Doug Slater
Director, Regulatory Affairs

Gas Regulatory Affairs Correspondence
Email: gas.regulatory.affairs@fortisbc.com

Electric Regulatory Affairs Correspondence
Email: electricity.regulatory.affairs@fortisbc.com

FortisBC
16705 Fraser Highway
Surrey, B.C. V4N 0E8
Tel: (778) 578-3874
Cell: (778) 214-3842
Fax: (604) 576-7074
Email: doug.slater@fortisbc.com
www.fortisbc.com

July 9, 2020

Commercial Energy Consumers Association of British Columbia
c/o Owen Bird Law Corporation
P.O. Box 49130
Three Bentall Centre
2900 – 595 Burrard Street
Vancouver, BC
V7X 1J5

Attention: Mr. Christopher P. Weafer

Dear Mr. Weafer:

Re: FortisBC Inc. (FBC)

Project No. 1599088

Application for a Certificate of Public Convenience and Necessity for the Kelowna Bulk Transformer Addition Project (the Application)

Response to the Commercial Energy Consumers Association of British Columbia (CEC) Information Request (IR) No. 1

On April 24, 2020, FBC filed the Application referenced above. In accordance with the British Columbia Utilities Commission Order G-107-20 setting out the Regulatory Timetable for the review of the Application, FBC respectfully submits the attached response to CEC IR No. 1.

If further information is required, please contact the undersigned.

Sincerely,

FORTISBC INC.

Original signed:

Doug Slater

Attachments

cc (email only): Commission Secretary
Registered Parties

1. Reference: Exhibit B-1, page 1

1. APPLICATION

1.1 EXECUTIVE SUMMARY

In this application (the Application) FortisBC Inc. (FBC or the Company) is seeking approval of the British Columbia Utilities Commission (BCUC) for a Certificate of Public Convenience and Necessity (CPCN) for the Kelowna Bulk Transformer Addition Project (referred to as the KBTA Project or the Project).

In summary, FBC seeks approval from the BCUC to install a third terminal transformer at the F.A. Lee Terminal Station (LEE) on McCurdy Road in Kelowna, BC, including the reconfiguration of the 138 kV bus into an industry standard ring bus configuration. The estimated total cost of the Project in as-spent dollars is $23.288 million, which includes Allowance for Funds Used During Construction (AFUDC) and the cost of equipment removal.

If the Application is approved, FBC plans to initiate the detailed design, procurement and construction for the Project early in the first quarter of 2021. The new transformer is scheduled to be in service by the end of 2022, with Project completion and close-out during the second quarter of 2023.

1.1 What is FortisBC's financial threshold for CPCNs?

Response:

FBC's threshold for CPCN applications is $20 million, as recently confirmed by Order G-166-20.

1.2 Does the application comply with all the Guidelines required for CPCN applications? Please explain.

Response:

FBC confirms that the Application complies with the CPCN Guidelines. Please refer to the table below which sets out the CPCN Guidelines, identifies where each item has been addressed and provides an explanation for items not included in the Application. FBC notes that the Guidelines are prefaced with the BCUC's expectation that:

> CPCN applications will generally be prepared in accordance with the guidelines…
>
> They provides (sic) general guidance regarding the Commission's expectations of the information that should be included in CPCN applications while providing

the flexibility for an application to reflect the specific circumstances of the applicant, the size and nature of the project, and the issues raised by the application. An applicant is expected to apply the guidelines in a flexible and reasonable manner that reflects the spirit and intent of the guidelines.

Application Requirements	Application Section/Comments
1. Applicant	
(i) Name, address and description of the nature of the applicant's business and all other persons having a direct interest in project ownership or management;	Section 2.1
(ii) Evidence of the financial and technical capacity of the applicant and other persons involved, if any, to undertake and operate the project;	Section 2.2
(iii) Name, title and address of the person with whom communication should be made respecting the application;	Section 2.3
(iv) Name and address of legal counsel for the applicant, if any;	Section 2.4
(v) Organizational chart of the project team, including the names of the Project Manager and Executive Sponsor for the project; and	Section 5.3 Post filing, D'Arcy Caron appointed Project Manager
(vi) Outline of the regulatory process the applicant recommends for the Commission's review of the application, including how persons who were consulted about the project can raise outstanding application-related concerns with the Commission.	Section 1.3
2. Project Need, Alternatives and Justification	
(i) Studies or summary statements identifying the need for the project and confirming the technical, economic and financial feasibility of the project, identifying assumptions, sources of data, and feasible alternatives considered. The applicant should identify alternatives that it deemed to be not feasible at an early screening stage, and provide the reason(s) why it did not consider them further;	Section 4
(ii) A comparison of the costs, benefits and associated risks of the project and feasible alternatives, including estimates of the value of all of the costs and benefits of each alternative or, where these costs and benefits are not quantifiable, identification of the cost area or benefit that cannot be quantified. Cost estimates used in the economic comparison should have, at a minimum, a Class 4[3] degree of accuracy as defined in the most recent revision of the applicable AACE International Cost Estimate Classification System Recommended Practices.	Costs – Section 6, Confidential Appendix B Benefits – Section 4 Risk Assessment – Section 5.7
(iii) A schedule calculating the revenue requirements of the project and feasible alternatives, and the resulting impacts on customer rates;	Section 6 and Confidential Appendix C
(iv) A schedule calculating the net present values of the incremental cost and benefit cash flows of the project and feasible alternatives, and justification of the length of the term and discount rate used for the calculation;	FBC considers that the revenue requirements analysis is a sufficient financial analysis for a CPCN application as liquidity is not at issue.
(v) A schedule and supporting discussion comparing the project and feasible alternatives in terms of social and environmental factors, and the applicant's assessment regarding the overall social and environmental impact of the project relative to the overall impact of the feasible alternatives; and	Social and environmental factors differ minimally, if at all, between alternatives. Please also refer to the response to BCUC IR1 29.1 and 29.2.

Application Requirements	Application Section/Comments
(vi) Information relating the project to the applicant's approved long-term resource plan filed pursuant to section 44.1 of the UCA, including the extent to which the project was considered in the plan, and, if applicable, a discussion explaining how the plan provides support and justification for the need for the project.	Section 8.3
3. Consultation	
First Nations Consultation	
Note: Crown utilities are required to provide the information requirements set out in the most recent version of the British Columbia Utilities Commission First Nations Information Filing Guidelines for Crown Utilities, which replace and supersede the application requirements in this First Nations Consultation section of the CPCN Application Guidelines.	N/A
If an applicant is of the view that the application does not require consultation with First Nations, reasons supporting its conclusion must be provided to the Commission. Unless otherwise justified, the following information should be filed:	N/A
(i) Identification of the First Nations potentially affected by the application or filing, including the feasible project alternatives; and the information considered to identify these First Nations.	Section 7.5
For each potentially affected First Nation, summarize the consultation to date, including:	
(ii) Identification of any group, body, specific band or specific person(s) that have been consulting on behalf of the First Nation in connection with the application. Identify the specific member bands represented by any group or body.	Section 7.5
(iii) A chronology of meetings, other communications and actions.	Section 7.5
(iv) Any relevant, non-confidential written documentation regarding consultation, such as notes or minutes of meetings or phone calls, or letters received from or sent to the First Nation.	Appendix D-5
(v) Identification of specific issues or concerns raised by the First Nation.	Section 7.5
(vi) Description of how the specific issues or concerns raised by the First Nation were avoided, mitigated or otherwise accommodated, or explain why no further action is required to address an issue or concern.	Section 7.5
(vii) Copies of any documents which confirm that the First Nation is satisfied with the consultation to date.	No documentation has been received.
(viii) Evidence that the First Nation has been notified of the filing of the application with the Commission and has been informed on how to raise outstanding concerns with the Commission.	Please refer to the responses to BCUC IR1 33 series.
(ix) The applicant's overall view as to the sufficiency of the consultation process with the First Nation to date, in the context of the decision which is being sought from the Commission.	Section 1.1.5. Please also refer to the responses to BCUC IR1 33 series.
(x) A statement of what future consultation with First Nations is contemplated subsequent to the preparation of the CPCN application.	Section 7.5. Please also refer to the responses to BCUC IR1 33 series.

Application Requirements	Application Section/Comments
Public Consultation	
(i) Overview of the community, social and environmental setting in which the project and its feasible alternatives will be constructed and operated, and of the public who may be directly impacted by the project and its feasible alternatives.	Section 7. Please also refer to the responses to BCUC IR1 29.1 and 29.2
(ii) Description of the information and consultation programs with the public, including the organizations, agencies and individuals consulted, the information provided to these parties, and a chronology of meetings and other communications with members of the public and their representatives. This includes consultation with both the public who may be directly impacted by the project and the public that may experience impacts on their rates and service.	Section 7 and Appendix D
(iii) Description of the issues and concerns raised during consultations, the measures taken or planned to address issues or concerns, or an explanation of why no further action is required to address an issue or concern.	Section 7 and Appendix D
(iv) Identification of any outstanding issues or concerns.	Section 7 and Appendix D
(v) Applicant's overall assessment as to the sufficiency of the public consultation process with respect to the project, in the context of the decision which is being sought from the Commission.	Section 1.1.5. FBC considers the public consultation process to date to be appropriate to the stage of the Project and has committed to continuing to work with customers and stakeholders to address any outstanding items as the Project progresses.
(vi) A statement of what future public consultation is contemplated subsequent to the preparation of the CPCN application.	Sections 7.6 and 7.7
4. Project Description	
(i) Description of the project, its purpose and cost, including engineering design, capacity, location options and preference, safety and reliability considerations, and all ancillary or related facilities that are proposed to be constructed, owned or operated by the applicant.	Sections 5 and 6
(ii) Outline of the anticipated construction and operation schedule, including critical dates of key events, a chart of major activities showing the critical path (e.g., GANTT4 chart), and the timing of approvals required from other agencies to ensure continued economic viability.	Section 5
(iii) Description of any new or expanded public works, undertakings or infrastructure that will result from or be required by the project, and an estimate of the costs and necessary completion dates.	No new or expanded public works or infrastructure are required.
(iv) Human capital resources required to undertake the project.	Section 5, Confidential Appendix B
(v) Risk analysis identifying all significant risks to successful completion of the project, including an assessment of the probability of each risk occurring, and the consequences and the cost to mitigate the risk. The applicant should provide a summary description of significant project risks, 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 risk evaluation should incorporate a risk assessment matrix with appropriate levels of severity and probability, a risk register and risk treatment as recommended in the latest revision of AACE International Recommended Practices.	Section 5.7

