TFO AND DFO RESPONSES TO AESO IRs

ALTALINK
A BERKSHIRE HATHAWAY ENERGY COMPANY

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June 28, 2019

Alberta Electric System Operator
Calgary Place
2500, 330-5th Avenue SW
Calgary, AB T2P 0L4

Dear Sir/Madam:

Re: Fortis Lethbridge Reliability

Please find enclosed AltaLink's responses to the AESO's questions from the above-referenced Project.

AltaLink consents to the AESO attaching the responses to its NID filing, provided that the responses are attached in their original format (*i.e.*, unedited and attached in their entirety). Should the AESO want to use the responses for any other purpose, the AESO must first receive written consent from AltaLink to do so. AltaLink further requests that the AESO provide us with an opportunity to review any information request responses which the AESO may provide to the Alberta Utilities Commission or any other intervenor regarding the responses.

Yours truly,

(Original signed by)

Fabrice Larre
Project Manager, Project Development

Question 1: Please provide history of outages on transformer 370ST1 at North Lethbridge 370S Substation based on the records presently available to the TFO, including the duration of those outages. In the response, please include time, date, duration and cause for each event.

Response:

During the 10-year period from 2009 to 2018, the North Lethbridge 370S Substation transformer T1 did not experience any outages caused by transformer integral subcomponents.

Table 1 below identifies transformer outages caused by transformer terminal subcomponents in the 10-year period from 2009 to 2018.

Table 1

Outage ID	Transformer	Date	Time	Duration	Cause	Subcomponent
941733-01	370ST1	9/22/2016	14:57	9 hrs and 2 mins	Defective Equipment	Transformer Terminal - Control And Protection Equipment

Question 2: Please provide history of outages on transformer 618ST1 and voltage regulator 618SVR1 at Riverbend 618S Substation based on the records presently available to the TFO, including the duration of those outages. In the response, please include time, date, duration and cause for each event.

Response:

There is no record of outages caused by 618ST1 or 618SVR1 in the 10-year period from 2009 to 2018.

Question 3: Please provide an overview of procedures that the TFO would take, and the estimated times the TFO expects it would take, to restore service to these substations in the event of a contingency of transformer 370ST1 at North Lethbridge 370S Substation. Please include any details on mobile substations available to restore load, time to deploy to site, and time to install/transfer load to the mobile substation.

Response:

For any permanent transmission line fault or equipment failure that interrupts a customer's connection or the bulk electric system, AltaLink follows established operating procedures for both its' field operations and the AltaLink Control Centre (ACC). These procedures include FortisAlberta (Fortis) acting as a first responder to the location of the event. Fortis then communicates any initial findings to the ACC and the on-call field operations personnel. This initial investigation helps to determine the cause of the event and determine the next steps. Once Fortis is contacted and dispatched, they are typically able to arrive at the site within 30 minutes depending on the location of the event, time of day/week, crew locations, weather and road conditions, and accessibility to the site at the time of the incident. If AltaLink field operations personnel are required on-site, they are typically able to arrive within 1 to 4 hours depending on the location of the event, time of day/week, crew locations, weather and road conditions, and accessibility to the site at the time of the incident.

If North Lethbridge 370S T1 failed, the existing standby transformer T4 would be connected to restore the supply. Because the transformers (T1 and T4) low side switches and bypass switches are not motorized, a field response would be required to transfer the load. AltaLink estimates that the time to transfer the load would be 2 to 6 hours, dependent on the time of day, crew locations, weather and road conditions, and accessibility to the site at the time of the incident. However, depending on the load at the time of the incident and the load transfer capability on Fortis's system, up to 4 to 5MW of load may be left unserved. If the transformer requires extensive repairs or replacement, a mobile substation would need to be connected to feed the unsupplied load on the distribution system.

In that scenario, the length of time required to mobilize and connect a mobile substation ranges from 24 to 72 hours depending on where the nearest appropriate mobile substation is located with respect to the failure site. These timelines assume the following, among other things:

(1) there will be sufficient availability of qualified manpower;

(2) weather and road conditions are reasonable; and

(3) there are no transport restrictions to the facility (i.e. road bans or construction).

Additional time may be required if any of the above factors or other factors increase timelines.

In the event the transformer only needs minor repairs or component replacement, then the restoration times would be less.

Question 4: Please provide an overview of procedures that the TFO would take, and the estimated times the TFO expects it would take, to restore service to these substations in the event of a contingency of transformer 618ST1 and voltage regulator 618SVR1 at Riverbend 618S Substation. Please include any details on mobile substations available to restore load, time to deploy to site, and time to install/transfer load to the mobile substation.

Response:

For any permanent transmission line fault or equipment failure that interrupts a customer's connection or the bulk electric system, AltaLink follows established operating procedures for both its' field operations and the AltaLink Control Centre (ACC). These procedures include FortisAlberta (Fortis) acting as a first responder to the location of the event. Fortis then communicates any initial findings to the ACC and the on-call field operations personnel. This initial investigation helps to determine the cause of the event and determine the next steps. Once Fortis is contacted and dispatched, they are typically able to arrive at the site within 30 minutes depending on the location of the event, time of day/week, crew locations, weather and road conditions, and accessibility to the site at the time of the incident. If AltaLink field operations personnel are required on-site, they are typically able to arrive within 1 to 4 hours depending on the location of the event, time of day/week, crew locations, weather and road conditions, and accessibility to the site at the time of the incident.

Riverbend 618S Transformer T1

Restoration times will vary depending on the extent of the damage. If the transformer fails and requires extensive repairs or replacement, a mobile substation would need to be connected to feed the unsupplied load on the distribution system.

The length of time required to mobilize and connect a mobile substation ranges from 24 to 72 hours depending on where the nearest appropriate mobile substation is located with respect to the failure site. These timelines assume the following, among other things:

(1) there will be sufficient availability of qualified manpower;

(2) weather and road conditions are reasonable; and

(3) there are no transport restrictions to the facility (i.e. road bans or construction).

Additional time may be required if any of the above factors or other factors increase timelines.

In the event the transformer only needs minor repairs or component replacement, then the restoration times would be less.

Riverbend 618S Voltage Regulator VR1

Restoration times will vary depending on the extent of the damage. If the 25 kV voltage regulator fails, AltaLink will manually bypass it within 2 to 6 hours and re-energize transformer T1 to restore the load at 618S, albeit with unregulated voltages. If unregulated voltages on the 25 kV bus is unacceptable for Fortis operations on its distribution system, a mobile substation would need to be connected which would have similar restoration times as for transformer T1.

Question 5: Is the historic availability of Substation transformer 370ST1 and 618ST1/618SVR1 typical for transformers of similar design?

Response:

The substation transformer 370ST1's availability in the 10-year period from 2009 to 2018 was 100.000%. AltaLink's typical 138 kV one three-phase tank transformer availability during the same 10-year period was 99.797%, based on the 2017 CEA ERIS report. On this basis, the transformer's availability has been better than typical for a transformer of similar design.

The substation transformer 618ST1's availability in the 10-year period from 2009 to 2018 was 100.000%. AltaLink's typical 138 kV one three-phase tank transformer availability during the same 10-year period was 99.797%, based on the 2017 CEA ERIS report. On this basis, the transformer's availability has been better than typical for a transformer of similar design.

Given the relatively small historic difference in performance and similarity in design, AltaLink has no expectations that the 370ST1 and 618ST1's performance would be any different than the system average performance in future periods.

The voltage regulator 618SVR1's availability in the 10-year period from 2009 to 2018 was 100.000%. AltaLink does not have data with respect to typical historical availability for 25 kV voltage regulators. AltaLink notes that 618SVR1 may be bypassed in the event of a failure.

