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September 15, 2016

Mr. Norman Gabana  
3850 Dogwood Drive  
Trail, BC V1R 2V5

Attention: Mr. Norman Gabana

Dear Mr. Gabana:

**Re: FortisBC Inc. (FBC)**

**Project No. 3698883**

**Application for the a Certificate of Public Convenience and Necessity for Replacement of the Corra Linn Dam Spillway Gates (the Application)**

**Response to Mr. Norman Gabana's Information Request (IR) No. 1**

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On June 29, 2016, FBC filed the Application referenced above. In accordance with the British Columbia Utilities Commission (Commission) Order G-107-16 setting out the Regulatory Timetable for the review of the Application, FBC respectfully submits the attached response to Mr. Gabana IR No. 1.

FBC has redacted certain details in the attached responses because they contain sensitive technical information that, if released, may jeopardize the safety and security of FBC's assets. FBC has filed the confidential version with the Commission and registered parties who have signed and filed Undertakings of Confidentiality.

If further information is required, please contact the undersigned.

Sincerely,

**FORTISBC INC.**

***Original signed:***

Diane Roy

Attachments

cc (email only): Commission Secretary  
Registered Parties

FortisBC Inc. (FBC or the Company) Application for a Certificate of Public Convenience and Necessity (CPCN) for Replacement of the Corra Linn Dam Spillwat Gates (the Application)	Submission Date: September 15, 2016
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1 1. Weight of a present gate. -----

2

3 **Response:**

4 The calculated weight of the gate is [REDACTED] kg.

5

6

7

8 2. Weight of proposed new gate -----

9

10 **Response:**

11 The weight of the new gate is estimated to be approximately [REDACTED] kg.

12

13

14

15 3. Explain how frequent the gates were exercised in each of the last years.

16

17 **Response:**

18 The Corra Linn spillway gates were exercised in the following manner over the past two years:

19 • 2016: All gates were individually operated in 2016

20 • 2015: A total of 12 individual spillway gates were operated

21

22

23

24 4. Where there any problems encountered as a result of question three?

25

26 **Response:**

27 No, the gates opened successfully.

28

29

30

31 5. State the largest number of gates that needed to be open to accommodate flow in each  
32 of the last five years and the duration of the openings.

FortisBC Inc. (FBC or the Company) Application for a Certificate of Public Convenience and Necessity (CPCN) for Replacement of the Corra Linn Dam Spillwat Gates (the Application)	Submission Date: September 15, 2016
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- 1  
2 **Response:**  
3 The number of spillway gates opened and the duration of spillway gate opening over the last  
4 five years is summarized below.

Year	Maximum number of Spillway Gates concurrently open	Total days of spilling (see Note 1)
2011	6	90
2012	7	121
2013	4	85
2014	5	80
2015	2	29

- 5  
6 Note 1: Total days of spilling is the duration that the spillway gates were opened to accommodate freshet  
7 flows, and it does not include spillway gate openings for reasons not related to river flow control  
8 (i.e. boom flushing, maintenance or similar infrequent short duration activities).

- 9  
10  
11  
12 6. How many days per year does flow exceed generation capacity from this location.

- 13 **Response:**  
14  
15 The Corra Linn Dam draws water from the same head pond as the Kootenay Lake Canal Plant  
16 and therefore spilling of water is only required when the generation capacity of both plants  
17 combined is exceeded. Over the previous five years, freshet flow exceeding the combined  
18 generation of the Corra Linn and Kootenay Lake generation facilities occurred for an average of  
19 81 days per year.

- 20  
21  
22  
23 7. Page 16.line 26-27 Please supply short description of the magnitude of the statement.

- 24 **Response:**  
25  
26 Lines 26 and 27 state: 'With the amendment, it was reclassified into the "extreme" category,  
27 based on the potential for loss of life as the result of a dam failure.'



