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July 9, 2020

British Columbia Utilities Commission
Suite 410, 900 Howe Street
Vancouver, B.C.
V6Z 2N3

Attention: Ms. Marija Tresoglavic, Acting Commission Secretary

Dear Ms. Tresoglavic:

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 British Columbia Utilities Commission (BCUC) Information Request (IR) No. 1

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

If further information is required, please contact the undersigned.

Sincerely,

FORTISBC INC.

Original signed:

Doug Slater

Attachments

cc (email only): Registered Parties

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A. APPLICANT

1.0 Reference: INTRODUCTION

Exhibit B-1, Section 1.1.3, p. 3

The Preferred Alternative

On page 3 of FortisBC Inc's (FBC) Application for a Certificate of Public Convenience and Necessity (CPCN) for the Kelowna Bulk Transformer Addition Project (KBTA Project) (Application), FBC states:

> The required substation modifications, including the reconfiguration of the 238 kV bus to a ring bus configuration, inside [the FA Lee Terminal Station];

1.1 Please confirm the reference to "238kV bus" is a typo.

Response:

Confirmed. This reference should read "138kV bus".

B. PROJECT NEED AND JUSTIFICATION

2.0 Reference: PROJECT NEED AND JUSTIFICATION

Exhibit B-1, Section 3.2, p. 12

Kelowna Area System

On page 12 of the Application, FBC states:

> 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

2.1 Please update Table 3-1 to include the overall load composition broken down for each rate class (i.e. the percent of overall load attributed to each rate class shown).

Response:

Based on 2019 billed consumption data for FBC direct customers in the Kelowna area, the table has been updated to include overall load composition:

Rate Class	Customer Count	Percent of Load Attributed to Rate Class (2019 Consumption)
Small Commercial/Commercial	9,781	41.87%
Large Commercial	22	8.88%
Irrigation	212	0.31%
Lighting	467	1.27%
Residential	66,133	47.68%
Total	76,615	100.00%

On page 12, FBC states:

> 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.

2.2 Please identify, to the best of FBC's knowledge, which of the major customers listed in the above preamble have on-site back-up generation to supply their load in the event of an FBC power outage.

Response:

To FBC's knowledge:

- Kelowna General Hospital has on-site back-up generation; and
- Big White Ski Resort can operate a number of chairlifts at partial or full capacity using diesel drive back-up in the event of an FBC power outage.

The ability of customers to self-generate in the event of a system outage does not relieve FBC of the requirement to serve customer load, nor does it affect FBC's system planning criteria. FBC does not include customer back-up generation in any system planning studies. Irrespective of a customer's potential capability to self-supply some or all of their electrical need, FBC considers an outage to a customer as a loss of load for planning purposes. As back-up generation is customer-owned equipment that FBC does not maintain or operate, FBC could not assume that this equipment will be available in the event of an outage. Further, FBC could not assume that a customer with on-site back-up generation would not be negatively impacted by an outage.

Further on page 12, FBC states:

> In addition, FBC provides electricity to BC Hydro for service to its approximately 8,000 customers in the Duck Lake area[6], which can also be seen in Figure 3-1.
>
> [6] The Duck Lake Wheeling Agreement between FBC and BC Hydro was approved by Order G-19-10.

2.3 Please describe how FBC provides electricity to British Columbia Hydro and Power Authority (BC Hydro) for service to its Duck Lake Customers (i.e. from which substation, at what voltage, etc.).

Response:

This electricity is supplied from FBC's 138 kV Kelowna system. At the Duck Lake substation, voltage is stepped down to 25 kV by two 50 MVA transformers. The 25 kV bus at Duck Lake supplies four BC Hydro distribution feeders via four distribution breakers.

2.3.1 If service to BC Hydro's Duck Lake service area is from FBC's 138 kV Kelowna system, please confirm if this load is included in FBC's peak load forecast provided in Table 3-5 of the Application.

Response:

Confirmed. BC Hydro's Duck Lake service area load is included in FBC's peak load forecast.

2.3.1.1 Please also describe in detail how FBC determines the peak load forecast for this area. Please include any underlying calculations and assumptions.

Response:

The Duck Lake BC Hydro peak load forecast is based on a 10-year winter peak forecast provided by BC Hydro. The following 10 years are based on the slope of the growth rate for the immediately previous 5 years. The summer forecast is based on the actual summer/winter DUC transformer load ratio to scale down the provided and extrapolated winter forecast values.

3.0 Reference: PROJECT NEED AND JUSTIFICATION

Exhibit B-1, Section 3.3.1, pp. 11, 14

Population and Housing

On page 11, FBC provides a map of the Kelowna Load area in Figure 3-1.

On page 14 of the Application, FBC states:

> 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%	

[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.

3.1 Please describe at what frequency BC Stats provides population projections to FBC.

Response:

BC Stats provides population projections to FBC on an annual basis.

3.2 Please confirm how recently the population projections shown in Table 3-2 were prepared by BC Stats for FBC.

Response:

The population projections from BC Stats were provided in January 2020.

3.3 Please confirm that the population projections provided in Table 3-2 refer to the same area that Figure 3-1 defines as the FBC Kelowna Load Area.

Response:

Confirmed. These population projections are for the area defined as "FortisBC Kelowna Load Area" in Figure 3-1. The area defined as "BC Hydro Kelowna Load Area" in Figure 3-1 is not included in these projections, however as noted in the response to BCUC IR1 2.3.1, the energy and demand related to BC Hydro's customers is included in FBC's actual and forecast loads.

3.3.1 Please also confirm whether the BC Hydro Kelowna Load area (Duck Lake) is included in the population projections.

Response:

As noted in the response to BCUC IR1 3.3, the BC Hydro Kelowna Load Area is not included in these population projections; however, the energy and demand related to BC Hydro's customers is included in FBC's actual and forecast loads.

4.0 Reference: PROJECT NEED AND JUSTIFICATION

Exhibit B-1, Section 3.3.2, pp. 15-16

Kelowna Area Load Forecast

On page 15 of the Application, FBC states:

> Peak load forecasting for system planning purposes differs from forecasting energy and peak load for resource (energy) supply purposes in one important way. Unlike a resource planning forecast, which is a "weather-normalized" forecast used to determine FBC's resource requirements, the forecast for system planning purposes must account for possible weather extremes that directly impact winter and summer peak loads, in order to ensure sufficient capacity under adverse conditions.
>
> FBC accomplishes this through the use of a "1-in-20" year load forecast. This forecast is higher than the expected load forecast under normal conditions, meaning that there is only a 5 percent probability that loads will be higher than the "1-in-20" year forecast. This forecast is used as the basis for determining compliance with FBC's transmission planning standards and is also consistent with industry practice.[13]
>
> [13] The success rate of the 1-in-20 forecast is expected to be 95 percent (a 5 percent chance that actual load will be higher). Industry practice requires that a quantitative risk factor, such as the 1-in-20 forecast, be incorporated into transmission planning studies such as the power flow models submitted by FBC to the Western Electricity Coordinating Council (WECC) for application in regional and system-wide transmission planning.

4.1 Please discuss how FBC determines that the use of a "1-in-20" load forecast for transmission planning studies to be consistent with industry practice. Please identify any relevant industry standards, if applicable.

Response:

The statement is meant to indicate that it is standard industry practice for a utility to attempt to quantify risk, not to state that there is a single standard accepted by all utilities. There are currently no standards, mandatory or other, that prescribe the risk level and confidence bands of a load forecast. Local conditions in the economy and weather vary significantly in different jurisdictions, making the application of uniform risk standards impractical. For example, a 95 percent confidence band will be wider in jurisdiction A versus B, if weather patterns in A are more variable than in B. Some utilities compute confidence bands for 90 percent and 95 percent confidence, while others employ Monte Carlo methods to compute a confidence band, which determine the probability that the actual peak load will exceed the forecast peak load in a particular year. Large geographic jurisdictions will generally have a lesser variance due to extreme weather, as non-uniform weather conditions will mitigate the total effect. Smaller areas,

such as FBC, are exposed to a greater relative risk. The objective of the 1-in-20 load forecast at FBC is to provide system planners with a benchmark level that quantifies the risk of the transmission plan. Transmission adequacy is extremely important, as shortages in transmission cannot be mitigated in the short term except with customer outages.

4.2 Please discuss for how long FBC has been using a "1-in-20" year load forecast for system planning purposes.

Response:

FBC has been using a "1 in 20" peak load forecast for planning purposes since at least 2011. The system planning forecast method, including the 1-in-20 peak load forecast method, was examined in FBC's Application for Approval of 2012-2013 Revenue Requirements and Review of 2012 Integrated System Plan.[1] This method underpins FBC's capital plans, including the capital detail filed in support of the 2014-2019 Performance-Based Rates Application and the capital plan filed in the 2020-2024 Multi-Year Rate Plan Application. The KBTA Project Application is the second CPCN application filed since 2011 in which the peak load forecast is relevant. The other, FBC's Grand Forks Terminal Station Reliability Project application,[2] was approved by Order G-2-19.

4.3 Please identify other applications FBC has submitted to the British Columbia Utilities Commission (BCUC) that utilizes a "1-in 20" year load forecast.

Response:

Please refer to the response to BCUC IR1 4.2.

4.4 Please discuss in detail FBC's process for preparing a "1-in-20" year peak load forecast. Please include all underlying calculations and assumptions.

[1] Application for Approval of 2012-2013 Revenue Requirements and Review of 2012 Integrated System Plan, Volume I, Tab 3, Appendix 3F.

[2] The 1-in-20 forecast was discussed in response to ICG IR 2.11.1, Exhibit B-12.

Response:

The system-wide 1-in-20 load forecast is developed in a series of steps:

- The hour for each peak (excluding self-generating customers and wheeling losses) in January, February, November, December, as well as June, July and August for each year in the period 2000-2019 is recorded.
- Historical net energy growth rates are derived from actual 2000-2019 sales. Forecast net energy growth rates are used to escalate the peaks into future years as described below.
- Assuming that the weather in 2020 will be similar to the weather of base year 2000, the corresponding January peak in 2020 is obtained by applying to the base year the cumulative growth of years 2000-2019. The 2020 peaks for February, November, and December, as well as June, July, August are obtained in the same manner. The calculation is then repeated for the remaining 19 base years from 2001 to 2019.
- The method yields 20 values for the 2020 winter peaks corresponding to 20 base years from 2000 to 2019. The maximum peak of these 20 values is defined as the 1-in-20 winter peak for 2020. The 1-in-20 summer peak is derived in the same manner. The resulting 2020 peaks are then escalated with growth rates to compute the 1-in-20 forecast peaks over the planning horizon.
- Area peak forecasts are created by allocating 1-in-20 system peak forecast among FBC's substations. This is done by scaling the Distribution Planning forecast, which is the sum of non-coincident substation peak forecasts to the system peak (the coincident peak). The Kelowna area peak forecast in Table 3-5 is the sum of the load distributed to Kelowna area substation buses in that manner, taking into account the need to ensure adequate capacity on the Duck Lake substation based on the peak forecast provided by BC Hydro, as described in the response to BCUC IR1 2.3.1.

FBC has not included the specific calculations because they are derived from a series of complex and inter-related models that would not be transparent to external parties. The peak load forecast to 2038 by distribution substation is provided in the response to ICG IR1 5.2.

4.4.1 Please compare this process to how FBC prepares a peak load forecast for resource supply purposes. Please explain, with rationale, where differences occur.

Response:

The peak load forecast for resource planning uses the same method explained in the response to BCUC IR1 4.4, with two exceptions: resource planning uses the average of the peaks instead of the maximum, and a ten-year timeframe instead of twenty.

For the purpose of resource planning, FBC plans to the expected forecast, excluding weather extremes, and secures additional resources if needed. If FBC acquired resources to meet the 1-in-20 forecast level, it would result in FBC entering into contacts or procuring resources that would not be fully utilized and add costs to customer rates.

Conversely, if FBC planned its system based on average temperatures, the higher peak loads caused by warmer or colder weather would not be accounted for. The forecast is necessarily higher than what would be expected under normal conditions because the forecast for system planning purposes must account for possible weather extremes that directly impact winter and summer peak loads in order to ensure sufficient capacity under adverse conditions as explained on page 15 of the Application.

4.5 In the above preamble, FBC indicates "…the forecast for system planning purposes must account for possible weather extremes…". Please explain what FBC considers to be a weather extreme.

Response:

For the purposes of System Planning forecasting, extreme weather is weather that occurs once every 20 years (1-in-20). Currently the coldest average daily temperature recorded at the Kelowna airport in the prior twenty years is -24.2C recorded on December 20, 2008. The warmest average daily temperature recorded in the prior 20 years was 27.5C recorded July 30, 2018.

Extreme weather days usually coincide with the monthly peaks since more energy is used to heat or cool homes, increasing capacity requirements. FBC does not directly include weather in the 1-in-20 forecast but instead uses the maximum peaks associated with that weather. Please also refer to the response to BCUC IR1 4.4 for further information on how the 1-in-20 peak is calculated.

4.6 Please explain how a "1-in-20" peak load forecast accounts for possible weather extremes.

Response:

The 1-in-20 forecast is based on the maximum peaks during the preceding twenty-year period, which occur on extreme weather days and increase capacity requirements. Please also refer to the response to BCUC IR1 4.4, which describes the 1-in-20 peak demand calculation.

4.7 Please discuss FBC's process for weather normalizing a peak load forecast used for resource supply purposes.

Response:

FBC does not explicitly weather-normalize the peak load forecast for resource supply purposes. Rather, the peak load is forecast using average peak in the preceding ten years, as explained in the response to BCUC IR1 4.4.1.

4.8 Please explain why a weather normalized load forecast is not appropriate for use in this Application.

Response:

Please refer to the response to BCUC IR1 4.4.1.

On page 16 of the Application, FBC provides the summer and winter peak actual loads from 2014 to 2019 in Table 3-4. Table 3-4 is reproduced 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

4.9 Please update Table 3-4 to include the actual summer and winter peak load data at the FA Lee Terminal Station (LEE) and the DG Bell Terminal Station (DGB) for each year shown.

Response:

Table 3-4 has been updated below to include the actual summer and winter peak load data for LEE T3, LEE T4, and DGB T2:

	2014	2015	2016	2017	2018	2019
LEE T3 Summer (MW)	104.8	94.4	95.1	95.3	103.3	110.5
LEE T4 Summer (MW)	88.4	108.8	105	105.3	112.4	123.2
DGB T2 Summer (MW)	83.8	86.1	86.3	91.1	87.1	82.7
Kelowna Summer (MW)	276.4	283.7	281.4	288.1	301.0	300.5
LEE T3 Winter (MW)	103.1	90.8	102.2	97.3	103.2	109.1
LEE T4 Winter (MW)	86.7	98.8	111.2	104.9	109.8	117.3
DGB T2 Winter (MW)	87.1	78.9	93.4	86.1	87.2	100.5
Kelowna Winter (MW)	277.0	268.3	306.9	283.6	298.6	324.9

4.10 Please provide, in a fully functioning Excel spreadsheet, the historical load data for LEE Transformer 3 (T3), LEE Transformer 4 (T4) and DGB Transformer 2 (T2) for years 2015 to present (or as recent as possible). Please identify where the peak loads occurred.

Response:

Please refer to Attachment 4.10 for fully functioning Excel spreadsheets containing historical load data for each of the three transformers for summer and winter periods from 2015 to 2019. Dates and times of the peak load on each transformer are provided at the top of each column. Peak values are highlighted in yellow.

4.11 Please discuss the performance of FBC's peak load forecasts as compared to actual peak loads experienced.

Response:

The actual peak loads experienced in summer and winter are impacted significantly by temperature extremes. This variability is seen in the data shown in Table 3-4, where actuals sometimes decrease year-over-year, despite a steadily increasing number of customers and an overall positive load growth trend. As such, a comparison of actual loads with those forecast by a 1-in-20 forecast would typically provide an indication of the presence or absence of weather extremes rather than a direct measure of forecasting performance.

4.11.1 Please discuss how FBC evaluates its peak load forecasting performance.

Response:

The load forecast methodologies are reviewed on an annual basis and the most recent actual peaks are inputs into the forecast. If there are significant changes in the forecast, the reasons for these changes are investigated. This annual evaluation of changes to the forecast and review of methods constitutes FBC's evaluation of performance.

4.11.2 Please provide any recent performance metrics related to FBC's peak load forecasting.

Response:

As described in the response to BCUC IR1 4.11, differences between the 1-in-20 peak forecast and actual peak loads experienced are typically driven by temperature. As such, performance metrics comparing forecast to actuals are not calculated.

4.11.3 Please discuss if and how FBC utilizes past performance of peak load forecasts in the development of future peak load forecasts.

Response:

Please refer to the response to BCUC IR 1.4.11.1.

Further on page 16, FBC provides the summer and winter peak load forecast from 2020 to 2028 in Table 3-5. Table 3-5 is reproduced 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

4.12 Please describe in detail how FBC prepares the summer and winter peak load forecast as shown in Table 3-5. Please include all underlying assumptions and calculations.

Response:

Please refer to the response to BCUC IR1 4.4.

4.13 Please provide substation level summer and winter peak load forecast, if possible, for LEE and DGB for each year shown.

Response:

Please see the table below for the substation summer and winter peak load forecast for LEE and DGB for each year from 2020 to 2028:

PEAK LOAD FORECAST (MW)

Substation	2020	2021	2022	2023	2024	2025	2026	2027	2028
Summer									
LEE	222.4	226.1	229.8	233.9	238.1	241.9	246.7	251.1	255.3
DGB	87.0	88.6	90.1	91.5	93.3	94.6	96.6	98.4	100.1
Winter									
LEE	238.5	241.1	244.0	247.2	250.1	253.2	256.5	259.7	262.6
DGB	101.9	102.8	104.3	105.6	106.9	108.1	109.3	110.6	111.9

On page 16, FBC states:

> 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.

4.14 Please describe how FBC determines that a load development is sufficiently probable to include in its peak load forecast.

Response:

Developments are determined to be sufficiently probable for inclusion in the area peak load forecast by assessing factors such as FBC experience with the developer, progress of construction, the amount of the required customer contribution for the extension, and the payment status of the customer contribution. In all cases, the FBC design for the extension or

service upgrade must be sufficiently advanced that peak load values and service extension details are known.

4.15 Please provide a breakdown of load (in MW) included in the peak load forecast that is not yet connected to FBC's system.

Response:

FBC's load forecast does not isolate the amount of incremental load growth in the peak load forecast that is attributable to load that is not yet connected to FBC's system. Attributing the growth in peak load to loads not yet connected to the system provides a reasonable approximation since the connection of new loads has been the primary driver of actual growth in the Kelowna area peak and since almost all of the incremental load growth included in the forecast is due to load that is not yet connected to FBC's system.

5.0 Reference: PROJECT NEED AND JUSTIFICATION

Exhibit B-1, Section 3.3.2.1, pp. 17-18

Impact of COVID-19 on Load Forecast

On page 17, FBC states:

> 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.

5.1 Please provide any updates to the peak load forecast as a result of expected impacts due to the COVID-19 pandemic.

Response:

To date, FBC has not identified a significant impact on load that is attributable to the COVID-19 pandemic. Energy consumption since mid-March of 2020 is less than 1 percent different from the most recent three year average for the same period after adjusting for weather and load growth. FBC does not believe these changes would result in a materially different peak forecast and therefore has not updated the peak forecast.

5.2 Please explain, with rationale, if FBC expects there to be differences in how the COVID-19 pandemic may impact FBC's energy consumption forecast versus how the COVID-19 pandemic may impact FBC's peak load forecast.

Response:

Please refer to the response to BCUC IR1 5.1.

6.0 Reference: PROJECT NEED AND JUSTIFICATION

Exhibit B-1, Section 3.2, p. 13; Section 3.4, p. 18; FortisBC Energy Inc. and FortisBC Inc. (collectively FortisBC) Application for Approval of a Multi-Year Rate Plan for 2020 through 2024; Exhibit B-10, Attachment 60.3

FBC Planning Criteria

In FortisBC Energy Inc. and FortisBC Inc. Application for Approval of a Multi-Year Rate Plan for 2020 through 2024, FortisBC includes Attachment 60.3 in Exhibit B-10, which is FortisBC's responses to BCUC IR1.[3] Attachment 60.3 states the following regarding the Kelowna Bulk Transformer Addition:

> The project is also required to ensure continued compliance with BC Mandatory Reliability Standard TPL-001-4, which requires that applicable thermal ratings are not exceeded following the loss of a single element.

In footnote 14 on page 18 of the Application, FBC states:

> The Kelowna area 138 kV system is not subject to provincial Mandatory Reliability Standards (MRS). Although greater than 100 kV (the threshold definition for the Bulk Electric System (BES) to which MRS apply, subject to exclusions), this area is a Local Network and meets the BES definition of Exclusion E3 for Local Networks as described in BCUC letter L-56-14 dated October 29, 2014.