Question 6: Please provide the age of transformers 370ST1 & 370ST4 at North Lethbridge 370S substation. Please describe any planned capital maintenance for these facilities, include durations of planned outages and any measures to be taken during the planned outages to provide service continuity.

Response:

The age of the North Lethbridge 370S transformer T1 is 38 years.

The age of the North Lethbridge 370S transformer T4 is 6 years.

No major capital maintenance is planned on any of these transformers in the next 5 years.

However, routine operational maintenance and testing is required on these transformers approximately every 6 years. This routine operational maintenance and testing requires these units to be out of service for 4 to 8 hours. Both transformers are due for maintenance in 2019 depending on outage availability.

Question 7: Please provide the age of transformer 618ST1 and voltage regulator 618SVR1 at Riverbend 618S substation. Please describe any planned capital maintenance for these facilities, include durations of planned outages and any measures to be taken during the planned outages to provide service continuity.

Response:

The age of the Riverbend 618S transformer T1 is 29 years.

The age of the North Riverbend 618S voltage regulator VR1 is 28 years.

No major capital maintenance is planned on any of these transformers in the next 5 years.

However, routine operational maintenance and testing is required on these transformers approximately every 6 years. This routine operational maintenance and testing requires these units to be out of service for 4 to 8 hours. The transformer T1 is due for maintenance in 2020 and voltage regulator VR1 is due for maintenance in 2019 depending on outage availability.

Question 8: Please provide a history of outages on other equipment (switches, busses, etc.) at North Lethbridge 370S substation and resulting in loss of service to the low voltage 25 kV bus, based on the records presently available to the TFO, including the duration of those outages. In the response, please include time, date, duration and cause for each event.

Response:

There is no record of outages caused by other equipment at North Lethbridge 370S Substation in the 10-year period from 2009 to 2018.

Question 9: Please provide a history of outages on other equipment (switches, busses, etc.) at Riverbend 618S substation and resulting in loss of service to the low voltage 25 kV bus, based on the records presently available to the TFO, including the duration of those outages. In the response, please include time, date, duration and cause for each event.

Response:

There is no record of outages caused by other equipment at Riverbend 618S Substation in the 10-year period from 2009 to 2018.

Question 10: In the event of an unplanned outage to other equipment (switches, busses, etc.) at North Lethbridge 370S substation resulting in the loss of service to the low voltage 25 kV bus, provide an overview of procedures, the TFO would take and the estimated times the TFO expects it would take to restore service to low voltage 25 kV bus and associated feeders at North Lethbridge 370S substation 370S. Please include any details on mobile substations/ standby transformer T4 available to restore load, time to deploy to site, and time to install/transfer load to the mobile substation.

Response:

Restoration times will vary depending on the extent of the damage and equipment impacted. Please refer to the response in Question 3 as typically the longest restoration times require a mobile substation to be connected.

Question 11: In the event of an unplanned outage to other equipment (switches, busses, etc.) at Riverbend 618S substation, resulting in the loss of service to the low voltage 25 kV bus, provide an overview of procedures, the TFO would take and the estimated times the TFO expects it would take to restore service to the low voltage 25 kV bus and associated feeders at Riverbend 618S substation. Please include any details on mobile substations available to restore load, time to deploy to site, and time to install/transfer load to the mobile substation.

Response:

Restoration times will vary depending on the extent of the damage and equipment impacted. Please refer to the response in Question 4 as typically the longest restoration times require a mobile substation to be connected.

Question 12: Is the historic availability of other equipment (switches, busses, etc.) at North Lethbridge 370S & Riverbend 618S substations typical for similar designs?

Response:

AltaLink does not have data with respect to typical historical availability for small components.

However, in AltaLink's experience, considering the historic outage records described in response to Questions 10 and 11, we expect the performance of other equipment (switches, busses, etc.) to be typical of other substations of similar design and age.

Question 13: Please provide a summary of any other planned TFO Capital Maintenance projects applicable to the project area (North Lethbridge 370S and Riverbend 618S substations) not described in the responses above. In the response, include durations of planned outages and any measures to be taken during the planned outages to provide service continuity.

Response:

AltaLink is forecasting the following capital maintenance in the project area in the next 5 years at the North Lethbridge 370S and Riverbend 618S Substations.

North Lethbridge 370S

The work consists of protection and control replacements for 240 kV and 138 kV, two 240 kV airbreak replacements (370s48, 370s50), full substation insulator replacements, five 138 kV airbreak replacements (370S1, 370S171, 370S3, 370S174, 370S27), and two 240 kV breaker replacements (370S47, 370S56).

Riverbend 618S

The work consists of a line protection replacement for the 863L.

AltaLink has not yet commenced detailed scoping of the proposed maintenance. AltaLink will develop outage plans and measures to maintain the supply based on this detailed scoping and coordination with AltaLink's operations team.

At this stage, AltaLink does not have information with respect to the need for or the duration of planned outages for the forecasted substation work.

Question 14: Please provide any other information the TFO thinks would be helpful to the AESO in assessing and supporting the DFO's SASR.

Response:

AltaLink has not identified any information that it believes would be relevant to the AESO. However, as AltaLink is not the system planner, and is not accountable for evaluating the need for this project, AltaLink cannot fully assess what further information the AESO may require. If the AESO identifies any further requests for information or questions for AltaLink to help it assess the need, AltaLink will be happy to assist at that time.

ALTALINK
A BERKSHIRE HATHAWAY ENERGY COMPANY

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August 8, 2019

Alberta Electric System Operator
Calgary Place
2500, 330-5th Avenue SW
Calgary, AB T2P 0L4

Dear Sir/Madam:

Re: Fortis Lethbridge Reliability

Please find enclosed AltaLink's response to the AESO's question from the above-referenced Project.

AltaLink consents to the AESO attaching the responses to its NID filing, provided that the responses are attached in their original format (*i.e.*, unedited and attached in their entirety). Should the AESO want to use the responses for any other purpose, the AESO must first receive written consent from AltaLink to do so. AltaLink further requests that the AESO provide us with an opportunity to review any information request responses which the AESO may provide to the Alberta Utilities Commission or any other intervenor regarding the responses.

Yours truly,

(Original signed by)

Fabrice Larre
Project Manager, Project Development

Question 15: Please add a column to Table 1 that indicates if each of the outage ID results in a total North Lethbridge 370S substation outage.

Original Question and Response:

Question 1: *Please provide history of outages on transformer 370ST1 at North Lethbridge 370S Substation based on the records presently available to the TFO, including the duration of those outages. In the response, please include time, date, duration and cause for each event.*

Response:

During the 10-year period from 2009 to 2018, the North Lethbridge 370S Substation transformer T1 did not experience any outages caused by transformer integral subcomponents.

Table 1 below identifies transformer outages caused by transformer terminal subcomponents in the 10-year period from 2009 to 2018.

Table 1

Outage ID	*Transformer*	*Date*	*Time*	*Duration*	*Cause*	*Subcomponent*
941733-01	*370ST1*	*9/22/2016*	*14:57*	*9 hrs and 2 mins*	*Defective Equipment*	*Transformer Terminal - Control And Protection Equipment*

Response:

Table 1 is updated as follows:

Table 1

Outage ID	Transformer	Date	Time	Duration	Cause	Sub-component	370S Outage
941733-01	370ST1	9/22/2016	14:57	9 hrs and 2 mins	Defective Equipment	Transformer Terminal - Control And Protection Equipment	Momentary outage to 25 kV bus

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October 8, 2019

Alberta Electric System Operator
Calgary Place
2500, 330-5th Avenue SW
Calgary, AB T2P 0L4

Dear Sir/Madam:

Re: Fortis Lethbridge Reliability

Please find enclosed AltaLink's response to the AESO's question from the above-referenced Project.

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Yours truly,

(Original signed by)

Fabrice Larre
Project Manager, Project Development

Preamble: The AESO wishes to understand the reported transmission outages and impact to FortisAlberta.