Application Requirements	Application Section/Comments
(vi) Identification and preliminary assessment of potential effects of the project on the physical, biological and social environments or on potentially affected First Nations and the public, proposals for reducing potentially negative effects and maximizing benefits from positive effects, and the cost to the project of implementing the proposals;	Section 5.5
(vii) Identification of the customers to be served by the project and, where the project would expand the area served by the applicant, a geographical description of the expanded service area.	Section 3.2
(viii) A list of all required federal, provincial and municipal approvals, permits, licenses or authorizations and any applicable environmental assessment or other required project review processes.	Section 5.6
(ix) A summary of the material conditions that are anticipated in federal, provincial and municipal approvals and confirmation that the costs of complying with these conditions are included in the cost estimate in the application.	Section 5.6
5. Project Cost Estimate	
(i) The project cost estimate should comply with applicable AACE International Cost Estimate Classification System Recommended Practices, use the terminology in the latest revision of AACE International Recommended Practice - Cost Engineering Terminology and list the AACE Recommended Practices used in the preparation of the cost estimate.	Section 6.2
(ii) The project cost estimate should include the basis of estimate, the preparation effort (level of effort used to develop the cost estimate), as defined in the latest revision of the AACE International Recommended Practices, along with a description of the method of estimating used, the percentage of project definition and design complete at the time of the estimate based on the judgment of the utility's management, identification and justification of all assumptions, exclusions, inflation and discount factors, and sources of benchmarks and other data including lessons learned from relevant past projects.	Section 6
(iii) The cost estimate should be stated in nominal as well as real dollars, identify an expected accuracy range with stated confidence level and have, at a minimum, a Class 3[5] degree of accuracy as defined in the latest revision of the AACE International Recommended Practices.	Section 6
(iv) The cost estimate should provide:	
(a) Any funds spent in prior years attributable to the project.	Section 6.2, Confidential Appendix C-1
(b) A list of all project direct and indirect costs using an appropriate level of work breakdown structure, based on the nature, size and complexity of the project, by year until completion.	Section 6.2, Confidential Appendix C-1
(c) Escalation (including inflation) amount and justification.	Section 6.2.6
(d) Contingency amount and justification.	Section 6.2.4
(e) Interest during construction or allowance for funds used during construction and corporate overhead.	Section 6.2.5
(f) Identification and explanation of any management or other reserves.	Confidential Appendix B-2
(g) Any legal, regulatory and other project costs, including costs associated with First Nations and public consultation and accommodation.	Section 6.2.1
(h) The amounts and sources of any contributions in aid of construction,	N/A

Application Requirements	Application Section/Comments
grants or other funding or credits related to the project.	
(v) Identification of any cost items not included in the estimate, such as transportation costs, sunk costs and the reason for the exclusion.	N/A
(vi) If a Monte Carlo analysis was used to model and provide justification for the amount of project contingency included in the cost estimate, then provide the following:	N/A
6. Provincial Government Energy Objectives and Policy Considerations	
(i) Discuss how the project is consistent with and will advance the government's energy objectives as set out in the *Clean Energy Act*, Part 1 – BC Energy Objectives. If the nature of the project precludes a direct link to the energy objectives, the application should discuss how the project does not hamper other projects or initiatives undertaken by the applicant or others, from advancing these energy objectives.	Section 8.2
7. New Service Areas	
(i) Telephone number or other means by which customers will be able to contact the utility, particularly regarding an emergency.	N/A
(ii) Description of facilities and trained personnel that will provide emergency response.	N/A
(iii) Tariff including terms and conditions of service, rate schedules and initial rates the applicant proposes for customers in the new service area.	N/A
(iv) Information confirming the proposed rates will be competitive with other service options that are available to customers in the new service area.	N/A

1.2.1 If not, please identify any areas that do not meet CPCN Guidelines, and explain why.

Response:

Please refer to the response to CEC IR1 1.2.

1.2.2 Please explain the costs of providing and the benefits of the ring bus configuration in relation to the Project costs.

Response:

The fundamental difference between Alternatives A and B is that Alternative A would include upgrading the existing 138 kV split bus at LEE to a ring bus configuration. As such, the cost

differential between Alternatives A and B in the Application represents the cost of providing a ring bus configuration.

For a description of benefits of the ring bus configuration, please refer to Section 4.3.1 of the Application. Please also refer to the responses to BCUC IR1 12.4 to 12.5.

2. Reference: Exhibit B-1, page 10 and page 18

> **3.1 *OVERVIEW***
>
> FBC has experienced high levels of customer load growth in the Kelowna area[5] and it expects electricity demand will exceed system planning reliability criteria by the summer of 2022. Specifically, FBC will not be able to meet the N-1 system reliability planning criteria in order to reliably maintain service to the area load during peak periods in the event of an outage or failure of one of the two existing 230/138 kV transformers at the F.A. Lee Terminal Station. Therefore, without expanding FBC's current resources, load will need to be shed in 2022 in the event of an outage or failure of one of the two existing transformers at LEE, as explained in Section 3.4 below. During an N-1 contingency event, the consequences of the required load shedding will increase as load grows in the Kelowna area.
>
> The normal operation (N-0) contingency planning criteria applies to all transmission facilities. The single contingency (N-1) planning criteria apply to all transmission facilities that are part of the FBC interconnected system, which excludes radial transmission lines. FBC plans and constructs its interconnected transmission system to meet and maintain its N-1 planning contingency criteria. The recently-approved Grand Forks Reliability Project[17] similarly proposed the addition of a new terminal transformer in order to meet the same planning criteria.
>
> The Kelowna load area is part of the interconnected system (that is, it is supplied from more than one 230 kV source, in this case 73 Line and 72/74 Lines as shown in Figure 3-2 above); therefore, the N-1 planning criteria applies. In addition, as discussed in Section 3.2, Kelowna is the largest load centre in FBC's service territory and includes a number of important institutional and other major customers, which emphasizes the importance of N-1 contingency planning.

2.1 Please explain at peak conditions what % of additional load would be required to cause a failure to be operationally consistent with N-1 criteria?

Response:

The supply limit for Kelowna is 315 MW and is defined by the summer peak load. The critical outage at this load level is the outage of a LEE 230/138 kV transformer. After this outage and after system reconfiguration to reduce the post contingency flow, the flow on the remaining LEE transformer is 168 MVA, the normal summer rating of the transformer. Kelowna area load higher than 315 MW will result in post contingency flow higher than 168 MVA on the remaining transformer. This will be in violation of the current operating procedures that allow operation at this level for only six hours and plans to reduce the loading must be implemented within this time frame.

2.2 Please provide the oversight body, if any, that defines how far the utility needs to be away from failing to meet the N-1 system reliability and therefore potentially to be shedding load, for the interconnected system.

Response:

The ability to meet the N-1 planning criteria is a threshold (not a continuum) based on equipment ratings, forecast load, and power flow analyses. FBC's operating procedures are based on its experience and guidance from the IEEE and determine the timeframes under which load shedding is required, as explained in the responses to BCUC IR1 7.8 through 7.10.

2.3 Please provide a service area map showing the areas for which FortisBC does not have N-1 system reliability.

Response:

Please refer to the response to BCUC IR1 6.7, filed confidentially.

Please also refer to the response to BCUC IR1 6.6 for a discussion of two exceptions where FBC's interconnected system does not currently meet the N-1 criteria.

3. Reference: Exhibit B-1, page 12

> Compared to other regions in FBC's service territory, the Kelowna load area covers a relatively small geographic area, but has the highest load concentration. It accounts for almost 50 percent of the total FBC summer peak load and more than 40 percent of the winter peak load.
>
> FBC has approximately 76,600 direct customers in the Kelowna area, shown by rate class in Table 3-1:
>
> **Table 3-1: FBC Kelowna Load Area Customers by Class**

Rate Class	Customer Count
Small Commercial / Commercial	9,781
Large Commercial	22
Irrigation	212
Lighting	467
Residential	66,133
Total	76,615

> Included in these customers in the Kelowna area are the following major customers:
>
> - Kelowna General Hospital;
> - University of British Columbia Okanagan;
> - Okanagan College;
> - Kelowna International Airport; and
> - Big White Ski Resort.

3.1 Please provide the total number of customers FortisBC has by rate class.

Response:

The table below provides the total number of direct customers by rate class, as of the end of March 2020.

Residential	122,909
Commercial	15,978
Industrial	52
Wholesale	6
Irrigation	1,087
Lighting	1,469
Total Direct Customers	**141,501**

