Further, CEC considers it important for FBC to ensure it is objective in its contractor selection given the advantage of HMI having been on the project and its consultant Brancon has an important role in ensuring this objectivity. In CEC's view, Brancon is sufficiently objective and qualified to make an appropriate determination.

With respect to CEC's submission that it is important that appropriate objectivity be used in the selection of a contractor, FBC agrees and asserts its proposed process will achieve this result. FBC points out that in spite of its submissions on the need for objectivity, CEC has not suggested that the safeguards put in place by the Company are not sufficient to ensure the selection of an appropriate contractor.[51]

Panel discussion

The Panel accepts that the ECI contractor selection process that FBC has put in place has resulted in the selection of an appropriate contractor, HMI, who has demonstrated extensive knowledge of ECI processes and is well qualified and able to perform the contractor role. Brancon, who has been acknowledged by CEC as sufficiently objective and qualified to make such a determination, confirms this. Brancon has favourably assessed the capabilities of HMI against relevant criteria and recommended they be engaged as the contractor for the Project.

[49] Ibid., BCUC IR 10.2; FBC Final Submission, pp. 29–30.
[50] FBC Reply Submission, pp. 11–12; FBC Final Submission, pp. 29–30.
[51] FBC Reply Submission, p. 5.

The Panel understands that FBC has no previous experience in working with the ECI model and a working relationship had been developed with HMI due to their working in collaboration with FBC on elements of this Application. Because of this, the Panel accepts that in this instance it is reasonable to continue to work together if terms and conditions can be agreed upon. Therefore, we accept the selection of HMI without a more competitive process as the benefits of the relationship established may well be reflected in the project implementation phase.

While the Panel accepts that HMI has the capabilities to perform as a contractor and also accepts that choosing them is appropriate in this instance, we are not persuaded the lack of engagement with other qualified contractors is an approach to be relied upon in the future when the traditional design tender model is not followed. A more standard approach to securing contracting services would be to send out a request for proposal to qualified contractors and rely on a competitive bid process. In the view of the Panel, this method is more likely to result in cost savings and still ensure that an appropriate contractor is engaged. FBC is urged to bear this in mind when planning future projects using this type of contracting model.

4.2.3 Construction and operating schedule

FBC states that it has prepared its preliminary project schedule on the basis that BCUC project approvals will be received by March 2017 and assumes a contract award date in the third quarter of 2017 and site work being completed without interruption on a year-round schedule. Table 2 outlines specific milestone activities and timing estimates.

Table 2: Corra Linn Spillway Gate Replacement Schedule and Milestones[52]

Activity	Date
CPCN Preparation	Mar. 2015 – June 2016
CPCN Filing	June 2016
CPCN Approval	Q1. 2017
Contract Evaluation	July 2016 – Feb. 2017
Contractor Selection and Contract Award	July 2017
Start of Detailed Engineering Design	July 2017
Procurement, Manufacturing and Delivery	
Temporary Equipment and Bulkhead	Aug. 2017 – May 2018
Mobilization to Site, Road Access, and Installation of Barge, Crane Barge and Crane and Temporary Equipment	June - July 2018
Site Installation	
Hoist Refurbishment	July - Sept. 2018
Phase #1 Installation - Sluice gate #14, 13, 12 & 11	Sept. 2018 – July 2019
Phase #2 Installation- Sluice gate #10, 9, 8 & 7	May 2019 – Jan. 2020
Phase #3 Installation - Sluice gate #6, 5, 4 & 3	Nov. 2019 – July 2020
Phase #4 Installation - Sluice gate #2 & 1	June 2020 – Dec. 2020
In Service	Dec. 2020
Restoration and Demobilization	Dec. 2020 – Jan. 2021

[52] Exhibit B-1, p. 44.