Question 16: a) Please confirm AltaLink did not experience any recorded outages in April 2010 at North Lethbridge 370S substation.

b) AltaLink identified that the September 22, 2016 transmission outage to transformer 370ST1 (ID # 941733-01) resulted in a momentary outage to a 25kV bus.

Please explain the actions undertaken by AltaLink to minimize the transmission outage impact to FortisAlberta.

Response:

a) Not confirmed. There were four outages originating on transmission elements outside of the North Lethbridge 370S Substation that resulted in a loss of supply of the transmission delivery point at the Lethbridge 370S Substation in April of 2010. These outages are outlined in the table below. AltaLink clarifies that none of the April, 2010 outages originated from equipment inside the Lethbridge 370S Substation.

Outage ID	Originating Element	Date	Time	Duration	Cause	370S Outage
938158-01	770L	4/14/2010	07:25	20 mins	Adverse Weather	21 mins interruption of 370S T1
938190-01	770L	4/14/2010	08:45	21 mins	Adverse Weather	13 mins interruption of 370S T1
938191-01	172L	4/14/2010	08:58	10 mins	Adverse Weather	10 mins interruption of 370S T1
938194-01	172L	4/14/2010	09:18	8 hrs and 12 mins	Adverse Weather	3 hrs and 15 mins interruption of 370S T1

b) Outage ID # 941733-01 was caused by a transformer protection relay failure. Further review of the previously provided information has confirmed that this event did not result in a momentary outage of the 25 kV bus at the Lethbridge 370S Substation as initially reported. The transformer protection relay failed and did not incorrectly operate. Instead, following the identification of the relay failure, AltaLink field personnel on site at the time (for other work) switched the standby transformer 370ST4 into service prior to 370ST1 being removed from service. Thus, there was no outage to the 25 kV bus at the Lethbridge 370S Substation. AltaLink tracks this outage as an unplanned outage as it required the transformer to be removed from service due to an equipment failure in real-time. AltaLink provides the following correction to Table 1 in response to Question 15 below.

Table 1

Outage ID	Transformer	Date	Time	Duration	Cause	Sub-component	370S Outage
941733-01	370ST1	9/22/2016	14:57	9 hrs and 2 mins	Defective Equipment	Transformer Terminal - Control And Protection Equipment	~~Momentary outage to 25 kV bus~~ No impact to 25 kV bus

Further, AltaLink confirms that the defective relay that initiated this transformer outage has been replaced. Furthermore, AltaLink maintains 370ST4 as an onsite spare to minimize transformer outage impacts to FortisAlberta supply at the Lethbridge 370S Substation.

Kevin Noble, P.Eng.
Manager, Engineering
Distribution Planning

FortisAlberta Inc
320 – 17th Avenue SW
Calgary, Alberta T2S 2V1
Telephone: 403-514-4327 (direct)
Fax: 403-514-5327
Jennifer.Kwong@fortisalberta.com

July 4, 2019

Alberta Electric System Operator
Calgary Place
Suite 2500, 330 – 5th Avenue SW
Calgary, Alberta T2P 0L4

Attention: Imtiaz Ali, Project Manager
Transmission Connection Projects

Re: Lethbridge Area – AESO Project P2123
Information Requests to FortisAlberta Inc.

Dear Mr. Ali:

I am writing further to the Alberta Electric System Operator's (AESO) recent request for information regarding FortisAlberta's Need for Development document for the Lethbridge area, generally. It is my understanding that the AESO requires this information to assist it in its assessment and preparation of a NID document for AESO Project 2123.

FortisAlberta Inc. has presented its responses to align with the specific questions raised in the AESO's request.

1. Request:

Does the DFO have a comprehensive standalone distribution system planning document? If so, it would be helpful to the AESO if the DFO could submit such a document to help the AESO fulsomely understand the DFO's need.

Response:

Yes, please refer to the attached *FortisAlberta Distribution Planning Outline* document. This document was recently developed based on information gathered from a variety of FortisAlberta internal engineering and planning sources including, but not limited to Distribution Planning manual, guidelines and procedural documentation.

2. **Request:**

If not addressed in its response to Q1 above, please provide the DFO's target restoration time(s) for loads in the study area (i.e., loads served by North Lethbridge 370S and Riverbend 618S substations). Please specify restoration times for feeder contingencies and transmission facility contingencies at both substations.

Response:

FortisAlberta's target restoration times for the Lethbridge study area are provided in Table 2.1. FortisAlberta's restoration criteria for both feeder N-1 contingencies and transmission facility N-1 contingencies require that adequate backup supply for contingency situations be available subject only to switching time. Factors influencing actual switching time, which in turn influence actual overall restoration time include, but are not necessarily limited to: travel time to locate and isolate the fault, determination and implementation of back-up options, weather, terrain, time of year and time of day when restoration is initiated.

Table 2.1: FortisAlberta Target Restoration Times in the Study Area

Substation	Load Type	Target Restoration Times
North Lethbridge 370S	Urban*	≤ 1 hour
Riverbend 618S	Urban*	≤ 1 hour

*Substation with one or more feeders that supply urban loads.

3. **Request:**

Please provide a history of the violations of the DFO's restoration criteria due to transmission outages that have occurred at the following substations:

a) North Lethbridge 370S substation

b) Riverbend 618S substation

Response:

Table 3.1 provides the total restoration time for transmission outages at the identified substations occurring over the last 10 years that resulted in FortisAlberta restoration criteria violations.

Table 3.1: FortisAlberta Records of Restoration Criteria Violation due to Transmission Outages in the Study Area in the past 10 years		
Substation	**Year**	**Duration**
North Lethbridge 370S	2010	3 hr. 15 min.
Riverbend 618S	No events identified	

4. Request:

In the event of a transmission outage which results in the loss of service to North Lethbridge 370S substation provide an overview of procedures the DFO would take, and the estimated times the DFO expects it would take, to restore service to customers normally served from North Lethbridge 370S substation.

Response:

In the event of a transmission supply outage at the North Lethbridge 370S substation, the FortisAlberta Control Center (FCC) coordinates and shares information with the AltaLink Control Center (ACC). This information includes real-time substation and feeder loading measurements occurring prior to the event, details of any suspected cause of the event, and the estimated time to restore transmission supply. Concurrently, FortisAlberta determines the adequacy of the real-time distribution system capacity to serve real-time loads, which will require restoration via distribution system switching. If the ACC confirms the likelihood of a prolonged event duration and FortisAlberta is unable to serve all real-time loads through switching operations, the Company develops an optimized restoration plan. This plan prioritizes restoration based on electrical load requirements including critical loads, and the location of available power system infrastructure.

The initial step for optimized outage restoration is to develop a switching plan to restore the maximum amount of load via available distribution system switching options. This enables FortisAlberta to identify the real-time magnitude and location of load that cannot be restored through the distribution system switching, referred to as real-time unsupplied load. To further minimize the real-time magnitude and duration of the unsupplied load, and following consultation with affected customers, FortisAlberta's restoration plan may involve additional outage mitigation procedures such as customer load curtailment, distribution line construction, provision of mobile generators (where available), and rotating power outages.

Restoration times in the event of a transmission supply outage at the North Lethbridge 370S substation can vary significantly as the result of differences in travel time for triage assessment

and transmission system switching, the complexity of failed transmission/substation component repair and replacement, weather, terrain, and real-time load requirements driven by the time of year and time of day. As an example, restoration following the loss of a source transformer at the North Lethbridge 370S substation could take up to 27 hours or more in cases requiring the installation of a mobile transformer. FortisAlberta has identified a need to construct additional power system infrastructure and make provision for adequate backup supply in this area to facilitate the satisfaction of the applicable target restoration time of one hour, or less.

