Alberta Utilities Commission

In the Matter of the Need for the Colinton 159S Substation Upgrade

And in the matter of the *Electric Utilities Act*, S.A. 2003, c. E-5.1, the *Alberta Utilities Commission Act*, S.A. 2007, c. A-37.2, the *Hydro and Electric Energy Act*, R.S.A. 2000, c. H-16, the *Transmission Regulation*, AR 86/2007 and Alberta Utilities Commission Rule 007, all as amended

Application of the Alberta Electric System Operator for Approval of the Colinton 159S Substation Upgrade Needs Identification Document

PART A - APPLICATION

1 Introduction

1.1 Application – Pursuant to Section 34(1)(c) of the *Electric Utilities Act* (Act), and in accordance with further provisions set out in legislation,[1] the Alberta Electric System Operator (AESO) applies to the Alberta Utilities Commission (Commission) for approval of the *Colinton 159S Substation Upgrade Needs Identification Document* (Application).

1.2 Application Overview – FortisAlberta Inc. (FortisAlberta), as the legal owner of the electric distribution facilities (DFO) in the Colinton area (AESO Planning Area 27, Athabasca / Lac La Biche), has requested system access service to meet distribution reliability criteria in the area. FortisAlberta's request can be met by upgrading the existing Colinton 159S substation, including the addition of a 138/25 kV on-load tap changing (LTC) transformer (the "Proposed Transmission Development", as further described in Section 2.2). The scheduled in-service date for the Proposed Transmission Development is August 23, 2016.

This Application describes the need to respond to the DFO's request for system access service. Having followed the AESO Connection Process,[2] the AESO has determined that the Proposed Transmission Development provides a reasonable opportunity for the DFO to exchange electricity. The Proposed Transmission Development is aligned with the AESO's long-term plan for the Colinton area. The AESO, in accordance with its responsibility to respond to requests for system access service, submits this Application to the Commission for approval.[3,4]

[1] The Alberta Utilities Commission Act, S.A. 2007, c. A-37.2, the Hydro and Electric Energy Act, R.S.A. 2000, c. H-16, the Transmission Regulation, AR 86/2007 and Alberta Utilities Commission Rule 007, all as amended.

[2] For information purposes, refer to note iii of Part C of this Application for more information on the AESO's Connection Process.

[3] For information purposes, some of the legislative provisions relating to the AESO's planning duties and duty to provide system access service are referenced in notes i and ii of Part C of this Application.

[4] Note iv of Part C of this Application describes the Application scope in more detail.

1.3 AESO Directions to the TFO – During the AESO Connection Process, the AESO issued various directions to AltaLink Management Ltd. (AltaLink), as the legal owner of transmission facilities (TFO), including direction to assist the AESO in preparing this Application.[5]

[5] The directions are described in more detail in the following sections of this Application and in Part C, note v.

2 Need Overview and Proposed Transmission Development

2.1 Duty to Provide Transmission System Access Service – The AESO, pursuant to its responsibilities under Section 29 of the Act, must provide system access service on the transmission system in a manner that gives all market participants (in this case the DFO), a reasonable opportunity to exchange electric energy and ancillary services.

The DFO, in executing its duties as defined under Section 105(1)(b) of the Act, has indicated that the Proposed Transmission Development will meet the need to improve distribution system reliability in the Colinton area. The DFO has made the appropriate applications to the AESO to obtain transmission system access service.[6]

Through the AESO Connection Process, the AESO, the DFO, and the TFO have collaborated to determine the characteristics of the Proposed Transmission Development and assess the impacts of connecting the Proposed Transmission Development to the transmission system. The DFO has indicated that there is an existing unsupplied load of 20 MVA under N-1 contingency that is forecast to grow to 22 MVA in the 10-year timeframe. The DFO has requested the addition of a 42 MVA transformer to address this need. The AESO has issued directions to the TFO to prepare a Facility Proposal[7] to meet the DFO's identified need.