Following approval of the application project activities will comprise of five groups:

1. Contractor selection and contract award;
2. Detailed design;
3. Procurement/manufacturing/delivery;
4. Mobilization to site; and
5. Site installation.[53]

FBC has laid out the activities of each of these project activities as follows:

1. Contractor selection and award

The selection of HMI as the contractor has been covered in Section 4.2.2 of these Reasons for Decision and notes that the negotiation of key commercial terms is still outstanding. Once the contractor has been engaged they will become a member of the project team which will tender various construction and supply contracts as a means of achieving competitive market rates.

2. Project detailed design

Design activities will commence in July 2017 and will encompass all engineering calculations, validations and drawing steps to cover required project needs. FBC states that engineering activities will be prioritized as they relate to fabrication/procurement lead times and the timing requirements for them to be on the work site. During this phase a number of engineering packages will be completed which will be reviewed by the Owner's Engineer and accepted by FBC and any requirements for environmental permits, approvals and authorizations identified and application processes initiated. It is expected the design phase will be concluded by June 2018.

3. Procurement/manufacturing

The procurement and manufacturing activities will commence once the design package for each element is finalized and approved. A Request for Quotation will be prepared once drawings and specifications are approved with longer lead times prioritized and short listed suppliers being requested to confirm their quotes and schedule for production. The project team will closely monitor materials conformance, specifications and drawings tolerances during the fabrication process and suppliers will be tasked with the provision of all quality assurance documentation and acceptance testing.

4. Mobilization

FBC estimates mobilization to take three months starting in June 2018.

5. Site installation

FBC anticipates the work sequence to be similar to what it has set out in the Application but notes that site installation activities will not be finalized until after the selection of the contractor. Work on the water passages is expected to start in August, 2018 with work being performed on four gates at a time and continue on a year-round basis. FBC notes that it is estimated the work activities for each set of four gates will take 11 months and work on the water passages is expected to wind up in December 2020 with a further two months needed to demobilize.[54]

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[53] Ibid.
[54] Exhibit B-1, pp. 46–48.

4.2.4 Project access and staging area

FBC states that a gravel road may be required for access to the downstream side of the left bank's concrete dam and is considering a site to be used as a staging area during construction. FBC indicates that it has initiated discussions with the landowner for temporary access and rights that will be required for project construction but has not yet finalized the location of either staging area or the access road.[55]

BCOAPO submits that once it has determined the access route and staging location FBC should be directed to confirm that it has notified First Nations and report on any issues raised as part of its overall reporting requirements. [56] This is addressed in Section 4.4.1 of these Reasons for Decision.

FBC states that it has no concerns with the Commission directing FBC to provide a report on any issues raised by First Nations with respect to the access road or the staging area ground disturbance. However, it does propose these updates be included as part of the Company's quarterly or semi-annual progress reports to the Commission.[57]

4.2.5 Project resources

FBC has separated its resource requirements into three categories: project management, design and quality control and construction.

1. Project management

A project manager will provide day-to-day management of the construction contractor throughout the Project and a FBC construction manager will lead the project site team and be accountable to the project manager for all aspects of construction. The construction manager will be provided with a support team and an operations liaison will be assigned to facilitate communication among the work groups. The construction contractor will also have a support team comprised qualified personnel including a project manager, discipline project engineers, a superintendent and other support personnel.

2. Design and quality control

The construction contractor will be the Engineer of Record for all project design and prior to final FBC approval, the engineering design will be reviewed by the Owner's Engineer. The construction contractor will have a team of project engineers and drafters to provide the detailed design with project engineers involved primarily at the beginning of the Project and performing support roles thereafter.

3. Construction services

Construction activities will be managed on site by the contractor and performed by qualified construction workers and supervisors from a broad range of trades. The project team personnel and a small construction crew will conduct the commissioning and start-up activities with FBC operations personnel actively involved. The contractor will look after procurement activities and place orders for various project components as well as sub-contracts for fabrication or specialty contracting.[58]

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[55] Exhibit B-1, p. 48.
[56] BCOAPO Final Submission, p. 11.
[57] FBC Reply Submission, p. 10.
[58] Exhibit B-1, pp. 49–50.