5. **Request:**

In the event of a transmission outage which results in the loss of service to Riverbend 618S substation provide an overview of procedures the DFO would take, and the estimated times the DFO expects it would take, to restore service to customers normally served from Riverbend 618S substation.

Response:

In the event of a transmission supply outage at the Riverbend 618S substation, the FortisAlberta Control Center (FCC) coordinates and shares information with the AltaLink Control Center (ACC). This information includes real-time substation and feeder loading measurements occurring prior to the event, details of any suspected cause of the event, and the estimated time to restore transmission supply. Concurrently, FortisAlberta determines the adequacy of the real-time distribution system capacity to serve real-time loads, which will require restoration via distribution system switching. If the ACC confirms the likelihood of a prolonged event duration and FortisAlberta is unable to serve all real-time loads through switching operations, the Company develops an optimized restoration plan. This plan prioritizes restoration based on electrical load requirements including critical loads, and the location of available power system infrastructure.

The initial step for optimized outage restoration is to develop a switching plan to restore the maximum amount of load via available distribution system switching options. This enables FortisAlberta to identify the real-time magnitude and location of load that cannot be restored through the distribution system switching, referred to as real-time unsupplied load. To further minimize the real-time magnitude and duration of the unsupplied load, and following consultation with affected customers, FortisAlberta's restoration plan may involve additional outage mitigation procedures such as customer load curtailment, distribution line construction, provision of mobile generators (where available), and rotating power outages.

Restoration times in the event of a transmission supply outage at the Riverbend 618S substation can vary significantly as the result of differences in travel time for triage assessment and

transmission system switching, the complexity of failed transmission/substation component repair and replacement, weather, terrain, and real-time load requirements driven by the time of year and time of day. As an example, restoration following the loss of a source transformer at the Riverbend 618S substation could take up to 27 hours or more in cases requiring the installation of a mobile transformer. FortisAlberta has identified a need to construct additional power system infrastructure and make provision for adequate backup supply in this area to facilitate the satisfaction of the applicable target restoration time of one hour, or less.

6. **Request:**

For the most current year that actual load is available, please confirm that unsupplied load could occur at different times of the year other than just at peak periods for all substations listed above. If confirmed, please provide a description of these occurrences.

Response:

The two substations identified in the NFD, North Lethbridge 370S and Riverbend 618S, could have unsupplied load at different times of the year other than just at peak periods. Specifically, load studies indicate that unsupplied load would occur in the event of a transmission facility contingency (N-1) at either substation for approximately 40 days that do not include peak periods of the 2018 planning year.

7. **Request:**

Please provide a summary of the type of customers (e.g. residential, industrial, commercial, and farming/agriculture) and number of customers within each type served by North Lethbridge 370S substation. Please describe the potential impacts on the unsupplied loads for each of the N-1 transmission contingency scenarios (loss of supply to North Lethbridge 370S substation). In the responses, please identify any critical loads with public safety or environmental sensitivities.

Response:

In the event of a transmission facility contingency resulting in loss of source at the North Lethbridge 370S substation, unsupplied loads associated with table 4-1 in the July 10, 2018 FortisAlberta Need for Development report, results in 286 services, including 1 critical site, to remain unsupplied until repairs are completed. North Lethbridge 370S normally supplies 3 sites identified as critical loads. Service to 2 critical sites would be restored through distribution system switching to adjacent feeders.

Table 7.1 provides the summary of the number and type of customers served by the North Lethbridge 370S substation.

Table 7.1: FortisAlberta Load Types served by 370S as of June 19, 2019	
	FortisAlberta Point-of-Delivery
Customer Type	**North Lethbridge 370S**
Residential	3526
Industrial	2
Commercial	592
Farms	673
Oil and Gas	2
Total	4795

8. Request:

Please provide a summary of the type of customers (e.g. residential, industrial, commercial, and farming/agriculture) and number of customers within each type served by Riverbend 618S substation. Please describe the potential impacts on the unsupplied loads for each of the N-1 transmission contingency scenarios (loss of supply to Riverbend 618S substation). In the responses, please identify any critical loads with public safety or environmental sensitivities.

Response:

In the event of a transmission facility contingency resulting in loss of source at the Riverbend 618S substation, unsupplied loads associated with table 4-1 in the July 10, 2018 FortisAlberta Need for Development report, results in 949 services to remain unsupplied until repairs are completed. Riverbend 618S does not normally supply sites identified as critical loads.

Table 8.1 provides the summary of the number and type of customers served by the Riverbend 618S substation.

Table 8.1: FortisAlberta Load Types served by 618S as of June 19, 2019	
	FortisAlberta Point-of-Delivery
Customer Type	**Riverbend 618S**
Residential	1251
Industrial	3
Commercial	413
Farms	684
Oil and Gas	6
Total	2357

9. Request:

What measures does the DFO currently use to manage the potential "unsupplied loads" identified in the DFO's NFD? Do these measures violate the DFO restoration criteria? If so, explain how.

Response:

FortisAlberta currently uses the means identified in the responses to Question 4 and Question 5, above, to mitigate real-time "unsupplied loads". These include customer load curtailment, distribution line construction, provision of mobile generators (where available), and rotating power outages. These mitigation measures are utilized only after restoration efforts via the distribution system switching have been exhausted and load remains unsupplied. These measures do not satisfy FortisAlberta's restoration criteria and are implemented only to minimize the impacts of the contingency event on affected customers.

The use of the measures described above to restore service to customers nonetheless results in violations in of FortisAlberta's restoration criteria, which are based on "switching time only" benchmarks.

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10. Request

Please explain the source (e.g. organic growth vs discrete load addition) and type of forecast load growth in the area (2018-2027), as shown in the NFD (refer to section and table 4-1). Please provide a rationale for the load increase from 2017 actuals to 2018 forecast.

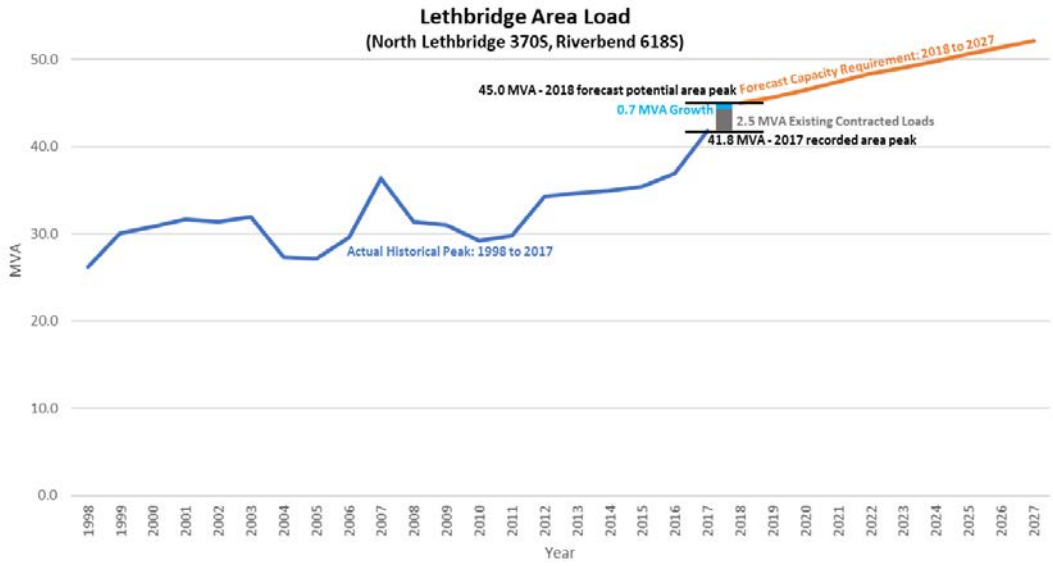
Response:

The forecasted increase in capacity requirement for the North Lethbridge area from 41.8 MVA in 2017 to 45.0 MVA in 2018, for a total net increase of 3.2 MVA, is outlined in table 10.1 below. The forecast load growth in the area (2018-2027), as shown in the July 2018 NFD table 4-1, was the result of the application of a Point-of-Delivery (POD) specific growth rates to predict the required capacity to accommodate aggregate load growth.