2.2 Proposed Transmission Development – The Proposed Transmission Development involves upgrading the Colinton 159S substation, including the following elements:

1. Add a 138/25 kV LTC transformer with an approximate rating of 42 MVA; and
2. Modify, alter, add or remove equipment, including switchgear, and any operational, protection, control and telecommunication devices required to

[6] For information purposes, some of the duties of the DFO are described in note vi of Part C of this Application.

[7] Also referred to as facility application, or FA, under Commission Rule 007.

undertake the work as planned and ensure proper integration with the transmission system.[8]

2.3 Proposed Transmission Development Cost Estimates – The AESO directed the TFO to prepare a cost estimate for the Proposed Transmission Development. The TFO estimated the in-service cost of the Proposed Transmission Development, described in Section 2.2, to be approximately $5 million ($2016).[9] In accordance with the ISO tariff, the AESO has determined that there are no system-related costs associated with the Proposed Transmission Development.

2.4 Transmission Development Alternatives – In addition to the Proposed Transmission Development, the following transmission development alternative was identified:

1. Add a 25 kV voltage regulator at the Colinton 159S substation – this alternative would add a second 25 kV voltage regulator to connect to the second, de-energized tap changer (DETC) transformer at the Colinton 159S substation. This alternative was the DFO's preferred alternative, however, it was ruled out by the TFO because the second DETC transformer is at its end-of-life and is to be removed from the substation as part of a maintenance project.

The Proposed Transmission Development, selected because of its increased reliability, forms the basis of the cost estimates described herein.[10]

[8] Details and configuration of equipment required for the Proposed Transmission Development, including substation single-line diagrams, are more specifically described in the AESO's Functional Specification included in the TFO's Facility Proposal. Also, further details will be determined as detailed engineering progresses and DFO operating requirements are finalized. Routing and/or siting of transmission facilities do not form part of this Application and are addressed in the TFO's Facility Proposal. This is subject to change as routing and/or siting is finalized by the TFO. Distribution facilities that may subsequently be connected to the Proposed Transmission Development are the responsibility of the DFO and are not included in the Application.

[9] Further details of this cost estimate can be found in Appendix B, with an approximate accuracy level of +20%/-10%.

[10] The DFO determined that distribution system upgrades alone could not completely address the reliability concern at the Colinton 159S substation and; therefore, is not a technically acceptable solution. The DFO's report detailing the alternative assessment is included as Appendix E.

2.5 Connection Assessment – Having followed the AESO Connection Process, the AESO has determined that system impact studies related to the Proposed Transmission Development are not required to support this Application.[11] The Proposed Transmission Development at the Colinton 159S substation meets FortisAlberta's request to meet its distribution reliability criteria in the Colinton area. In consideration of these facts and that there is no Demand for Transmission Service (DTS) increase at the Colinton 159S substation, the AESO has determined that a connection assessment is not required.

2.6 Transmission Interdependencies – The AESO's corporate load forecasts for the Colinton area are consistent with the load to be served from the Proposed Transmission Development.[12] The AESO's corporate load forecasts are used by the AESO to assess the adequacy of the regional transmission system and to identify future transmission system expansion and enhancement plans. Therefore, the need associated with the Proposed Transmission Development is consistent with the AESO's long-term plans for the region. Future AESO needs identification documents in the Colinton area will assume the Proposed Transmission Development will be in-service for the date specified, unless new information indicates otherwise.

2.7 AESO Participant Involvement Program – The AESO directed the TFO to assist the AESO in conducting a participant involvement program (PIP), in accordance with requirement NID14 and Appendix A2 of Commission Rule 007. Between May and July 2015, the TFO and the AESO used various methods to notify occupants, residents, landowners, government bodies, agencies and stakeholder groups (collectively, the Stakeholders) of the need for the Proposed Transmission Development in the area where transmission facilities could be installed to address the identified need. Additionally, the AESO notified the public in the area where transmission facilities could be installed, of its intention to file this Application with the Commission for approval. No

[11] Appendix A to this Application provides a description of the connection process followed by the AESO while processing the DFO's request for transmission system access service.