4.2.6 Other Application approval requirements

FBC reports that it will have a qualified environmental professional working with its Environmental Group to help identify any permits, approvals or required authorizations as well as on the development of a site-specific Environmental Management Plan. FBC notes that there is no requirement for an Environmental Assessment Certificate and there is no screening requirement under the *Canadian Environmental Assessment Act*. The Company will also ensure any environmental regulatory requirements are identified pending final review of the detailed design with consideration of the *Fisheries Act*, *Species at Risk Act*, *Water Sustainability Act*, and *Heritage Conservation Act*. In addition, authorization from the Dam Safety Office will be initiated upon completion of the detailed design.[59]

Panel discussion

The Panel finds the project construction and operating schedule as prepared by FBC to be reasonable, as it will allow the Project to proceed on a timely basis. We accept that this schedule is preliminary and there may be a requirement to revisit the timing of some of the activities once the Contractor is selected and awarded the contract for the project. However, the Panel is satisfied that to this point the Company has applied sufficient diligence in preparing its project schedule and identifying the necessary project resource requirements. Barring unforeseen circumstances, in our estimation the Project should proceed in a manner that is close to that outlined in the Application.

4.3 Risk analysis

FBC initiated a risk assessment early in the Project following AACE IR No. 62R-11 '*Risk Assessment: Identification and Qualitative Analysis'* for guidance. Following the identification of general risk categories, a comprehensive list of risks was identified for each category and formed the basis of the Risk Register. Once identification was completed, the next step was to provide context for the risk in terms of the following:

- Proposed mitigation measure;
- Risk likelihood and consequence scales; and
- Responsibility for each risk.[60]

Working with HMI, FBC established the most likely risks that are typical for any spillway upgrade work. A qualitative analysis was then conducted to prioritize and rank risks and a likelihood category and confidence rating was applied to each. A product of the likelihood of occurrence and the consequence were then computed and determined the risk score and ranking of each risk. The financial impact of the identified risks were then calculated and included in computing the overall impact on the Project. The responsibility for each risk was then allocated by FBC to either FBC or the contractor. The allocation process was guided by the principle that risks are typically allocated to the party best able to manage a particular risk and "bear the financial cost, so as to provide that party an incentive to manage the risk.[61]

[59] Ibid., pp. 50–51.
[60] Ibid., p. 51.
[61] Ibid., pp. 51–52.

HMI and FBC identified and classified the known risks in the Risk Register which has yet to be finalized. FBC intends to transfer a significant portion of the known risks to the construction contractor by means of the $2.148 million Construction Contingency. FBC will retain responsibility the remaining known risks and for unidentified or unknown risks.[62]

In its review FBC identified a possible hydrological risk during the actual construction phase of the project where use of the spillways would be required to deal with excessive water flows. FBC identified a primary constraint as the number of gates that could be closed at any one time during the Project. A study conducted concluded that up to five gates could be closed without affecting the operations of the dam (four spillways would be taken out of service at any one time during the Project).[63]

FBC also indicated there was some potential for impacts on the physical environment as well as the biological environment [64]during the execution of the Project. FBC indicated that a site specific Emergency Management Plan (EMP) will be developed to manage all environmental concerns related to the proposed construction activities and site conditions.[65]

Commission determination

The Panel is satisfied that the approach to risk management employed by FBC is appropriate. FBC and HMI have collaborated on determining the known risks and quantified them in terms of likelihood of occurrence and consequence. These have been listed in the Risk Register which continues to be developed and allocated to the appropriate party. In the view of the Panel the work done by FBC and HMI in preparing a Risk Register will be important in managing risks and contingencies as the Project moves forward**. Accordingly, FBC is directed to file the Risk Register within 30 days of its completion.**

4.4 Project impacts and mitigation measures

4.4.1 Project consultation

Public Consultation

As part of their due diligence FBC indicated that "Public consultation has been fairly limited for the Project, given the permanent works will be contained entirely within an existing FBC facility."[66] FBC stated that it had discussed the potential for this Project with the International Joint Commission[67] and with the Regional District of Central Kootenay (RDCK). The RDCK raised the possible issue of disturbance of any contaminated soils but FBC confirmed there is no contaminated soil to be disturbed during the Project.[68]