6.1 Please confirm if FBC's 138 kV Kelowna system is subject to Mandatory Reliability Standards (MRS).

Response:

FBC's 138 kV Kelowna system is not subject to MRS, as explained in the Application. FBC notes that prior to March 2016 (at which time the BCUC formally confirmed the exclusion methodology for Local Networks), the Kelowna 138 kV system was considered part of the Bulk Electric System and hence was subject to the BC MRS. The statement provided in the Multi-Year Rate Plan proceeding was inadvertently included based on this previous requirement which was no longer in effect.

[3] https://www.bcuc.com/Documents/Proceedings/2019/DOC_54278_B-10-FortisBC-Responses-to-BCUC-IR1.pdf

6.2 Please confirm if FBC is required to submit any power flow models to the Western Electricity Coordinating Council (WECC) for the Kelowna 138 kV system.

6.2.1 If yes, please discuss the requirements for these submissions.

Response:

FBC is required to submit power flow models for the entire FBC system to WECC. These models represent various load and generation conditions (i.e., winter peak, summer peak etc.) as per WECC identified requirements. These power flow models are prepared and supplied to WECC through the planning coordinator, BC Hydro, several times a year both for current and future years.

On Page 18 of the Application, FBC states:

> Typical industry transmission planning standards require the system to be planned such that all projected customer loads are served during both normal (N-0)[15] operation and single contingency (N-1)[16] operation.

[15] Normal operation, also referred to as N-0 reliability, means that with all major elements of the power system in service, the network can be operated to meet projected customer demand in order to avoid a load loss (customer outage).

[16] Single contingency, also referred to as N-1 reliability, means that an outage of a single element with all other elements of the power system in service (a single transmission line, transformer, generating unit, power conditioning unit like a shunt capacitor bank, a shunt reactor bank, a series capacitor, a series reactor, etc.) results in no load loss.

6.3 Please provide specific references for the typical industry standards FBC refers to in the above preamble.

Response:

Please refer to the response to BCUC IR1 4.1.

6.4 Footnote 16 above provides a partial list of power system elements that N-1 planning criteria is applied to. Please provide a complete list of power system elements that FBC applies N-1 planning criteria to.

Response:

FBC applies N-1 planning criteria to transmission lines, transformers, generating units, and power-conditioning units. A power-conditioning unit includes a shunt capacitor bank, a shunt reactor bank, a series capacitor, a series reactor, a synchronous condenser, a static VAR compensating device, a filter bank, or other similar device that can be removed from the system by protection equipment.

On Page 18 on the Application, FBC states:

> 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.

6.5 Please describe what FBC considers to be the defining characteristics of an interconnected system.

Response:

FBC considers an interconnected system to refer to certain areas or loads that have more than one transmission source (i.e., areas or loads that are not supplied radially) and that can continue to be supplied without interruption during a single contingency event.

6.6 Please discuss whether all transmission facilities which FBC considers to be part of FBC's interconnected system achieve N-1 planning criteria.

6.6.1 For those facilities that do not, please discuss why not.

Response:

Subject to the exceptions set out below, all FBC transmission facilities meet the N-1 planning criteria such that, following a contingency event, an alternate source is available to continue supplying load following a momentary interruption. There are two exceptions:

- In the event of an outage of line 30L from South Slocan substation to Coffee Creek substation, line 32L from Crawford Bay to Lambert Terminal substation has limited capability and cannot supply the area peak load. A review of alternatives to provide contingency support for line 30L is underway. In the meantime, FBC has implemented more aggressive vegetation management along line 30L to reduce the probability of an outage and improve its reliability.
- A.S. Mawdsley (ASM) transformers T1 & T2 located at FBC Warfield are currently protected by a single high side circuit breaker. In case of a fault, both the transformers are out of service, which does not meet N-1 planning criteria. Options for the ASM transformers and station upgrades are currently under review.

6.7 Please provide a map of FBC's Transmission System labelled to identify which parts of the system FBC's considers to be part of the interconnected system where N-1 planning criteria applies, and which parts of the system are not considered part of the interconnected system where N-1 planning criteria does not apply.

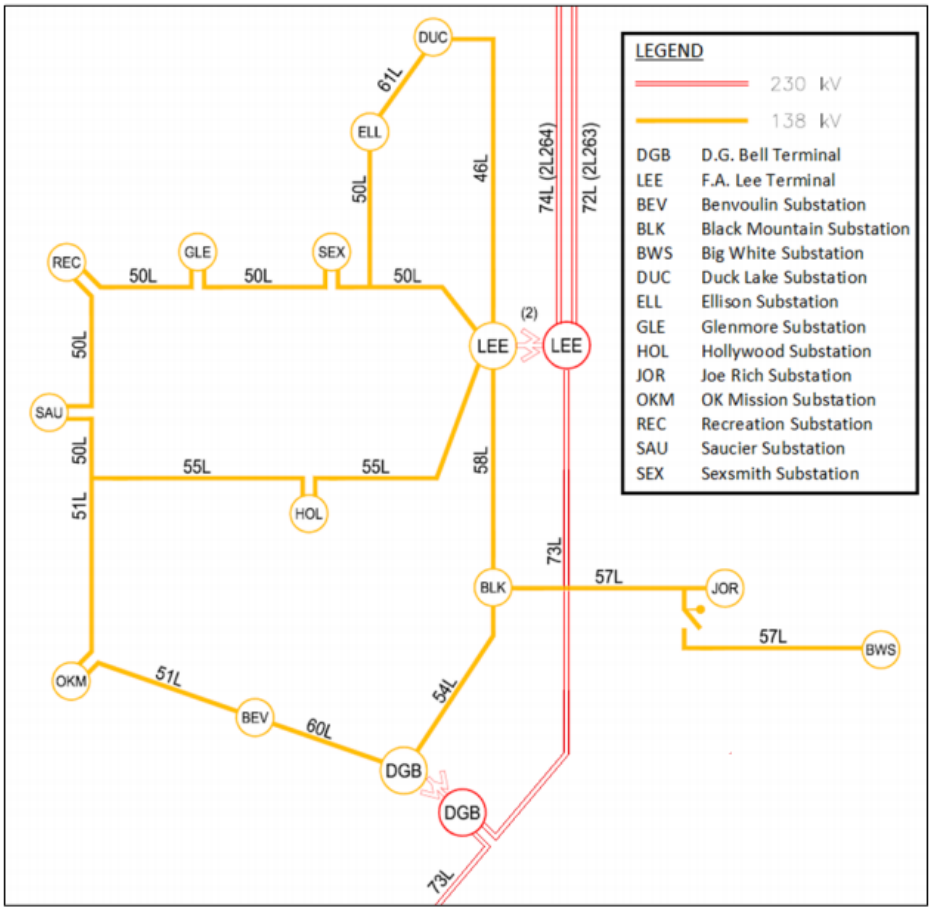
Response:

Please refer to Confidential Attachment 6.7 which includes a single line drawing for FBC's interconnected system, the radial lines are highlighted. The N-1 planning criteria applies to the entire FBC system with the exception of radial lines.

Attachment 6.7 is being filed confidentially pursuant to Rule 18 of the BCUC's Rules of Practice and Procedure regarding confidential documents as set out in Order G-15-19 on the basis that it contains sensitive technical information pertaining to the Company's assets. Public disclosure of the technical and engineering information contained in Attachment 6.7 elevates the risk of potential harm to FBC's assets by persons with malicious intent, which could result in damage to the assets and/or limit, restrict or impair their operation. Disclosure of this information could reasonably be expected to result in harm to the safety of the public, the Company's employees, and the assets themselves. 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.

On page 13 of the Application, Figure 3-2 describes the Kelowna Area Transmission System. Figure 3-2 is reproduced below.

Figure 3-2: Kelowna Area Transmission System



On Page 18 on the Application, FBC states:

> 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.

6.8 Please discuss if FBC considers transmission line 57L, as shown in Figure 3-2, to be a radial transmission line.

Response:

FBC confirms that 57L is considered a radial transmission line.

6.8.1 Please confirm the 2019 summer and winter peak load data for all load connected to 57L.

Response:

There are two stations connected to 57L: Joe Rich and Big White substations. The 2019 summer and winter peak loads for those stations were as follows:

Station	Summer Peak MVA	Winter Peak MVA
Big White (BWS)	3.06	13.29
Joe Rich (JOR)	1.45	2.78

6.9 Other than the transformer capacity being considered in this Application, please identify if there are any other power system elements in the Kelowna area (where FBC considers N-1 planning criteria to apply) that are at risk of not maintaining the N-1 planning criteria for the 2020-2030 time period. Please include in the response FBC's plans to address these items.

Response:

There are currently no power system elements in the Kelowna area that are at risk of not maintaining the N-1 planning criteria within the 2020-2030 time period.

6.10 Please discuss the contingency scenarios for FBC's 230 kV system in Kelowna in the 2020-2028 time period. Specifically, please confirm that any one of transmission lines 74L, 72L or 73L can be taken out of service while still maintaining service to Kelowna area load.

Response:

Confirmed. FBC's 230 kV system in the Kelowna area meets the N-1 planning criteria. As such, any one of 72L, 73L or 74L can go out of service without any interruption of Kelowna load within the 2020-2028 time period.

7.0 Reference: PROJECT NEED AND JUSTIFICATION

Exhibit B-1, Section 3.3.2, pp. 16-17; Section 3.4.1, p. 19

Seasonal Peaks Forecast to Reach Emergency Limits in N-1 Conditions

On pages 16-17 of the Application, FBC states:

> 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.

7.1 Please provide the summer transformer limit in MVA.

Response:

The summer transformer limit is 332 MVA, assuming a power factor of 0.95.

7.2 Please describe how FBC determined the existing N-1 Summer and Winter Transformer Limits for the Kelowna Area. Please include all underlying calculations and assumptions.

Response:

Both summer and winter limits are based on the post contingency flow after the outage of a LEE transformer. FBC's operating procedures require the post contingency flow to be brought within the emergency rating within 15 minutes and to be reduced within the normal rating level within six hours.

The summer peak load level of 315 MW is considered to be the summer transformer limit because it is the maximum load that a reconfigured area system can manage while remaining within normal operating limits, as determined by power flow studies. The corresponding winter peak load is 370 MW.

At a summer peak load level of 315 MW in case of the outage of LEE T3 or T4, the power flow on the remaining transformer is 191 MVA, 91 percent of its 210 MVA emergency rating. After system reconfiguration, the flow on the remaining transformer is 168 MVA, which is 80 percent of the emergency rating and 100 percent of the normal rating of T3 and T4.

At a winter peak load level of 370 MW in case of the outage of LEE T3 or T4, the power flow on the remaining transformer is 232 MVA, 103 percent of its 227 MVA emergency rating. After

system reconfiguration the flow on the remaining transformer is 205 MVA, that is 90 percent of the emergency rating of T3 and T4 and 103 percent of the normal rating of T3 (199 MVA) and 100 percent of normal rating of T4 (205 MVA).

On page 19 of the Application, FBC states:

> 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.

7.3 Generally speaking, please describe the ratings and limits associated with FBC's transformers (i.e. normal ratings, emergency limits). Please also describe which ratings and limits are impacted by seasonal temperatures.

Response:

The summer normal rating utilized by FBC is 100 percent of the maximum transformer nameplate rating as provided by the manufacturer. The summer emergency rating is 125 percent of the maximum transformer nameplate rating as provided by the manufacturer. Both of these summer ratings are based on an ambient temperature of 40 degrees Celsius.

The winter normal rating utilized by FBC is 100 percent of the maximum 0 degree Celsius transformer nameplate rating if this is provided by the manufacturer. If the 0 degrees Celsius rating is not provided on the nameplate, then 110 percent of the summer normal rating is used for the winter normal rating. The winter emergency rating is 135 percent of the summer normal rating. Both of these winter ratings are based on an ambient temperature of 0 degrees Celsius.

FBC's equipment is not dynamically rated, that is, ratings are not adjusted for temperatures different from 40 degrees in summer and 0 degrees in winter.

For the LEE and DGB transformers, the nameplate ratings are provided by the manufacturer, and the summer and winter ratings are as shown in the table below. Also shown in the table is the system load corresponding to the transformer ratings. It is industry convention to refer to system load in MW, while equipment ratings are expressed in MVA. They are related according

to the following formula: Real Power (MW) = Power Factor x Apparent Power (MVA). MW ratings are then rounded down to the lower integer.

For the Kelowna area, the average Power Factor is 0.98, which is close to unity. To be more conservative when modelling load flows, FBC generally applies a 0.95 Power Factor when converting MVA to MW (for example, the load level at which the winter emergency rating for LEE T3 is met is 199.5 MVA (line 6) times 0.95 = 189 (line 12)). The actual 2019 power factors are 0.97 for LEE and 0.99 for DGB.

Line	Particulars		LEE T3	LEE T4	DGB T2
1	Equipment Ratings (MVA)				
2	Maximum Nameplate Rating (40° C)		168	168	200
3	Summer Normal Rating	100% * Line 2	168	168	200
4	Summer Emergency Rating	125% * Line 2	210	210	250
5	Maximum Nameplate Rating (0° C)		199.5	205.8	237.5
6	Winter Normal Rating	100% * Line 5	199.5	205.8	237.5
7	Winter Emergency Rating	135% * Line 3	226.8	226.8	270.0
8					
9	System Load (MW)				
10	Summer Normal Rating	95% * Line 3	159	159	190
11	Summer Emergency Rating	95% * Line 4	199	199	237
12	Winter Normal Rating	95% * Line 6	189	195	225
13	Winter Emergency Rating	95% * Line 7	215	215	256

7.3.1 Please confirm all of the ratings and limits described above for LEE T3, LEE T4 and DGB T2.

Response:

Please refer to the response to BCUC IR1 7.3.

7.3.2 Please explain how FBC determines each rating and limit described. Please include all underlying calculations and assumptions.

Response:

Please refer to the response to BCUC IR1 7.3.

On page 19 of the Application, FBC states:

> 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.
>
> [18] The loss of one of the two transformers at LEE is the critical outage for planning purposes. If DGB transformer were to fail, the system could continue to supply all load within normal limits from LEE transformers and 138 kV lines.
>
> [19] It is industry convention to refer to system load in MW, while equipment ratings are expressed in MVA. They are related according to the following formula: Real Power (MW) = Power Factor x Apparent Power (MVA). For the Kelowna area, the average Power Factor = 0.98, which is close to unity. For accuracy, when modelling load flows, FBC applies substation-specific power factors.

7.4 Please provide the substation specific power factors for LEE and DGB.

Response:

Please refer to the response to BCUC IR1 7.3.

7.5 Please describe the details of the system reconfiguration noted in the preamble.

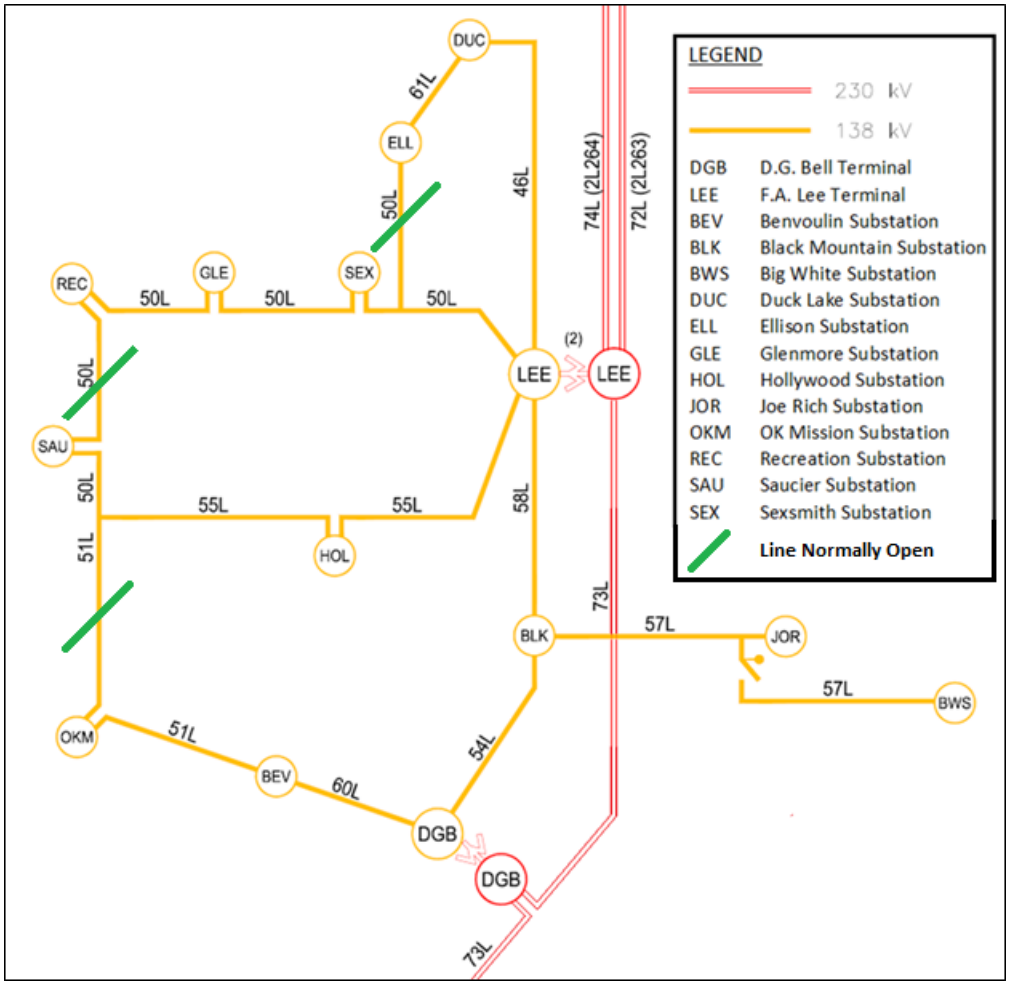
Response:

The Kelowna 138 kV system is operated with normal open points.

1. REC-SAU connection is normally open. Loads at SEX, GLE and REC substations are supplied radially from LEE via line 50L.
2. ELL-SEX connection is normally open. Loads at DUC and ELL substations are supplied radially from LEE via line 46L.
3. Loads at HOL and SAU substations are supplied radially from LEE via line 55L.
4. OKM-SPR Tap connection is normally open. Loads at BEV and OKM substations are supplied radially from DGB via line 60L.

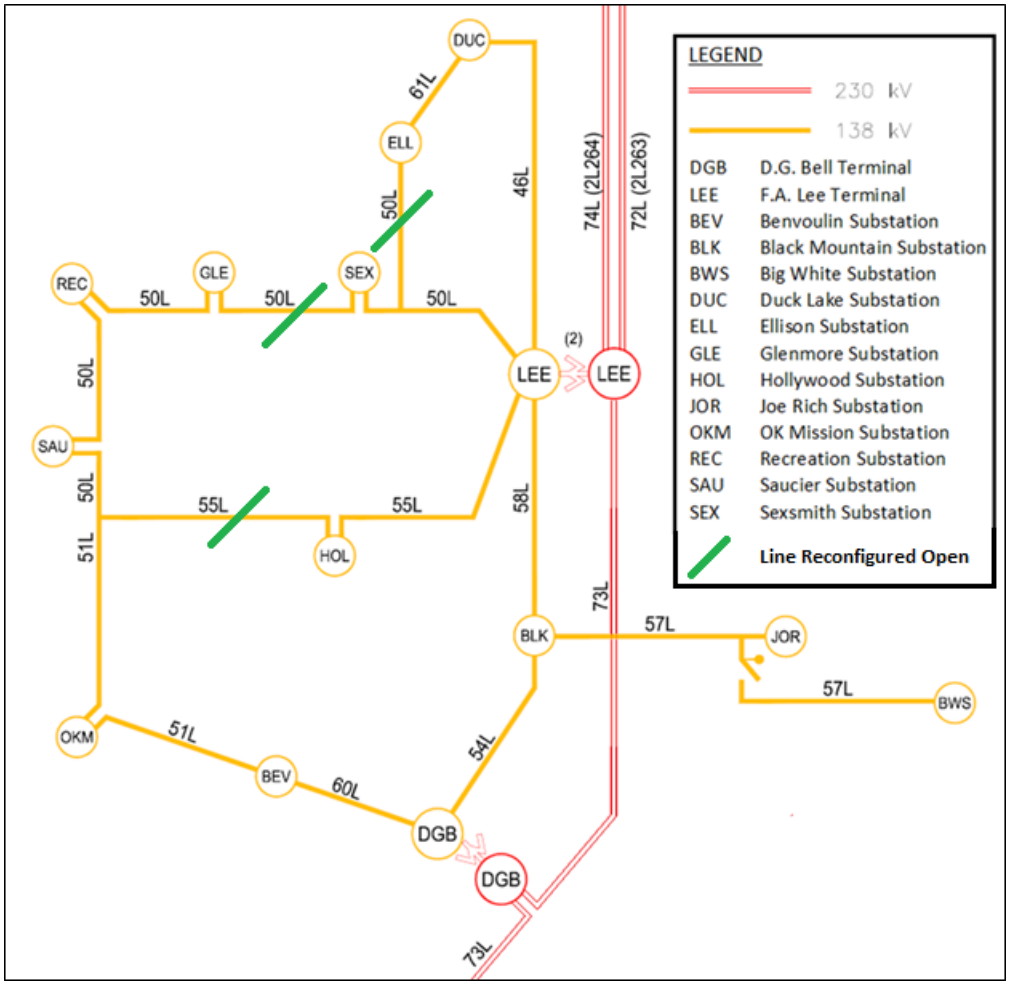
The 138 kV system is reconfigured when either LEE T3 or T4 goes out of service to reduce the post contingency flow on the remaining transformer. This is done by closing the OKM-SPR Tap and SAU-REC line sections and opening HOL-SPR Tap and SEX-GLE line sections. This results in more optimal distribution of the post contingency power flow between the remaining LEE and DGB transformers. Please refer to the figures below.