Table 10.1: FortisAlberta Year 1 Load Growth Decomposition in the Study Area

Type of load	**Amount of load forecasted based on historical feeder load levels (MVA)**	**Explanation**
Forecasted aggregate load growth	0.7	Generic small load growth and variation resulted in 0.7 MVA of load increase being forecast for the Lethbridge area.
Existing contracted committed load reservation	2.5	There was 2.5 MVA of capacity allocated to existing contracted committed loads operating during the 2017 peak at levels below their contracted capacity or, for those contracts older than 5 years, their historical operating levels.
Total	3.2	

The following graph illustrates the composition of load represented in the increase from 2017 “Actual” area peak load to 2018 “Forecast” required capacity for the Lethbridge area.



11. Request:

Please show the calculations used to determine the maximum backup capability identified in each load table. Please provide calculations for how these assessments were determined for each backup calculation.

Response:

FortisAlberta's determination of the maximum backup capability for any given substation is not calculated in a mathematical manner that can be presented as simple calculations. FortisAlberta determines the backup capability of alternative supply options through simulation utilizing load flow software on a feeder-feeder basis to determine the maximum amount of load that can be restored by reconfiguring the distribution system using existing switching options. This assessment considers not only the thermal capacity of substation transformers and distribution feeder conductors, but also considers the ability to start motors and deliver acceptable voltage levels at individual load locations. The capability of the existing distribution feeder ties is utilized to the maximum extent possible while ensuring that FortisAlberta's planning criteria is not violated. This results in the determination of the coincident backup MVA capability for each feeder tie. The values obtained for the available ties are then summed for each substation and presented in the N-1 tables.

12. Request:

Does FortisAlberta have any plans to address the feeder 618S266LE overload: if yes, please explain those plans including any planned load transfers?

Response:

The existing 13 MVA normal feeder loading violation of the 618S-266LE feeder is being addressed by a separate distribution-only project. It includes a 2 MW load transfer to 618S-18LN in 2019 and is reflected in Table 4-1 of FortisAlberta's July 10, 2018 Need for Development report. Actual recorded feeder loading data will be reviewed after the 2 MW load transfer has been completed to determine if further load shifting is required.

13. Request:

Please provide any other information the DFO thinks would be helpful to the AESO in assessing and supporting the DFO's SASR.

Response:

Apart from mitigating the identified concerns regarding existing and forecasted unsupplied load, the completion of AESO project P2123 will provide additional benefits in the area including increased overall operational flexibility to accommodate transmission and distribution system maintenance; and increase resiliency of the local distribution system.

The information provided in relation to AESO project P2123 demonstrates that FortisAlberta's distribution planning approach leads to the timely identification of reliability-driven concerns and the development of efficient and cost-effective solutions for customers. In the Company's view, these outcomes are a direct result of FortisAlberta's principled reliance on a combination of deterministic contingency planning approaches and the considered use of data obtained from detailed system modeling and load studies.

I trust that this information will assist the AESO. Please do not hesitate to contact either myself at (403) 514-4683 or Zurex Fontanilla at (403) 514-4533 with any questions that you may have regarding the foregoing.

Sincerely,

(Original signed by)

Kevin Noble
Manager, Engineering Distribution Planning

Kevin Noble, P.Eng.
Manager, Engineering
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August 2, 2019

Alberta Electric System Operator
Calgary Place
Suite 2500, 330 – 5th Avenue SW
Calgary, Alberta T2P 0L4

Attention: Imtiaz Ali, Project Manager
Transmission Connection Projects

Re: Lethbridge Area – AESO Project P2123
Information Requests to FortisAlberta Inc.

Dear Mr. Ali:

I am writing further to the Alberta Electric System Operator's (AESO) recent request for information regarding FortisAlberta's Need for Development document for the Lethbridge area, generally. It is my understanding that the AESO requires this information to assist it in its assessment and preparation of a NID document for AESO Project 2123.

FortisAlberta Inc. has presented its responses to align with the specific questions raised in the AESO's request.

14. Request:
Re: Response to AESO question 2

a. Under the contingency of North Lethbridge 370S T1, AML indicated the existing standby transformer T4 would be energized to restore supply. AML estimates this could take 2-6 hours. If AML can reduce the switching time to less than FortisAlberta's Target Restoration Time (≤1Hour), could FortisAlberta develop a distribution solution to mitigate their reliability concerns?

Response:

a. A reduction of the time required to isolate a contingency of the North Lethbridge 370S

T1 and energize transformer T4 would not enable FortisAlberta to develop a distribution solution to mitigate unsupplied load resulting from all N-1 contingencies at the North Lethbridge 370S substation. For example, the time reduction does not address an N-1 contingency on the 25 kV bus that is common to both of the substation transformers (T1 and T4). Neither substation transformer would be able to supply FortisAlberta's distribution system via a faulty 25 kV bus.

15. Request:

Re: Response to AESO question 3

a. Please add a column in Table 3.1 to indicate the date (year, month, date and time if known) when each reported outage occurred.
b. Please add a column to indicate how the magnitude of real-time load lost for each of these outages in Table 3.

Response:

a. Table 15.1 below, adds a column to Table 3.1 that indicates the date and time of the reported outage.
b. Table 15.1 below, adds a column to Table 3.1 that identifies the recorded load lost prior to the beginning of the reported outage. The values, in the added column, represent the magnitude of the recorded peak load at the affected 25 kV feeder breakers prior to the loss of supply event. The magnitude of real time load lost may not be representative of the peak magnitude of load that would have materialized during the outage period had the outage not occurred.

Table 15.1: FortisAlberta Records of Restoration Criteria Violation due to Transmission Outages in the Study Area in the past 10 years

Substation	Recorded Date (DD-MMM-YY)	Recorded Time	Recorded Loading Prior to Sequence of Outages	Duration
North Lethbridge 370S	14-Apr-10	8:00 AM	10.2 MVA	7 hr. 30 min.
Riverbend 618S	No events identified			

16. Request:

Re: Response to AESO question 6

a. FortisAlberta indicates "Specifically, load studies indicate that unsupplied load would occur in the event of a transmission facility contingency (N-1) at either substation for approximately 40 days that do not include peak periods of the 2018 planning year." How many total days, approximately, would unsupplied load occur in 2018 including peak periods?

Response:

a. In the event of a transmission facility contingency (N-1) at either substation, loads would have been left unsupplied on a total of approximately 40 days during the 2018 planning year. FortisAlberta's original response to question 6, inadvertently, included the single peak day for each substation.

17. Request:

Re: Response to AESO question 7 & 8

a. Please describe the customer type and typical amount of load for the 1 critical site that would be anticipated to be unsupplied in the event of loss of 370S substation. Describe why FortisAlberta and/or the end use customer classifies this site as critical. If known, please describe if this site have customer on-site backup generation.
b. Please describe the type of load which makes up the 286 customers sites that would be anticipated to be unsupplied in the event of loss of 370S substation.
c. Please describe the type of load which makes up the 949 customers sites that would be anticipated to be unsupplied in the event of loss of 618S substation.

Response:

a. Table 17.1 below indicates the customer type and typical amount of load for the critical site that would be anticipated to be unsupplied in the event of loss 370S substation.