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[62] Ibid., pp. 59–60; Exhibit B-9, BCUC IR 10.2.
[63] Ibid., pp. 52–53.
[64] Ibid., p. 61; Exhibit B-3, BCUC IR 3.2 and 3.2.1.
[65] Exhibit B-1, pp. 53–54.
[66] FBC Final Submission, p. 38.
[67] Ibid., p. 38, footnote 175.
[68] Exhibit B-1, p. 65.

First Nations consultation

FBC is of the view that First Nations consultation is not required. This is because the planned construction activities for the permanent works of the Project will occur entirely within existing FBC facilities and the proposed Project execution will not affect river flows or have any impact on the environment or fish populations.[69]

FBC has identified 12 First Nations that have an interest in the Corra Linn Project area. FBC is proposing that should issues arise from the detailed project design that could trigger consultation, FBC will engage any affected First Nations to discuss potential impacts. Concurrent with this Application, FBC sent a Notice of Filing letter to all First Nations who may be affected and who may want to comment on the Application.[70]

In its Final Submission, FBC indicated "With respect to temporary works, the construction of an access road and staging route has the potential to cause ground disturbance. However… the exact site of the access route and staging area has not been finalized, meaning that the area being disturbed has not been determined."[71] FBC indicated it would conduct an archaeological study in concert with the First Nations potentially affected should there be any use of undisturbed land for the Project.[72]

Positions of the parties

The only comment made by interveners was from BCOAPO who submit that once FBC has determined the access route and staging location, it should be directed to confirm with the BCUC that it has notified the identified First Nations and to subsequently report to the BCUC any issues that are raised by the First Nations and how they are being addressed and mitigated.[73]

Commission determination

The Panel notes that FBC is not bound by a duty to consult First Nations as is required of the Crown. The Panel accepts that FBC has performed sufficient consultation to date with First Nations that may be affected by this project and the public at large. Both the proposed staging area and the access road to the dam are on land that has previously been disturbed and would not require any further evaluation. The Panel notes there is a possibility that part of the access road may traverse previously undisturbed land. However, FBC has indicated that should this be the case, it will conduct an archaeological study on undisturbed land in conjunction with First Nations that may be impacted. **The Panel directs FBC to report on any such First Nations consultations and studies as part of their project reporting (outlined in Section 6.0) to the Commission.**

5.0 PROJECT COST ESTIMATE

5.1 Cost estimate methodology and details

FBC notes that this type of project involves a specialized skillset and requires the contractor to consider the construction complexities, the duration of the project and the requirement of an AACE Class 3 level estimate (10

[69] Ibid., p. 66.
[70] Ibid., p. 67.
[71] FBC Final Submission, p. 38, para. 142.
[72] Exhibit B-3, p. 30.
[73] BCOAPO Final Submission, p. 11.

to 40 percent of full project definition with engineering deliverables typically 10 to 40 percent complete). As noted in Section 4.2.2 of these Reasons for Decision, FBC opted to engage HMI for this project estimate because of its understanding and experience with such projects.

To form the basis for the estimate HMI completed a Design Basis Memorandum establishing a basis of analysis for the spillway gates and structures and a Preliminary Engineering Report providing a detailed analysis of the current condition of the actual spillway structure and the electrical components. This was accomplished through a series of site inspections as well as a separate site inspection at a similar dam providing access to the embedded part along with the upstream side of the gate and allowing HMI to establish a probable estimate of conditions and assisting in development of the scope of the proposed refurbishment. Following these assessments HMI prepared a detailed breakdown of work for each of the alternatives that would satisfy the needs of the project. FBC and HMI were then able to collaboratively develop contractor cost estimates.[74]

FBC and HMI undertook a cost estimation process in accordance with AACE recommended practices and an evaluation of the following; front end engineering costs, supply and fabrication costs, transportation costs, construction costs, site establishment costs, commissioning and start-up costs, quality assurance and quality control costs, financial costs and project management and owner costs. FBC notes that its cost estimates exclude First Nations Capacity Funding and Accommodation Cost as none are anticipated. This yielded an estimate in as spent dollars for the project of $62.694 million that is summarized in Table 3.