1 **Normal System Configuration**



2

System After Reconfiguration



7.5.1 Please provide an update to Figure 3-2 to show the 138 kV system before and after the noted system reconfiguration.

Response:

Please refer to the response to BCUC IR1 7.5.

7.6 Please discuss the limiting factors of the noted system reconfiguration.

Response:

This system reconfiguration is a temporary measure to reduce the post contingency flow on the remaining transformer after the outage of LEE T3 or T4 to delay the installation of the third transformer as long as possible. System reconfiguration to pre-empt the outage of a LEE transformer exposes much higher load to interruption in case of a single contingency and overload of 138 kV lines 58L, 54L and 60L in case of an outage of the DGB transformer.

This reconfiguration to reduce the post contingency flow on the remaining transformer after the outage of LEE T3 or T4 results in the maximum transfer of load from LEE to DGB. Further transfer of load from LEE to DGB results in the overloading of line 60L between DGB and Benvoulin substation.

7.6.1 Please confirm whether more load could be transferred from LEE to DGB, and if not, why not.

Response:

Please refer to the response to BCUC IR1 7.6.

7.7 Please provide additional power flow study data in the following 2 tables. Please use the same system reconfigurations as indicated in the above preamble.

Response:

The power flow data is provided in the table below.

Kelowna Summer Peak Load (MW) (Data from Table 3-4 & 3-5)	Year	Condition	Power Flow Analysis (Before System Reconfiguration)					
			LEE T3		LEE T4		DGB T2	
			MVA	% of normal rating	MVA	% of normal rating	MVA	% of normal rating
300.5	2019	All elements in service	109	65	109	65	86	43
		LEE T3 out			183	109	122	61
		LEE T4 out	183	109			122	61
		DGB T2 out	152	90	152	90		
309.5	2020	All elements in service	112	67	112	67	89	44
		LEE T3 out			188	112	126	63
		LEE T4 out	188	112			126	63
		DGB T2 out	167	94	157	94		
314.6	2021	All elements in service	114	68	114	68	90	45
		LEE T3 out			191	114	128	64
		LEE T4 out	191	114			128	64
		DGB T2 out	159	95	159	95		
319.8	2022	All elements in service	116	69	116	69	92	46
		LEE T3 out			195	117	131	65
		LEE T4 out	195	117			131	65
		DGB T2 out	162	97	162	97		

1

Kelowna Summer Peak Load (MW) (Data from Table 3-4 & 3-5)	Year	Condition	Power Flow Analysis (After System Reconfiguration)					
			LEE T3		LEE T4		DGB T2	
			MVA	% of normal rating	MVA	% of normal rating	MVA	% of normal rating
300.5	2019	All elements in service	96	57	96	57	112	55
		LEE T3 out			160	95	144	72
		LEE T4 out	160	95			144	72
		DGB T2 out (1)	154	93	154	93		
309.5	2020	All elements in service	99	59	99	59	115	57
		LEE T3 out			165	98	148	74
		LEE T4 out	165	98			148	74

Kelowna Summer Peak Load (MW) (Data from Table 3-4 & 3-5)	Year	Condition	Power Flow Analysis (After System Reconfiguration)					
			LEE T3		LEE T4		DGB T2	
			MVA	% of normal rating	MVA	% of normal rating	MVA	% of normal rating
		DGB T2 out (2)	160	96	160	96		
314.6	2021	All elements in service (3)	100	59	100	59	117	58
		LEE T3 out			167	100	151	75
		LEE T4 out	167	100			151	75
		DGB T2 out (4)	162	98	162	98		
319.8	2022	All elements in service (5)	102	61	102	61	12	60
		LEE T3 out (6)			169	101	155	77
		LEE T4 out (6)	169	101			155	77
		DGB T2 out (7)	166	100	166	100		

Notes:

(1) Flow on 58L (LEE-BLK) is 138% of normal rating and 113% of emergency rating. Flow on 54L (BLK-DBG) is 123% of normal rating and 101% of emergency rating. Flow on 60L (DGB-BEV) is 100% of normal rating and 89% of emergency rating.

(2) Flow on 58L (LEE-BLK) is 144% of normal rating and 118% of emergency rating. Flow on 54L (BLK-DBG) is 128% of normal rating and 105% of emergency rating. Flow on 60L (DGB-BEV) is 104% of normal rating and 93% of emergency rating.

(3) Flow on 60L (DGB-BEV) is 101% of normal rating.

(4) Flow on 58L (LEE-BLK) is 147% of normal rating and 120% of emergency rating. Flow on 54L (BLK-DBG) is 130% of normal rating and 106% of emergency rating. Flow on 60L (DGB-BEV) is 106% of normal rating and 95% of emergency rating.

(5) Flow on 60L (DGB-BEV) is 102% of normal rating.

(6) Flow on 60L (DGB-BEV) is 103% of normal rating 92% of emergency rating.

(7) Flow on 58L (LEE-BLK) is 150% of normal rating and 123% of emergency rating. Flow on 54L (BLK-DBG) is 134% of normal rating and 109% of emergency rating. Flow on 60L (DGB-BEV) is 108% of normal rating and 97% of emergency rating.

On page 19 of the Application, FBC states:

> 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.
>
> [20] The six hour requirement has been verified by FBC operational performance history, engineering analysis, and is based on the recommendations of many IEEE standards.

7.8 Please describe in detail how FBC has verified the six-hour requirement by FBC operational history.

Response:

The FBC operational policy to allow certain equipment to operate above normal ratings (but below emergency ratings) for a six-hour period became effective in 2012. Under this policy, FBC's systems and equipment have performed as intended and FBC has not experienced any system or equipment operational issues that would suggest a change or modification to the operational policy is required.

7.9 Please describe in detail how FBC has verified the six-hour requirement by engineering analysis.

Response:

The basic loading of a power transformer for normal life expectancy is continuous loading at the nameplate ratings when operated under usual service conditions. Normal life expectancy will result from operating with an acceptable continuous hottest-spot conductor temperature which is calculated based on the hottest spot rise plus the standard average ambient temperature.

Emergency loading causes either the conductor hottest-spot or the 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 is applied to transformers carrying continuous steady loads and a loss of insulation life is expected. Engineering analysis using IEEE standard guidelines has been applied by FBC to ensure that a six-hour period of emergency loading operation is within an expected acceptable loss of insulation life for transformers.

7.10 Please identify which Institute of Electrical and Electronics Engineers (IEEE) standards recommend the six-hour requirement.

Response:

FBC uses the IEEE Guide for Loading Mineral-Oil-Immersed Transformers and Step-Voltage Regulators (IEEE Standard C57.91-2011) to determine the load capability of distribution and transmission transformers. This standard provides numerous calculations and tables for the estimated loss of transformer life based on the expected maximum transformer hot spot temperature, the amount the transformer is loaded over the nameplate rating, and the duration of the overloading period. Based on the application of this standard, FBC selected the six-hour period to provide an acceptable estimated loss of life.

Other IEEE standards that detail equipment overload operation based on similar analysis that FBC has applied to determine the six-hour time period are as follows:

- IEEE Application Guide for AC High-Voltage Circuit Breakers > 1000 VAC 12 Rated on a Symmetrical Current Basis (IEEE Standard C37.010-2016); and
- IEEE Standard Requirements for AC High-Voltage Air Switches Rated Above 1000 V (IEEE Standard C37.30.1-2011 including Amendment 1: Criteria for Acceptance IEEE C37.30.1a-2017).

7.11 Please describe how FBC defines the transformer “normal rating”, as referred to in the above preamble. Please reconcile this with the ratings and limits FBC describes in response to IR 7.3.

Response:

Please refer to the response to BCUC IR1 7.3.

7.12 Please identify whether LEE T3, LEE T4 or DGB T2 have ever been operated above their respective normal rating.

7.12.1 If yes, please identify the size, timing and duration.

Response:

The LEE T3, LEE T4, and DGB T2 transformers have not been operated above their respective normal ratings since at least February 1, 2010 (the date from which FBC has available records).

On page 19 of the Application, FBC states:

> …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.

7.13 Please discuss why FBC does not own a mobile transformer of suitable size and voltage.

Response:

Mobile transformers of the necessary size are not manufactured and are therefore not available. This is because the physical size of such of a unit far exceeds the practical limits of a mobile transformer, which is intended for routine road transport. A fully equipped and serviceable transformer such as LEE T3 or T4 weighs in excess of 200 metric tonnes and is over 8 metres tall.

Even if a mobile transformer that could meet the requirements for the LEE installation were available, replacement of one of these transformers with a spare or mobile transformer would not be possible in a timeline that meets N-1 planning criteria. Further, in the event of a LEE transformer outage under future peak load conditions, load would need to be shed resulting in customer outages until such a time as the out of service transformer could be replaced by a spare or the load returns to a non-peak level. For this reason, mobile transformers are generally better suited to support planned work rather than contingencies.

8.0 Reference: PROJECT NEED AND JUSTIFICATION

Exhibit B-1, Section 1.1, p. 1; Section 3.6, p. 21

Additional 138 kV Capacity is Needed

On page 21 of the Application, FBC states:

> Beginning in summer 2022, the outage of a LEE transformer under peak load conditions would result in overloading of the remaining LEE transformer even after Kelowna network reconfiguration. Where overloading is projected to persist for more than six hours over the peak period, it would violate FBC's planning criteria requiring customer load shedding, creating considerable impacts.

On page 1 of the Application, FBC states:

> 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.

8.1 Please discuss the risks to Kelowna area customers during summer 2022 when FBC's planning criteria may be violated.

Response:

In summer 2022, the outage of a LEE transformer under peak load conditions would result in overloading of the remaining LEE transformer even after Kelowna network reconfiguration. However, this overloading of the remaining LEE transformer would not be projected to persist for more than six hours over the peak period based on the Kelowna load forecast. As such, there is a low risk that customer load shedding would be required in 2022 under this contingency.

8.1.1 Please discuss why FBC considers these risks acceptable for the summer 2022 time period.

Response:

Please refer to the response to BCUC IR1 8.1.

8.1.2 Please discuss how FBC is planning for and mitigating these risks.

Response:

The existing mitigation (please refer to the response BCUC IR1 7.5), that includes Kelowna network reconfiguration, is expected to be sufficient to avoid load shedding in a LEE transformer outage scenario in summer 2022. Completion of the KBTA Project would provide mitigation in future years when risk increases due to higher forecast peak loads.

9.0 Reference: PROJECT NEED AND JUSTIFICATION

Exhibit B-1, Section 3.2, p. 13; Section 3.5, p. 20

Kelowna Area Planning

On page 13 of the Application, FBC states:

> The transformers were manufactured in 1978 (LEE T4), 1985 (LEE T3), and 2004 (DGB T2).

On page 20 on the Application, FBC states:

> 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.

9.1 Please discuss when FBC anticipates a need to replace LEE T3 and LEE T4.

Response:

With proper maintenance and presuming there are no sudden changes in equipment condition, FBC anticipates a need to replace LEE T4 between 2033 and 2038, and LEE T3 in approximately 2045.

BC Hydro's West Kelowna Transmission Project Website[4] indicates BC Hydro is considering an alternative (alternative 3d) where BC Hydro would connect to FBC's system in Kelowna.

9.2 In FBC's view, please discuss at a high level how BC Hydro's West Kelowna Transmission Project may impact FBC's 138kV system. Please describe any and all potential interdependencies with the work planned for the KBTA Project.

Response:

FBC understands that one of the options being considered by BC Hydro to reinforce its supply to West Kelowna is a 138 kV transmission line that would be used on a continuous basis to wheel power through the Kelowna area system to a BC Hydro substation in West Kelowna. FBC and BC Hydro are currently in discussions with respect to this possibility. If FBC receives

[4] https://www.bchydro.com/energy-in-bc/projects/wktp.html

an Interconnection Request from BC Hydro, FBC will complete a System Impact Study in a timely manner, to determine feasibility. At this time, FBC believes that it would be possible to connect the BC Hydro West Kelowna system to FBC's system.

A transmission line connecting the FBC and BC Hydro systems would increase the peak load on the FBC Kelowna area transmission network, which would intensify the need for the KBTA Project.

C. DESCRIPTION AND EVALUATION OF ALTERNATIVES

10.0 Reference: OVERVIEW

Exhibit B-1, Section 3.2, pp. 13-14; Section 4.1 p. 22; Section 3.5, p. 20

Other possible alternatives

On page 22 of the Application, FBC states:

> FBC considered a number of alternatives to increase the 138kV capacity in the Kelowna load area to continue meeting the transmission planning criteria and to maintain reliable service to Kelowna's growing customer base. Among the alternatives considered were demand reduction measures, local generation, and adding 230 kV to 138 kV transformation capacity. Ultimately FBC determined that the only feasible means of adding the necessary capacity is the addition of an additional transformer at one of the two terminal stations in Kelowna.

10.1 Please discuss all other alternatives considered in addition to those noted in the preamble above and explain why these alternatives were determined not to be feasible.

Response:

FBC has included a list of all other alternatives considered, but rejected, in Section 4.2 of the Application. For the reasons described in this Section, the alternatives titled Status Quo, Demand Response, Local Generation and Addition of a Terminal Transformer to Distribution Substation were determined not to be feasible.

10.2 Please explain whether FBC considered the use of a 230/138 kV portable spare to mitigate for N–1 contingency in the event of a loss of a transformer.

10.2.1 If FBC did consider a portable spare, please discuss the reasons why a portable spare is not a feasible alternative.

10.2.2 If FBC did not consider a portable spare, please explain why not.

Response:

Please refer to the response to BCUC IR1 7.13.

On page 13 of the Application, FBC provides the age of the existing transformers at LEE and DGB substations: "The transformers were manufactured in 1978 (LEE T4), 1985 (LEE T3), and 2004 (DGB T2). While there are no significant condition issues known for these transformers at present, FBC discusses the impact of operating the transformers above the normal operating limits in Section 3.5."

On page 20 on the Application, FBC states:

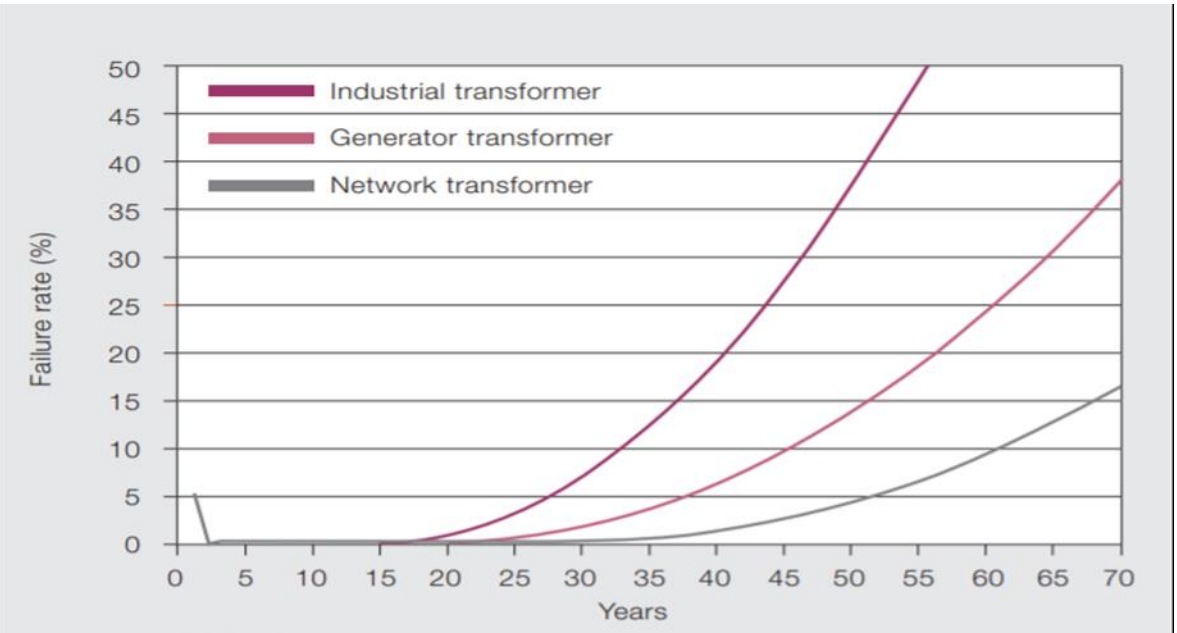
> While transformers have an average life of 40 years, if a transformer is lightly loaded throughout its in-service life, the winding insulation can be expected to last longer; conversely, insulation life would be expected to be less than a year if the transformer is overloaded on a consistent basis.

10.3 Please discuss what FBC considers to be the likelihood of failure of LEE T3, LEE T4, or DGB T2, and when failure is anticipated to occur. Please include in the discussion how the age of each transformer impacts their likelihood of failure.

Response:

Based on age and transformer type (LEE T3 and LEE T4 network transformers are 42 years and 35 years old, respectively), LEE T3 and LEE T4 currently have a risk of failure of less than 2 percent, as shown in the graph below.[5] DGB T2 (a network transformer which is 16 years old) currently has a risk of failure less than 0.5 percent. FBC expects that LEE T3 and T4 have potential remaining lifespans of approximately 15 to 20 years, and DGB a potential lifespan of approximately 40 to 44 years.

[5] CIGRE (International Council for Large Electric Systems) https://www.cigre.org/GB/about/.



Source: CIGRE WG 12-05. (1983). An international survey on failures in large power transformers. ELECTRA, 88, 21-48.

In addition, a condition that may result in premature failure of LEE T4 is a recently observed increase in acetylene concentration over the past five years. Recent trending shows the acetylene concentration is currently 15 ppm, but is now considered stable. The cause of the increase in acetylene concentration is unknown but was likely a result of the acetylene leaching out of the transformer solid insulation after the 2017 unit refurbishment. The transformer will continue to be monitored.

It should be noted that even well-maintained transformers can fail with no advance indication. As such, the requirement to meet the N-1 planning criteria is not dependent on the age or condition of equipment; therefore, any differences in the likelihood of failure rates among the transformers does not affect the project analysis. In the event that one of these units fails, the remaining two units would supply area loads. Under peak loads conditions, the remaining transformers would be overloaded beyond their MVA ratings, which would also reduce the remaining units' life expectancy.

10.3.1 Please explain how this variance in likelihood affected the project alternatives analysis.

Response:

Please refer to the response to BCUC IR1 10.3.

10.3.2 Considering the age of the 230/138 kV transformers at LEE, please explain whether FBC considered a project alternative consisting of replacing the two existing transformers with larger transformers.

10.3.2.1 If not, please explain why.

10.3.2.2 If FBC did consider this option, please explain why it was not considered a feasible alternative.

Response:

FBC did not actively consider the alternative of replacing both existing transformers with newer, larger units as this would not be a cost-effective nor long-term solution to the capacity limitations in the Kelowna area.

Currently, the LEE T3 and T4 transformers have nameplate ratings of 168 MVA. As a hypothetical example, even if both transformers were replaced with 200 MVA units (the largest standard size used by FBC), the firm station capacity would only increase by approximately 32 MVA. This is because if one of the two new transformers was out of service for any reason, the capacity of the remaining new transformer would only be 32 MVA greater than today (200 MVA versus 168 MVA). However, to achieve this relatively nominal capacity increase would require replacement of both transformers along with substantial additional station upgrades (as the larger transformers would require, for example, larger transformer foundations and oil containment, replacement of under-rated switches, breakers, buswork, etc.). While no formal estimates were prepared, based on the cost of the transformers alone, FBC estimates the cost of upgrading of the two transformers alone to be in excess of $7 million. The addition of a third transformer as proposed in this Application would still be required by 2028, thereby increasing the cost of the KBTA Project by more than $7 million.

It is on this basis that FBC discarded this option as it is neither a cost-effective nor a long-term solution.