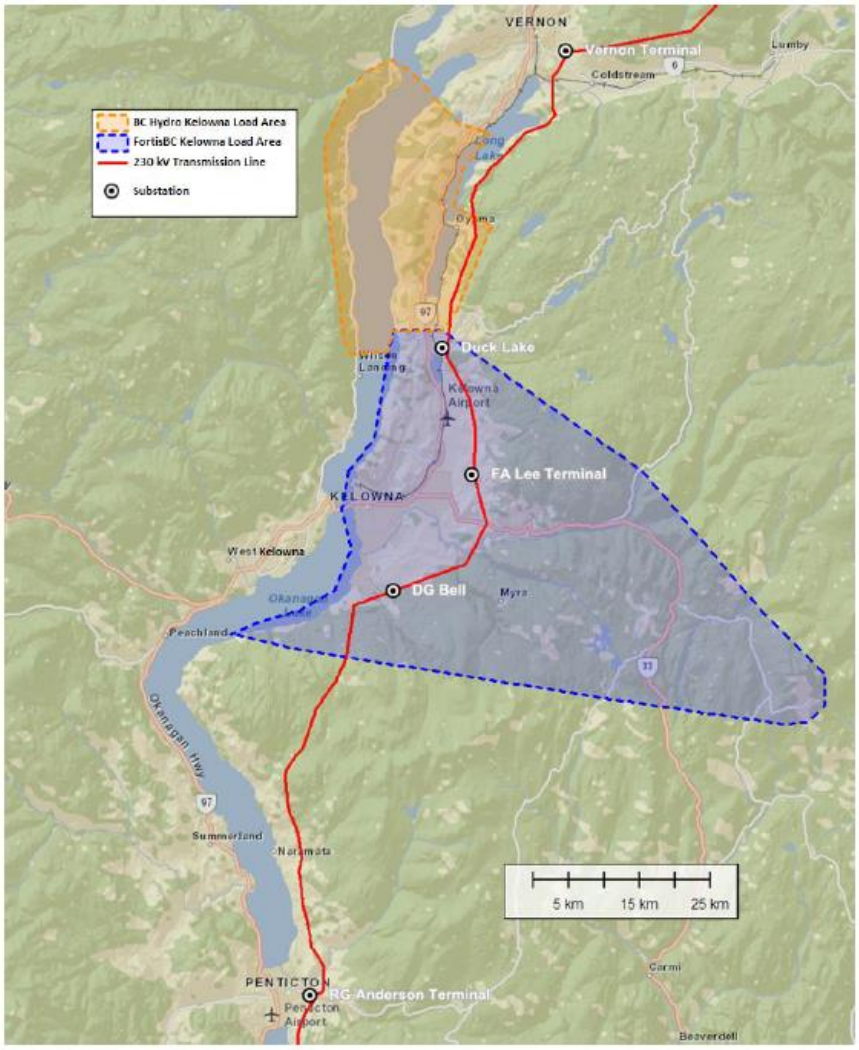
3.2 Please provide information on the back-up generation capabilities of each of the five major customers listed and explain whether or not they would be part of a load shedding contingency and how any "customer" generation capability is factored into N-1 planning, if at all.

Response:

Please refer to the response to BCUC IR1 2.2.

4. Reference: Exhibit B-1, page 11 and page 14

Figure 3-1: Map of Kelowna Load Area



3.3.1 Population and Housing

The Kelowna area is the fastest growing region in FBC's service area. The City of Kelowna and surrounding area has a population base of more than 140 thousand and is the largest urban centre in the British Columbia interior and the twenty-first largest metropolitan area in Canada. Kelowna has been one of the fastest growing cities in Canada during the last decade,[7] and has grown by an average annual rate of 1.6 percent during the 20-year period 1996-2016. As shown in Table 3-2, the population is forecast to continue to grow at a similar rate in the subsequent 20 year period to 2036.

Table 3-2: Actual and Forecast Kelowna Area Population 1996-2041[8]

Year	Population	Annual Avg Growth Rate	20-Yr Avg Growth Rate
1996	102,021		
2001	110,995	1.7%	
2006	120,392	1.6%	
2011	131,835	1.8%	
2016	141,022	1.4%	1.6%
2021	149,705	1.2%	
2026	164,711	1.9%	
2031	177,072	1.5%	
2036	188,445	1.3%	1.5%
2041	199,031	1.1%	

Other sources demonstrate a consensus view of continued, consistent growth in the Kelowna area. For example, in 2011 the City of Kelowna adopted the Kelowna 2030 Official Community Plan,[9] anticipating the addition of 8,565 single / two unit homes and 11,520 multiple unit homes by 2030. In 2018, the City of Kelowna further predicted that the total number of new housing units required by 2040 will be between 23,000 and 25,000 units.[10]

[7] Statistics Canada, Table 17-10-0135-01, Population estimates, July 1, by census metropolitan area and census agglomeration, 2016 boundaries. July 1, 2018 data.
[8] Population projections prepared for FBC by BC Stats.
[9] https://apps.kelowna.ca/CityPage/Docs/PDFs/Bylaws/Official%20Community%20Plan%202030%20Bylaw%20No.%2010500/Chapter%2003%20-%20Growth%20Projections.pdf
[10] https://www.kelowna.ca/sites/files/1/docs/related/ff-population_and_housing.pdf

4.1 Please provide the rationale and any additional evidence FortisBC has to support the 1.9% forecast growth rate in 2026.

Response:

FBC commissions population forecasts specific to its service territory from BC Stats. Beyond this forecast, FBC is not aware of any other available population forecast specific to its service territory.

4.2 Please confirm that in the Great Recession growth rates were significantly and structurally reduced from prior planning estimating and please quantify where possible.

Response:

FBC does not have information regarding the City of Kelowna's planning estimates prior to the 2008-2009 recession.

4.3 Please provide the company's views as to whether or not the COVID pandemic and resultant worldwide economic slow-downs anticipated may end up affecting growth rates in the City of Kelowna, particularly given the pandemic impacts on destination attraction economies and please quantify where possible.

Response:

At this time FBC does not have any evidence to suggest that there will be a lasting impact to City of Kelowna growth rates due to the pandemic that would affect the timing of this project. Please refer to the response to BCUC IR1 5.1 for discussion of the impact of COVID-19 on FBC's load to date.

4.4 Please confirm that the key issue with N-1 reliability and growth projections primarily relates to the City of Kelowna, rather than the other affected areas? Please explain.

4.4.1 If no, please provide details of the potential impacts of growth in the other areas.

Response:

FBC confirms that the majority of customers supplied by the Kelowna area 138 kV network are within the boundaries of the City of Kelowna. Likewise, the majority of the increase in the peak load for this area is expected to be due to new services and service upgrades within city limits.

5. Reference: Exhibit B-1, page 16

Historical summer and winter peak loads for the Kelowna area are shown in Table 3-4 below.

Table 3-4: FBC Kelowna Area Summer and Winter Peak Loads, 2014-2019

	2014	2015	2016	2017	2018	2019
Summer (MW)	276.4	283.7	281.4	288.1	301.0	300.5
Winter (MW)	277.0	268.3	306.9	283.6	298.6	324.9

The Kelowna area load forecast for 2020-2028 is shown below:

Table 3-5: Kelowna Load Area Summer and Winter Peak Load Forecast, 2020-2028

	2020	2021	2022	2023	2024	2025	2026	2027	2028
Summer (MW)	309.5	314.6	319.8	325.5	331.5	336.5	343.3	349.4	355.5
Winter (MW)	340.4	343.9	348.3	352.9	357.0	361.3	365.8	370.3	374.5

After forecasting peak load from historical data, FBC includes the impact of known or highly probable load developments, such as community developments that have an expected connection date and defined loads. It is reasonable to expect that other incremental loads may materialize in the near to medium term. For example, FBC has received transmission service interconnection inquiries related to cannabis, cryptocurrency and data processing facilities. Additionally, electric vehicle (EV) adoption and electrification of transit fleets and new government policy all have the potential to result in further increases to the Kelowna area load forecast.

In the last two years, FBC has received five preliminary inquiries from cannabis and data processing facilities for transmission service in the Kelowna area or with the flexibility to locate anywhere in the FBC service territory. The potential load associated with these facilities is approximately 500 MW. While most of these inquiries are considered to be speculative and to have a fairly low probability of proceeding to completion, as an example, one potential connection in the range of 40 MW is considered to be feasible and to have a reasonable probability of proceeding. FBC includes this information to illustrate the potential impact of new large loads on the Kelowna area transmission facilities. None of these potential incremental loads has been included in the forecast above, since none has been confirmed.

Figure 3-3 below indicates the existing summer and winter transformer limits relevant to the KBTA Project and the actual and forecast summer and winter peak loads (the difference between summer and winter seasons and their respective limits is explained in Section 3.4). The summer peak load is

5.1 Is the forecast weather normalized? Please explain.

Response:

The peak load forecast is not weather-normalized. Please refer to the response to BCUC IR1 4.4.1.

5.2 Please confirm the CEC's interpretation, or otherwise explain, that only those loads from known events with defined loads and expected connection dates are included in the forecast.

5.2.1 If confirmed, in table 3-5, please break out the new load from load developed from historical data.

5.2.2 If not confirmed, please break out from load developed from historical data:

a) the load from known events that have a connection date and defined loads;

b) the load from other expected incremental loads such as the cannabis, cryptocurrency, data processing;

c) load from EV; and

d) load from any other potential load included in the load forecast.

Response:

Confirmed. FBC has not included any new large connections in this forecast. FBC works with key account managers to identify loads and add them to the forecast when they become certain.

5.3 Please provide FortisBC's expectation of how the EV charging will develop with quantification.

Response:

FBC expects to see continued growth in electric vehicle adoption over the next 20 years, driven primarily by BC's *Zero-Emission Vehicle Act* (ZEV Act). The ZEV Act requires that ZEV sales account for an escalating percentage of new light-duty vehicle sales: specifically, 10 percent of sales by 2025; 30 percent by 2030; and 100 percent by 2040. However, translating ZEV targets into FBC system impacts is difficult for the following reasons:

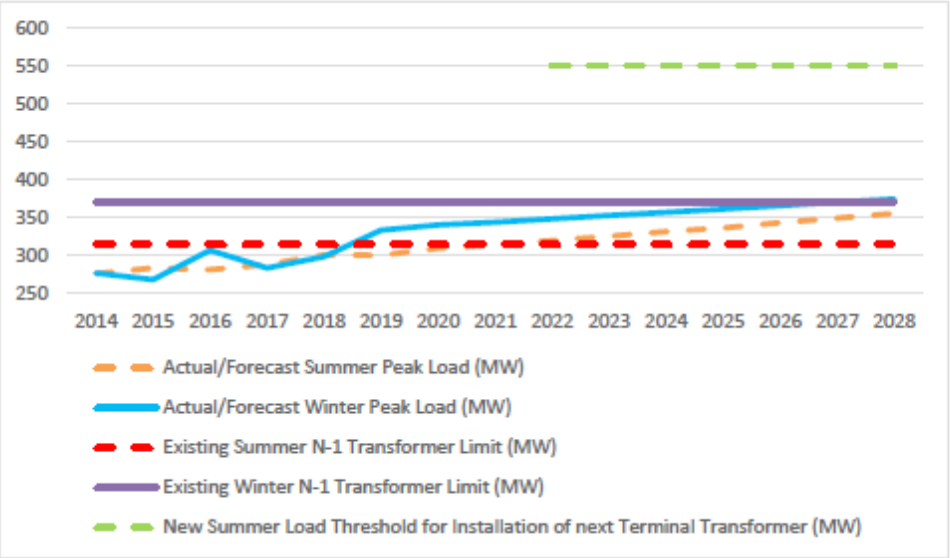
- Generally speaking, most light-duty ZEV charging loads can be shifted to off-peak times. FBC is working on proactively identifying existing EV loads in order to better understand customers' current charging behavior. FBC is also monitoring industry developments regarding the use of rates and programs to modify customers' charging behavior which may help inform a future regulatory application for such rates and/or programs.