Table 17.1: Critical Sites Associated w/ Unsupplied Loads in Table 10.1

Customer	Type	Peak Loading (kVA) *(past 12 months)*
1	Water Plant	81.2

Classification of these sites as being critical was identified by the electricity retailer and communicated to FortisAlberta.
In FortisAlberta's view, the type of critical site in Table 17.1 provide service for public health enabling safe water consumption, hygiene and sanitation.
FortisAlberta has no record of back up generation at the critical site.

b. The value provided for question 7 only captures the number of services (load transformers) supplied by the North Lethbridge 370S substation and not the total number of customers that would remain unsupplied. Further, as of July 31, 2019, the number of service transformers that would have been left unsupplied due to an N-1 contingency at the North Lethbridge 370S substation has been corrected to be 508. The 508 service transformers supply 2318 customer sites. Table 17.2 below indicates the load types that make up the

2318 customer sites unsupplied in the event of a transmission facility contingency (N-1) at the North Lethbridge 370S substation.

Table 17.2: North Lethbridge 370S Unsupplied Load Types Associated with Table 4-1	
Customer	**Type**
Residential	1876
Industrial	1
Commercial	256
Farms	185
Oil and Gas	0
Total	2318

c. The value provided for question 8 only captures the number of services (load transformers) supplied by the Riverbend 618S substation and not the total number of customers that would remain unsupplied. Further, as of July 31, 2019, the number of service transformers that would have been left unsupplied due to an N-1 contingency at the Riverbend 618S substation has been corrected to be 944. The 944 service transformers supply 1789 customer sites. Table 17.3 below indicates the load types supplied by the 949 unsupplied services in the event of a transmission facility contingency (N-1) at the Riverbend 618S substation.

Table 17.3: Riverbend 618S Unsupplied Load Types Associated with Table 4-1	
Customer	**Type**
Residential	915
Industrial	3
Commercial	370
Farms	497
Oil and Gas	4
Total	1789

18. Request:

Re: Response to AESO question 9

a. Under the contingency of North Lethbridge 370S T1, AML indicated the existing standby transformer T4 would be energized to restore supply. Please confirm if load at North Lethbridge 370S substation is only unsupplied during the time it takes AML to energize standby transformer T4.

Response:

a. Confirmed. If the loss of supply is limited to a 370S T1 transformer contingency, the unsupplied loads could be addressed with the energization of the standby transformer 370S T4, combined with the isolation of 370S T1 and required switching to supply the 25 kV bus from 370S T4. Additional distribution system switching would be required to restore all affected loads, since the forecast capacity requirement for year 1 to year 10 exceeds the capacity rating of the 370S T4 transformer. As noted, in response to question 14, energizing the existing standby transformer T4 does not address an N-1 contingency on the 25 kV bus that is common to both of the substation transformers (T1 and T4). Neither substation transformer would be able to supply FortisAlberta's distribution system via a faulty 25 kV bus.

19. Request:

Re: FortisAlberta NFD Section 6.1, Alternative 1: Distribution Upgrades

a. Please describe the scope, and associated costs of the distribution upgrades required to mitigate the voltage criteria and distribution equipment nameplate capacity limitations identified by FortisAlberta.

Response:

a. There is no amount of distribution upgrades that would mitigate the issues identified by FortisAlberta regarding the inability of the distribution system to back up all the loads connected to the North Lethbridge 370S substation. The inadequacy of backup capability of distribution upgrades, including load transfers and building/re-building distribution lines between the North Lethbridge 370S substation and the adjacent substations results from distant proximity of the affected load from adjacent substations. Installation of FortisAlberta's largest standard conductor size and voltage support equipment would not mitigate the reliability concerns identified as the resultant load requirements would exceed the capacity rating of the distribution equipment.

20. Request:

Re: FortisAlberta NFD Section 4.1, Load Forecast

a. If 2018 Recorded – MVA Loading is available please update Table 4-1.
b. Please provide a 10-yr peak load forecast which does not include contracted capacity.
c. Please describe how FortisAlberta's use of engineering judgment affects the forecasts. Use examples if helpful.
d. Please describe how FortisAlberta ensures that there is no possible duplication in its forecast when it is adding existing contracts on top of recorded peak load values.

Response:

a. Please refer to table 20.1 for an updated version of Table 4-1 based on 2018 peak load data forming part of the 5-year historical recorded peak load.

Table 20.1: Updated Table 4-1 Showing 2018 Actuals

				RECORDED - MVA LOADING						PREDICTED - REQUIRED CAPACITY									
			W	2014	2015	2016	2017	2018		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
SUB		CAPACITY	or	Peak	Peak	Peak	Peak	Peak		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
No	Feeder	T/R MVA	S	MVA	MVA	MVA	MVA	MVA	PF	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA
370S	N. Lethbridge (Spare)	T4 15/20/ 25																	
370S	Lethbridge (North)	T1 25/33/ 41	S	**23.0**	**21.4**	**22.5**	**24.6**	**23.9**	**93%**	**27.4**	**27.8**	**28.3**	**28.8**	**29.1**	**29.5**	**30.1**	**30.5**	**31.0**	**31.6**
370S	17LN (SPARE)			6.7	0.0	0.0	0.0	0.0	90%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
370S	204LN	T1 C.L.B.O.E. 30.3MVA	S	7.3	7.3	7.4	8.6	7.6	91%	8.6	8.7	8.8	8.9	8.9	9.0	9.1	9.1	9.2	9.3
370S	455LW		S	4.5	7.9	8.2	8.3	8.2	91%	8.5	8.6	8.8	9.0	9.2	9.3	9.5	9.7	9.9	10.1
370S	465LE		S	6.3	7.1	7.8	8.3	8.7	97%	11.3	11.5	11.7	11.9	12.1	12.3	12.6	12.8	13.0	13.3
618S	Riverbend	T1 15/20/ 25																	
618S		VR1 15/20/ 25	S	**12.0**	**14.0**	**14.4**	**17.2**	**16.9**	**90%**	**18.2**	**18.5**	**18.9**	**19.2**	**19.5**	**19.8**	**20.2**	**20.5**	**20.8**	**21.1**
618S	18LN		S	4.1	4.2	4.2	4.4	4.6	97%	6.7	6.8	6.9	7.0	7.1	7.2	7.4	7.5	7.6	7.7
618S	266LE		S	8.5	10.5	11.3	13.3	12.9	87%	12.3	12.5	12.8	13.0	13.2	13.4	13.6	13.9	14.1	14.3
Notes		**Area Total**		**35.0**	**35.4**	**36.9**	**41.8**	**40.8**		**45.6**	**46.3**	**47.2**	**48.0**	**48.6**	**49.3**	**50.3**	**51.0**	**51.8**	**52.7**

C.L.B.O.E.: Capacity Limited By Other Equipment.

Transfer 2.0 MW from 618S-266LE to 618S-18LN
Transfer 0.6 MW from 618S-266LE to 370S-465LE

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
N-1 Assessment for 370S											
Total Station Load	**23.9**	**27.4**	**27.8**	**28.3**	**28.8**	**29.1**	**29.5**	**30.1**	**30.5**	**31.0**	**31.6**
N-1 Capacity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back-up from 254S	11.0	10.0	9.7	9.4	9.1	8.8	8.5	8.2	7.9	7.6	7.6
Back-up from 492S	6.0	5.4	5.0	4.6	4.2	3.8	3.4	3.0	2.6	2.2	1.7
Back-up from 618S		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N-1 Unsupplied Load	**6.9**	**12.0**	**13.1**	**14.3**	**15.5**	**16.5**	**17.6**	**18.9**	**20.0**	**21.2**	**22.3**
N-1 Assessment for 618S											
Total Station Load	**16.9**	**18.2**	**18.5**	**18.9**	**19.2**	**19.5**	**19.8**	**20.2**	**20.5**	**20.8**	**21.1**
N-1 Capacity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back-up from 254S	0.8	1.1	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.1
Back-up from 67S	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back-up from 385S	2.7	3.2	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2.4	2.7
Back-up from 370S		1.3	1.2	1.1	1.0	0.9	0.8	0.0	0.0	0.0	0.0
N-1 Unsupplied Load	**12.0**	**12.6**	**13.2**	**13.9**	**14.5**	**15.1**	**15.7**	**17.1**	**17.6**	**18.1**	**18.3**

b. Table 20.2 provides a 10-yr peak load forecast which does not include contracted committed loads. In FortisAlberta's view, it is inadvisable to not include contracted committed loads in the 10-yr forecast, as it leads to a risk of FortisAlberta not being able to meet its statutory obligations to serve contracted customer loads. Further, such a practice could potentially inhibit FortisAlberta's inability to accommodate future customer load additions in a timely manner.