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1 Section 3.2.1.2.1 (Page 18) of the Application outlines the criteria that a dam needs to meet in  
2 order to be classified as “extreme”, including the Population at Risk, Loss of Life, Environmental  
3 and Cultural Values, and Infrastructure and Economics categories. Based on the results in the  
4 Corra Linn Hydroelectric Project 2011/2012 Dam Safety Review (Confidential Appendix B), the  
5 permanent downstream population at risk is in excess of 100 people. The Loss of Life criteria  
6 has caused the increase in rating from “Very High” to “Extreme” (lines 26-27, page 18).

7  
8

9

10 9. Page 31. Line 10 to 16. Supply the short description of the best case one could hope  
11 for, with an estimate of dollars value of repairs.

12

13 **Response:**

14 Page 31, Line 10 to 16 refers to Alternative 3 – Gate Refurbishment and states:

15 The Project scope could potentially be impacted once the actual extent of refurbishment  
16 work required is determined; the potential for scope variation during the construction  
17 period is more likely because the condition of each gate cannot be confirmed until it is  
18 removed from service and inspected. While this risk is partially mitigated by the  
19 inspections completed on three of the Corra Linn spillway gates, there continues to be  
20 uncertainty associated with each individual spillway gate and hence to the overall  
21 required refurbishment scope.

22 The best case would be that all of the 11 other spillway gates and interconnected works are of  
23 similar or in better condition than the 3 spillway gates inspected and none of the Project  
24 contingency estimated to account for this risk would be required. The contingency allocated for  
25 this risk is shown in Confidential Appendix L of the Application (under “Optional Contingency for  
26 Option B Only”) and was based on the most likely possibility of the risk occurring.

27 The worst case scenario would be that all of the 11 other spillway gates and interconnected  
28 works are in much worse condition than the 3 spillway gates inspected and the risk is fully  
29 realized. In this scenario, the Project contingency estimated to account for this risk would not  
30 be adequate and would likely increase by approximately an additional \$575 thousand.

31 FBC cannot estimate the full extent of contingency that might be required until the condition of  
32 the gates is known.

33

34

35

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1 10. The same question 9. Replace best case one could hope for with, the worst case one  
2 might find.

3  
4 **Response:**

5 Please refer to the response to Gabana IR 1.9.

6  
7

8  
9 11. Page 32 line 24 the present gate bearings have some problems please provide the  
10 percentage of reduced load the proposed anti-friction bearings will provide over the  
11 existing bearings if they were working properly.

12  
13 **Response:**

14 Please note that bushings, not bearings, are currently installed in the existing gate main rollers.

15 The total friction component of the gate lifting load (from the main rollers and side seals) is  
16 estimated to be reduced by approximately 51% (from [REDACTED] lbf to [REDACTED] lbf) as indicated in  
17 the Preliminary Engineering Report (Confidential Appendix E of the Application).

18  
19

20  
21 12. Page 32 line 22 to 26. Explain the -improve roller path statement

22  
23 **Response:**

24 Page 32, Lines 22-26 are in reference to the Alternative 4 – Gate Replacement Advantages and  
25 state:

26 In addition, the new rollers would be designed to be positioned at different locations than  
27 the existing ones, in order to provide an improved rolling path, mainly at the initial  
28 opening (cracking) of the gate. This would decrease the force required to lift the gates  
29 and improve operational reliability of the lifting components;

30 As the spillway gate opens and closes, the main rollers mounted on both vertical edges of the  
31 spillway gate travel up and down inside the embedded roller guide. While the spillway gate is  
32 closed, the rollers do not move and the large hydrostatic force applied to the upstream face of  
33 the spillway gate is transferred to the embedded roller guide surfaces through the main rollers.  
34 Over the 84 years that the spillway gates have been in service, it is likely that the forces applied  
35 to the roller guides have created indentations in the roller guide. These indentations make it



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1 more difficult for the hoist to initially open the gate as the rollers must be pulled out of the  
2 indentations.

3 The main rollers of the new gate will be installed at different elevations than the current gate  
4 rollers so as to avoid being positioned in the embedded roller path indentions when fully closed,  
5 making it easier to initially open (crack) the spillway gate and in turn decrease lifting loads and  
6 the loads imposed on the hoist and superstructure.