- The ZEV Act applies to light-duty vehicle sales at the provincial level. According to the Ministry of Energy, Mines & Petroleum Resources, Q3 2019 ZEV sales as a percentage of light-duty sales were 9.6 percent and 9.9 percent in the Lower Mainland and Vancouver Island respectively. This compares with 4 percent and 2.4 percent in the Thompson-Okanagan and Kootenay regions respectively. It is likely that growth in ZEV sales in FBC's service territory will continue to lag behind sales growth in the Lower Mainland and Vancouver Island regions in the near to medium term. This is due primarily to the predominantly rural nature of FBC's service territory and the current unavailability of other light duty vehicle types including trucks and four/all-wheel drive vehicles.
- Sales of used light-duty ZEVs, as well as new and used medium- and heavy-duty ZEVs, are unaccounted for in the ZEV Act. Associated system impacts from these future loads are therefore difficult to forecast at this time.

6. Reference: Exhibit B-1, pages 16-17

> Figure 3-3 below indicates the existing summer and winter transformer limits relevant to the KBTA Project and the actual and forecast summer and winter peak loads (the difference between summer and winter seasons and their respective limits is explained in Section 3.4). The summer peak load is forecast to reach the transformer limit of 315 MW in 2021 and to exceed the limit in 2022 as set out in Table 3-5, and the forecast winter peak load will exceed the winter transformer limit of 370 MVA in 2027. Finally, the incremental summer transformer capacity to be gained from the KBTA Project (assuming the preferred alternative) can be seen beginning in 2022. The incremental capacity increase is 235 MW (550 MW less the existing 315 MW).

Figure 3-3: Kelowna Area Peak Loads and N-1 Transformer Limits (Preferred Alternative)



6.1 Please provide in the graph the New Winter Load Threshold of next Terminal Transformer.

Response:

FBC does not have a New Winter Load Threshold for the current system configuration because the current configuration cannot be reasonably expected to persist above the 550 MW load level. As described in the response to BCUC IR1 14.1, a decision about the future expansion of the Kelowna transmission system will be required at the 550 MW load level. Current load projections show that Kelowna area winter peak load would not be expected to exceed this threshold until after 2060.

6.2 Please provide Figure 3-3 assuming peak load from historical data only, and including the New Winter Load Threshold.

Response:

Although historical peak load values are an integral part of the forecast, FBC does not produce a forecast that is only based on actuals. As such, it is not possible to provide the requested figure.

6.3 Please comment on the variability being seen in the Actual/Forecast Winter Peak Load. What caused the changes from 2014-2018, and why does FortisBC forecast ongoing increases instead of variability going forward?

Response:

The variability in actual winter peak load from 2014 to 2018 can primarily be attributed to the presence or absence of very cold winter temperatures in these years. As the forecast years are based on a 1-in-20 year forecast, as set out in the response to BCUC IR1 4.4, the potential for extreme winter weather to affect peak load is considered in each of the forecast years, hence the forecast is linear.

7. Reference: Exhibit B-1, page 17

> ***3.3.2.1 Impact of COVID-19 on Load Forecast***
>
> FBC's peak demand forecast was prepared in 2019, before the onset of the COVID-19 pandemic. FBC acknowledges that the immediate and near-term impacts of the pandemic may be significant for some rate classes and economic sectors. However, the Company is optimistic about the timeline for recovery from these impacts in its service territory and believes that the execution of this critical transmission project should not be deferred as a result of the COVID-19 situation, particularly as the Project is not expected to be in service until the end of 2022. As of the date of filing, there is insufficient data to quantify the COVID-19 impact during 2020, or to forecast future impacts on energy consumption or, more importantly for system planning, on peak loads.
>
> In the near term, COVID-19 may result in commercial loads declining due to business closures (in compliance with public health orders or as a result of general economic conditions). However, there are also some of the factors that may mitigate the economic impacts of COVID-19 as they relate to energy and peak load forecasting, For example, there is expected to be some offsetting increase in residential loads, as a result of individuals working from home or spending more time at home due to job losses. Further, some of these impacts will be temporary and are likely to be resolved during 2020 but the timing and magnitude of full recovery cannot be forecast. Similarly, the reduction in load for some large commercial customers (such as educational institutions) will be temporary and may in fact have a limited impact on 2020 and future summer peak loads. At this time FBC has no information available to quantify the impact on other customer classes or economic sectors.
>
> FBC noted above a number of possible factors that could act to increase load above the baseline forecast presented above, including residential developments, cannabis, cryptocurrency and data processing facilities, EV adoption and government electrification policy. Since the occurrence of COVID-19 FBC continues to receive inquiries and requests for preliminary planning for certain projects. FBC cannot conclude that COVID-19 will result in the deferral or cancellation of these potential additional loads.
>
> In summary, given the lack of firm information on COVID-19 related impacts on the summer peak load in 2022 and future years, the continuing potential for significant new loads in the Kelowna load area, and the lead time required for a project of this nature, FBC concludes that it would not be prudent to delay the addition of transmission capacity in the Kelowna load area and that the KBTA Project should proceed as set out in this Application.

7.1 Please provide the commercial reductions that have been experienced to date likely as a result of COVID-19, if any.

<u>Response:</u>

For the period from April 1 through June 30, aggregate commercial energy demand is down 12 percent compared to 2019 and down 14 percent compared to forecast.

For June 2020, the aggregate commercial energy load is down 8.6 percent when compared to both 2019 and forecast. This follows variances of more than 20 percent in May, demonstrating the commencement of a return to more normal conditions, coincident with the phased BC Restart Plan.

However, as noted in the response to BCUC IR1 5.1, FBC has not experienced a significant reduction in total load attributable to COVID-19. Gross load on a normalized basis for the period since mid-March is less than 1 percent different from the most recent three year average for the same period after adjusting for load growth.

7.2 Please provide any range of impact scenarios that FortisBC has developed with respect to the impact of COVID-19.

Response:

FBC has not developed any COVID-19 impact scenarios. Please also refer to the response to BCUC IR1 5.1.

7.3 Please show a sensitivity in Figure 3-3 assuming commercial load reductions of 10%, 20%, 30%, and gradual recovery with final recovery occurring in years 3, 5, 7, and 10.

Response:

Figure 3-3 shows the peak loads with reference to the Kelowna Area and peak loads are based on gross load and not individual loads. Since the effects of COVID-19 are expected to include an increase to residential load that would offset at least some portion of a commercial reduction, it would be unrealistic to model only a decline in the commercial sector. At this point in time FBC has not seen any material changes to the gross load. Please refer to the response BCUC IR1 5.1 for a discussion of the impact of COVID-19 on load.

In order to be responsive, however, FBC has modeled the impact on peak load, assuming a reduction of 10 percent in the commercial load, a three-year recovery period, and no other increased loads such as residential or new connections. The result is a maximum reduction in peak load of three percent, which would delay the project timing by no more than one year.

FBC continues to monitor the situation; however, there is not enough evidence to support a reduction in the peak load at this point in time.

8. Reference: Exhibit B-1, page 19

> **3.4.1 Seasonal Peaks Forecast to Reach Emergency Limits in N-1 Conditions**
>
> For the 138 kV transmission system in the Kelowna area, seasonal peaks will reach system emergency limits during the summer season before the seasonal peaks will reach system emergency limits in the winter season. This is because higher ambient temperatures reduce the summer emergency limits below the winter emergency limits. For example, summer emergency limits for LEE T3 and T4 are both much lower in summer at 159 MW, as compared to their respective winter emergency limits of 189 MW and 195 MW.
>
> Power flow simulation studies were used to analyse single contingency scenarios. When either of the two existing LEE terminal transformers[18] is out of service, the loading on the remaining transformer is 191 MVA (91 percent of its emergency limit) when the total Kelowna area load reaches 315 MW, which is just marginally higher than the forecast summer peak load forecast in 2021[19], as provided in Table 3-5. The loading on the remaining LEE transformer can be lowered by adjusting the load supply configuration in the Kelowna 138 kV system to transfer additional load to DGB. After system reconfiguration, the flow on the remaining LEE transformer is 168 MVA, which is 80 percent of the emergency limit and 100 percent of normal rating.

8.1 Please provide further elaboration on why higher ambient temperatures reduce the summer emergency limits below the winter emergency limits.

Response:

As noted in the *IEEE Guide for Loading Mineral-Oil-Immersed Transformers*[1], "*[a]mbient temperature is an important factor in determining the load capability of a transformer since the temperature rises for any load must be added to the ambient to determine operating temperatures*." In other words, the operating temperature of electrical equipment is a combination of both the ambient temperature as well as the temperature rise resulting from thermal losses due to the flow of electrical current through the device. Since equipment thermal limits are based on an absolute maximum temperature, higher ambient temperatures limit the allowable thermal rise due to losses. As a result, equipment operated in higher ambient termperatures must be derated when compared to operation at lower ambient temperatures.

Please also refer to the response to BCUC IR1 7.3 for a discussion on transformer limits and the impact of seasonal ambient temperatures.

8.2 What factors contribute to the level of emergency limits? Please explain.

[1] IEEE Std C57.91-1995 - IEEE Guide for Loading Mineral-Oil-Immersed Transformers, clause 6.1.

Response:

As noted in the response to CEC IR1 8.1, ambient temperature is an important factor in determining the load capability of a transformer since the ambient temperature must be added to temperature increases related to load to determine operating temperatures.

Emergency loading normally results from the prolonged outage of some system element and causes either the conductor hottest-spot or the transformer top-oil temperature to exceed those suggested for continuous loading at the nameplate rating. This is not a normal operating condition and may persist for some time, but it is expected that such occurrences will be rare.

Emergency loading limits are set by FBC so that a power transformer is loaded to ensure that its hottest-spot temperature is within an acceptable emergency temperature range.