[12] Section 6.2 of the AESO's *2014 Long-term Outlook* discusses the Northeast Region, which includes the Proposed Transmission Development area.

concerns or objections have been raised regarding the need for the Proposed Transmission Development.[13]

2.8 Information Regarding Rule 007, Section 6.1 - NID13 – The AESO has been advised that the TFO's Facility Proposal addresses the major aspects listed in Commission Rule 007, Section 6.1 - NID13.[14] In consideration of that fact, and as the filing of the Application is combined with the TFO's Facility Proposal, the AESO has not undertaken a separate assessment of the sort contemplated in Commission Rule 007, Section 6.1 – NID13.

2.9 Date to Amend or Cancel Approval (if granted) – The AESO will apply to the Commission to either amend or cancel the approval, if granted, for the needs identification document, in the event that the Proposed Transmission Development approved as a result of the needs identification document, or any portion thereof, will not be constructed by the scheduled in-service date of August 23, 2016. This application will be submitted to the Commission soon after the AESO is informed that the Proposed Transmission Development will not be constructed by the scheduled in-service date and no later than August 23, 2016.[15]

2.10 Approval is in the Public Interest – Having regard to the following:

- the transmission planning duties of the AESO as described in Sections 29, 33 and 34 of the Act;
- the System Access Service Request;
- the DFO's Need for Development Report;
- information obtained from AESO PIP Activities; and
- the AESO's long-term transmission system plans;

[13] Further information regarding the AESO's PIP for this Application is included in Appendix C.

[14] Please refer to the letter included as Appendix D of this Application.

[15] Detailed project schedule can be found in the TFO's Facility Application.

it is the conclusion of the AESO that the Proposed Transmission Development provides a reasonable opportunity for the market participant to exchange electricity. In consideration of these factors, the AESO submits that approval of this Application is in the public interest.

3 Request to Combine this Application with the Facility Proposal for Consideration in a Single Process

3.1 Pursuant to Subsection 35(1) of the Act, the AESO has directed the TFO to prepare a Facility Proposal to meet the need identified. The AESO understands that the TFO's Facility Proposal will be filed shortly.[16] The AESO requests, and expects the TFO will request, that this Application be combined with the Facility Proposal for consideration by the Commission in a single process. This request is consistent with Section 15.4 of the *Hydro and Electric Energy Act* and Section 6 of Commission Rule 007.

3.2 While it is believed that this Application and the Facility Proposal will be materially consistent, the AESO respectfully requests that in its consideration of both, the Commission be mindful of the fact that the documents have been prepared separately and for different purposes. The purpose of this Application is to obtain approval of the need to respond to the DFO's request for system access service and provide a preliminary description of the manner proposed to meet that need. In contrast, the Facility Proposal will contain more detailed engineering and designs for the Proposed Transmission Development and seek approval for the construction and operation of specific facilities.

[16] The AESO understands that the TFO intends to file a Facility Proposal relating to this Application to be titled *Colinton 159S Transformer Replacement*.

4 Relief Requested

4.1 The AESO submits that its assessment of the need to meet the market participant's request for transmission system access service is technically complete and that approval is in the public interest.

4.2 The AESO will apply to the Commission to either amend or cancel the approval, if granted, for the needs identification document, in the event that the Proposed Transmission Development approved as a result of the needs identification document, or any portion thereof, will not be constructed by the scheduled in-service date of August 23, 2016. This application will be submitted to the Commission soon after the AESO is informed that the Proposed Transmission Development will not be constructed by the scheduled in-service date and no later than August 23, 2016.

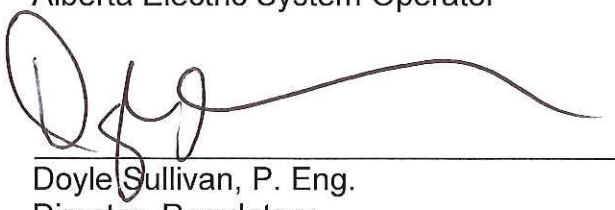
4.3 For the reasons set out herein, and pursuant to Section 34 of the Act, the AESO requests that the Commission approve this Application, including issuing an approval of the need to respond to the market participant's request for system access service, and to upgrade the Colinton 159S substation, as follows:

A. Add a 138/25 kV LTC transformer with an approximate rating of 42 MVA; and

B. Modify, alter, add or remove equipment, including switchgear, and any operational, protection, control and telecommunication devices required to undertake the work as planned and ensure proper integration with the transmission system.