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Table 20.2: 10 Year Forecast Excluding Existing Contract Reservations

					RECORDED - MVA LOADING						PREDICTED - REQUIRED CAPACITY									
				W	2014	2015	2016	2017	2018		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
SUB		CAPACITY		or	Peak	Peak	Peak	Peak	Peak		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
No	Feeder	T/R	MVA	S	MVA	MVA	MVA	MVA	MVA	PF	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA
370S	N. Lethbridge (Spare)	T4	15/20/ 25																	
370S	Lethbridge (North)	T1	25/33/ 41	S	23.0	21.4	22.5	24.6	23.9	93%	24.6	25.0	25.4	25.9	26.4	26.7	27.2	27.7	28.2	28.7
370S	17LN (SPARE)			S	6.7	0.0	0.0	0.0	0.0	90%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
370S	204LN	T1 C.L.B.O.E. 30.3MVA		S	7.3	7.3	7.4	8.6	7.6	91%	7.7	7.8	7.8	7.9	8.0	8.0	8.1	8.2	8.2	8.3
370S	455LW			S	4.5	7.9	8.2	8.3	8.2	91%	8.5	8.6	8.8	9.0	9.2	9.3	9.5	9.7	9.9	10.1
370S	465LE			S	6.3	7.1	7.8	8.3	8.7	97%	9.3	9.5	9.7	9.9	10.2	10.4	10.6	10.8	11.1	11.3
618S	Riverbend	T1	15/20/ 25																	
618S		VR1	15/20/ 25	S	12.0	14.0	14.4	17.2	16.9	90%	16.0	16.3	16.6	16.9	17.2	17.5	17.9	18.2	18.5	18.8
618S	18LN			S	4.1	4.2	4.2	4.4	4.6	97%	6.7	6.8	6.9	7.0	7.1	7.2	7.4	7.5	7.6	7.7
618S	266LE			S	8.5	10.5	11.3	13.3	12.9	87%	10.0	10.2	10.4	10.6	10.8	11.0	11.2	11.5	11.7	11.9
Notes			Area Total		35.0	35.4	36.9	41.8	40.8		40.6	41.3	42.0	42.8	43.6	44.2	45.1	45.9	46.7	47.5

C.L.B.O.E.: Capacity Limited By Other Equipment.

Transfer 2.0 MW from 618S-266LE to 618S-18LN
Transfer 0.6 MW from 618S-266LE to 370S-465LE

c. Engineering judgement is applied when external factors, such as the impact of known load reductions and/or permanent load transfers made for FortisAlberta-initiated distribution system reconfigurations, are not adequately recognized and addressed by relying solely on statistical analysis to determine the predicted capacity requirement peak or the annual load growth rate. Values may be manually adjusted in accordance with the exercise of engineering judgement, when it is determined that the predicted peak or growth calculated by the statistical method does not appear reasonable in the particular operational context. Specifically, in Table 20.1, the statistical analysis forecast for the North Lethbridge 370S-17LN and 370S-455LW feeders were manually adjusted to account for permanent load transfers that materialized in 2015.

d. FortisAlberta specifically scrutinizes the Company's capacity requirement forecast, to ensure there is no duplication in its forecast when it is adding existing contracts on top of recorded peak load values. This is accomplished by determining if a portion of the contracted committed loads is deemed to be a duplication of predicted growth of the area. Any deemed duplication is excluded from the forecast. Additionally, load growth rates are only applied to the recorded peak demand and permanent load transfers. Load growth rates are not applied to the contracted committed loads which are subsequently summed with the trended peak demand and planned loads transfers.

I trust that this information will assist the AESO. Please do not hesitate to contact either myself at (403) 514-4683 or Zurex Fontanilla at (403) 514-4533 with any questions that you may have regarding the foregoing.

FORTIS ALBERTA

Sincerely,

(Original signed by)

Kevin Noble
Manager, Engineering Distribution Planning

Kevin Noble, P.Eng.
Manager, Engineering
Distribution Planning

FortisAlberta Inc
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October 11, 2019

Alberta Electric System Operator
Calgary Place
Suite 2500, 330 – 5th Avenue SW
Calgary, Alberta T2P 0L4

Attention: Imtiaz Ali, Project Manager
Transmission Connection Projects

Re: Lethbridge Area – AESO Project P2123
AESO Questions to FortisAlberta Inc.

Dear Mr. Ali:

I am writing further to the Alberta Electric System Operator's (AESO) recent request for information regarding FortisAlberta's Need for Development document for the Lethbridge area, generally. It is my understanding that the AESO requires this information to assist it in its assessment and preparation of a NID document for AESO Project 2123.

FortisAlberta Inc. has presented its responses to align with the specific questions raised in the AESO's request.

21. RE: Response to AESO question 20 a.

Preamble: The Lethbridge Area Load consisting of North Lethbridge 370S and Riverbend 618S has been growing since 1998 and recently peaked in 2017.

a) Please provide the year FortisAlberta was aware of the N-1 violation.

b) If the distribution deficiency has existed in the past, please provide the rationale, including any new drivers relative to previous years, for requesting improved transmission reliability service at this time.

Response:

a) FortisAlberta has been aware of unsupplied load under N-1 contingencies at both the North Lethbridge 370S and Riverbend 618S substations since 2011.

b) The objective of P2123 Lethbridge Area project is not to improve transmission reliability. The P2123 Lethbridge Area project must be completed to mitigate unsupplied load in the event of a POD substation N-1 contingency. FortisAlberta is of the view that POD substation N-1 contingencies continue to occur throughout AltaLink's service area. The P2123 Lethbridge Area will provide a cost effective solution to enable the Company to restore service to unsupplied distribution loads.

FortisAlberta performs an annual assessment of the Company's distribution system to identify planning criteria violations. The Company's execution of projects needed to mitigate identified planning criteria violations, including those related to unsupplied load, is prioritized based on available resources. Transmission infrastructure upgrades required to mitigate unsupplied load are prioritized based on the magnitude of unsupplied load risk, with applications made to the AESO based on this prioritization. Reliability projects not addressed at a particular time are then prioritized for execution in subsequent years. Until recently, FortisAlberta had identified POD substation deficiencies in other distribution system planning areas as having a higher priority than the Lethbridge area for upgrading.

22. RE: Response to AESO question 3 and 15.

Preamble: FortisAlberta indicated that North Lethbridge 370S violated the restoration criteria once by 2 hours and 15 mins over the last 10 years. FortisAlberta's distribution planning restoration switching time is 1 hour or less.

a) Given the historical performance of the North Lethbridge transformers are better than AltaLink transformers of typical design, and the relatively short duration of the past outages, please explain why FortisAlberta believes improving the reliability with additional transmission service is an efficient way to deliver electric energy to FortisAlberta customers?

b) Has FortisAlberta consulted with AltaLink to determine the scope and estimated costs to provide an operational solution which would reduce the switching time to 1 hour or less? If yes, please provide details. If no, why not? Can FortisAlberta please explain why an operational solution cannot be provided that could reduce the switching time to 1 hour or less?

c) Please clarify the inconsistency in FortisAlberta's response to Q#3 and Q#15. Was the 2010 recorded outage 3 hours and 15 mins or 7 hours and 30 mins?