7  
8

9  
10 13. Page 32. line 27 What is the present skin thickness and the thickness in the proposed  
11 new gates, Is there any deflection latterly or horizontally in any of the existing gate under  
12 maximum up stream pressure. If so please state amount.

13  
14 **Response:**

15 The existing spillway gates were designed with a skin plate thickness of 9.5 mm, as is described  
16 in footnote 36 on page 32 of the Application. The results of field measured material thickness  
17 tests using Ultrasonic Non Destructive examination methods are described in Confidential  
18 Appendix F-3, which indicate areas of reduced skin plate thickness.

19 The skin plate thickness of the new gate is 22.2 mm.

20 Deflection of the existing gate skin plate and main girders under hydrostatic loading is expected  
21 but FBC has not measured the deflection.

22  
23

24  
25 14. Page 33. line 1. With 14 gates please explain how one gate failure would effect  
26 generation.

27  
28 **Response:**

29 The failure of one gate would not directly impact generation at the Corra Linn Dam. Please also  
30 refer to the response to BCUC IR 1.1.1. The requirement for the Project is not related to the  
31 generating capacity of the Corra Linn Dam. The need for the Project is driven by requirements  
32 to meet BC Dam Safety Regulation (BCDSR) and Canadian Dam Association Dam Safety  
33 Guidelines (CDSG), and to minimize the risks to public and employee safety.

34  
35

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1  
2 15. Page 41 line 1. Pictures show spillways dry, if there is leakage please state the amount  
3 and where, and cause of problem.  
4

5 **Response:**

6 Some water leakage is normal and expected for all spillway gates. Leakage (or lack thereof) in  
7 itself is not an indicator of the strength or condition of a spillway gate, and hence has not been  
8 cited as a Project justification in the Application.

9  
10

11  
12 15 A Page 40 line 10 during the opening and closing process how much  
13 pressure will the proposed new bronze bearing take on the up stream  
14 side?.

15  
16 **Response:**

17 Page 40, Line 10 does not reference a bronze bearing. It references bronze seal bars on the  
18 upstream side of the spillway gate. The hydrostatic pressure applied to the spillway gate and  
19 bronze seal bar is dependent on the depth below water.

20 In the Preliminary Engineering Report (Confidential Appendix E of the Application), the  
21 pressures applied to the bottom of gate (which is the highest applied pressure) are as follows:

- 22
- 23 • [REDACTED] kPa – Maximum Normal Water Elevation (884.2 m)
  - 24 • [REDACTED] kPa – Seismic conditions in conjunction with the Maximum Normal Water Level  
(884.2 m)

25  
26

27  
28 16. Page 59. Is 15% contingency a normal engineering estimating practice.?  
29

30 **Response:**

31 FBC considers the 15% applied for Project Contingency to be reasonable and appropriate and  
32 to reflect engineering best practice. Please refer to the response to BCUC IR 1.3.2.1 for more  
33 detail.

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17. Is it feasible to have a two part gate with a mechanical locking device that would allow a smaller top section to be opened that would reduce discharge pressure, reduce erosion and corrosion and be designed to be able to be attached to the lower section for full gate lifting.

**Response:**

FBC does not consider a sectionalized spillway gate (consisting of two or more parts) to be a feasible alternative for the Project. The use of sectionalized spillway gates would provide very limited operational benefits to the Corra Linn facility, but would require additional costs for construction and would have additional operations and maintenance costs.

18. Page 61. line 9. Provide number of customers that consume less than 991 kW of electricity per month on a yearly average what percent of the lower rate group go over 991kw in high demand times like winter months.

**Response:**

The information requested is not readily available without undertaking significant data extraction and analysis which FBC submits is not applicable to the Project. However, the Company's Residential Conservation Rate (RCR) Report to June 30, 2014 identified that approximately 53 percent of customers have annual consumption of 9,999 kWh annually (833 kWh monthly)<sup>1</sup>, or less.