Table 3: Summary of Estimated project Capital Costs ($ millions)[75]

	2015 $	As-Spent $
Contractor's Costs		
Engineering	2.349	2.506
Supply, Installation & Testing	18.098	19.302
Site-Support Work	9.443	10.071
Indirect Costs	0.624	0.666
Project Management	4.322	4.610
Subtotal	*34.837*	*37.155*
Removal Cost[50]	5.331	5.804
Construction Contingency	2.008	2.148
Total Contractor Costs	*42.177*	*45.108*
FBC Owner's Costs		
FBC – Project Management	2.920	3.155
Generation Admin Overhead	0.543	0.589
Project Contingency[51]	6.846	7.328
Pre-Approval Project Costs	1.062	1.081
Subtotal (Contractor & Owner's Costs)	*53.548*	*57.260*
AFUDC	n/a	5.434
TOTAL Project Capital Costs	*53.548*	*62.694*

FBC estimates its project definition to be in the 10 to 15 percent range. It does not specifically state its estimate of the accuracy level but does state that the cost estimate meets a minimum of an AACE Class 3 level of project

[74] Exhibit B-1, pp. 56–57.
[75] Ibid., p. 59.

definition and design and the expected accuracy of the cost estimate is as defined in AACE: Low: -10% to -20% and High: +10% to +30%. FBC has provided no confidence level for its estimate pointing out that the Monte Carlo method was not used.[76]

5.2 Project contingency

FBC states there are four methods for determining contingency estimates that are generally accepted: expert judgement, predetermined guidelines, Monte Carlo and parametric modelling. Both the Monte Carlo and parametric risk modelling methods were not considered because of their heavy reliance on a historical database which does not exist. Given these limitations FBC sought guidance from HMI who has demonstrated experience in performing contingency estimates on similar projects they have undertaken. FBC and HMI jointly prepared a risk register of known risks that were identified by experience and ranked them on the basis of description, probability level of occurrence, impact level and estimated financial impacts. FBC included a $2.148 million Construction Contingency in its estimate of total contractor costs covering risks to be transferred to the construction contractor. In addition, FBC established a contingency for unknown risk accounting for scope changes or future events as yet unknown and not quantified in the risk register.[77]

Based on this methodology FBC estimates the overall Project Contingency of $7.382 million in as spent dollars or 15 percent. FBC points out that “during Project execution the Project Manager will have authority to release the known contingency amounts but the contingency amounts for unknown risks will require approval from the Project Director if they materialize over the course of the Project.”[78]

Positions of the parties

BCOAPO states it does not appear that FBC sought HMI’s advice as to the appropriateness of the 15 percent project contingency and there is no indication as to why this was not done – given HMI’s past experience in estimating project contingencies. BCOAPO submits it is important that the Project Reporting clearly identify not only changes in project costs but what risk category (known vs. unknown risk) to which the change is attributable.[79]

CEC recommends the Commission approve the Application subject to its suggested reporting requirements. With reference to project costs, CEC submits the following:

- The HMI database used to develop the construction cost estimate represents an appropriately competitive basis upon which to develop the cost estimate;
- To the extent that the reliable information required in order to produce a confidence interval is not available its absence is accepted;
- There is limited evidence to support the appropriateness of a pre-established 15% contingency. Moreover, “the predetermination of 15% and residual calculation of ‘Unknown Risks’ may be reasonable but is difficult to evaluate when the project cost estimate is developed only to 10% to 15% and there are no confidence intervals associated with the estimate;”
- The Project Contingency has been developed to the required level of detail for the required Class 3 cost estimate using appropriate expertise; and

[76] Ibid., pp. 58-62; Exhibit B-3, BCUC IR 2.7; Exhibit B-9, BCUC IR 12.1 and 12.2.
[77] Ibid., pp. 60–61.
[78] Exhibit B-3, BCUC IR 3.2.3.
[79] BCOAPO Final Submission, paras. 41–42.