All of which is respectfully submitted this 14th day of August 2015.

Alberta Electric System Operator



Doyle Sullivan, P. Eng.
Director, Regulatory

PART B – APPLICATION APPENDICES

The following appended documents support the Application (Part A).

APPENDIX A **Overview of AESO Connection Process –** Appendix A provides a description of the connection process followed by the AESO while processing the DFO's request for transmission system access service.

APPENDIX B **TFO Capital Cost Estimates –** Appendix B contains detailed cost estimates corresponding to the Proposed Transmission Development. These estimates have been prepared by the TFO at the direction of the AESO, to an approximate accuracy level of +20%/-10%, which exceeds the accuracy required by Commission Rule 007, NID11.

APPENDIX C **AESO PIP –** Appendix C contains a summary of the PIP activities conducted regarding the need for the Proposed Transmission Development. Copies of the relevant materials distributed during the PIP are attached for reference.

APPENDIX D **Information Regarding Rule 007, Section 6.1 - NID13 –** Appendix D contains a letter provided by the TFO confirming that the seven major aspects of Commission Rule 007, NID13 will be addressed within the TFO's Facility Proposal.

APPENDIX E **DFO Need for Development Report –** Appendix E contains the DFO's *Need for Development Colinton 159S Substation Upgrade* report that provides information in support of the DFO's request for system access service including describing the need for development.

PART C – REFERENCES

i. **AESO Planning Duties and Responsibilities –** Certain aspects of AESO duties and responsibilities with respect to planning the transmission system are described in the Act. For example, Section 17, Subsections (g), (h), (i), and (j), describe the general planning duties of the AESO.[17] Section 33 of the Act states that the AESO "must forecast the needs of Alberta and develop plans for the transmission system to provide efficient, reliable, and non-discriminatory system access service and the timely implementation of required transmission system expansions and enhancements." Where, as in this case, the market participant (refer to note ii below) is requesting system access service to meet its distribution planning needs, and the request requires or may require the expansion or enhancement of the capability of the transmission system, the AESO must prepare and submit for Commission approval, as per Section 34(1)(c), a needs identification document that describes the need to respond to requests for system access service, including the assessments undertaken by the AESO regarding the manner proposed to address that need. Other aspects of the AESO's transmission planning duties and responsibilities are set out in Sections 8, 10, 11, and 15 of the *Transmission Regulation*.

ii. **Duty to Provide Transmission System Access –** Section 29 of the Act states that the AESO "must provide system access service on the transmission system in a manner that gives all market participants [the DFO in this case] wishing to exchange electric energy and ancillary services a reasonable opportunity to do so."

iii. **AESO Connection Process** – For information purposes, the AESO Connection Process, which changes from time to time, is generally described at: http://www.aeso.ca/connect[18]

iv. **Application for Approval of the Need to Response to a Request for System Access Service –** This Application is directed solely to the question of the need to respond to a request for system access service, as more fully described in the Act and the *Transmission Regulation*. This Application does not seek approval of those aspects of transmission development that are managed and executed separately from the needs identification document approval process. Other aspects of the AESO's responsibilities regarding transmission development are managed under the appropriate processes, including the ISO Rules, Alberta Reliability Standards and the ISO Tariff, which are also subject to specific regulatory approvals. While the Application or its

[17] The legislation and regulations refer to the Independent System Operator or ISO. "AESO" and "Alberta Electric System Operator" are the registered trade names of the Independent System Operator.