The report also identified that 81 percent of electric heat customers and 65 percent of non-electric heat customers have consumption in Block 2 (greater than 800 kWh monthly) at least once during the year.<sup>2</sup>

19. Provide number of resident customers in the hire rate and average dollars their billing will increase using the average consumption of the total usage of all in this higher rate.

<sup>1</sup> RCR Report to June 30, 2014, Figure 1-2.  
<sup>2</sup> Ibid., Table 2-4.



1

2 **Response:**

3 The information requested is not readily available without undertaking significant data extraction  
 4 and analysis which FBC submits is not applicable to the Project. However, the Company's  
 5 Residential Conservation Rate (RCR) Report to June 30, 2014 identified that approximately  
 6 47% of customers have annual consumption of 10,000 kWh annually or more<sup>3</sup>. Given that  
 7 FBC's residential Block 2 rate is for electricity consumption of more than 1,600 kWh bimonthly  
 8 (i.e. 9,600 kWh per year), FBC believes that the data from the RCR report reasonably  
 9 represents customers in the Block 2 consumption range.

10 The following table shows the bill impact of the levelized rate increase of 1.46 percent compared  
 11 to 2016 rates for customers consuming 10,000 kWh or more on an annual basis. FBC has not  
 12 estimated the average usage for those customers with consumption in excess of 25,000 kWh  
 13 annually. The proportion of residential customers in each consumption range is from FBC's  
 14 Residential Conservation Rate Report to June 30, 2014.

Consumption Range (kWh/yr)	Average Annual Usage (kWh/yr)	Annual Bill Impact of 1.46% Levelized Increase over 2016 Rates	Average Bill Impact per Month	% of Residential Customers
10,000 to 14,999	12,500	\$ 23.02	\$ 1.92	21.2%
15,000 to 19,999	17,500	\$ 34.12	\$ 2.84	11.9%
20,000 to 24,999	22,500	\$ 45.22	\$ 3.77	6.3%
Over 25,000	-	-	-	7.3%

15

16

17

18 20. Please provide a plan of lifting options and amenities required for removal of old gates  
 19 and the numbers of transfers that will be required for each gate.

20

21 **Response:**

22 The Project will be executed by either utilizing a barging system (one lifting barge with a crane  
 23 and one service barge) in front of the spillway gates or with a service barge and a new gantry  
 24 lifting system. From a lifting perspective, the number of lifts is the same regardless of which  
 25 method is utilized.

26 The existing gate will be cut into thirds horizontally and removed one section of a time by the  
 27 lifting barge or the gantry and placed onto a transport truck for disposal. This will take place  
 28 three times to remove one entire gate. The new gate will be installed in a similar manner, one

<sup>3</sup> RCR Report to June 30, 2014, Figure 1-2.

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1 section at a time for a total of three sections. Therefore, the number of lifts/transfers per gate is  
2 approximately six.

3  
4

5

6 21. Please provide plan and amenities required for installation of proposed new gates.

7

8 **Response:**

9 Please refer to the response to Gabana IR 1.20. Either a barging system (one service barge  
10 and one lifting/crane barge) will be used or a service barge and a new gantry will be used to  
11 remove and install the new gates.

12 If the barging method is used, the road and surrounding area on the east side of the BC Hydro  
13 intake canal will have to be upgraded, a laydown area developed, and a floating wharf built to  
14 load and off-load freight.

15 If the gantry option is used, the road along the west side of the BC Hydro intake canal would  
16 have to be upgraded and a laydown area developed just downstream of the east dam wing wall.  
17 With the gantry option, a gantry crane would be installed to travel the length of the spillway and  
18 over top of the laydown area to load and off-load freight.

19

20

21

22 22. Would inverting the present jacks crews be beneficial to extend their working life.?

23

24 **Response:**

25 Inversion of the jack screws would not be beneficial to extending their working life at this time.  
26 The hoist screws were found to be in good condition (refer to page 11 of Confidential Appendix  
27 F-1) and the existing screws will be re-used (Section 5.1.1, page 40, Line 8 of the Application). It  
28 is also noted that there would be additional costs associated with the logistics of inverting the  
29 screws and modifying the inverted screw ends to facilitate attachment with the gate.

30