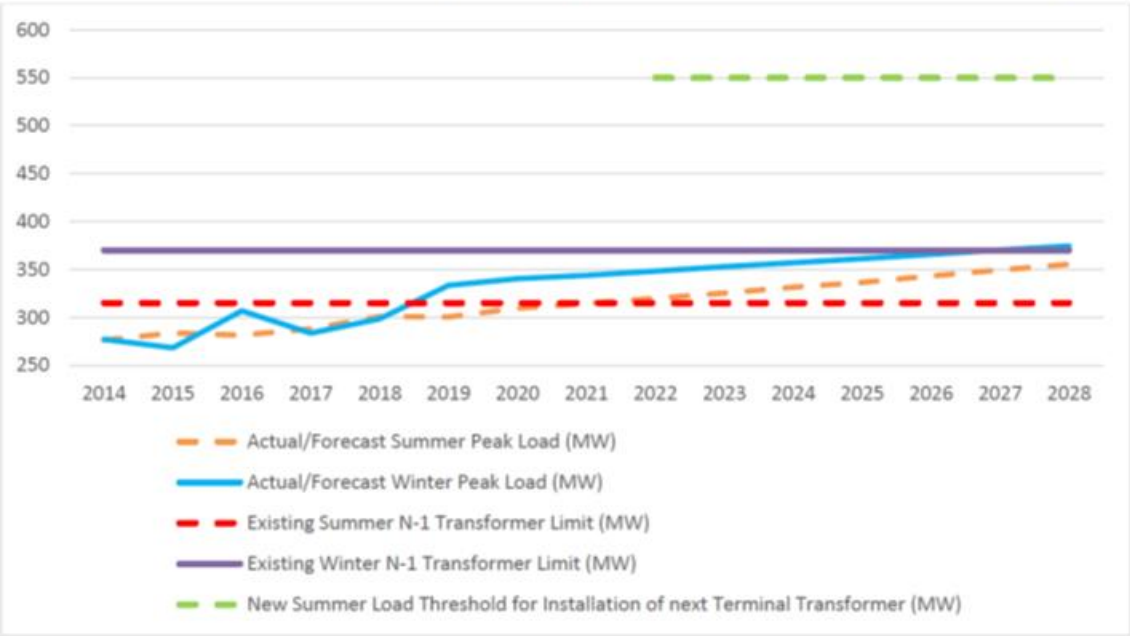
11.0 Reference: ALTERNATIVES FOR FURTHER REVIEW

Exhibit B-1, Section 4.3, pp. 24, 25

Alternatives for further review

On page 24 of the Application, FBC provides Figure 4-1, showing the Kelowna Area peak load and N-1 transformer limits under the LEE substation Alternatives. FBC states, "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."

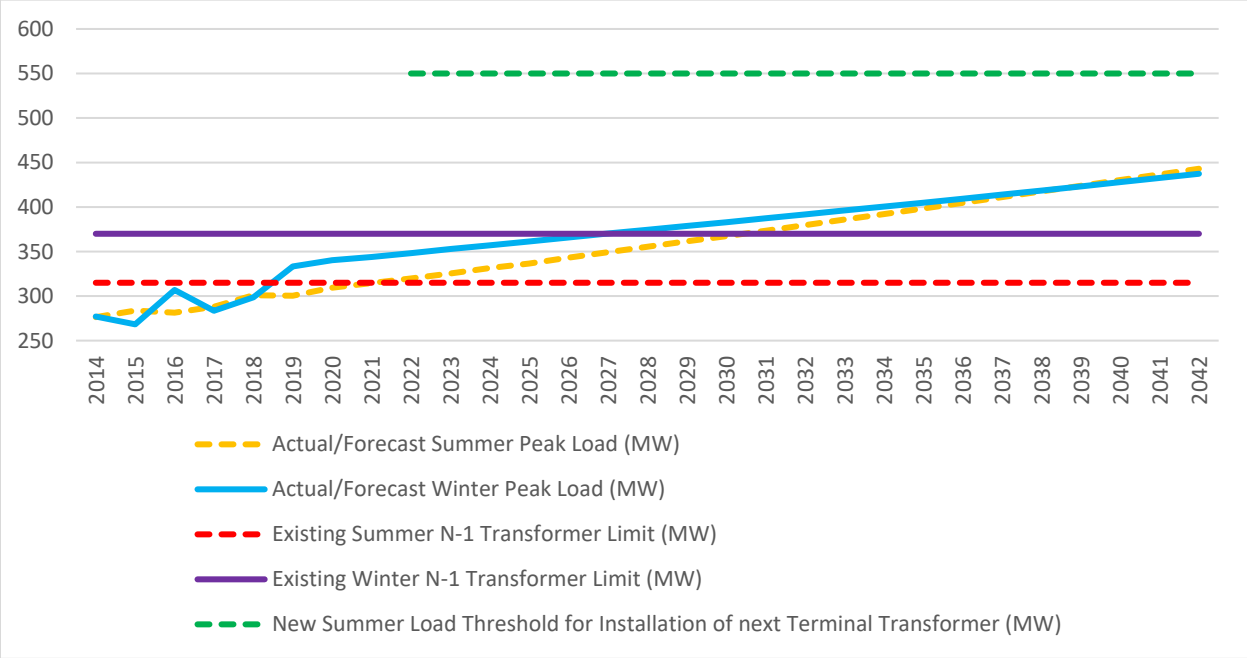
Figure 4-1: Kelowna Area Peak Loads and N-1 Transformer Limits (LEE Alternatives)



11.1 Please update Figure 4-1, with the time axis extending to 2042, 20 years beyond the in-service date of the project.

Response:

Figure 4-1A: Kelowna Area Peak Loads and N-1 Transformer Limits (LEE Alternatives) Extended to 2042



11.2 Please confirm when (i.e. what year) FBC expects Kelowna area peak summer load to reach 550MW.

Response:

Based on an extrapolation of the current forecast, Kelowna area summer peak load would reach 550MW in approximately 2060. It should be noted that there is low confidence in any projection this many years in the future. The actual rate of peak load growth over this period will be dependent on factors such as large capacity requests, EV adoption, and other influences on electric usage that cannot be reasonably foreseen at this time.

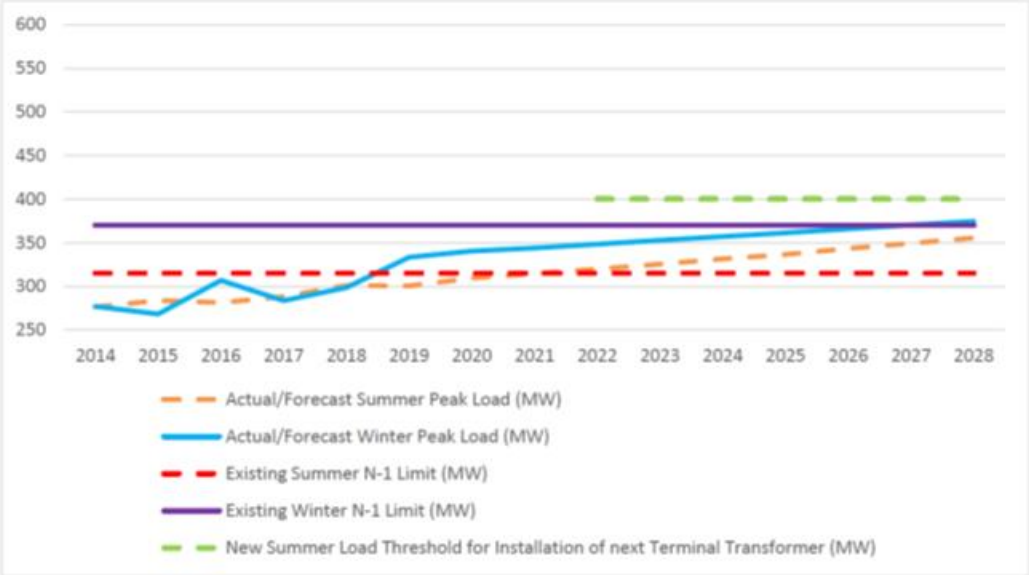
11.3 Please provide the data set for Figure 4-1 in a fully functioning Excel spreadsheet.

Response:

Please refer to the live Excel spreadsheet provided in Attachment 11.3 for the data set for Figure 4-1.

On page 25 of the Application, FBC provides Figure 4-2, showing the Kelowna area peak load and N-1 transformer limits for Alternative C. FBC states, "[t]he capacity gain from the DGB alternative would be lower than the LEE alternative, and a second terminal transformer addition would be required for the Kelowna area when summer peak load reaches 400MW, which provides for incremental emergency capacity of 85 MW."

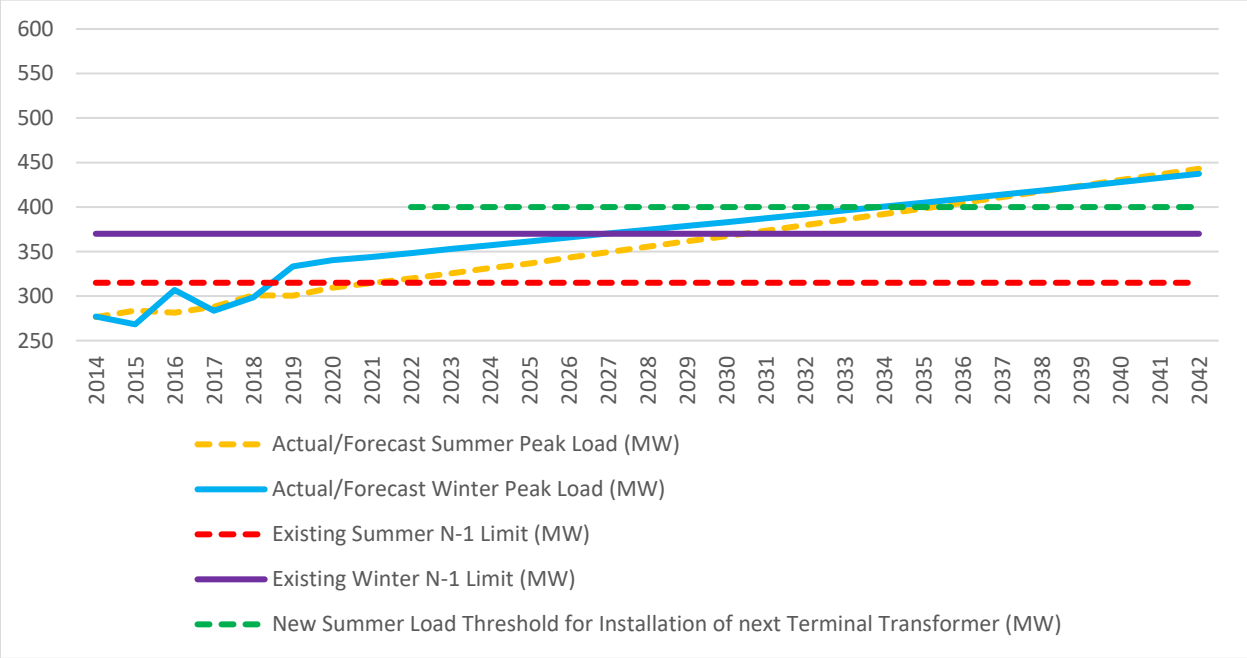
Figure 4-2: Kelowna Area Peak Loads and N-1 Transformer Limits (DGB Alternative with 60L and 51L Reconductoring)



11.4 Please update Figure 4-2, with the time axis extending to 2042, 20 years beyond the in-service date of the project.

Response:

Figure 4-2A: Kelowna Area Peak Loads and N-1 Transformer Limits (DGB Alternative with 60L and 51L Reconductoring) Extended to 2042



On page 25 of the Application, FBC further describes Alternative C:

> As a result of the load distribution and Kelowna network configuration, undertaking the capacity addition at DGB would also require increasing the capacity of certain 138 kV transmission lines in the Kelowna area. Referring to Figure 3-2, the Sexsmith (SEX), Glenmore (GLE), Duck Lake (DUC), Hollywood (HOL) and Recreation (REC) distribution stations are the more heavily loaded stations in the Kelowna area. DGB has two 138 kV transmission lines compared to four at LEE, and is more distant from the high-load area. Consequently, 60 Line and 51 Line would require reconductoring in order to transmit the incremental capacity installed at DGB.

11.5 Please explain whether there are any advantages or benefits to FBC, its customers and/or potential customers from reconductoring the required 138 kV lines under Alternative C.

Response:

There are no additional advantages or benefits to reconductoring the 138 kV lines under Alternative C. In the context of the KBTA Project, reconductoring of the lines under Alternative C is necessary to meet the N-1 planning criteria because reconductoring allows more load to be served from DGB so that Kelowna area load shedding and resulting customer outages will not be required at peak load levels.

12.0 Reference: ALTERNATIVES FOR FURTHER REVIEW

Exhibit B-1, Section 4.3.1, p. 26

Ring Bus vs. Split Bus Configuration

On page 26 of the Application, FBC lists several advantages of the ring bus configuration over the split bus configuration:

> Research on substation reliability shows that a ring bus configuration results in a more than 50 percent reduction in outage minutes per year as compared to a split bus configuration.
>
> Further, a breaker failure on a split bus causes a larger outage than on a ring bus. This is due to the redundant path for power to flow created by the ring configuration.
>
> The ring bus configuration is easier to maintain and operate than split bus because any single breaker can be taken out of service without the need for bus reconfiguration.
>
> The ring bus configuration reduces safety risk as compared to split bus because it provides a clear zone of isolation when working on equipment that is free from complex transfer buses and switches.
>
> The ring bus configuration has less complicated protection and switching schemes than split bus because each transformer and transmission line has its own discrete node in the bus between two breakers.
>
> The ring bus configuration is less prone to human error when operating, resulting in fewer instances of mis-operation than a split bus.

12.1 Please discuss if and when a failure of LEE T3, LEE T4, and DGB T2 has occurred in their respective lifespans.

Response:

The following is the list of failures recorded between 2006 and 2020 for LEE T3, LEE T4 and DGB T2:

	Transformer		
Year	LEE T3	LEE T4	DGB T2
2009			Failure of online Dissolved Gas Analysis (DGA) monitor.
2011	Trip to lockout, due to damaged wires on transformers mechanical protection.		
2015	Unit taken offline to resolve load tap changer issues.	Load tap changer failed to operate and high dissolved gasses were recorded. Unit out of service due to a grounding transformer oil leak.	
2016			Load tap changer failed to operate due to ice accumulation Replacement of sudden pressure relay.
2017		Load tap changer beyond its life expectancy and leaking into the main tank. All three units were replaced.	
2018	Trip to lockout, due to oil temperature gauge internal fault.		Load tap changer failed to operate due to ice accumulation.
2020		Pending repair. Two 138kV bushings with increased power factor indicating deteriorating of the bushing. Parts on order and repair scheduled for end of Q3 2020.	

12.2 Please provide the annual outage minutes for the LEE substation for the past 5 years.

Response:

Over the past five years, there have been three outages affecting equipment at LEE substation. However, only one outage resulted in loss of customer load (Event 1 in the below table). This outage occurred on February 4, 2015 and affected nearly 25 thousand customers. All customers were restored from an alternate source within approximately 30 minutes. However, it

took 2 hours and 27 minutes to isolate the faulted equipment and restore the system to its normal configuration.

Event	Year	Annual Outage Minutes
1	2015	147
2	2015	4,265
3	2017	200

12.3 Please explain how frequently, on an annual basis, any single breaker must be taken out of service at LEE, for maintenance or other reasons.

Response:

FBC's maintenance schedule requires that breakers be taken out of service every six years.

12.4 Please explain the safety risk reduction characterized in the preamble.

Response:

With a ring bus configuration, the operation and protection scheme of the station are unaffected by an outage of any one element. Conversely, in a split bus configuration, removing a station element from service leads to complicated offloading, switching and isolation procedures, which could differ between each element, depending on the station set up. The complexity of this operation within a split bus requires careful examination to ensure that an element has been isolated correctly and is therefore inherently more exposed to human error.

In a split bus configuration, the protection setting scheme is also typically revised during a by-pass situation, leading to slower clearing of faults as compared to normal system operation. Longer protection operating time leads to prolonged exposure to and influences maximum allowable step and touch potential, which exposes personnel and the public to this hazard. An extended trip time can also lead to an explosive equipment failure or rupture.

In a split bus configuration, preparation for work, risk assessment, temporary protection changes and isolation of equipment can take up to two extra days at LEE as compared to a

typical ring bus station[6]. The Kelowna station's system ring, which is fed from LEE and includes Hollywood (HOL), Sexsmith (SEX), Glenmore (GLE), Recreation (REC), Saucier (SAU), OK Mission (OKM), Benvoulin (BEV) and DGB stations, is additionally complicated from a protection point of view. The Kelowna system ring can be operated with many varying normally open or closed points. The protection scheme is therefore more complex, considering all these combinations even during system normal operation. However, with the additional complication of by-passing station elements at LEE, the protection scheme is more complex and is inherently more exposed to human error. Additionally, due to this Kelowna system ring configuration, to achieve proper protection coordination trip time delays are set longer than standard delays, adding to slow clearing of faults.

In other words, reconfiguring the LEE station to a 138 kV ring bus adds an additional layer of protection to ensure the safety of FBC employees by reducing operating complexity. It is an accepted principle in high-risk industries that engineered barriers which are not reliant on human intervention are the most effective in reducing incidents. Given the major work that will be required to install the third transformer at the LEE terminal, FBC considers this an ideal opportunity and hence an appropriate time to reconfigure the station to a standardized bus arrangement which is both safer and more reliable.

12.4.1 Please explain how frequently crews working within the LEE substation would be exposed to the hazards from a split bus isolation zone.

Response

The LEE station equipment is maintained every six years. In addition to this scheduled testing, unforeseen failures can occur and the crews may be exposed to switching hazards at LEE numerous times a year. Based on recent experience, switching at LEE station is required approximately 16 times per year.

12.4.2 Please explain how exposure to the hazards from a split bus isolation zone impacts day to day operations at LEE or impacts the project costs.

[6] FBC has not included an estimate of the savings in time for the proposed ring bus in the financial analysis of the alternatives.

Response:

Please refer to the response to BCUC IR1 12.4.

12.5 Please explain what benefits to outage statistics FBC expects as a result of a ring bus configuration versus the current split-bus configuration.

Response:

Based on the analysis in the substation reliability research referenced on page 26 of the Application, annual outage minutes could be reduced by 50 percent or more if the existing split bus configuration is replaced by ring bus. This benefit is difficult to quantify empirically since terminal outages occur infrequently and FBC operates few terminals of this size and configuration (therefore requiring a very long period of study). As such, FBC considers this research to be the best source of information relating to benefits to its outage statistics.

13.0 Reference: ALTERNATIVES FOR FURTHER REVIEW

Exhibit B-1, Section 4.3.2, p. 27

Current Bus Configuration

On page 27 of the Application, FBC discusses its standard substation bus configuration for high voltage switching substations:

> LEE was constructed prior to FBC's adoption of ring bus as a standard configuration, meaning that it differs from the ring configurations in service at DGB, Vaseux Lake Terminal, Bentley Terminal, Warfield Terminal, Black Mountain and Duck Lake. Ring bus configurations are also in service at Brilliant Terminal Station and Brilliant Switching Station, which are operated by FBC.

13.1 Please list how many 230 kV/138 kV switching stations owned by FBC have a ring bus or a split-bus configuration.

Response:

There are three terminal stations in FBC's system that have 230/138 kV voltage levels. Two of these terminals have ring configurations:

- DGB (230 kV / 138 kV / 13 kV); and
- Bentley Terminal (230 kV / 161 kV / 138 kV / 63 kV)

One terminal has a split bus configuration:

- LEE (230 kV / 138 kV / 13 kV).

14.0 Reference: DISCUSSION OF ALTERNATIVES

Exhibit B-1, Section 4.4.1.1, p. 28

Alternative A – Description and Scope

On page 28 of the Application, FBC discusses the future potential for expansion of Alternative A, "[t]hough not part of this Project, the seven breaker ring bus could be converted in future to a nine breaker ring without expanding the bus, creating two additional nodes for connection of new transmission line(s) and/or a 138 kV/13 kV distribution transformer."

14.1 Please explain when FBC expects to require another node, either for connection of a new transmission line, a 230/138 kV transformer, or a 138/13 kV transformer.

Response:

A future expansion to meet local area load in the Kelowna area will depend on a number of factors, including whether generation is added in the area, whether the 230 kV network is expanded by bringing in a new 230 kV line, or whether a 500 kV source is added. As the Kelowna area reaches the 550 MW load level, additional transmission or generation will be required and a decision will need to be made about how to expand the Kelowna transmission system.

Due to ongoing growth in the Kelowna area, the potential to expand provided by Alternative A is also beneficial before load reaches 550 MW. While there is presently no expected timeline for the addition of a 138/13 kV distribution transformer at LEE, the flexibility to efficiently add a transformer to a station when the system need arises is a valuable attribute. Since the LEE terminal is centrally located between the Sexsmith, Black Mountain, Ellison and Hollywood stations, such a transformer could provide beneficial support for distribution load growth and distribution contingency scenarios in this part of Kelowna. If the LEE Ring Bus Alternative is constructed, the option to add a distribution transformer at LEE would be studied as part of the options analysis for any potential capacity upgrade project at neighbouring stations.