9. Reference: Exhibit B-1, page 19 and page 22

> As Kelowna area load increases, an N-1 event in 2022 and beyond would result in loading above 168 MVA on the remaining LEE transformer, even after the reconfiguration described above. FBC's operating procedures allow operation above the normal rating for only six hours[20], and plans to reduce the loading must be implemented within this time frame. If loading above the normal rating of 168 MVA is expected to persist for longer than six hours, the facility loading must be reduced below 168 MVA as soon as practicable by shedding customer load during peak load periods. Initially, the requirement for such load shedding would be confined to only part of the peak load period on summer peak days. However, as Kelowna area load increases, the duration and frequency of required load shedding events would increase. As shown in Figure 3-3, load shedding events could also be required on winter peak days beginning in winter 2027; the forecast winter peak load in load in 2027 is 370.3 MW (Table 3-5) compared to the winter emergency limit of 370 MW. FBC's Kelowna area transmission system will then be in violation of its transmission planning criteria unless additional 138 kV capacity is added.
>
> b) ***Demand Response:*** Demand Response (DR) can be an effective means of reducing or shifting peak load and FBC is investigating the potential use of DR for mitigating system peaks. A DR pilot is currently underway in the Kelowna area, however as explained in FBC's 2019-2022 Demand Side Management Expenditures application, the DR pilot is a proof-of-concept initiative and the magnitude of the proposed target of 1.75 MW capacity is insufficient to defer the KBTA Project. Accordingly, DR is not a reasonable alternative for this Project.

9.1 Please provide quantification of FortisBC's history of outages related exceeding N-1 conditions lasting longer than 6 hours for the last 10 years.

Response:

FBC Transmission System Planning Criteria require that it shall be possible for the system to be adjusted (excluding firm load curtailment) after an N-1 contingency such that all line and transformer loadings are within normal ratings within 6 hours. This means that FBC has not experienced a transformer outage that caused another transformer to exceed its normal ratings for longer than 6 hours in the last 10 years.

9.2 Could Time of Use ("**TOU**") pricing also be used to reduce or shift peak? Please explain.

9.2.1 If yes, what actions has FortisBC taken to implement TOU pricing?

Response:

TOU pricing is primarily intended to shift consumption from one time period to another, but is generally considered to also have the impact of reducing peak demand. FBC currently has TOU pricing available to all customer classes, with Residential TOU rates closed to new customers by BCUC Order G-3-12. FBC filed its 2017 Cost of Service Analysis (COSA) and

Rate Design Application (RDA) on December 22, 2017 in which it proposed a new set of TOU rates for all customers. However, the proposal to revise and re-open the optional residential TOU rate to all residential customers and revise all other non-residential TOU rates was denied.

9.3 What capacity target would FortisBC need to set for a Demand Response ("**DR**") or TOU pricing program in order to defer the KBTA project? Please explain and provide quantification relating the target to the duration of the deferral.

Response:

The Kelowna area summer peak load forecast increases by approximately 6 MW per year. As such, any DR or TOU pricing program would need to provide firm summer peak load reductions beginning in 2022 with an incremental capacity of approximately 6 MW for each year of deferral. Beginning in 2027, the DR or TOU peak load reductions would also be required to provide an incremental load reduction of approximately 4.5 MW per year at winter peak for each year of deferral. FBC does not have any indication at this time that such DR or TOU targets are feasible. In the case of DR, preliminary estimates indicate that the total demand response potential for the Kelowna area is likely less than 6 MW.

9.4 Would it be feasible to increase the capacity targets of the DR to useful levels for deferring this project? Please explain why or why not.

Response:

It would not be feasible to defer the Project using DR measures. The DR pilot target was 1.75 MW of winter capacity and, despite considerable efforts, the 2019-20 winter DR activities yielded an average DR capacity reduction of 0.5 MW per event, with the highest single demand reduction at 0.7 MW. It would not be feasible to scale up the DR activities, to match the growth curve shown in Table 3-5 (6 MW per year summer and 4.5 MW per year winter), in time to defer this Project.

9.5 Please provide order of magnitude estimates of the cost of DR or TOU programs.

Response:

FBC already has TOU rates that have been approved by the BCUC. As part of its 2017 Application to revise and re-open the optional residential TOU rate to all residential customers and revise all other non-residential TOU rates, FBC provided a +/- 50 percent estimate of $166,000 to implement the changes it recommended.[2]

The estimated cost of a service area wide DR program is approximately $3 million in the first year, increasing to $8.5 million by the fourth year. A large portion of these costs are related to program marketing to recruit participants and installing enabling technologies for demand reductions.

9.6 Please provide approximations of the time it would take to implement DR or TOU programs that could potentially address the issue instead of the current project.

Response:

As discussed in the response to CEC IR1 9.2, with the exception of new Residential customers, FBC currently has TOU rates in place for all customer classes. Given that FBC already has TOU rates in place and that the primary purpose of TOU rates is to shift consumption from one period to another, FBC does not believe that adding to, or amending its TOU rates is a feasible alternative for the Project.

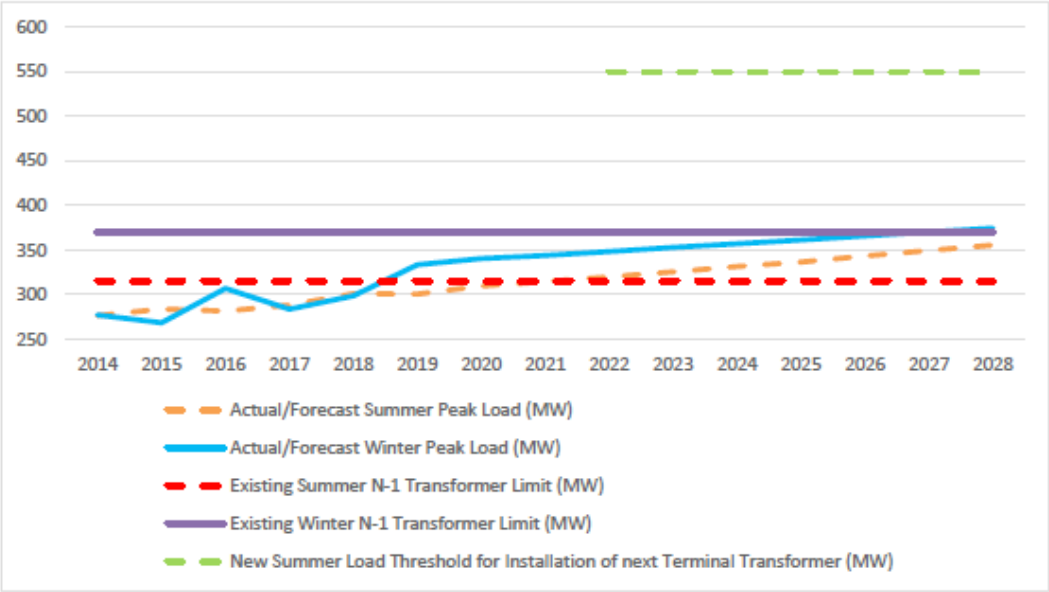
As discussed in the response to CEC IR1 9.4, it is also not feasible to scale up the DR pilot program as an alternative for this project. As such there is no time schedule developed to do so.

[2] FBC 2017 Cost of Service Analysis and Rate Design Application, Exhibit B-21, Response to BCUC IR2 135.8.

10. Reference: Exhibit B-1, page 19 and page 24

> Finally, in the event of a LEE terminal transformer failure, it would likely take more than a year to procure and install a replacement transformer. Since FBC does not own a mobile transformer of suitable size and voltage, such a failure would require customer outages for the Kelowna area under peak load conditions to prevent excessive operation of the transformers within emergency limits. The number of customers affected and the duration of the outages would depend on load conditions at the time; one option to manage loading through peak periods would be to rotate blackouts between substations or feeders in the area to reduce loads to less than 168 MVA.

Figure 4-1: Kelowna Area Peak Loads and N-1 Transformer Limits (LEE Alternatives)



10.1 Does FortisBC have other mobile transformers that may not be suitable? Please explain and identify how many mobile transformers it has and what makes such mobile transformer suitable.

Response:

FBC has four (4) mobile transformers designed for utilization at the distribution level (primary voltage of 138kV or 69kV, secondary voltage of 25kV or 13kV) that are less than 50MVA.

Mobile transformers can be used for emergency outage response at the distribution level. Due to the timelines required to transport and install mobile transformers, they are better suited to support planned equipment outages. However, they may also be utilized in unplanned outages when no other options are available for restoration.

Please refer to the Response to BCUC IR1 7.13 which explains that manufacturing a unit suitable for LEE is not feasible.

10.2 In what ways could a suitable mobile transformer be used to address the current issues? Could it be used to temporarily meet peak lead when required? Could it replace or defer the project?

Response:

Please refer to the responses to CEC IR1 10.1 and BCUC IR1 7.13.

10.3 Please discuss the costs and benefits of using mobile transformer(s) and provide the expected cost of a mobile transformer of suitable size and voltage.

Response:

Please refer to the responses to CEC IR1 10.1 and BCUC IR1 7.13.

10.4 Could a mobile transformer address multiple risks within FortisBC service territory by addressing various issues when they arise? Please explain how it could be used to do so.

Response:

Please refer to the responses to CEC IR1 10.1 and BCUC IR1 7.13.

10.4.1 If feasible, why did FortisBC not assess purchasing a mobile unit as an alternative?

Response:

Please refer to the responses to CEC IR1 10.1 and BCUC IR1 7.13.

10.4.2 If feasible, please provide figure 4-1 with the New Summer Threshold using a mobile unit.

Response:

Please refer to the response to BCUC IR1 7.13, which explains that manufacturing a unit suitable for LEE is not feasible.

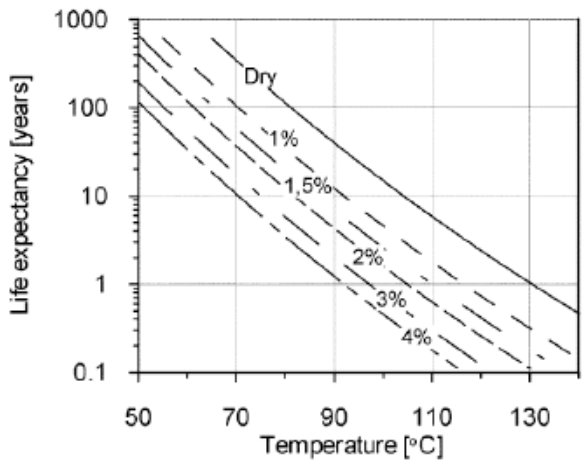
11. Reference: Exhibit B-1, page 20

3.5 *Overloading The Terminal Transformer Will Shorten Its Lifespan*

Loading of substation transformers above the normal nameplate rating has a significant impact on their remaining expected lifespan. As noted in Section 3.4, even after reconfiguration of the Kelowna network in the event of an outage of one of the LEE transformers, the remaining LEE transformer could be overloaded, beginning in summer 2022.