Response:

a) The past performance of equipment located at the North Lethbridge 370S substation is irrelevant to FortisAlberta's identification of the requirement of complete upgrades to this facility. As stated in response 21 b) above, the objective of P2123 Lethbridge Area project is not to improve transmission reliability but rather to mitigate unsupplied load by having adequate electric power infrastructure in place to enable restoration of service to distribution system customers when and not if an N-1 contingency occurs. This planning outcome is consistent with the Company's own longstanding approach to distribution system planning, and the planning approaches used by other DFOs in Alberta. The deterministic character of these planning approaches reflects the fact that many causes of failures are not influenced by the past performance of the affected assets.

   In any event, the fact that critical components of the North Lethbridge 370S substation have not experienced significant failures in the past does not provide a logical basis upon which to conclude that this equipment will not suffer damage, or otherwise fail in the future. However, the countervailing fact that FortisAlberta customers have experienced outages resulting from equipment failures at AltaLink POD substations in the past that have required significant repairs or replacements to be completed is not disputed.

   If another such event was to occur in the future, the deployment of a mobile transformer with built in voltage regulation capabilities could be required. Such equipment can take upwards of 27 hours to deploy and energize. The Company submits that it is prudent to invest in capital expenditures that mitigate distribution deficiencies through prioritized implementation of solutions. This includes distribution deficiencies related to unsupplied load, of the kind identified in connection with the North Lethbridge 370S substation.

   Transmission facility N-1 contingencies can result for various reasons, including failures of, or damage to, substation equipment, components, or both. In the specific case of the North Lethbridge 370S substation, the failure of, or damage to, either of the two substation transformers (T1 and T4) would not result in unsupplied load within FortisAlberta's distribution system. Rather, it is the potential for the failure of, or damage to the 25kV bus that would result in unsupplied load. Since the two substation transformers (T1 and T4) at the North Lethbridge 370S substation provide alternate supply to the FortisAlberta's distribution system via a common substation 25kV bus, they are not able to supply FortisAlberta's distribution system simultaneously.

b) The Company has already determined that during an N-1 event at either the North Lethbridge 370S substation or the Riverbend 618S substation, operational solutions would be inadequate to resolve the reliability concerns due to insufficient transformation capacity or inadequate access to the transformation capacity in the area. As such, FortisAlberta did not explore an operational solution with AltaLink.

c) There is no inconsistency in FortisAlberta's responses to Q#3 and Q#15. The response to question #3 provided the duration, 3 hours and 15 mins, that the North Lethbridge 370S substation was without supply. The response to question #15 provided the duration, 7 hours and 30 mins, that the distribution system loads normally fed from the North Lethbridge 370S substation were unsupplied.

The failure of a transmission line, 207L, supplying the North Lethbridge 370S resulted in the substation outage and in damage to a section of FortisAlberta's distribution feeder, 370S-455L that was underbuilt on the transmission line structures of 207L. Although the North Lethbridge 370S substation was able to be restored through isolation of the failed transmission line, 207L, isolation of damaged section of the underbuilt distribution feeder, 370S-455L, required additional switching. The additional switching on the distribution system to isolate the damaged section resulted in the distribution system outage being of a longer duration than the substation outage.

23. RE: Response to AESO question 10 and 18.

Preamble: FortisAlberta's original forecast in Table 4.1 of NFD (version 1) for North Lethbridge 370S and Riverbend 618S is approximately 6% and 17% higher respectively than the 2018 recorded load.

a) Please provide the specific assumptions contributing to the load growth in the original forecast, confirm if those assumptions are still valid for the updated forecast; and, whether any new assumptions were made in the updated forecast.

Response:

a) FortisAlberta's forecast peaks identify the upper bounds of electric system peak capacity that would be required annually to address customer needs, inclusive of generic small customer load growth, customer committed loads (new and existing), and planned load transfers that may or may not materialize in any given year. FortisAlberta's forecast peaks must include customer committed loads because of FortisAlberta's statutory obligation to ensure that transmission and distribution capacity is available, which means that the contracted peak demands can be delivered when the customer requires. Accordingly, FortisAlberta's forecast peaks are normally expected to be higher than the actual peaks.

For the North Lethbridge 370S substation, the incremental difference between the recorded actual peak load in 2018 and the 2018 forecast capacity requirement results from statistical trending of historical recorded peak loads at the North Lethbridge 370S substation, inclusion of reservations for existing contracted committed loads in the area, and the application of distribution system planning and engineering judgement. There were no new contracted load

additions nor planned load transfers in the original forecast, while the updated forecast included a new contracted committed load and a planned load transfer from the Riverbend 618S substation to the North Lethbridge 370S substation. The same existing contracted committed loads have been included in the original and updated forecast.

For the Riverbend 618S substation, the incremental difference between the recorded actual peak area load in 2018 and the 2018 forecast capacity requirement results from statistical trending of historical recorded peak loads at the Riverbend 618S substation, inclusion of reservations for existing contracted committed loads in the area, and the application of distribution system planning and engineering judgement. The updated forecast included a planned load transfer from the Riverbend 618S substation to the North Lethbridge 370S substation. There were no new contracted load additions included in the original or the updated forecast. The same existing contracted committed loads have been included in the original and updated forecast, with the exception that a commercial subdivision was not included in the updated forecast.

24. RE: Response to AESO question 19.

Preamble: FortisAlberta states these feeders are voltage limited and that installation of the largest conductor and voltage support equipment is not able to mitigate existing and predicted voltage criteria violations.

a) Did FortisAlberta consider technology equivalent to flexible AC transmission system (FACTS) or other newer and emerging technologies (e.g. energy storage) as a distribution option to mitigate voltage concerns? If not, please explain why.

Response:

a) FortisAlberta is currently evaluating distribution system applications of newer and emerging technology for technical and economic feasibility. However, the Company is presently not aware of any proven technology that could be cost effectively utilized to mitigate the identified voltage concerns in the Lethbridge area.

Nonetheless, FortisAlberta routinely includes series capacitor compensation technology in the Company's set of solutions to address voltage concerns. Currently, the Lethbridge area does not require the utilization of series capacitor compensation technology.

25. RE: Response to AESO question 20 b.

Preamble: FortisAlberta stated, "*…it is inadvisable to not include contracted committed loads in the 10-yr forecast, as it leads to a risk of FortisAlberta not being able to meet its statutory obligations to serve contracted customer loads.*"

a) Please identify the applicable act or regulation and specific section identifying this obligation, including whether the obligation includes to planning for N-1?

Response:

a) Section 105 of the Electrical Utility Act (EUA) identifies the duties of owners of electric distribution systems. Section 105(1) (b) specifies the obligation to both make decisions regarding upgrades to the distribution system and to provide safe, reliable and economic delivery of electric energy. It is the Company's view that this section of the EUA includes distribution planning decisions related to mitigating unsupplied load risk resulting from N-1 contingencies.

Section 105 of the EUA is reproduced below.

> **Duties of owners of electric distribution systems**
>
> **105(1)** *The owner of an electric distribution system has the following duties:*
>
> *(a) to provide electric distribution service that is not unduly discriminatory;*
>
> *(b) to make decisions about building, upgrading and improving the electric distribution system for the purpose of providing safe, reliable and economic delivery of electric energy having regard to managing losses of electric energy to customers in the service area served by the electric distribution system;*
>
> *(c) to operate and maintain the electric distribution system in a safe and reliable manner;*

I trust that this information will assist the AESO. Please do not hesitate to contact either myself at (403) 514-4683 or Zurex Fontanilla at (403) 514-4533 with any questions that you may have regarding the foregoing.

Sincerely,

(Original signed by)

Kevin Noble
Manager, Engineering Distribution Planning