Finally, while there are currently no firm plans to connect a new 138 kV transmission line at LEE, FBC has received several large load requests and the ability to add another 138 kV line without expanding the footprint of the bus provides flexibility to meet demand using the LEE terminal.

15.0 Reference: DISCUSSION OF ALTERNATIVES

Exhibit B-1, Section 4.3, p. 23; Section 4.4.3, pp. 28- 31;

Alternative C – Description and Scope

On page 24, FBC briefly describes Alternative C: "Alternative C: Purchase and install a second terminal transformer at DGB and extend the existing 138 kV industry standard ring bus configuration."

15.1 Please explain the risks to having a single 230/138 kV transformer at DGB substation, including the consequences of a long-term transformer outage in the event of a failure.

Response:

A single transformer at DGB would pose a risk only in the event of a second coincidental outage to a 138 kV line. In the event of a long-term outage of the DGB T2 transformer, loading on the three transformers at LEE would increase, but they would be capable of carrying all Kelowna area load without exceeding normal ratings. In the event of a subsequent 138 kV line outage during a DGB T2 outage, a larger amount of Kelowna load could be exposed to outages than would normally be the case when 138 kV lines are supplied from both LEE and DGB.

On page 31 of the Application, FBC explains the future needs of the Kelowna area due to future load growth over the 40-year evaluation period:

> Even after the addition of a second transformer at DGB and the reconductoring of 51L and 60L, Kelowna area load is forecast to exceed the 138kV capacity no later than 2036. The addition of a fifth terminal transformer in the Kelowna area would be required at that time. Since this additional transformer falls within the 40-year period of financial analysis, FBC included the additional transformer cost in its evaluation of this alternative. The capital cost of the new transformer at DGB and the transmission line reconductoring in this alternative is $33.332 million including removal costs and AFUDC. Excluded from the $33.332 million is the capital cost of the next capacity addition in 2036. FBC assumes the cost of that addition to be the same as Alternative A, subject to inflation. These 2036 costs have been included in the 40-year financial analysis of this project for comparability to Alternatives A and B.

15.2 Please explain how FBC compares the long-term performance of the alternatives against each other.

Response:

For clarity, the initial capital cost estimate for Alternative C in 2021-2023 is $32.332 million. Alternative C also requires an additional investment in 2036 for the installation of a fifth terminal transformer. The sentences in the preamble,

> The capital cost of the new transformer at DGB and the transmission line reconductoring in this alternative is $33.332 million including removal costs and AFUDC. Excluded from the $33.332 million is the capital cost of the next capacity addition in 2036,

should have read:

> The capital cost of the new transformer at DGB and the transmission line reconductoring in this alternative is $32.332 million including removal costs and AFUDC. Excluded from the initial capital cost of $32.332 million is the capital cost of the next capacity addition in 2036.

FBC evaluated each alternative over the same 40-year period and factored in all reasonable incremental costs. To compare the projects from a financial perspective, FBC has calculated the cost of service by year for the 40-year period and has calculated and compared both the Present Value (PV) of the cost of service and the levelized rate impact. Alternatives were ranked in order by their respective PV of cost of service and associated levelized rate impact from lowest to highest.

Specifically, to evaluate the full 40 year cost of service of Alternative C, FBC has included in the analysis the required subsequent investment in the fifth terminal transformer by using the cost estimate included in Alternative A and adding inflation. This allows for an adequate comparison between each of the alternatives cost of service for the full 40 year period.

15.3 Please explain, under a long-term analysis, how Alternative C compares to the other alternatives, in terms of reliability, number of outages, load management within Kelowna, or other applicable criteria.

Response:

As summarized in Table 4-1 of the Application, Alternative C scored equally with Alternative A with scores of 3 (Best) for “Safety”, “Operability”, “Complexity of protection schemes”, and “Reliability” criteria. This is because the DGB terminal would be constructed with the 230 kV and 138 kV ring bus configurations that are also provided for in Alternative A at LEE. Alternative B scored lower in these categories since the 138 kV split bus has a number of disadvantages, as described in Section 4.3.1 of the Application.

Alternative C scored as 2 (Good) for the ‘Potential for Future Expansion’ criteria because it provides space to expand but would require bus expansion to connect new equipment. Alternative A is superior as it allows for the addition of a transmission line and/or distribution transformer without expanding the footprint of the bus. Alternative B did not score as well because it does not provide the ability to expand.

Alternative C scored as a 1 (Fair) for ‘N-1 Criteria Considerations’ and ‘Removal of Legacy Infrastructure’ criteria, which was the lowest score in both categories. The difference in N-1 Criteria Considerations is due to the much lower incremental capacity provided by Alternative C, as described in Section 4.3 of the Application. The scope of Alternative C does not include the removal or replacement of any end-of-life equipment, which is the reason that it scored lowest for ‘Removal of Legacy Infrastructure’.

Project risks are not relevant over the long-term, but the comparison of these scores is also available in Table 4-1. The comparison of Financial Considerations is provided in Table 4-2.

16.0 Reference: EVALUATION OF ALTERNATIVES

Exhibit B-1, Section 4.5.1, p.33

Evaluation Criteria

On page 33 of the Application, FBC provides Table 4-1:

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 simpler 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**	

16.1 Please explain how the weight given to each criterion was determined.

Response:

The weight given to each criterion was established based on input gathered from FBC's internal stakeholders. Since all Alternatives meet N-1 planning criteria, the weighting is meant to prioritize other considerations that internal stakeholders determined to be most important. FBC's understanding of existing issues and risks were also utilized in setting these values.

Weighting of criteria fits into three categories:

- 20 percent weighting is for criteria that were determined to be the most important to internal stakeholders, including operability, reliability and the potential for future expansion.
- 10 percent weightings were given to criteria that were important to internal stakeholders, but perhaps were partially addressed by other technical or financial criteria. In addition, the Project Risk parameters in aggregate fit into this category.
- 5 percent weighting is for criteria that were determined to merit inclusion in the analysis, but with a low impact on the final scoring.

As described in the description of the 10 percent weighting, the relationship between different Technical Criteria was assessed. For example, "Safety" is related to "Operability" and "Complexity of protection and switching schemes". Since risks or benefits associated with operability and complexity also affect safety, the weighting of "Safety" was set lower than it would have been otherwise.

16.2 Please explain why the weighting for "Potential for future expansion" is 20 percent, whereas "N-1 Criteria Considerations" is 10 percent.

Response:

Since all three Alternatives meet FBC's N-1 Planning Criteria, the "N-1 Criteria Considerations" parameter is intended to capture differences in timelines for which the Alternatives provide the required support. Further, as the financial comparison in Table 4-2 also reflects differences in future capital requirements related to the different timelines for N-1 support, it was determined that 10 percent was an appropriate weighting to capture the technical impact of these differences.

"Potential for future expansion" was weighted at 20 percent because FBC considers this to be an important distinction between the Alternatives. The flexibility to efficiently and cost-effectively expand the function of a terminal station in the future is a valuable attribute. Since the differences in potential to expand were not captured in the financial analysis, FBC determined that this should be weighted more heavily than N-1 criteria considerations.

There has been significant growth in the Kelowna area, and the load forecast shows an expectation of continued growth. As such, it is very likely that further expansion of Kelowna transmission and/or distribution networks will be required in the future. To support ongoing growth in the Kelowna area, it is likely that it will be beneficial to expand the function of the LEE terminal at some point in the life of the station.

16.3 Please explain how the attribution of ratings 1, 2 and 3 are determined.

Response:

As described in Section 4.5.1 of the Application, the scores were determined depending on whether an Alternative is Fair (1), Good (2), or Best (3) at addressing a specific criterion. If an Alternative is best, or tied for the best, in a given parameter it was scored as a 3. If an Alternative is not the best in a given parameter, but is not substantially worse, it was scored as a 2. If an Alternative is significantly compromised in a given parameter, it was scored as a 1.

16.4 Please explain why under "N-1 Criteria Consideration", Option C is given a score of "1", given that it also meets N-1 criteria.

Response:

Only Alternatives (referred to as "OPTIONS" in Table 4-1) that meet N-1 criteria were selected for further review, as described in Section 4.3 of the Application. Given that all feasible Alternatives meet N-1 criteria, this parameter in the evaluation was established as "N-1 Criteria Considerations" to capture any distinctions between the Alternatives.

While Alternative C meets N-1 criteria, it only provides an additional 85 MW of incremental capacity. Since Alternatives A and B meet N-1 criteria and provide 235 MW of incremental capacity, these Alternatives were scored as a 3 (Best). As Alternative C provides only 36 percent of the capacity that is provided by Alternatives A and B, it was determined that a score of 1 (Fair) was appropriate.

16.5 Please explain why under "Safety", Option B was provided a score a "1", given that the substation can be operated safely, similar to today.

Response:

It is possible to safely operate the existing LEE terminal with comprehensive work methods, training, and the diligent safety focus of personnel. Likewise, it would be possible to continue safe operation of the station with the scope of Alternative B in service.

However, the split bus in Alternative B is much more congested than the ring bus alternatives and requires more switching and reconfiguration in order to isolate equipment. As stated in Section 4.3.1 of the Application, the ring bus configuration reduces safety risk as compared to split bus because it provides a clear zone of isolation when working on equipment that is free from complex transfer buses and switches.

As discussed in the response to BCUC IR1 12.4, reconfiguring the LEE station to a 138 kV ring bus adds an additional layer of protection to ensure the safety of FBC employees by reducing operating complexity. It is an accepted principle in high-risk industries that engineered barriers which are not reliant on human intervention are the most effective in reducing incidents. Given the major work that will be required to install the third transformer at the LEE terminal, FBC considers this a unique opportunity and hence an appropriate time to reconfigure the station to a standardized bus arrangement which is both safer and more reliable.

FBC maintains that the Alternative B split bus would be significantly inferior to Alternatives A and C in terms of safety risk to personnel working in the station. As such, it was scored as 1 (Fair).

16.6 Please explain the scoring of Option B as a “1” under “Complexity of protection and switching schemes.”

Response:

As stated in Section 4.3.1 of the Application, the ring bus configuration has less complicated protection and switching schemes than split bus because each transformer and transmission line has its own discrete node in the bus between two breakers. The split bus configuration requires more complex protection schemes in normal operation, and the protection and switching schemes become substantially more complex when reconfiguring for planned or unplanned outages of lines or station equipment. Please also refer to the response to BCUC IR1 12.4.

FBC determined that the Alternative B split bus would be significantly inferior to Alternatives A and C in terms of the complexity of protection and switching schemes. As such, Alternative B was scored as 1 (Fair).

16.7 For "Potential for future expansion," please explain the difference between Option C and Option A.

Response:

As described in Section 4.4.1.1 of the Application, Alternative A would include construction of a 138 kV ring bus that could be expanded by up to two nodes, without expanding the bus, by adding breakers. On that basis, Alternative A was awarded a 3 (Best) rating.

Alternative C also provides for future expansion as it would free up additional space inside the bounds of station fencing at DGB. However, while the DGB 138 kV bus could be expanded in future, nodes could not be added to the bus without a bus expansion/modification project and breaker additions. On that basis, Alternative C was awarded a 2 (Good) rating.

17.0 Reference: PREFERRED ALTERNATIVE AND JUSTIFICATION

Exhibit B-1, Section 1.1.1, pp. 1, 3, 34

Technical Evaluation

On page 1 of the Application, FBC summarizes the need for the project in the Executive Summary:

> FBC has experienced high levels of customer load growth in the Kelowna area and it expects that 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 LEE. Therefore, without expanding FBC's current capacity 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. The likelihood and duration of the required load shedding under these contingency conditions will increase as load grows in the Kelowna area.

On page 3 of the Application, FBC states it has selected Alternative A as the preferred Alternative because "[a]lternative A best addresses the reliability concerns and growth opportunities for the Kelowna load area."

17.1 Please confirm, or explain otherwise, that each of the three project Alternatives meets the N-1 reliability criteria mentioned in the preamble.

Response:

Confirmed. Each of the three project alternatives will initially allow FBC to continue to meet the N-1 reliability criteria. However, as outlined in the Application, Alternative C would only support meeting this criteria until Kelowna summer peak load reaches 400 MW, whereas Alternatives A and B would support Kelowna summer peak load up to 550 MW.

17.2 Please confirm, or explain otherwise, that the lowest cost alternative, Alternative B, meets the growth opportunities for the Kelowna area load.

Response:

Alternative B is equivalent to Alternative A in providing the ability to support increasing Kelowna area load while continuing to meet N-1 transmission planning criteria in the event of a LEE transformer outage.

As described in Section 4.4.1.1 and Table 4-1 of the Application, Alternative A provides additional benefits in terms of the potential for future expansion. By adding breakers to the Alternative A ring bus, it will be possible to create two additional nodes for connection of new transmission line(s) and/or a 138 kV/13 kV distribution transformer. This capability provides options and flexibility that support FBC's ability to support growth opportunities in the Kelowna area.

On page 34 of the Application, FBC provides justification of the technical superiority of Alternative A. FBC states:

> Although the reliability associated with Alternative C is expected to exceed that of Alternative B, and would simplify outage planning and facilitate network reconfiguration due to the ring bus configuration, Alternatives A and B both have significant advantages over Alternative C as they do not require any associated transmission line reconductoring.

17.3 With reference to Table 4-1: KBTA Project Alternatives Comparison, please discuss whether assessing Alternatives A, B, and C over a 20-year and a 40-year lifespan would impact the results of the comparison.

17.3.1 If so, please provide details.

17.3.2 If not, please explain why not.

Response:

Assessing Alternatives A, B, and C over a 20-year lifespan rather than a 40-year lifespan would not make a difference to the comparison in Table 4-1. With the exception of the Project Risks criteria, which only apply during execution of the Project, the majority of the Technical Criteria are not time-bound. The N-1 Criteria Considerations do have a time-based element due to the differences in incremental capacity provided by the Alternatives. However, since the load forecast already takes into account that the incremental capacity provided by Alternative C would only be adequate until 2036, shortening the analysis period to a 20-year lifespan would not affect the scoring of Alternatives.

Further on page 34, in support of Alternative A, FBC states: "a breaker failure on a split bus causes a larger outage than on a ring bus; substation reliability research shows that a ring bus configuration provides 50 percent fewer outage minutes per year than a split bus configuration."

17.4 Please provide the source of the substation reliability research quoted in the preamble.

Response:

The reference for this statement is:

> Daniel Nack, Iowa State University, "Reliability of Substation Configurations", 2005, http://www.ee.umn.edu/class/ee5725/SubstationReliability.pdf

FBC adds that the lower outages resulting from a ring bus configuration occur because a breaker failure in a ring bus configuration leads to only an outage of two station circuits, while a breaker failure in a split bus configuration can lead to an outage of many circuits depending on how many feeds are supplied by the bus.

Further on page 34, FBC states:

> …the ring bus configuration simplifies outage planning and maintenance activities, and reduces time required for network reconfiguration, also because of the redundant path. The ring bus reduces safety risks because it provides clear zones of isolation to work on station equipment. The risk of instances of mis-operation is also lower with a ring bus since it does not require complex transfers, and new employees will more quickly become familiar with this simple and standardized bus configuration.

17.5 Please explain how FBC currently manages outage planning and maintenance activities at LEE substation, with the current split bus configuration.

Response:

Please refer to the response to BCUC IR1 12.4 which describes the safety and operational considerations associated with the split bus configuration. Due to the complexity of the switching sequence required for a split bus configuration, urgent equipment restoration and load transfer are more challenging from a safety perspective. Accordingly, FBC incorporates the following additional measures applicable to work at LEE:

- No planned or regular work is permitted at LEE station without five days' notice. This notice period allows FBC's system operators and the crew leaders to thoroughly analyze the impact on the system and prepare a proper isolation sequence; and
- For equipment that must be manually operated, FBC uses an individualized padlock system, which is intended to eliminate human error and prevent inadvertent equipment operation.

17.6 Please explain how FBC employees and contractors can safely work at LEE substation today, with the current split bus configuration. Please elaborate on any special safety measures taken to mitigate the safety risks associated with working on or near a split bus configuration.

Response:

Please refer to the response to BCUC IR1 17.5.

17.7 Please confirm how many mis-operations FBC has experienced at LEE substation annually, over the past five years, that can be attributed to the split bus configuration.

17.7.1 Please state how many customers were negatively affected by these mis-operations.

Response:

Over the past five years, there have been no mis-operations due to the split bus configuration at the LEE substation.

However, the reliability disadvantage of a split bus was evident in the circumstances of the February 2015 outage, caused by the failure of a breaker at LEE. In this instance, the LEE CB

CAP1 circuit breaker failed. This failure tripped 50 Line and 46 Line, causing an outage to 24,667 customers until the faulted equipment could be isolated and bypass switches used to feed the customers from a separate line breaker while equipment was repaired. CB CAP1 was isolated and load was restored via 55 Line. If LEE had been configured as a ring bus, the customer outages would not have occurred.

D. PROJECT DESCRIPTION

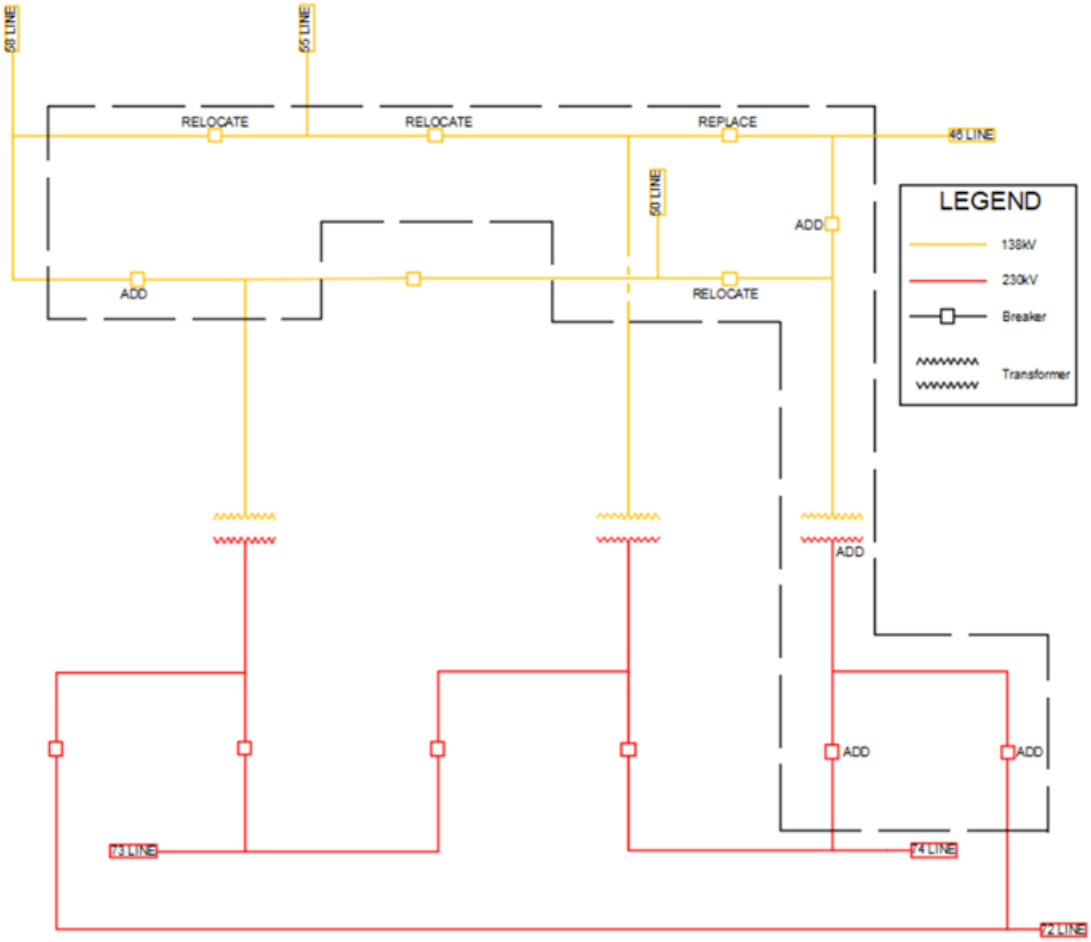
18.0 Reference: OVERVIEW

Exhibit B-1, Section 5.1, p. 38

Substation one-line diagram

On page 38 of the Application, FBC provides Figure 5-1, "LEE Terminal Ring Bus Simplified Single Line Drawing" under Alternative A.