- The construction contingency is in keeping with other similar projects and has been developed using appropriate expertise.

Overall, CEC states it has reviewed the Project Cost estimates and is satisfied the Project Cost estimate has been developed with the appropriate expertise and to the required specifications.[80]

Concerning BCOAPO's assertion that FBC did not appear to seek HMI's advice on the contingency amount, FBC notes that it had worked with HMI to determine the known risk contingencies. For unknown risks such as possible scope changes or unknown future events, FBC relied on information in AACE technical publications and industry guidance in determining what it considered to be the appropriate amount.[81]

Panel discussion

Given the lack of historical data available and the fact that ECI contracting methodology is new to FBC, the Panel accepts the method of estimating costs employed by FBC for this project is reasonable. We note that FBC and HMI undertook their cost estimation process in accordance with AACE recommended practices and after a detailed analysis of the current condition of the spillway gates and a review of a similar site. The level of product definition at 10 to 15 percent qualifies as an AACE Class 3 estimate although it is at the lower end of the scale. However, HMI's experience in preparing estimates for this type of project provides some comfort.
Concerning the development of contingency estimates, the Panel acknowledges the lack of available data precluded the use of the Monte Carlo or parametric modelling. However, FBC's reliance on judgement based on the characteristics of the Project and industry references to prepare contingency cost estimates is a reasonable alternative given the circumstances. Moreover, contingency amounts appear to be within the normal ranges for such projects.

The Panel is satisfied with FBC's explanation in response to BCOAPO's assertion that HMI's advice was not sought in preparing the contingency amount. Contrary to BCOAPO's point HMI appears to have been consulted extensively on all aspects of preparing the cost estimates.

6.0 PROJECT REPORTING

As part of implementing an approved CPCN, it is regulatory practice for the proponent to report out on the progress of the project and any other information filings required by the Decision. In its Application, FBC suggests the following clauses be inserted in its proposed Draft C Order with respect to reporting:

- FBC shall file with the Commission within 30 days of the end of each reporting period a Quarterly Progress Report on the Project.
- FBC shall file with the Commission a Final Report, within six months of the actual completion of the Project that provides a complete breakdown of the final costs of the Project, compares these costs to the cost estimate in the Application, and provides an explanation and justification of material cost variances.[82]

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[80] CEC Final Submission, pp. 18–21.
[81] FBC Reply Submission, pp. 6–7.
[82] Exhibit B-1, Appendix p–2.

In BCUC IR 8.1 an alternative reporting option of semi-annual progress reports combined with notification of cost variances greater than $500,000 over the Project cost baseline was suggested.[83] In the response to this IR, FBC indicated it is supportive of the proposed changes to semi-annual reporting. It did not support notification of cost estimates greater than $500,000 and suggested a 10 percent variance in the total Project costs to be the benchmark to be used.[84]

FBC was also asked if it would consider a suggested list of pre-construction reporting requirements if it were to tender the main construction contract.[85] FBC responded with a modified list of pre-construction reporting requirements.

FBC proposed the following for reporting on the Project:

> A letter from the Owner's Engineer, stating that the Owner's Engineer has reviewed a) the contractor's Project costs and finds them to be fair market value, b) the scope/work package documents associated with the contractor's Project costs and finds them to be consistent with industry best practice in general and consistent with the objective of minimizing the overall project cost; and c) the design specifications and scope/work package documents and finds them to be consistent with industry best practice in general and consistent with the objective of minimizing the overall cost from change orders.
>
> The Company is also supportive of providing the Commission Semi-Annual Progress Reports for the Project, along with a requirement to provide the Commission a report of any material changes to the schedule (i.e. greater than 6 months) or costs (i.e. greater than 10% of the Total Project Capital Cost), within 30 days of identification of the material changes. Additionally, FBC proposes filing a Final Report with the Commission that provides a complete breakdown of the final costs of the Project, compares these costs to the cost estimates in the Application, and provides an explanation and justification of any material variances, to be filed within six months of the actual completion of the Project.[86]