[18] This link is provided for ease of reference and does not form part of this Application.

supporting appendices may refer to other processes or information from time to time, the inclusion of this information is for context and reference only**.**

Any reference within the Application to market participants or other parties and/or the facilities they may own and operate or may wish to own and operate, does not constitute an application for approval of such facilities. The responsibility for seeking such regulatory or other approval remains the responsibility of the market participants or other parties.

v. **Directions to the TFO –** Pursuant to Subsection 35(1) of the Act, the AESO has directed the TFO, in whose service territories the need is located, to prepare a Facility Proposal to meet the need identified. The Facility Proposal is also submitted to the Commission for approval. The TFO has also been directed by the AESO under Section 39 of the Act to prepare a proposal to provide services to address the need for the Proposed Transmission Development. The AESO has also directed the TFO, pursuant to Section 39 of the Act and Section 14 of the *Transmission Regulation*, to assist in the preparation of the AESO's Application.

vi. **Duties of the owner of an electric distribution system (DFO) –** The duties of DFO to make decisions about building, upgrading and improving their electric distribution systems are described in Section 105(1)(b) of the Act. The DFO, being responsible for electric distribution system planning, determines its need for transmission system access service based on its own distribution planning guidelines and criteria. While the DFO's plans are considered during the AESO Connection Process, the AESO, in executing its duties to plan the transmission system, does not oversee electric distribution planning or the development of specific DFO planning criteria. The AESO does, however, seek to ensure that DFO load growth forecasts used in the Connection Process are consistent with AESO load growth forecasts as described in Part A of this Application.

vii. **Capital Cost Estimates –** The provision of capital costs estimates in the Application is for the purposes of relative comparison and context only. The AESO's responsibilities in respect of project cost reporting are described in the *Transmission Regulation*, including Section 25, and ISO Rule 9.1.

APPENDIX A OVERVIEW OF AESO CONNECTION PROCESS

A.1 The AESO Connection Process

The AESO is the sole provider of system access service on the transmission system.[1] All market participants requesting connection to the Alberta transmission system that require either the expansion or enhancement of the capability of the transmission system are required to follow the AESO Connection Process. This process, which consists of six gated stages, sets out the necessary requirements to facilitate the requested connection. All requirements defined in each stage must be met before proceeding to the next stage.[2] In Stage 3 of the AESO Connection Process, a needs identification document is prepared that describes the need to respond to the market participant's request for system access service. In Stage 4 of the AESO Connection Process, this needs identification document is submitted to the Alberta Utilities Commission (Commission) for approval.

As connection requests advance through the AESO Connection Process, the scope of the requested transmission development may evolve as engineering progresses and study results are interpreted. Based on key activities and requirements set out in Stages 2 and 3 of the AESO Connection Process, the preferred transmission development as described in the needs identification document will be vetted and accepted by the market participant, and the AESO will have received confirmation that the preferred development is acceptable to the market participant.

A.2 The AESO Connection Process and DFO Requests

Most Alberta electricity consumers are supplied electricity at or below 25 kV and therefore are served by a local electric distribution system rather than being directly served by the transmission system.

[1] *Electric Utilities Act*, Section 28. Section 29 of the *Electric Utilities Act* states that the AESO "must provide system access service on the transmission system in a manner that gives all market participants wishing to exchange electric energy and ancillary services a reasonable opportunity to do so."

[2] For information, a general overview of the AESO connection process, which changes from time to time, is provided at: http://www.aeso.ca/connect. This link is provided for ease of reference and does not form part of this Application.

The point of connection between the high voltage transmission system and lower voltage electric distribution system is often referred to as the *point of delivery* or POD. Generally, a POD is a substation that contains one or more transformers and related equipment used to step-down voltage from 69 kV or higher to electric distribution levels of 25 kV or lower for the purpose of serving load.[3]

The AESO does not oversee electric distribution system planning. Each legal owner of distribution facilities (DFO) is responsible for distribution system planning to reliably serve its customers.[4] DFOs forecast local distribution system load growth and determine how these forecasts affect the specific loading on individual distribution system components, such as distribution feeders and transformers at individual PODs. When a DFO identifies a need to improve distribution system reliability, it must apply to the AESO for system access service. System access service requests that require expansion or enhancement of the capability of the transmission system are processed through the AESO Connection Process.