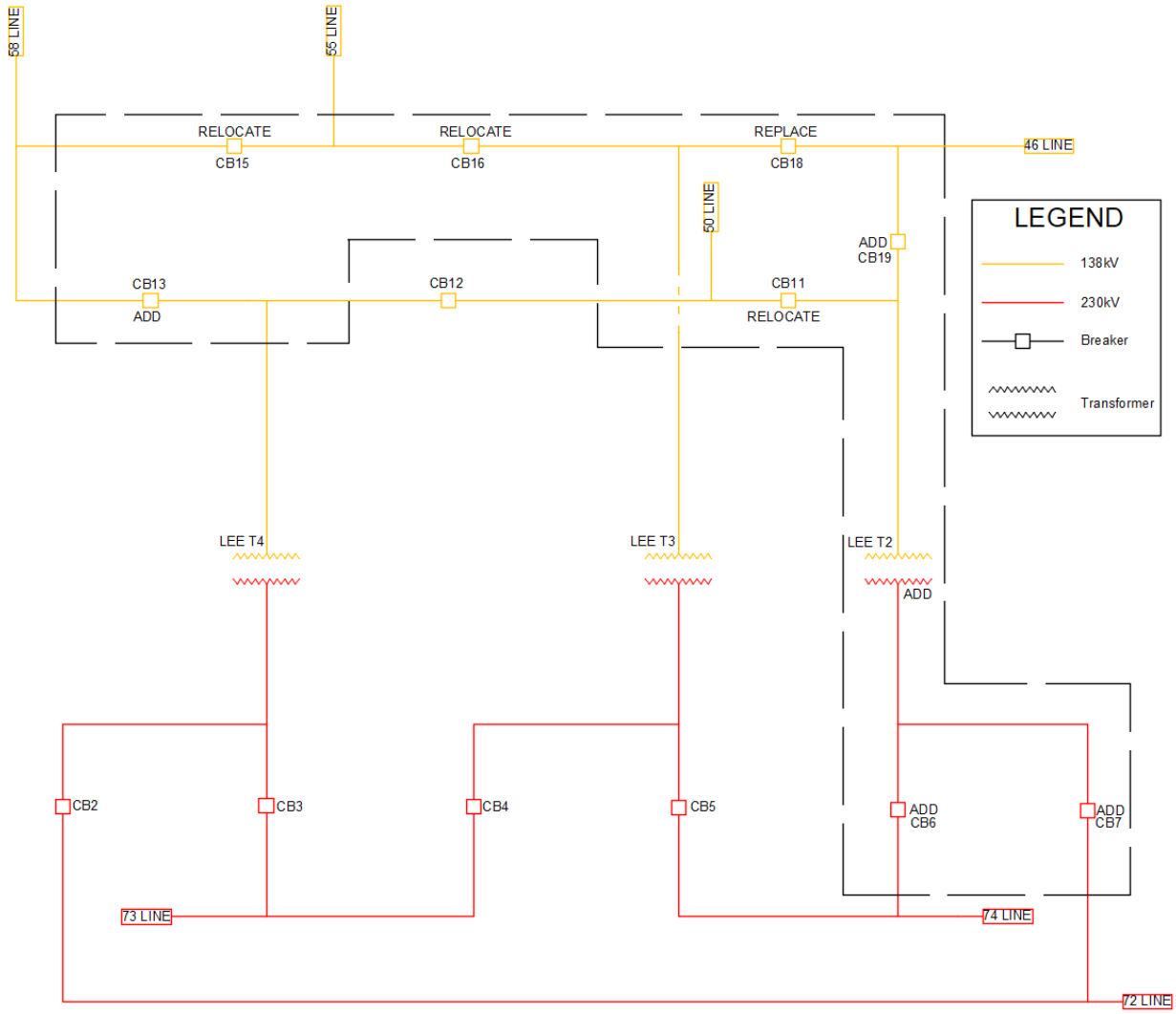
Figure 5-1: LEE Terminal Ring Bus Simplified Single Line Drawing



18.1 Please provide an updated Figure 5-1, with the transformers and circuit breakers labelled.

Response:

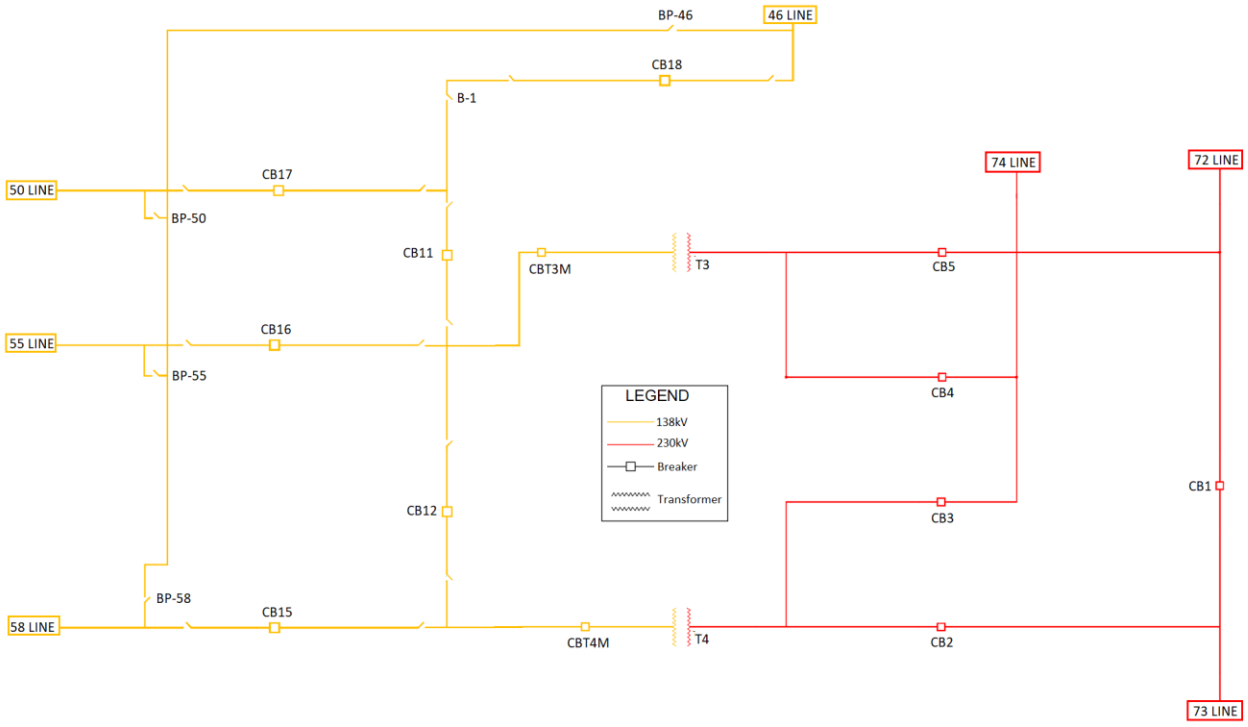
Please refer to the updated figure below which includes the labelled transformers and circuit breakers.



18.2 Please provide a similar Simplified Single Line Drawing for LEE substation today.

Response:

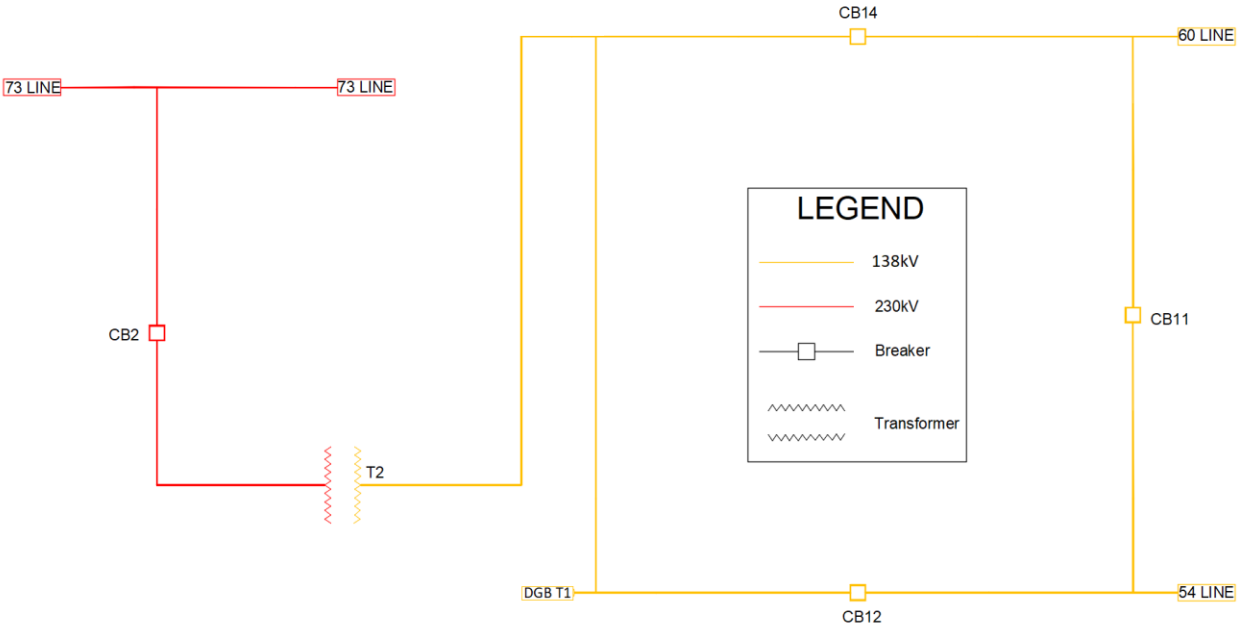
Please refer to the simplified single line drawing below for the existing LEE substation.



18.3 Please provide a similar Simplified Single Line Drawing for DGB substation today.

Response:

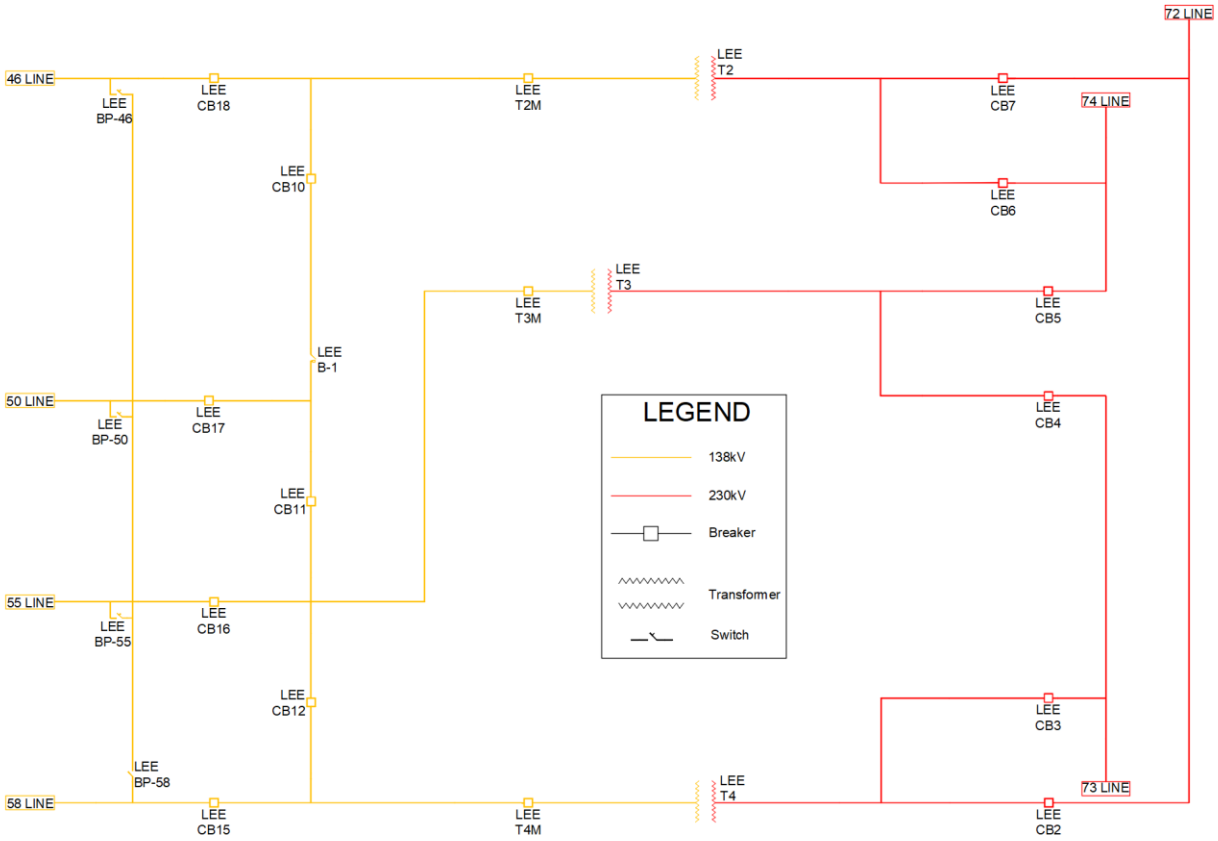
Please refer to the simplified single line drawing below for the existing DGB substation.



18.4 Please provide a similar Simplified Single Line Drawing for LEE substation under Alternative B.

Response:

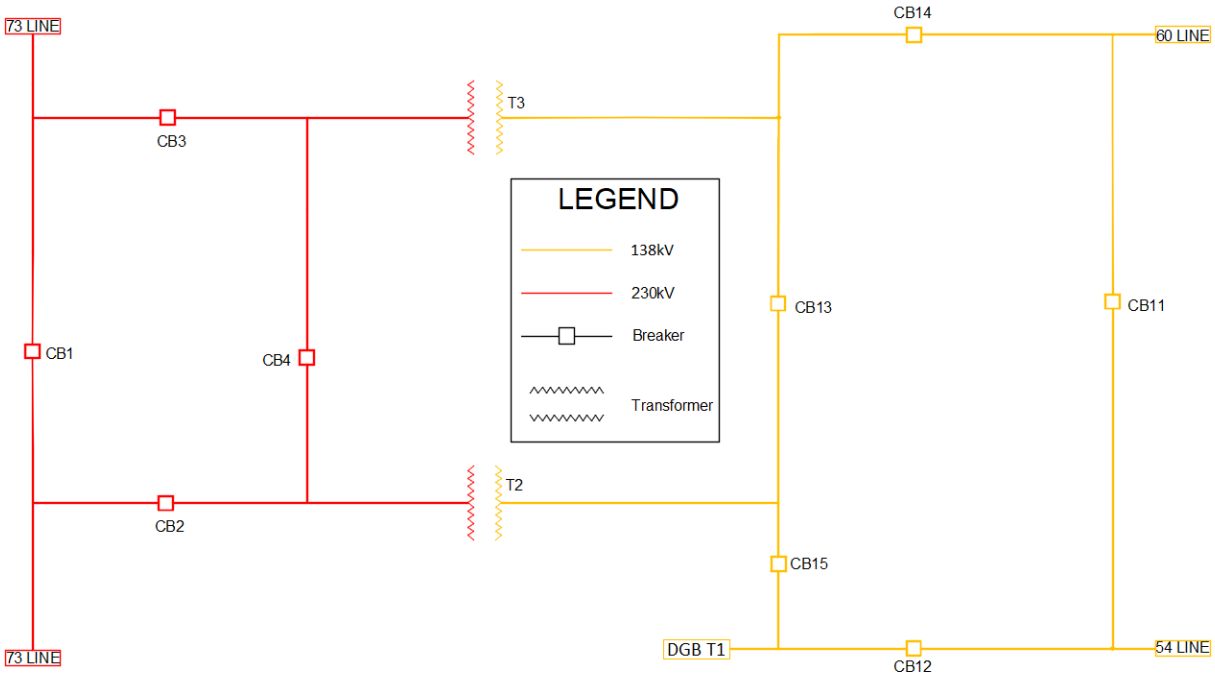
Please refer to the simplified single line drawing below for LEE substation under Alternative B.



18.5 Please provide a similar Simplified Single Line Drawing for DGB substation under Alternative C.

Response:

Please refer to the simplified single line drawing below for DGB substation under Alternative C.


73 LINE
CB3
T3
CB14
60 LINE
LEGEND
138kV
230kV
Breaker
Transformer
CB1
CB4
CB13
CB11
T2
CB2
CB15
73 LINE
DGB T1
CB12
54 LINE

1

2

19.0 Reference: OVERVIEW

Exhibit B-1, Section 5.1.2, p. 39

Distribution Line Modifications

On page 39 of the Application, FBC discusses the distribution line modifications portion of the project:

> With the transfer of distribution load from LEE to Sexsmith Feeder 6 in 2020, the 13 kV feeders LEE 1 and 2 will no longer be utilized. Distribution lines will be re-aligned as they will be underbuilt on 55L and 50L just inside the station's south and west property lines. The distribution lines will bypass LEE and will run between Sexsmith substation and Black Mountain with a normal open point just west of LEE.

19.1 Please explain the benefits of re-aligning the distribution lines to be underbuilt on 55L and 50L.

Response:

The two distribution feeder breakers that are the source for the existing LEE1 and LEE2 13 kV feeders will be demolished as part of this Project. Further, the existing overhead conductor and poles that run from the 13 kV distribution bus to just beyond the LEE station fence will be demolished. As described in the Application, these distribution feeders will be supplied by other stations by the end of 2020.

The main distribution line trunks south and west of the LEE station are presently underbuilt on 55L and 50L. When 55L and 50L structures are relocated and re-aligned, as described in Section 5.1.1 of the Application, the distribution circuit will be attached to these structures. This will be the most efficient way to maintain a distribution tie between Sexsmith and Black Mountain substations since it does not require the addition of dedicated distribution poles.

20.0 Reference: OVERVIEW

Exhibit B-1, Section 5.1.3, p. 39; Section 5.4, p. 44

Equipment demolished and salvaged

On page 39 of the Application, FBC discusses the demolition of distribution equipment as part of the project: "[e]xisting 13 kV equipment in the station will be demolished since this distribution load will be supplied from Sexsmith station upon completion of the Sexsmith Second Distribution Transformer project in 2020."

On page 44 of the Application, FBC provides the following components of the project schedule:

> Salvage existing 13 kV distribution structures and equipment;
>
> - Salvage existing T3 and T4 tertiary equipment, except station service transformers;
> - Salvage existing T3 and T4 grounding transformers;
> - Salvage existing Feeder (FDR)1 and FDR2 egress structures and lines

20.1 Please discuss what FBC intends to do with the salvaged or demolished equipment. For example, will the equipment be repurposed for use in other projects, used as spares or scrapped? Please include a discussion on the 13 kV equipment removed from LEE during this project.

Response:

The majority of the equipment has reached the end of its useful life or is considered obsolete as it is no longer supported by the original equipment manufacturer. Accordingly, most of the existing 13 kV equipment that is supplied by tertiary of T3 and T4 transformers will be scrapped, including grounding transformers and egress structures and cables.

FBC considered a life extension for the grounding transformers, which have been in service for 40 years. However, due to the size of the units and the fact that they cannot be universally relocated/re-used within FBC's system, a life extension would be of no benefit.

In contrast, the Feeder 1 regulator is a standard distribution sized regulator and will be stored as emergency spares for other locations.

On page 28 of the Application, FBC states:

> Though not part of this Project, the seven breaker ring bus could be converted in future to a nine breaker ring without expanding the bus, creating two additional nodes for connection of new transmission line(s) and/or a 138 kV/13 kV distribution transformer.

20.2 Please discuss what impact, if any, removal of the 13 kV equipment from LEE would have on FBC's future plans to add a 138 kV /13 kV distribution transformer.

Response:

The removal of the 13 kV equipment from LEE would not have any impact on FBC's future plans to add a 138 kV/13 kV distribution transformer. The existing 13 kV equipment is either at end of life (such as bulk oil breakers) or obsolete and not required in a modern standard configuration (such as voltage regulators).

21.0 Reference: PROJECT ENGINEERING AND DESIGN

Exhibit B-1, Section 5.2, p. 40; Section 5.3.3, p. 41

Project Engineering and Construction

On page 40 of the Application, FBC states: "[e]ngineering will be completed either by FBC or by an FBC pre-qualified external engineering firm."

On page 41 of the Application, FBC describes construction services for the project:

> All Project activities will be managed directly on site by FBC. Construction work will be tendered and contracted to pre-qualified vendors, with the exception of technical support, outage coordination, and security-sensitive work such as communications, protection, and controls, which will be performed by internal FBC resources. All laydown/storage will be at site and use FBC's standard project security measures such as locked storage containers and security guard patrol.

21.1 Please explain the rationale for the use of vendors or FBC resources for the engineering and construction work. Please discuss the advantages and disadvantages for each.

Response:

The rationale for using vendors versus FBC resources to complete the engineering and construction work is as follows:

Engineering:

The magnitude of this project will require a dedicated project engineering team to complete the design. Because FBC does not have the capacity to complete this design, it has decided to use external resources. However, FBC will assign a Project Engineer to oversee and manage the Project design.

Construction:

FBC does not have the internal construction resources to complete such a large scale project. As such, all civil, physical, and electrical construction will be completed by a pre-qualified contractor which will have the necessary resources to complete the scope of work.