Positions of the parties

CEC agrees with having reporting requirements with a caveat that the Owner's Engineer letter include a statement that "the Company would not likely have received better value from going to tender."[87]

BCOAPO was supportive of the proposed reporting structure but was of the view there should be a reporting threshold of expected cost increases of more than $2 million over the Project costs baseline. BCOAPO also suggested the following additions:

a) The submission of a finalized Risk Register that sets out the risks assigned to the contractor vs the owner.

b) Notification to the BCUC once FBC has determined the access route and staging area location, along with subsequent confirmation that it has notified the identified First Nations and indication of any issues that are raised by the First Nations and how they are being addressed and mitigated.

[83] Exhibit B-3, BCUC IR 8.1.
[84] Ibid., p. 38.
[85] Ibid., p. 38.
[86] FBC Final Submission, pp. 32–33.
[87] CEC Final Submission, p. 22.

c) An assessment, within six months of the completion of the Project, as to the effectiveness of the ECI contracting model along with any recommendation as to how the model could be improved if applies to future projects.[88]

FBC did agree with providing a finalized Risk Register and the follow-up on any First Nations issues related to the finalized access route and staging area location. However, it did not agree with the filing of an assessment of the ECI contracting model nor did it agree with BCOAPO's changing of the costs threshold to $2 million versus its proposal of 'greater than 10% of the Total Project Costs.'[89] FBC argues that the $2 million threshold is too low of a variance to trigger a special reporting requirement given the size of the Project.[90]

With regard to CEC's suggested reporting requirement, FBC indicates that it understands that the Owner's Engineer "could not provide a general statement that the Company would not have likely received better value from going to tender as there will not be actual tender data from which to make this comparison."[91]

Commission determination

The Panel acknowledges BCOAPO's suggestion to lower the overall reporting cost threshold to $2 million. However, we agree with FBC that BCOAPO's proposed amount is too small given the size of the Project and having FBC report variances quarterly will adequately inform the Commission of variances on a timely basis.

We also note CEC's proposal concerning assurances from the Owner's Engineer but agree with FBC that this would not be reasonable because there is no tender data which could be relied on to make the comparison.

The Panel agrees with FBC that the reporting of significant delays or material cost variances is appropriate. In addition, there were a number of issues raised in this proceeding that effect specific reporting requirements. These are addressed in the detailed reporting regimen following.

The Panel notes that the Commission has established a level of consistency in the reporting regimen in many of its recent CPCN decisions and considers it appropriate to continue this practice. Therefore, the Panel has modelled the reporting requirements for this CPCN in a similar manner to these recent decisions with additions where warranted.

Accordingly, the Panel in consideration of the reporting requirement proposals and suggestions from FBC and the interveners and the Commission's recent practice directs FBC to file the following:

1) A Contract Finalization Report

This report must be filed with the Commission within 30 days after the finalization of the construction contract. The body of the report shall include:

- An updated schedule and capital cost estimate with the same cost estimate breakdown provided in Table 6-1 of the Application with the Project contingency broken down into known owner risks and management reserve for unknown project risks plus an explanation and justification of any line item cost variances of 10 percent or greater;

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[88] BCOAPO Final Submission, p. 12.
[89] FBC Reply Submission, pp. 9–10.
[90] Ibid., pp. 9–11.
[91] Ibid., p. 8.

- A description of any material scope changes;
- Summary description of any material project level risks that were not identified in the Application, including an assessment of the impact of each risk, the proposed risk mitigation strategy, and to the extent known, the financial and schedule impacts if the risk is realized.