Prolonged loading in the emergency range increases winding hot spot temperature[21] and decreases the expected remaining life of the transformer. For transformers of the type installed at LEE and DGB, this relationship between temperature and life expectancy is exponential, as can be seen below in Figure 3-4. While transformers have an average life of 40 years, if a transformer is lightly loaded throughout its in-service life, the winding insulation can be expected to last longer; conversely, insulation life would be expected to be less than a year if the transformer is overloaded on a consistent basis. Each hour that a transformer is loaded above nameplate rating brings a corresponding increase in winding hotspot temperature that has a substantial negative impact on remaining expected lifespan.

Figure 3-4: Expected life for solid insulation and its dependence upon moisture and temperature.[22]



11.1 Please provide the current remaining life of the transformers in question.

Response:

Please refer to the response to BCUC IR1 10.3.

11.2 Is the average life expectancy of 40 years that of FortisBC's history, standard to the industry, or both? Please explain.

Response:

The 40-year transformer life expectancy, as described in Section 3.5 of the Application, represents the industry average life expectancy of the transformer. FBC's decision to replace transformers is based on condition and risk of failure, and not on equipment age itself.

11.3 Please provide FortisBC's full range of life expectancy for all of its transmission transformers.

Response:

FBC respectfully submits that the life expectancies of transmission transformers not affected by the KBTA Project are beyond the scope of what is reasonably required to evaluate this Application.

11.4 Is it possible for transformers to be repaired, such as replacing the winding insulation in order to extend their working lives? Please explain.

11.4.1 If yes, please provide an estimate of the costs to do so.

Response:

FBC confirms that power transformers can be repaired. Transformer repair or refurbishment work that can be completed onsite includes tap changer work, bushing replacement, re-gasket, cooling refurbishment and control cabinet work. In order to extend its transformer fleet life, FBC has successfully performed all of these activities. Certain work, such as re-winding of the coils and re-insulating the core can only be performed at transformer manufacturing facilities.

Performing the above-mentioned work might be cost effective where the original design is available. Nevertheless, repairing or refurbishing a unit does not address original design flaws.

Finally, based on FBC's experience, the cost of a load tap changer replacement can be as high as $1 million whereas the cost of re-winding of coils or re-insulating the core could be up to 80 percent of the cost of a new unit.

12. Reference: Exhibit B-1, page 24

> In each alternative, the transformer to be installed is a 230/138 kV transformer with a rating of 120/160/200 MVA, which is the modern standard size for transformers in applications of this type, and matches the rating of the transformers at DGB and other FBC terminal stations. The new transformer rating needs to match or exceed the 168 MVA rating of the existing LEE transformers so that its rating would not be the limiting factor in future N-1 scenarios.

12.1 Please provide an explanation as to 'future N-1' scenarios.

Response:

"Future N-1 scenarios" is intended to reference N-1 transformer outage scenarios that could occur after the KBTA Project is in service.

12.2 Please provide further details of the future risk to N-1 if the transformer rating did not match or exceed the 168 MVA rating, and provide quantification of the risk. How would it affect the ability to meet the forecast summer peak?

Response:

The summer emergency limit for the existing LEE T3 and T4 transformers is 199 MW. If a transformer with a rating of less than 168 MVA was installed as the third transformer at LEE, the emergency limit for that transformer would become a constraint in the event of an outage to LEE T3 or T4.

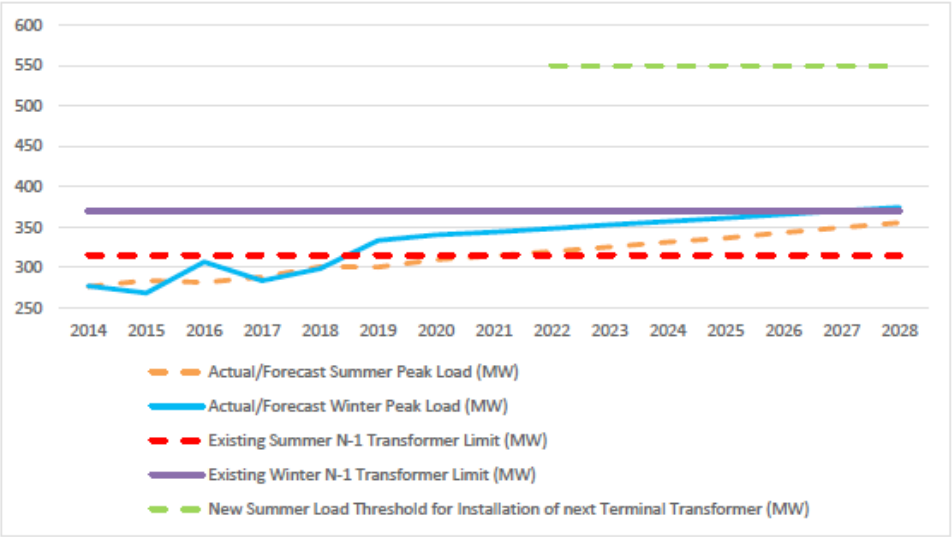
For example, if the new LEE T2 transformer was rated at 100 MVA, the emergency limit would be approximately 95 MW. With LEE T4 out of service, LEE T2 and LEE T3 would carry the load in parallel with a limitation of 95 MW x 2 = 190 MW. This only represents an incremental capacity increase of 31 MW with regard to the summer N-1 limit, which means summer peak load would exceed the N-1 limit in 2028.

Another important consideration is the fact that FBC anticipates a need to replace the existing LEE T3 and T4 transformers between 2033 and 2045 as described in the response to BCUC IR1 9.1. When these transformers are replaced, the replacement units would be FBC standard 120/160/200 MVA size. Having all transformers at this same 200 MVA rating optimizes the FBC's capability to meet N-1 planning criteria as the forecast peak increases.

13. Reference: Exhibit B-1, page 24 and page 25

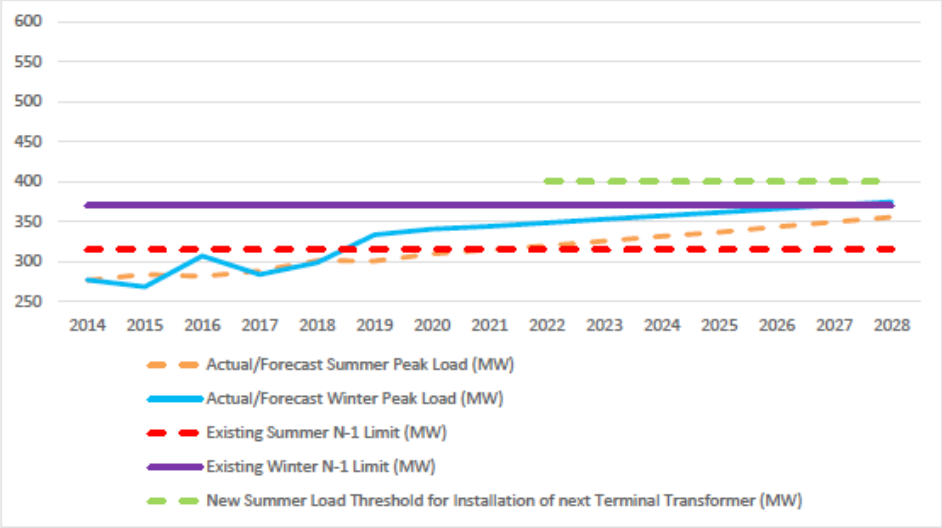
Figures 4-1[23] and 4-2 below show the incremental 138 kV capacity that would be achieved by installing the transformer at LEE (Alternatives A and B) and at DGB (Alternative C), respectively. The figures show the actual and forecast summer and winter peak loads for the Kelowna area, along with the existing limits for N-1 reliability and the new load thresholds after installation of the additional transformer at each station.

Figure 4-1: Kelowna Area Peak Loads and N-1 Transformer Limits (LEE Alternatives)



After installation of an additional transformer at LEE, the next terminal transformer addition would not be required for the Kelowna area until the summer peak load reaches 550 MW, which provides for an incremental emergency capacity of 235 MW.

Figure 4-2: Kelowna Area Peak Loads and N-1 Transformer Limits (DGB Alternative with 60L and 51L Reconductoring)



13.1 Please confirm that both Alternatives A and B are represented by Figure 4-1, and Alternative C is represented by Figure 4-2.

Response:

Confirmed.

13.2 Please provide a forecast of when FortisBC expects that summer peak might reach 550 MW.

Response:

Please refer to the response to BCUC IR1 11.2.

13.3 Please provide a forecast of when FortisBC expects the summer peak to exceed 400 MW.

Response:

Kelowna area summer peak load is forecast to exceed 400 MW in 2036.