The advantages and disadvantages of FBC's approach are as follows:

Advantages:

- Using external engineering resources allows FBC staff to maintain focus on the engineering and design of its Sustainment and Other capital projects;
- External engineering vendors have the capacity to create the Issue For Construction (IFC) packages in a shorter period to meet construction needs;
- FBC's construction crews are able to complement the Project by focusing on other key tasks such as switching, outage coordination, protection and control, and communications.
- FBC is able to leverage the external contractor's construction experience for the duration of the Project, and once the Project is complete, the contractor can be released.

Disadvantages:

- Using external resources requires a procurement and competitive bid process which will take time to prepare and evaluate;
- FBC will need to ensure vendors understand and apply FBC's engineering and design standards.

21.1.1 When selecting between vendors, please explain how FBC selects the successful vendors, detailing any criteria applied.

Response:

FBC typically issues a Request for Proposal (RFP) with material specifications to a variety of vendors for large items such as the circuit breakers and power transformers. As part of the process, FBC completes a formal evaluation of the proposals based on both Commercial and Technical criteria. This review is completed by Procurement and Project Management before a Purchase Order is awarded to the successful candidate.

Similarly, once the engineering packages are complete FBC will issue an RFP for construction services to a group of pre-qualified construction contractors. FBC will then review and award a contract to the successful bidder following a commercial and technical review of the proposals.

21.1.2 When using vendors, please discuss how FBC ensures it retains control over project costs and design.

Response:

As part of the procurement process, vendors submit proposals based on drawings and specifications issued by FBC. The contract with the vendor is based on their submission and sets the baselines for cost expectations and scope. The contracts are typically fixed price for the known scope coupled with force account/unit prices for less certain quantity driven activities. During the life of the Project any deviation from the original contract with the vendor will be monitored and controlled by the on-site FBC representative and approved by the Project Manager before proceeding.

All scope changes will be controlled through the FBC Change Management Program. Change Notices are used to identify the scope change and mutually agreed upon by both the vendor and FBC before proceeding. This Change Notice identifies the out-of-scope work required to complete the task and the financial impact to the Project.

The Project Manager will be responsible for monitoring the Project, approving scope changes, and forecasting financials to monitor and track costs for the duration of the Project. The Project Engineer will approve any design changes, and the Construction Manager will be the FBC on-site representative, which will monitor scope, quality assurance, and safety.

22.0 Reference: PROJECT ENGINEERING AND DESIGN

Exhibit B-1, Section 5.2, p. 41; Appendix E, pp. 1, 14; Appendix G to Appendix E, p. 5

Noise mitigation

On page 41 of the Application, FBC writes of its Noise Impact Assessment:

> When the transformer specification is issued to potential vendors during procurement, it will include proactive noise mitigation measures based on the recommendations of the Noise Impact Assessment that is further described in Section 5.5. In order to minimize noise impact for nearby customers, it will include a requirement for the transformer cooling fans to meet an acoustic specification of a maximum of 82 decibels (dBA) at a distance of one meter. Installation of a variable frequency drive (VFD) system on the fans will also be considered in order to reduce overall acoustic impact.

In Appendix E, FBC submits its Noise Impact Assessment, prepared by Patching Associates Acoustical Engineering Ltd. (Patching Associates) dated April 3, 2020.

In the Executive Summary of Appendix E, Patching Associates states: "the requirements of the Alberta Utilities Commission (AUC) Rule 012: Noise Control (the Rule) were used as a guideline for this analysis and to establish a target sound level for the Lee Substation facility design."

On page 14 of Appendix E, in its section titled Noise Control Recommendations, Patching Associates states its recommendations as: "[i]nstall 6m high barrier walls around the proposed T2 and the existing T3 and T4 Transformers. The suggested layout is depicted below in figure 6."

22.1 Please explain whether the AUC Noise Control rule is an industry-accepted guideline for establishing a target sound level for substation design in BC.

Response:

The AUC Noise Control rule serves only as a point of reference in the Noise Impact Assessment. The inclusion of this rule in the study serves as a comparison to provide context to the study findings. The inclusion of this rule in the noise impact study was not intended to acknowledge it as an industry-accepted guideline for substation design in BC.

22.2 Please confirm that the proactive noise mitigation measures FBC intends to implement are "install 6m high barrier walls around the proposed T2 and the existing T3 and T4 transformers," as recommended by Patching Associates.

Response:

FBC expects that the addition of a third transformer will lower loading on the existing transformers and thereby reduce noise levels. Accordingly, FBC will conduct field diagnostic noise measurements as recommended by Patching Associates prior to considering the implementation of any additional noise mitigation measures provided in the "Noise Control Recommendations (Optional)" section on Page 14 of Appendix E and as documented in Section 5.2 on Page 41 of the Application.

22.3 Please explain whether FBC has received any customer complaints or questions regarding noise levels with respect to either the existing LEE substation and/or the proposed KBTA Project.

Response:

FBC provided summary results of the noise level study conducted to area residents, stakeholders and Indigenous communities. FBC did not receive any questions or complaints from stakeholders, Indigenous communities, or area residents regarding noise associated with the existing station. Further, the questions raised by area residents related to noise associated with the proposed KBTA Project during the virtual open house on April 22, 2020 were addressed at that time, as discussed in Section 7.4.3 of the Application.

Appendix G of the Patching Associates Noise Impact Assessment is titled, "Technical Details and Best Practices Approach." Page 5 details several best practices to minimize impacts of construction noise.

22.4 Please confirm, or explain otherwise, that FBC intends to follow these best practices to minimize construction noise during the project.

Response:

FBC intends to follow typical construction practices to minimize the impact of construction noise during the Project. These closely align with the referenced best practices, with the exception of one recommendation:

- Take advantage of acoustical screening from existing on-site buildings to shield dwellings from construction equipment noise.

Given the large site and the relatively small dimensions of existing on-site buildings, there will be limited or no practical opportunity to apply this recommendation.

23.0 Reference: PROJECT SCHEDULE

Exhibit B-1, Section 5.4, pp.43,. 45

COVID-19 impacts to project schedule and construction costs

On page 43 of the Application, FBC provides the proposed project schedule as Figure 5-3.

On page 45 of the Application, FBC discusses the impacts of COVID-19 on its project schedule:

> The construction schedule in Figure 5-3 assumes no critical path delays, including those as a result of pandemic-related impacts on supply chain or resources. However, there are risk mitigations available should delays materialize. Mitigations include scheduling float for major equipment supply, construction methodology resequencing, resource levelling and blitzing, overtime and shift rotations, and activity stacking.
>
> During the 2020 COVID-19 pandemic, FBC initiated measures to combat the spread of the virus and ensure health and safety of our workers and contractors. The Company's work is deemed essential, which includes the KBTA Project. Should the COVID-19 pandemic remain a concern during the construction phase, at minimum the approach would be to continue with the measures adopted in 2020, evaluate the risks in accordance with standard health and safety practices, and institute mitigation measures as required.

23.1 Please confirm that any measures FBC is taking to mitigate COVID-19 risks for workers and contractors on its project construction sites and in its offices are in alignment with Work Safe BC requirements.

Response:

Confirmed. In support of the critical service provided to its customers, FBC has put in place measures to mitigate COVID-19 risks for workers and contractors on its project construction sites and in its offices. A key element of FBC's risk mitigation is its Exposure Control Plan, which specifically addresses COVID-19 risks to its employees and contractors. This Plan, which was filed in confidence with the BCUC on May 29, 2020, has been reviewed by WorksafeBC and conforms to all current requirements. At this time, it is uncertain how long the COVID-19 pandemic will persist; however, FBC has robust measures in place to mitigate risks through the various phases of the pandemic.

23.2 Since the Application was filed on April 24, 2020, the COVID-19 pandemic in B.C. has progressed. Please discuss whether any measures implemented in B.C. to control the COVID-19 pandemic will impact the proposed project schedule.

23.2.1 If applicable, please provide update the project schedule provided in Figure 5-3.

Response:

At this time, FBC does not anticipate that the COVID-19 pandemic will have a material impact on the project schedule. While the pandemic has progressed globally since April 24, 2020, the situation in BC has improved. As a result, the provincial government announced a move to Phase 3 of its Restart Plan on June 24, 2020. This announcement marked a further relaxation of some of the measures and restrictions in place at the time that the Application was filed. While it is possible that a second wave of infection could cause BC to revert to earlier phases of its Restart Plan, FBC does not believe an update to the project schedule is required at this time, but will continue to monitor the situation.

23.3 Please explain whether any additional allowances directly related to the COVID-19 pandemic, including but not limited to material cost increases and labour shortages, have been included in the project cost estimates.

Response:

Since the impact and duration of the COVID-19 pandemic remains uncertain, FBC has not included any additional allowances directly related to the COVID-19 pandemic in its project cost estimates. FBC will continue to monitor the pandemic situation and will report any material impacts to its project cost estimates should they occur.

23.4 If delays mentioned in the preamble above do materialize, please discuss the affect they may have on the project cost. Please also discuss FBC's cost risk mitigation measures for potential delays.

Response:

Material delivery time of major equipment such as circuit breakers and the power transformer are the largest risk foreseen at this time. To mitigate this risk, FBC has created an internal task force to identify critical long-lead items, communicate with vendors and monitor the supply chain. In addition, FBC will consider earlier order times and will include scheduled flexibility in the project schedule. Please also refer to the response to BCUC IR1 23.3.

24.0 Reference: PROJECT SCHEDULE

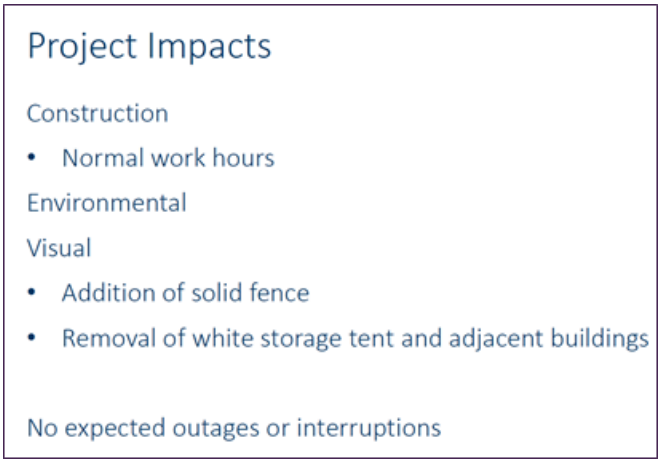
Exhibit B-1, Section 5.4, p.43; Section 7.4.3, p. 60; Appendix D-4, p. 11

Work scheduling

On page 43 of the Application, FBC states: "[d]uring times when outages have constraints such as loading or other conflicting outage plans, FBC will plan work to occur during low load periods such as nights and weekends."

On page 60 of the Application, FBC states as part of their community consultation: "[l]ighting: will be improved for safety purposes and will only be in use when night work is required in the station. FBC confirmed that lighting will not be on 24 hours per day;"

Appendix D-4 of the Application contains FBC's Virtual Town Hall Presentation. Page 11 of the presentation is reproduced below:



24.1 Please clarify and explain during what hours of the day construction will take place. In your response please identify what portions of the project are anticipated to include night and/or weekend work.

Response:

The majority of construction activity will occur between the hours of 7 am to 5 pm Monday through Friday. Once the contract is awarded, construction schedules will be finalized with the vendor and the surrounding neighbours will be notified.

As an exception, during certain stages of the Project where short outages are needed to isolate equipment, or when it is necessary to off-load a portion of the system due to construction constraints, FBC will typically choose a time that has a low impact to customers (for example, an early Sunday morning outage). Should certain phases of the Project require night or

weekend shifts, the appropriate notifications will be relayed to all affected stakeholders and surrounding neighbours.

FBC also anticipates completing the majority of the transmission reconfiguration outage work during shoulder seasons to reduce system risk, customer impacts, and outage duration. FBC's shoulder seasons are historically March through May and September through November depending on seasonal weather patterns.

24.2 IF FBC expects to undertake work during nights and weekend, please confirm if construction working hours will be included in the construction notification letters, as discussed in Section 7.6 of the Application.

Response:

Confirmed. Please also refer to the response to BCUC IR1 24.1.

E. PROJECT COST AND FINANCIAL EVALUATION

25.0 Reference: PROJECT COST AND FINANCIAL EVALUATION
Exhibit B-1, Section 5.7, p. 48; Section 6.2, p. 52
Project Capital Cost Estimate

Page 52 of the Application states, "[t]he expected accuracy of the cost estimate is, as defined in AACE: Low: -10 percent to -20 percent and High: +10 percent to +30 percent." [*Emphasis added*]

On page 48 of the Application, FBC states that "[d]etailed class three estimate [have been] completed for construction."

25.1 Please discuss the level of project definition for each alternative with reference to the AACE classes of estimates.

Response:

The cost estimates for Alternative A and Alternative B are defined to an AACE Class 3 level, while the cost estimate for Alternative C is defined to an AACE Class 4 level.

- Class 3 estimates have an expected accuracy: Low: -10 percent to -20 percent and High: +10 percent to +30 percent;
- Class 4 estimates have an expected accuracy: Low: -15 percent to -30 percent and High: +20 percent to +50 percent.

FBC notes, however, that the accuracy range and cost estimate for any given project is still an estimate based on professional judgment and the information available to the Company at the time. FBC believes that all prudently incurred costs associated with safely and reliably completing necessary capital work is legitimately included in rate base.

25.2 Please confirm, or otherwise explain, whether the accuracy of the cost estimate for each alternative is within the expected accuracy range for a Class 3 estimate.

25.2.1 Please provide the accuracy range for each cost estimate.

Response:

Please refer to the response to BCUC IR1 25.1.

25.3 Please complete the table below to illustrate the range of the Project Costs for Alternatives A, B and C.

Alternative	Project Cost	Low Estimate		High Estimate		
		Cost Decline 20%	Cost Decline 10%	Cost Increase 10%	Cost Increase 20%	Cost Increase 30%
A	$23.288M					
B	$17.008M					
C	$32.332M					

Response:

The requested information is provided below.

Alternative	Project Cost	Low Estimate		High Estimate		
		Cost Decline 20%	Cost Decline 10%	Cost Increase 10%	Cost Increase 20%	Cost Increase 30%
A	$23.288M	$18.630M	$20.959M	$25.617M	$27.946M	$30.274M
B	$17.008M	$13.606M	$15.307M	$18.709M	$20.410M	$22.110M
C	$32.332M	$25.866M	$29.099M	$35.565M	$38.798M	$42.032M

25.4 Please discuss the probabilities of these alternatives being at either the low or high end of their estimates.

Response:

FBC has not employed probabilistic methods to evaluate its estimation and therefore, cannot quantify the probabilities at the extremes of the estimating ranges. However, from an estimating standpoint, all of the alternatives, and in particular Alternatives A and B, are very similar in nature. The civil works for the site expansion are identical and there are no significant differences in the items identified in the project risk register (Table 5-1) between the alternatives. Therefore, FBC expects that cost variances would be similar in direction and magnitude between the alternatives.

26.0 Reference: PROJECT COST AND FINANCIAL EVALUATION

Exhibit B-1, Section 6.4.1, p. 54; Appendix B-3, p. 1

Construction Costs

Page 54 of the Applications states, "construction of the Project is scheduled to be completed in multiple phases."

Page 1 of Appendix B-3 reflects the costs of the line work by phase.

26.1 Please provide the costs of the station work by phase, on a confidential basis if required.

Response:

FBC has not prepared an estimate of the station work by construction phase or chronology of tasks to complete the project. The phases referred to in the document depict an operational view of the steps required to complete the project, but do not align with the timing of the completion of assets nor the timing of when the assets enter rate base. Therefore, the costs in this view do not align, nor are they intended to align, with the rate impacts in Schedule 9, which are aligned with changes in O&M and rate base as the project progresses and as assets enter rate base.

The work involved to re-cast the costs by project phase would be considerable and would not have any impact on the timing of assets entering rate base, or on Schedule 9 and the indicative rates calculated in that schedule.

26.2 Please confirm, or explain otherwise, whether incurring estimated station costs by their phase of construction affects the indicative rates displayed in Schedule 9 in Appendix C.

26.2.1 If not confirmed, please provide updated Schedule 9 for Alternatives A, B and C, on a confidential basis if required, highlighting any changes.

Response:

Please refer to the response to BCUC IR1 26.1.

27.0 Reference: PROJECT COST AND FINANCIAL EVALUATION

Exhibit B-1, Section 5.7, pp. 48, 51; Section 6.2.4, p. 53; FBC Certificate of Public Convenience and Necessity (CPCN) Application for the Grand Forks Terminal Station Reliability Project (Grand Forks CPCN Application) Decision and Order C-2-19 dated July 25, 2019, Section 6.1.3, p. 42

Project Contingency

Page 53 of the Application states, "FBC has applied a contingency amount to the estimates (before materials handling and provincial sales tax) of 15 percent for all construction and removal, other than for transmission and distribution line construction at 20 percent, and line removal costs at 7 percent. Contingency amounts that have been applied are based on FBC experience."

27.1 Please explain which past construction projects and experience were used to determine the contingency amounts for this Application. Please also explain why this past experience is relevant for the KBTA Project.

Response:

In accordance with AACE International Recommended Practice No. 10S-90, the contingency is typically estimated using statistical analysis or judgement based on past asset or project experience. The KBTA Project contingency is based on experience with past projects of a similar size and/or complexity, most recently the Grand Forks Terminal Station Reliability Project, and Ruckles Substation Rebuild Project.

27.2 Please explain why line removal requires half the contingency compared to the other construction removals.

Response:

For added clarity, the 7 percent line removal costs are in relation to the Station estimate for 230 kV shield wire removal within the LEE substation. The contingency for this portion of work reflects a lower assessed risk and limited potential for specific scope escalation due to its straight forward, well defined scope requirements. Accordingly, costs related to the work have been viewed as having limited overall risk.

Conversely, the contingency for the main Transmission and Distribution overhead line removal is 20 percent, which is consistent with the line construction work and reflective of a higher assessed risk and potential for scope escalation.

Page 42 of Exhibit B-1 of FBC's Grand Forks CPCN Application states, "[a] contingency of 17.7 percent (including Project loadings) was used for the stations component and a contingency of 20 percent was used for the transmission and distribution component."

27.3 Please provide the reasoning for the construction and removal contingencies being set at 15 percent in this Application compared to the contingency for the station component of the Grand Forks CPCN Application.

Response:

The construction and removal contingencies were initially set at the same values for both applications. A CPI increase of 4.2 percent was added to the contingency for the Grand Forks Terminal Application to convert the construction estimate from 2016 dollars to 2018 dollars[7].

Table 5-1, Risk Register, on page 48 of the Application shows:

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

Page 51 of the Application states, "[a]ny cost impacts that may arise from these risk factors are expected to be manageable within the Project contingency."

[7] FBC Application for Approval of the Grand Forks Terminal Station Reliability Project, Exhibit B-9-1, Response to BCUC Confidential IR 2.10.1.

27.4 Please confirm, or explain otherwise, that anticipated foreign exchange and raw material escalation are included in the 15 percent and 20 percent contingencies mentioned above.

Response:

Confirmed. Material costs for the Project are based on Class 3 estimates that rely on current budgetary pricing, and it is expected that the project contingencies can be used to account for typical variations, inflation[8], and general increases in estimated costs that may occur due to foreign exchange or raw material escalation.

However, the contingency does not account for any extreme events that may significantly impact material costs (e.g., major larger scale weather event, pandemics, market crashes/surges, commodity spikes, etc.). If an extreme event were to occur during the execution of the Project, it is expected that the material costs would be reviewed and re-evaluated at that time to properly reflect current pricing, schedules, expedited deliveries, and the related items.

There are no events that are currently expected to significantly impact the materials costs used for the current timing of the Project (or for that matter, otherwise warrant the materials costs to be re-evaluated). As discussed in the response to BCUC IR1 23.3, while FBC will continue to monitor the COVID-19 pandemic situation, it does not anticipate re-evaluating Project costs due to the pandemic at this time.

27.5 Please confirm, or explain otherwise, whether the 15 percent and 20 percent contingencies mentioned above include any allowances for increased labour costs.

Response:

Confirmed. Labour costs for the Project are based on Class 3 estimates that rely on current typical contractor labour rates, and it is expected that the project contingencies would be used to account for reasonable variations in labour costs[9] or variations in tender contract pricing. Labour costs for the estimates use a built-up hourly labour rate that is based on current typical fully loaded industry rates. This includes direct costs (wages), indirect costs (risks, profit

[8] An annual CPI rate of 2.0% was used to escalate any cost estimates (including materials), based on the Conference Board of Canada Consumer Price Index forecast.

[9] An annual CPI rate of 2.0% was used to escalate any cost estimates (including labour) when required, based on the Conference Board of Canada Consumer Price Index forecast.

margins, premiums, living out allowances, pensions, etc.), equipment rates, and related disbursements.

However, the contingency allowance does not account for any extreme events that may significantly impact labour costs (e.g., major weather events, pandemics, etc). If an extreme event were to occur, it is expected that the labour costs would be reviewed and re-evaluated at that time to properly reflect and address current pricing and scheduling for the project.