For DFO applications processed through the AESO Connection Process, the AESO usually receives a report from the DFO that describes the distribution planning studies undertaken to identify the need and that proposes the development preferred by the DFO to address the need. The DFO and TFO often collaboratively prepare this report to ensure that the proposed development is viable from a transmission facility and electric distribution system perspective.

[3] The *Electric Utilities Act,* Section 1(1)(bbb), item (v), defines transmission facilities to include "all equipment in a substation used to transmit electric energy from (A) the low voltage terminal, to (B) the electric distribution system lines that exit the substation and are energized at 25 000 volts or less…".

[4] For information, some of the duties of the DFO are described in note vii of Part C of this Application.

A.2.1 Needs Identification

Within the AESO Connection Process, and prior to submitting a needs identification document related to a DFO request for transmission service, the AESO has three primary needs identification responsibilities: (1) review the DFO's forecast for POD loading for consistency with the AESO's transmission load forecasts; (2) consider the effects of the forecasted POD loading on the immediately adjacent transmission system elements; and (3) ensure that the proposed connection configuration aligns with best utility practices.

A connection assessment may not be required when there is no load increase associated with the proposed connection. If there is a load increase associated with the proposed connection, a detailed connection assessment may be required to assess the impact of the proposed connection on the transmission system. When system studies[5] have already accounted for the increased load, the AESO may refer to those studies.[6] Alternatively, the AESO may refer to system studies or connection assessments that include the load associated with the proposed connection, which are to be filed shortly with the Commission.

A.2.2 Operational Mitigation Measures

If, after submitting a needs identification document, the transmission system supporting the POD is constrained, it may be necessary to develop temporary mitigation measures applicable to the POD, such as limiting DTS contract amounts, applying a Remedial Action Scheme (RAS), or other operational measures the AESO deems appropriate. The detailed development of operational mitigation measures is an operational matter that is usually completed just prior to energizing transmission developments (Stage 5 of the AESO Connection Process); these measures do not form part of the needs identification document application.

[5] The AESO performs regular transmission system studies as part of its ongoing responsibility to plan and operate the transmission system, in accordance with the *Transmission Regulation*, Section 10(1), and develops and adjusts long-term plans every two years. The AESO will apply for approval of the need for the appropriate developments in a timely manner.

[6] The *AESO 2013 Long-term Transmission Plan* has been posted on the AESO website.

The AESO also develops rules to address broader transmission constraints that may arise. Creating these rules is managed through the ISO Rules process that requires in-depth consultation with DFOs and TFOs, as well as any other affected market participants.[7] These rules are created and amended as a result of broad area growth, existing transmission deficiencies, or AESO/TFO operational requirements. They are not created and amended as a result of growth at a single POD or of an increase in the transmission capacity of a POD.

A.3 AESO Connection Process Conclusions

In consideration of its three primary responsibilities in the AESO Connection Process, the AESO has reached conclusions regarding the DFO's request for system access service and the proposed transmission development. These conclusions are found in Sections 2.5 and 2.6 of the Application.

[7] The AESO's duty to direct the safe, reliable and economic operation of the interconnected electric system is set out in Section 17(h) of the *Electric Utilities Act*. The AESO's power to make rules respecting the operation of the interconnected electric system is set out in Section 20(1)(c) of the *Electric Utilities Act*. The AESO's duty to make rules and establish practices respecting the operation of the transmission system and the management of transmission constraints that may arise from time to time is set out in Section 17 of the *Transmission Regulation.*