14. Reference: Exhibit B-1, page 33

Table 4-1: KBTA Project Alternatives Comparison

Evaluation Criteria (Section 4.5.1)	PARAMETERS FOR RATING	WEIGHT	OPTION A RATING	OPTION B RATING	OPTION C RATING	GENERAL COMMENTS / RATIONALE FOR RATING
	Technical Criteria					
1	N-1 Criteria Considerations	10%	3	3	1	All alternatives allow FBC to serve load growth in the Kelowna area while continuing to meet N-1 planning criteria. Alternatives A & B provide 235 MW of incremental capacity in the event of a LEE transformer failure, while Alternative C provides only 85 MW of incremental capacity.
2.1	Safety	10%	3	1	3	As described in Section 4.3.1, the ring bus configuration in Alternatives A and C reduces safety risk as compared to split bus.
2.2	Operability	20%	3	2	3	As described in Section 4.3.1, the ring bus configuration in Alternatives A and C is easier to operate and maintain than split bus.
2.3	Complexity of protection and switching schemes	5%	3	1	3	As described in Section 4.3.1, the ring bus configuration in Alternatives A and C reduces the risk of misoperation incidents due to simpller protection and switching schemes.
2.4	Removal of legacy infrastructure	5%	3	2	1	Alternatives A & B address end-of-life 13 kV distribution equipment at LEE. Alternative A also addresses obsolete 138 kV breakers at LEE, as four end-of-life breakers are salvaged.
3	Potential for future expansion	20%	3	1	2	**Alternative A:** The seven breaker 138 kV ring bus could be converted in future to a nine breaker ring without expanding the bus. A nine breaker ring bus would create two additional nodes for connection of new transmission line(s) and/or a 138 kV/13 kV distribution transformer. **Alternative B:** 138 kV split bus would not provide the ability to add future nodes for the installation of a distribution transformer and/or transmission line(s). **Alternative C:** The construction of the new 230 kV yard leaves ample space for future equipment installation. The removal of 230 kV equipment from the existing station creates space for the installation of future 138 kV equipment.
4	Reliability	20%	3	2	3	As described in Section 4.3.1, the ring bus configuration in Alternatives A and C is more reliable than split bus.
	Subtotal Technical Criteria Score	**90%**	**2.70**	**1.55**	**2.2**	
	Project Risks					
5.1	Schedule Risk	2.5%	2	3	2	Transformer for all alternatives has a lead-time in excess of a year and will need to be ordered in early design stage. Construction activities for Alternative B are the less complex than Alternatives A and C, so schedule risk is lowest.
5.2	Lands Risk	2.5%	3	3	3	Agricultural Land Commission approval is required for station expansion in all alternatives.
5.3	Environmental Risk	2.5%	3	3	3	None of the alternatives require environmental permitting.
5.4	Archaeological Risk	2.5%	3	3	3	There are no known archaeological sites near LEE or DGB.
	Subtotal Risk Criteria	10.0%	0.275	0.3	0.275	
	Total Technical and Risk Criteria Score (Max 3.0)	**100%**	**2.98**	**1.85**	**2.48**	

Table 4-2: KBTA Project Alternatives Financial Comparison

	Financial Considerations					
			OPTION A	**OPTION B**	**OPTION C**	
6	**Annual O&M Costs**	**N/A**	$0.028M reduction	$0.023M reduction	$0.020M increase	
7	**Present Value Incremental Revenue Requirement**	**N/A**	$23.0M	$17.1M	$44.0M	
8	**Levelized Rate Impact**	**N/A**	0.39% $0.00045 /kWh	0.29% $0.00034 /kWh	0.75% $0.00086 /kWh	

14.1 Please provide a discussion of how FortisBC determined the appropriate weight to be applied to each of its Evaluation Criteria parameters. Was this based on judgement, or on some other formulaic measure? Please elaborate on the rationale for each criterion and explain the weighting relative to the others. For instance, why is N-1 Criteria Consideration provided with only 10%, while Potential for Future expansion is provided with double that, at 20% weighting.

Response:

Please refer to the responses to BCUC IR1 16.1 and 16.2.

14.2 Please provide a discussion of how FortisBC selects its Parameters for Rating. Are these standard parameters, or are they developed for each project?

Response:

The list of parameters for rating are typically developed for each project in recognition of the unique circumstances of the project. Parameters are identified based on input from internal stakeholders regarding key outcomes for the project and important differences between project alternatives. However, some parameters, such as Project Risks, are likely to be present in any technical comparison of project alternatives.

14.3 Did FortisBC select the scale of 3 because there are 3 Alternatives being considered? Please explain and provide FortisBC's rationale for the size of the scale. Is this how FortisBC typically determines its scale?

Response:

The scale of 1-3 was not established because three Alternatives are being considered. FBC could have selected other scales since the Alternatives are not being ranked as first, second, and third in each Parameter.

This scale is similar to that used by FBC in the 2006 CPCN for the Ellison Project (approved by Order C-4-07). Table 10 in the Ellison Project CPCN scored technical criteria for each Alternative as either:

- H (high) = best relative outcome
- M (moderate) = acceptable outcome
- L (low) = less than preferred outcome

Rather than scoring with these three qualitative ratings, the numerical equivalents of 3, 2 and 1 were chosen for this Application.

14.4 Please provide a discussion of how FortisBC determined the Rating values for each Evaluation Criteria.

Response:

Please refer to the response to BCUC IR1 16.3.

14.5 Please provide justification for the 20% weight given to the 'Potential for Future Expansion.' Please consider the following and provide quantification to support the statements.

Response:

As described in the response to BCUC IR1 16.2, "Potential for future expansion" was weighted at 20 percent because FBC considers this an important benefit and distinction between the Alternatives.

14.5.1 Under what circumstances can FortisBC expect to require Future Expansion?

Response:

Please refer to the response to BCUC IR1 14.1 for a discussion of possibilities for future expansion of LEE terminal.

14.5.2 What is the likelihood of that occurring?

Response:

Please refer to the response to BCUC IR1 14.1.

14.5.3 What would be the expected additional costs to meet this requirement?

Response:

Expected additional costs are not known at this time since the requirements for future expansion are not yet defined. However, there is an expectation that the cost to add a new transmission line and/or a distribution transformer at LEE would be significantly lower if Alternative A is selected since the bus would be configured to efficiently allow for expansion.

14.6 Please provide empirical data demonstrating the likelihood that there will be a need for Future Expansion and when.

Response:

As discussed in the response to BCUC IR1 14.1, it is likely that it will be beneficial to expand the function of the LEE terminal at some point during the life of the station. Since 2000, FBC has constructed the Benvoulin, Big White, Black Mountain, and Ellison stations in the Kelowna area. Second distribution transformer addition projects are underway or planned to begin in the next five years for the Sexsmith, Duck Lake, and DG Bell stations as well.

At this time, FBC does not have a timeline for future expansion of LEE. However, FBC maintains that the flexibility to efficiently expand a terminal station when the system need arises is a valuable attribute regardless of whether the timeline for expansion is firm.

14.7 The 'ring bus' difference appears to be the source of nearly all the Technical Criteria, please explain the reasons for this.

Response:

After eliminating potential options that are not feasible solutions for the Kelowna area, FBC concluded that an alternative that includes the addition of another terminal transformer at one of the existing terminal stations (LEE or DGB) is the preferred means of increasing the 138 kV supply to the Kelowna area[3]. Among the three Alternatives selected for further review, the significant differences are the station in which to locate the new transformer, and the configuration of the bus. FBC explains the reasons for considering only ring bus and split bus configurations in Section 4.3.1 of the Application. The technical criteria are a means of

[3] Exhibit B-1, Application, page 23, lines 26 – 28.

choosing between the available Alternatives, based on the differences between the Alternatives. Therefore, it is reasonable for the criteria to be used to evaluate those differences.

15. Reference: Exhibit B-1, page 33 and 35

Table 4-2: KBTA Project Alternatives Financial Comparison

	Financial Considerations					
			OPTION A	OPTION B	OPTION C	
6	Annual O&M Costs	N/A	$0.028M reduction	$0.023M reduction	$0.020M increase	
7	Present Value Incremental Revenue Requirement	N/A	$23.0M	$17.1M	$44.0M	
8	Levelized Rate Impact	N/A	0.39% $0.00045 /kWh	0.29% $0.00034 /kWh	0.75% $0.00086 /kWh	

4.6.3 The Preferred Solution is Alternative A

The Company's preferred solution is Alternative A, under which FBC would purchase and install a new 230/138 kV 200 MVA transformer at LEE and would reconfigure the 138 kV bus into an FBC and industry standard ring bus configuration.

From a financial perspective, the rate impact of Alternative A is approximately 0.10 percentage points higher than Alternative B.[27] However, FBC maintains that Alternative A provides a number of technical advantages that justify the additional cost. The difference in the annual bill impact for an average residential customer using 11,000 Kwh is $1.27 between Alternative A and Alternative B.

Of the three alternatives considered, Alternative A provides the best technical solution. It meets the Company's transmission planning criteria, delivers the most reliable, operable and safe final station configuration, and provides better potential for future expansion. On this basis, Alternative A is selected as the preferred solution for the KBTA Project.

15.1 Please confirm that there is no significant flaw with Alternative B, such that it would not meet the key requirements of the project, be acceptable to various regulators or perform adequately.

Response:

FBC confirms that Alternative B would meet N-1 transmission planning criteria. However, as described in the technical analysis in Sections 4.5 and 4.6.1 of the Application, Alternative B has a number of significant disadvantages as compared to Alternative A. FBC maintains that Alternative A provides the best technical solution.

15.2 Please provide the basis upon which FortisBC determines that the total cost difference of about $6 million, or a 35% premium over the lower-cost solution, is justified by the improvements in the Technical analysis.

Response:

Please refer to the response to BCOAPO IR1 14.1, which explains that FBC uses a balanced approach to determining the preferred alternative. With respect to rate impact, the capital cost differential of approximately $6 million results in a slight increase of approximately 0.10 percentage points compared to Alternative B. On balance, FBC concludes that Alternative A is the preferred solution based on the technical and financial criteria.

16. Reference: Exhibit B-1, page 46-47

5.6 *Other Approvals Required*

City of Kelowna

A municipal building permit will be required for the new control building that will be constructed within the station.

Ministry of Transportation and Infrastructure Permits

Highways and areas under the jurisdiction of the Ministry of Transportation and Infrastructure may require permits. Once the extent of any transportation impact is determined during detailed design, permits will be prepared and submitted for approval by either FBC or its vendor(s), as required. The terms and conditions outlined in these permits will be adhered to during the construction of the Project.

Agricultural Land Commission (ALC)

LEE is within the provincial Agricultural Land Reserve, and approval will be required for the station expansion. ALC approval is expected to be granted as the site is approved for non-farm use and the substation expansion will take place entirely on the existing FBC-owned property.

There are no other federal, provincial, or municipal approvals, permits, licenses or authorizations required to complete the Project.

16.1 Please confirm or otherwise explain that FortisBC does not anticipate any issues receiving the Other Approvals Required and why.

Response:

Confirmed. At this time, FBC does not anticipate any issues obtaining these permits.