There are no events that are currently expected to significantly impact the labour rates used for the current timing of the project (or for that matter, otherwise warrant the labour costs to be re-evaluated). As discussed in the response to BCUC IR1 23.3, FBC does not anticipate to re-evaluate project costs due to the COVID-19 pandemic at this time, though it will continue to monitor the situation.

28.0 Reference: PROJECT COST AND FINANCIAL EVALUATION

Exhibit B-1, Section 3.3.2.1, pp. 17-18; Section 4.5.1, p. 33;

Section 6.2, p. 52; Section 6.4.2, p. 55

Incremental Revenue Requirements and Rate Impact

Table 4-2 on page 33 of the Application states the PV of 40 years of Incremental Revenue Requirement for each of Alternative A, B and C is equal to $23.0M, $17.1M and $44.0M, respectively.

Page 52 of the Application states, "[t]he expected accuracy of the cost estimate is, as defined in AACE: Low: -10 percent to -20 percent and High: +10 percent to +30 percent."

Page 55 of the Application states:

> 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.

28.1 For Alternatives B and C, please provide the annual bill increase for an average residential customer using 11,000 kWh at: (i) the Cost of Service; and (ii) 40 year levelized rate.

Response:

FBC provides the requested amounts in the table below:

Item	Alternative A	Alternative B	Alternative C
2024 Cost of Service Rate Increase	0.54%	0.40%	0.74%
2024 Bill Impact *Avg. Residential Customer Using 11,000KWH*	**$ 6.87**	**$ 5.05**	**$ 9.35**
40 Year Levelized Rate Increase	0.39%	0.29%	0.75%
40 Year Levelized Bill Impact *Avg. Residential Customer Using 11,000KWH*	**$ 4.96**	**$ 3.69**	**$ 9.49**

28.2 Please complete the table below to illustrate the variability in the PV of the 40-year Incremental Revenue Requirement for Alternatives A, B and C.

Alternative	Base NPV	NPV Value If:		Difference to Base NPV if:	
		Cost Decline 20%	Cost Increase 30%	Cost Decline 20%	Cost Increase 30%
A	$23.0M				
B	$17.1M				
C	$44.0M				

Response:

FBC provides the requested table below:

Alternative	Base NPV	NPV Value If:		Difference to Base NPV if:	
		Cost Decline 20%	Cost Increase 30%	Cost Decline 20%	Cost Increase 30%
A	$ 23.0	$ 18.6	$ 29.7	$ (4.4)	$ 6.7
B	$ 17.1	$ 13.9	$ 22.0	$ (3.2)	$ 4.9
C	$ 44.0	$ 35.5	$ 56.9	$ (8.5)	$ 12.9

28.3 Please complete the table below to illustrate the percentage rate impact and change in annual bill based on the calculations applied in IR 28.2.

Alternative	Base NPV	% Rate Impact if:		Change in Annual Bill if:	
		Project Cost Decline 20%	Project Cost Increase 30%	Project Cost Decline 20%	Project Cost Increase 30%
A	$23.0M				
B	$17.1M				
C	$44.0M				

Response:

FBC provides the requested table below summarizing the change to the levelized 40-year rate impact.

Alternative	Base NPV	% Rate Impact if:		Change in Annual Bill if:	
		Project Cost Decline 20%	Project Cost Increase 30%	Project Cost Decline 20%	Project Cost Increase 30%
A	$23.0M	0.32%	0.51%	$ 4.00	$ 6.40
B	$17.1M	0.24%	0.38%	$ 2.98	$ 4.74
C	$44.0M	0.60%	0.97%	$ 7.64	$ 12.25

1

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F. CONSULTATION

29.0 Reference: CONSULTATION

Exhibit B-1, Section 7.1, p. 57

General

The BCUC's CPCN Guidelines[10] (CPCN Guidelines) outline the minimum requirement for an application submitted under sections 45 and 46 of the *Utilities Commission Act* (UCA). Page 6 of the CPCN Guidelines incudes items specific to Public Consultation. Item (i) of that section is as follows:

> (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.

29.1 Please provide an overview of the community, social and environmental setting in which the KBTA Project will be constructed and operated.

Response:

For the preferred KBTA Project alternative, the overview of the community, social and environmental setting reflects the presence of the LEE station as a pre-existing asset, as shown in Figure 4.3 of the Application, which has served the community for many years. As such, the focus of FBC has been to minimize the impact of any required changes to the station and surrounding area as the Project progresses. In the view of FBC, this requires a comprehensive consultation process, although different in scope than would be expected for a greenfield location.

In reviewing Project alternatives, community, social and environmental considerations are identified primarily through engagement and consultation with Indigenous communities, government agencies and stakeholders, in particular, members of the public who may be directly impacted by the Project.

This direct interaction with area residents and businesses is augmented by a review of any potential environmental or community impacts that may occur as a result of the Project as it progresses through the stages of construction.

Since the station footprint and fence line would be only modestly expanded, but remaining on FBC land, FBC considers any incremental environmental impact to be minimal. Respondents to public consultation activities did not raise the expanded footprint as a concern, instead showing more interest in visual screening, lighting and noise impacts.

[10] Order G-20-15, dated February 12, 2015, https://www.bcuc.com/Documents/Guidelines/2015/DOC_25326_G-20-15_BCUC-2015-CPCN-Guidelines.pdf

Further discussion of the community, social and environmental considerations can be found in the Application, Section 5.5 (Environmental and Archeological Impacts), and Section 7 (Consultation), in particular Section 7.4.3 (Virtual Town Hall/ Information Session) where issues of community and social importance are described.

FBC has committed to a construction notification letter that will be sent to area residents during Project planning and leading up to construction, focusing on potential impacts related to noise, dust and construction activities and how these issues may be mitigated.

29.2 Please provide an overview of the community, social and environmental setting in which Alternative C would be constructed and operated, and of the public who would be directly impacted.

Response:

Similar to Alternates A and B at the LEE substation, Alternative C would have little incremental impact given that the pre-existing station is already included in the community, social and environmental setting as it currently exists.

Alternative C involves installing a new transformer at the DG Bell Terminal Station, the reconductoring of 60 Line and 51 Line to OKM, and construction of a new 230 kV yard on an undeveloped portion of the land owned by FBC (as shown in Figure 4.4 of the Application). FBC did not actively consult with the public regarding Alternative C, since Alternative A is the preferred solution and is superior with respect to its financial cost[11], its physical impact and its technical evaluation. Finally, given the similarities in the community, social and environmental setting, FBC believes that any concerns raised with respect to Alternative C would likely have been similar to those that raised for Alternative A.

[11] The PV of incremental revenue requirements for Alternative A is $21.0M lower than Alternative C.

30.0 Reference: CONSULTATION

Exhibit B-1, Section 7.2, p. 57

Key Stakeholders

On page 57 of the Application, FBC states:

> 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.

30.1 Please identify how many other residents are adjacent to or in close proximity to LEE that are not part of the Tower Ranch subdivision that FBC identifies as key stakeholders to the KBTA Project.

Response:

FBC identified five stakeholders adjacent to or in close proximity to LEE. The stakeholders are two residential and three commercial customers, including the operators of a golf course, a development company and the local irrigation district.

30.1.1 Please confirm, or otherwise explain, that notification letters were sent to these residents who do not live within the Tower Ranch subdivision.

Response:

FBC confirms that notification letters were mailed via Canada Post to these stakeholders on March 30, 2020.

31.0 Reference: CONSULTATION

Exhibit B-1, Section 7.3, p. 57

Consultation with Local Government

Page 57 of the Application states:

> FBC contacted City of Kelowna staff and, at their request, provided a brief overview of the Project by email on March 16, 2020. The overview included information about the Project, the purpose for the upgrade, application timelines and how FBC is consulting with local community members and area residents. FBC sent a follow-up letter on March 31, 2020 that included the visual renderings and noise study summary, and offered to provide additional information if needed, or to set up a meeting or Council presentation if required. A response received on March 31, 2020 29 advised that the City Manager had briefed Council and would be in contact if further information was requested. As of the date of filing, no further information has been requested.

31.1 Please discuss if there has been any further communication with the City of Kelowna staff regarding the KBTA Project since the date of filing of the Application. If so, please provide details of any communications.

Response:

FBC has not had any further communication with, or meeting requests from, the City of Kelowna since the date of filing.

32.0 Reference: CONSULTATION

Exhibit B-1, Section 7.3, p. 58-61; Appendix D-2, Appendix D-4, p. 11

Consultation with Local Residents

On page 58 of the Application, FBC states:

> The Project has a dedicated webpage containing information on the Project and includes an opportunity to provide feedback via an online survey.

Appendix D-2 of the Application provides KBTA Survey Results as of April 22, 2020.

32.1 Please provide a summary of any additional surveys or any additional feedback received from local residents since the date of filing of the Application.

Response:

FBC confirms that no additional surveys or feedback have been received since the date of filing of the Application.

On page 59 of the Application, FBC states:

> On April 22, 2020 from 5:00 p.m. to 7:30 p.m., FBC hosted a virtual Town Hall/Information Session with the TRCA President and area residents to provide an additional opportunity for stakeholders to engage directly with Project technical staff, Communications and Regulatory Affairs representatives of FBC. This session was hosted virtually, as a opposed to being an in-person public open house, due to the recent COVID-19 events and the related limitations on public meetings and requirements for social distancing.

Further on page 59 of the Application, FBC states:

> Approximately 12 residents called into the virtual Town Hall event…

32.2 Please confirm approximately how many residents and other key stakeholders were invited to the April 22, 2020 virtual town hall.

Response:

FBC included information for the virtual town hall in the notification letter sent to Tower Ranch residents, area residents and area businesses on March 30, 2020. Invitations were extended to

all Tower Ranch residents (approximately 280) as well as area residents (two) and commercial customers (three) in proximity to LEE to attend the April 22 virtual town hall.

32.3 Please discuss, based on FBC's experience hosting town hall meetings for other projects, whether FBC considers the attendance at the April 22, 2020 virtual town hall to be average, above average, or below average.

Response:

Based on previous experience, FBC considers the attendance at the virtual town hall to be average. Two previous town halls in 2012 for the proposed LEE Station project at that time had a total of 12 attendees between them.

FBC was able to work with the Tower Ranch Community Association (TRCA) President to reach a very high percentage of area residents in advance of the virtual town hall on April 22, 2020. The TRCA maintains a contact list covering 100 percent of the residents, including e-mail addresses, allowing FBC to work with the TRCA to distribute Project information directly to area residents. This collaboration assisted with communicating with residents during the COVID-19 pandemic and allowed for opportunities to gather feedback through the online survey and Project email.

On pages 60-61 of the Application, FBC states:

> The primary topics of discussion focused on:
>
> - Aesthetic improvement options FBC is considering including concrete wall height and colour, as well as vegetative screening;
> - Clarification on results of noise study summary and whether noise levels will increase substantially;
> - Lighting concerns about the number of lights and times of use;
> - The extent to which work would be done within current station footprint or beyond;

- Impacts during construction such as road closures and/or planned outages; and
- Levels of electromagnetic fields post construction.

FBC provided the following information to address each concern raised:

- Aesthetic improvement: FBC is open to feedback on options for concrete wall height and colour that would be acceptable to area residents and complimentary to them neighbourhood aesthetics, as well as consideration of input on vegetative screening;
- Noise: not expected to substantially increase given the change in operation of the station with the load spread across a higher number of transformers;
- Lighting: will be improved for safety purposes and will only be in use when night work is required in the station. FBC confirmed that lighting will not be on 24 hours per day;
- Station work will not require any expansion outside of existing station property. Confirmed a small fence modification will be required on the southwest corner, away from the residential area;
- Construction impacts are expected to be minimal and will be communicated to the residents as outlined in section 7.6; and
- FBC has committed to assess any change in EMF levels that may result from the Project.

The information provided was well received by participants, with FBC either sufficiently addressing the concerns raised and answered questions asked, or agreeing to work collaboratively with the TRCA Board of Directors by creating a focus group to continue discussions as the Project progresses. Not all decisions related to station aesthetics need to be finalized prior to commencing station planning and construction, and FBC will work in partnership with the TRCA Board to incorporate customer input into design plans for appropriate aesthetic improvements to the extent possible.

32.4 For each concern listed in the above preamble, please identify which concerns FBC considers to be sufficiently addressed and resolved, and which concerns FBC will be continuing to address through the noted focus group.

Response:

FBC considers that concerns regarding noise, lighting and station work outside the existing station footprint were sufficiently addressed and that stakeholders were satisfied with the

information provided to them. The Company's commitment to assess any changes in EMF levels satisfied initial concerns in this regard. FBC will work with the focus group being established by the Tower Ranch Community Association Board of Directors to continue discussions on station aesthetic improvements and will communicate about construction impacts leading up to and during construction.

FBC believes the improvements to the aesthetics of the station are an important part of the Project and will consider aesthetic measures where they do not negatively impact the safety, reliability, or security of its facilities.

32.4.1 For those items to be continued to be addressed, please discuss how FBC may consider resolving issues where consensus can not be achieved.

Response:

Please refer to the response to BCUC IR1 32.4.

33.0 Reference: CONSULTATION

Exhibit B-1, Section 1.1.5, p. 4; Section 7.5, pp. 61-62

Engagement with Indigenous Communities

On pages 61-62 of the Application, FBC states the following in regard to notification of Indigenous communities:

> The Project notification letter was emailed on December 19, 2019. A sample letter can be found at Appendix D-5. FBC did not receive any requests for meetings as a result of the notification letter and received only one response deferring further engagement to Okanagan Indian Band and Westbank First Nation as these communities are in closer proximity to the station site.
>
> FBC followed up on April 2, 2020 by sending an update email with a link to the Project webpage, summary of the noise study and visual renderings of the Project. FBC offered to host a virtual Town Hall with the Indigenous communities. Two responses were received, one deferring further engagement to Westbank First Nation; and one requesting additional information on the Project location, which was provided.
>
> Following the filing of this Application, FBC will send a follow up letter to the Indigenous communities advising of the filing and extending another offer to discuss the Project, if requested. FBC will continue to update and engage with Indigenous communities as the Project progresses.

33.1 Please discuss if FBC has considered any means of communication other then letter and email to notify Indigenous communities of the KBTA Project.

33.1.1 If not, please discuss why not.

Response:

FBC considered a number of options for follow up communication other than letter or email to notify Indigenous communities about the KBTA Project. These included phone calls and in-person meetings to address questions or concerns that may have arisen from the letters.

Shortly following the email sent on April 2, 2020, offices in Indigenous communities began to close or reduce staffing levels due to COVID-19. This limited FBC's options including scheduling in-person meetings or contacting anyone by phone prior to filing the Application.

33.2 Please provide a copy of the follow up letter, as noted above, which FBC indicates would be sent to Indigenous communities following the filing of the Application.

Response:

Please find the Project filing update letter at Attachment 33.2. While this letter was drafted shortly after the filing of the Application, in preparing these responses to Information Requests, FBC determined that the letter had inadvertently not yet been sent. The letter was sent to Indigenous communities by email on June 27, 2020, confirming the Application filing date, providing information on how to contact the BCUC, and extending a further offer to host a conference call or meeting, if requested.

33.3 Please discuss if there has been any additional communication with Indigenous communities regarding the KBTA Project since the date of filing of the Application.

Response:

FBC has not received further communication or meeting requests from Indigenous communities since the date of filing. However, as noted in the response to BCUC IR1 33.1, FBC remains open to future engagement.

On page 61 of the Application, FBC states:

> A list of potentially affected Indigenous communities was developed using the Province of British Columbia's Consultative Areas Database (CAD) to create a comprehensive list of those Indigenous communities whose area of interest is located in the area of the F.A. Lee Terminal Station. The list includes:
>
> - Okanagan Indian Band;
> - Penticton Indian Band;
> - Okanagan Nation Alliance;

- Lower Similkameen Indian Band;
- Westbank First Nation; and
- Upper Nicola Indian Band

Page 4 of the CPCN Guidelines incudes items specific to First Nations Consultation. Items (i), (ix), and (x) of that section are as follows:

(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. [*Emphasis added*]

(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.

(x) A statement of what future consultation with First Nations is contemplated subsequent to the preparation of the CPCN application.

33.4 Please provided a list of potentially affected First Nations for Alternative C.

Response:

Using the Province of British Columbia's Consultative Areas Database (CAD), the Indigenous communities whose area of interest is located in the area of Alternative C are listed as: Esh-kn-am Cultural Resource Management, Nooaitch Indian Band, Penticton Indian Band, Okanagan Nation Alliance, Westbank First Nation, Upper Nicola Indian Band, Lower Similkameen Indian Band and Okanagan Indian Band.

33.5 Please provide a statement as to FBC's overall view as to the sufficiency of the consultation process with Indigenous communities to date, in the context of the decision that is being sought from the BCUC.

Response:

It is FBC's view that the consultation process undertaken with Indigenous communities to date has been reasonable and sufficient. FBC's approach has been respectful of the administrative capacity of Indigenous communities, is consistent with FBC's approach taken on previous projects, and is consistent with the fact that the Project was in the early, planning stage.

Additionally, the consultation process with Indigenous communities undertaken to date is consistent with the CPCN Guidelines for consultation prior to filing. The CPCN Guidelines

stipulate the identification of First Nations that may be impacted by feasible project alternatives, which FBC has completed. However, the CPCN Guidelines do not indicate a requirement for full consultation on all viable project alternatives and, in FBC's view, the requirement for consultation in the context of the decision which is being sought from the BCUC is indicative of a requirement to direct consultation efforts toward the project for which approval is being sought as opposed to alternatives.

FBC will continue to engage with Indigenous communities as the Project moves forward, construction timelines are confirmed, and procurement opportunities are identified.

33.6 Please provide a statement of what future consultation is contemplated.

Response:

FBC will continue to inform and engage with Indigenous communities as the Project progresses and will remain open and available for further discussions. FBC will contact Indigenous communities to determine if meetings to review the Project in more detail are requested.

FBC will communicate potential contracting or supply opportunities once preliminary plans and detailed design information is available and will offer opportunities to participate in the Project.

On Page 4 of the Application, FBC states:

> FBC will continue to engage with Indigenous communities throughout the Project, including with respect to potential jobs, training and supply chain opportunities as well as any opportunities for cultural preservation.

33.7 Please discuss how FBC will engage with Indigenous communities with respect to potential jobs, training and supply chain opportunities as well as any opportunities for cultural preservation.

Response:

FBC will continue to engage Indigenous communities leading up to construction to identify opportunities to involve local Indigenous businesses in aspects of construction. Specific opportunities to source materials, supplies and hiring of potential contactors from local

1 Indigenous businesses will be identified during the detailed planning and design stage of the
2 project and during further discussion with Indigenous communities leading up to and during
3 construction.

4 FBC will engage with Indigenous communities to seek input and understanding if there is
5 potential to impact culturally sensitive areas and if so, how to mitigate during construction.

Attachment 4.10

REFER TO LIVE SPREADSHEET MODELS

Provided in electronic format only

(accessible by opening the Attachments Tab in Adobe)

Attachment 6.7

FILED CONFIDENTIALLY

Attachment 11.3

REFER TO LIVE SPREADSHEET MODEL

Provided in electronic format only

(accessible by opening the Attachments Tab in Adobe)

Attachment 33.2

Shelley Martens
Community & Aboriginal Relations

FortisBC Inc.
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June 27, 2020

First Nation
Address
City, BC postal code

Attention: *Contact*

Re: FortisBC Kelowna Bulk Transformer Addition (KBTA), Lee Station Project Update

As a follow up to our letter email dated April 2, 2020 regarding FortisBC's proposed Kelowna Bulk Transformer Addition (KBTA) Lee Station project, we would like to let you know that our Certificate of Public Convenience and Necessity (CPCN) application was submitted to the BC Utilities Commission (BCUC) on April 24, 2020.

Due to significant growth in the Okanagan region, the addition of a new power Transformer will ensure that we can continue to provide sufficient power supply to our customers, now and into the future. As mentioned previously, the project will include the installation of the new Transformer, re-routing of some power line approaches to the station, upgrading site lighting, removal of the existing white storage facility and improved aesthetic appearance around the station site. The majority of the work will be done inside the substation property.

As a regulated utility, FortisBC must have projects like this reviewed and approved through a rigorous and transparent process with the BCUC. If *(First Nation)* wish to participate in the application process, information on how to get involved can be found at www.bcuc.com. All related documents filed on the public record are on the "Current Proceedings" page on the Commissions website.

If the application is approved, construction work will take place in 2021 and 2022. If you would like to be kept informed of the project's progress, information can be found on our website at Kelowna Lee Station Upgrade Project.

If you have any questions regarding this project, or if you would like to schedule a meeting to review the project in more detail, feel free to contact me directly at 250.868.4525 or by email at shelley.martens@fortisbc.com.

Sincerely,

Shelley Martens
Community & Indigenous Relations Manager

cc.