The appendices of the report shall include:

A. The finalized version of the Risk Register;
B. A letter from the Owner's Engineer stating the Owner's Engineer has reviewed:
    i. All the contractor's project costs and finds them to be fair market value;
    ii. The scope/work package documents associated with the contractor's Project costs and finds them to be consistent with industry best practice in general and consistent with the objective of minimizing the overall project cost; and
    iii. The design, specifications and scope work packages documents associated with subcontractor procurement and finds them to be consistent with industry best practice in general and consistent with the objective of minimizing the overall costs from change orders.

The Contract Finalization Report is required to allow the Commission to be informed of any changes in cost, schedule, scope and risk of the project as a result of the further design work prior to the start of construction. The inclusion of the letter from the Owner's Engineer gives the Commission some assurance that the portion of the project not competitively tendered is fair market value and there has been no unnecessary additions to the scope.

2) Progress Reports

1. Quarterly Progress Reports

The Quarterly Progress Report must be filed within 30 days of the end of each quarterly reporting period, starting after the submission of the Contract Finalization Report and ending upon the filing of the Final Report, Quarterly Progress Reports."

Each report is required to detail:

i. Actual costs incurred to date compared to the CPCN estimate (see Table 6-1 of the Application) with the project contingency broken down into known owner project risks and management reserve for unknown project risks and highlighting variances with an explanation and justification of significant variances;
ii. Updated forecast of costs, highlighting the reasons for significant changes in project costs anticipated to be incurred;
iii. A description of any material scope changes; and
iv. The status of project risks, highlighting the status of identified risks, changes in and additions to risks, the options available to address the risks, the actions that FEI is taking to deal with the risks and the likely impact on the projects' schedule and cost.

Quarterly Progress Reports are to be structured similar to the requirements outlined in Appendix A to Order C-2-09.

2. **Material Change Report**

   The report should identify and detail any significant delays (i.e. greater than 6 months or material cost variances (i.e. greater than 10 percent of execution capital cost summary total that approval of this CPCN is based on). These must be reported to the Commission as soon as practicable or within 30 days or if within the 30 days, be included in the Quarterly Progress Report. The Material Change Report must highlight the reasons for the delay or material cost variance, FBC's consideration of the options available and actions FBC is taking to address the issue.

3. **A Final Report**

   The Final Report is to be filed no later than six months following the final in-service date. The Final Report must include a breakdown of the final costs of the projects compared to the cost estimates included in the Application broken down as described under Quarterly Reporting and providing an explanation and justification of any material cost variances of 10 percent or more from the execution capital cost summary total that approval of this CPCN is based on.

7.0 CPCN DETERMINATION AND APPROVALS

Subject to and in accordance with the findings, approvals and determinations in these Reasons for Decision, the Panel finds the Corra Linn Dam Spillway Gate Replacement Project as proposed by FBC is in the public interest and grants a CPCN for design, construction and operation of the Project.

As outlined in these Reasons for Decision, the Panel has determined there is a need for the project and after examination of the alternatives from both a technical and financial standpoint, a full replacement of the spillway gates is warranted. FBC has provided a listing of key project components and a description of the work to be performed. The Panel has accepted FBC's selection of the ECI model to undertake this project noting the advantages this model offers with this type of project. While expressing some concern with the methodology for selecting the contractor for this project, the Panel accepts HMI as an appropriate choice in this instance due to its knowledge of the ECI model, its previous experience with such projects and the working relationship it has established with FBC. While a contract between the parties has not been agreed to it is expected that negotiations will be concluded in the near future.

The Panel has reviewed and accepted the construction and operating schedule while acknowledging that it is preliminary and subject to revision once the contractor is in place. The Panel notes that public and First Nations consultation has been limited to date but considers it sufficient because much of the work is being conducted within the existing FBC facilities. Further, where plans for undisturbed land are not firm, consultation will continue if required. Moreover, a reporting regimen has been established for this project to ensure the Commission is apprised of ongoing progress of the Project and can act on any issues that have arisen.