17. Reference: Exhibit B-1, page 48

Table 5-1: Risk Register

Type of Risk	Risk Description	Mitigating Actions	Likelihood of Occurrence (Low / Medium / High)
Scope	Scope creep due to existing conditions not reflecting that of existing as-built drawings on record	FBC will validate existing conditions on site by surveying and reviewing substation drawings to reflect existing infrastructure	Medium
Safety	Contractors not familiar with FBC safe work practices resulting in injury or violations	Selection of contractor with FBC substation experience or train selected contractor prior to work commencing. FBC will provide a CAT 6[28] worker to act as a site safety watch for construction work	Low
Quality	Poor quality installations	FBC will have dedicated resources monitoring construction activities as scheduled by the Construction Manager. As well an Inspection & Test plan will be implemented with installation contractor for Hold and Witness points[29]	Low
Cost	Raw materials cost increase due to inflation/market value	Purchase all equipment from established suppliers and, where possible, with agreed purchase prices. Competitive tendering will be used to ensure lowest cost at best value products. Contingency may be used in the case of higher than anticipated foreign exchange or raw material escalation	Low
	Actual costs of construction higher than estimated	Detailed class three estimate completed for construction	Low

17.1 Please explain how FortisBC determines the risk levels in the risk register. Is this based on FortisBC judgement, or has there been a third party analysis undertaken?

Response:

FBC determines the risk levels in the risk register based on its experience with similar projects. FBC has completed many large station upgrades in the past and the risk register reflects the typical risks that are encountered and associated likelihoods. No third party analysis was undertaken.

17.2 Please confirm that the Risk Register identifies the likelihood of the risk, but does not identify the scale of the potential impact.

Response:

A portion of this response is being filed confidentially pursuant to Section 18 of the BCUC's Rules of Practice and Procedure regarding confidential documents adopted by Order G-15-19, as it contains capital cost estimates for the Project, the public disclosure of which could reasonably be expected to prejudice FBC's negotiating position when procuring contracts and could result in higher costs for the Project. A confidential version of this response is being filed

with the BCUC under separate cover and can be made available to registered parties upon providing a signed form of Confidentiality Declaration and Undertaking acceptable to the BCUC.

Confirmed. Table 5-1 includes a list of generic project risks and only identifies the likelihood of the risk. FBC includes in its Class 3 cost estimates a risk allowance for those risks assigned a "medium" likelihood of occurring. No provision is made for risks with a "low" expectation of occurrence.

The risk allowance by project component is provided in Confidential Appendix B-2, page 19 of 21. The following table summarizes costs by type of risk. Unused risk allowance is released from the budget and estimate to complete as the project progresses.

[redacted]

17.3 Please confirm that for a complete risk analysis the potential impacts need to be considered and evaluated and please provide the FortisBC assessment of the

consequences in financial quantitative terms and or in quantitative load shedding terms.

Response:

Confirmed. Please refer to the response to CEC IR1 17.2, for the project risk allowances.

17.3.1 Please assign an approximate quantitative range for the scale of low, medium and high.

Response:

The likelihood scale is based on FBC's previous project experience. FBC assigns the following quantitative probabilities for the different levels of risk:

- Very Low – 5%
- Low – 20%
- Medium – 40%
- High – 60%
- Very High – 80%

17.4 Please provide another column in Table 5-1 identifying the potential magnitude of the cost risk associated with each Risk.

Response:

The Safety, Quality, and Cost risks identified in Table 5-1 are all identified as low risk and FBC has not included specific cost for these 3 categories. The project contingency is expected to absorb these costs if incurred. Please refer to the response to CEC IR1 17.2 for the magnitude of cost risk associated with Scope in Table 5-1 above.

18. Reference: Exhibit B-1, pages 49 and 50

Type of Risk	Risk Description	Mitigating Actions	Likelihood of Occurrence (Low / Medium / High)
Schedule	Availability of resources	External contractors will be used with support from internal FortisBC crews. FBC anticipates availability of qualified external resources	Low
	Delivery of services and materials	Schedule and order long lead-time materials in the early stages of the design to allow for ample time for delivery to site before required	Low
	Meeting construction windows for transmission outages	In depth planning and scheduling of outages will be used to reduce this risk along with provisions of schedule buffers to mitigate impacts	Low
	Scheduling conflicts with other system outages	Early involvement and awareness from all internal groups well before construction to align outage requirements with system constraints	Medium
	Project completion delayed	Insert milestones in the contract with contractor and consider implementing liquidated damages or bonus structure to achieve schedule	Medium
	Agricultural Land Commission (ALC) approval	Application to ALC for approval of station expansion (the property is currently approved for non-agricultural use)	Low
Environment & Archaeological	Contaminated soils around existing oil filled equipment	Early recognition by soil sampling to identify any contaminated areas	Low
	Wildfire risk when relocating transmission structures and completing site expansion	In depth planning and scheduling this portion of work outside of wild fire season when possible. The work is confined to the substation property which has limited vegetation	Low

Type of Risk	Risk Description	Mitigating Actions	Likelihood of Occurrence (Low / Medium / High)
	Ground water issues may cause construction delays	In depth planning and scheduling work outside of the peak spring runoff times. Review of station environmental ground water survey	Medium
	Unforeseen environmental or archaeological discoveries during construction	Early consultation and exploration of unforeseen archaeological sites in the area of construction	Low

18.1 Please confirm that there is no known risk to wildlife as a result of the project.

Response:

According to the Ministry of Forest, Lands, and Natural Resource Operations' database, there are no Species at Risk Critical Habitat designations adjacent to the LEE Substation. Lewis's Woodpecker and Great Basin Spadefoot Toad each have designated Critical Habitat approximately 500m from the substation. American Badger are known to occur throughout the Okanagan, though there are no specific sites associated with this animal in the vicinity of LEE.

The LEE Substation sits outside of the City of Kelowna's Natural Environment Development Permit zone and the City of Kelowna's Hazardous Condition Development Permit zone; therefore, no permitting from the City is required.

The substation footprint expansion is on disturbed land which is expected to have low wildlife habitat suitability.

Environmental Risks, including potential wildlife impacts, associated with construction are managed under a site specific Environmental Management Plan developed by a Qualified Environmental Professional.

18.2 Would any of the risks have changed significantly under a different alternative? Please explain.

Response:

The risks identified above would not change under a different alternative since the outages required to complete both alternatives are very similar in nature. In addition, the civil works for site expansions are identical for both alternatives.

19. Reference: Exhibit B-1 page 55-56

6.4.2 Incremental Revenue Requirements and Rate Impact

The Project construction period is between 2021 and 2022 with the majority of assets entering rate base in 2023. A 40 year cost of service model, equivalent to the life of the assets, was used to evaluate the rate impact. The rate impact in 2024, the year when all assets have been transferred into plant asset accounts is estimated at 0.54 percent. This equates to an annual bill increase of $6.87 for an average residential customer using 11,000 kWh. The levelized 40 year rate impact is 0.39 percent or approximately $0.45 per MWh. The annual bill impact for an average residential customer using 11,000 kWh at the 40 year levelized rate would be approximately $4.96.

6.5 *SUMMARY*

In this section, FBC has described the Project cost estimate, the financial evaluation, accounting treatment, and the estimated rate impact. The Project is estimated to cost $23.288 million in as-spent dollars including net removal costs. The levelized rate impact of Alternative A is projected to be 0.39 percent or approximately $0.45 per MWh, and will add approximately $4.96 to the annual bill for the average customer using 11,000 kWh.

19.1 Please explain if there would be any change in treatment or other impacts depending on the form of regulation (i.e. cost of service or MRP).

Response:

The regulatory regime does not have any impact on the treatment of CPCN project costs. Under the recently approved MRP[4], CPCN projects are recorded on a cost of service basis. That is, actual project costs are recorded in rate base in the year subsequent to being placed in service. The Project will result in a reduction to Gross O&M Expense of approximately $28 thousand upon project completion, beginning in 2023. Under the MRP, the majority of O&M expense is determined by formula and FBC will reduce the formula amount for the KBTA Project savings. Under cost of service regulation, a similar adjustment to O&M Expense would also be required.

[4] FBC's MRP was approved by Order G-166-20.

20. Reference: Exhibit B-1, page 58 and 59

7.2 *KEY STAKEHOLDERS*

The Key Stakeholders for the KBTA Project have been identified as:

- City of Kelowna elected officials and staff;
- Residents and businesses at the Tower Ranch subdivision and Tower Ranch Golf & Country Club, and other residents adjacent to or in close proximity to LEE; and
- Indigenous Communities as identified through the Provincial Consultative Areas Database.

20.1 Please provide the number of Residents and businesses at the Tower Ranch subdivision and Tower Ranch Golf & Country Club, and other business or residents adjacent to or in close proximity to LEE. Please separate by Rate Class.

Response:

Please refer to the table below for the requested information.

Rate Classification	Number of customers
Residential	280 (approximately)
Small Commercial	17
Irrigation	7

21. Reference: Exhibit B-1, page 58

> ### 7.4 CONSULTATION WITH LOCAL RESIDENTS
>
> With the assistance of the Tower Ranch Community Association (TRCA), FBC has had an opportunity to reach a very high percentage of local residents. The TRCA maintains a contact list covering 100 percent of the residents living in the subdivision, including e-mail addresses. The Company has been able to work through the TRCA to send consultation information directly to the affected customers. This is of particular importance since many of the residents were absent from the area during the consultation phase of the Project.
>
> To date, activities included the following:
>
> - Development of a Project webpage, providing an email address where questions/ inquiries can be submitted to the Company, and a link to a short survey where residents can provide their input on the Project;
> - Sending notification letters to area residents and businesses directly impacted by the Project; and
> - Hosting a virtual Town Hall / Information Session for area residents.

21.1 Did FortisBC offer businesses an equivalent survey to residents? Please explain.

Response:

FBC offered businesses the same survey as residents. Specifically, businesses were provided the same letter by mail that included information about the Project, a link to the Project webpage and the online survey, as well as information to participate in the virtual town hall / information session.

21.2 What proportion of businesses was FortisBC able to reach?

Response:

There are two businesses in proximity to the Project, as well as an irrigation district with interests in the area. A project notification letter was sent to each. The letter to the irrigation district was returned to sender after filing of the Application. FBC will follow up with this irrigation district once correct contact information is confirmed to provide information on the Project. The other two notifications letters, sent to the businesses, were not returned to sender, and one of the businesses participated in the virtual town hall on April 22, 2020.