APPENDIX B TFO CAPITAL COST ESTIMATES

Project Name & No.	Fortis Colinton		D.0568	TRANSMISSION PROJECT ESTIMATE SUMMARY	Captial Maintenance (if applicable)
Prepared by:	AltaLink				
AACE Class: (future use)	N/A	Estimate Basis	PPS		
High Range	20%	Low Range	-10%		
Date of Estimate:	July 7, 2015	Base Year Used	2015		
	SYSTEM	CUSTOMER	TOTAL	ASSUMPTIONS	
TRANSMISION LINE					
Material	$ -	$ -	$ -		$ -
Labour	$ -	$ -	$ -		$ -
Supply & Install	$ -	$ -	$ -		$ -
TOTAL TRANSMISSION LINE	$ -	$ -	$ -		**$ -**
SUBSTATION					
Material	$ -	$ 1,912,000	$ 1,912,000		$ -
Labour	$ -	$ 48,000	$ 48,000		$ -
Supply & Install	$ -	$ 1,307,000	$ 1,307,000		$ -
TOTAL SUBSTATION	**$ -**	**$ 3,267,000**	**$ 3,267,000**		**$ -**
TELECOMMUNICATION					
Material	$ -	$ -	$ -		$ -
Labour	$ -	$ -	$ -		$ -
Supply & Install	$ -	$ -	$ -		$ -
TOTAL TELECOMMUNCATIONS	$ -	$ -	$ -		**$ -**
OWNERS					
Pre-PPS cost	$ -	$ 96,000	$ 96,000		$ -
Proposal to Provide Service	$ -	$ 78,000	$ 78,000		$ -
Facility Applications	$ -	$ 168,000	$ 168,000		$ -
Regulatory & Compliance	$ -	$ -	$ -		$ -
Land Rights - Easements	$ -	$ 21,000	$ 21,000		$ -
Land - Damage Claims	$ -	$ -	$ -		$ -
Land - Acquisitions	$ -	$ -	$ -		$ -
Other	$ -	$ -	$ -		$ -
TOTAL OWNERS COST	**$ -**	**$ 363,000**	**$ 363,000**		**$ -**
DISTRIBUTED					
Procurement Management	$ -	$ 47,000	$ 47,000		$ -
Project Management	$ -	$ 306,000	$ 306,000		$ -
Construction Management	$ -	$ 119,000	$ 119,000		$ -
Contingency	$ -	$ 696,000	$ 696,000		$ -
Escalation	$ -	$ 42,000	$ 42,000		$ -
TOTAL DISTRIBUTED	**$ -**	**$ 1,209,000**	**$ 1,209,000**		**$ -**
SALVAGE					
Transmission Line Labour	$ -	$ -	$ -		$ -
Substation Labour	$ -	$ -	$ -		$ 124,000.00
Telecom Labour	$ -	$ -	$ -		$ -
Land Remediation and Reclamation	$ -	$ -	$ -		$ -
	$ -	$ -	$ -		$ -
	$ -	$ -	$ -		$ -
TOTAL SALVAGE	**$ -**	**$ -**	**$ -**		**$ 124,000.00**
OTHER COSTS					
AFUDC	$ -	$ -	$ -		$ -
E&S/Overhead	$ -	$ 282,000	$ 282,000		$ -
TOTAL OTHER	**$ -**	**$ 282,000**	**$ 282,000**		**$ -**
TOTAL PROJECT	**$ -**	**$ 5,123,000**	**$ 5,123,000**		**$ 124,000**

APPENDIX C PARTICIPANT INVOLVEMENT PROGRAM (PIP)

1.0 Participant Involvement Program (PIP)

From May 2015 to August 2015, the AESO conducted a Participant Involvement Program (PIP) to assist in preparing its Colinton 159S Substation Upgrade Needs Identification Document (NID). The AESO directed transmission facility owner (TFO), AltaLink Management Ltd. (AltaLink), to assist the AESO in providing notification in accordance with NID14 and Appendix A2 of Alberta Utilities Commission Rule 007.

1.1 Stakeholder Notification

The AESO's PIP was designed to notify and provide information to all occupants, residents and landowners within the notification area of the proposed development, as well as to other interested parties, including the following government bodies, agencies and other stakeholder groups (Stakeholders):

- Industry Canada
- Nav Canada
- Transport Canada Civil Aviation
- Alberta Environment and Parks, Regional Resource Management
- Alberta Environment and Parks, Regional Integrated Approvals
- Alberta Environment and Parks, Parks Land Use and Dispositions
- Alberta Transportation and Infrastructure
- Athabasca County, Planning and Development Services
- Town of Athabasca
- Fortis Alberta Inc.
- TELUS Communications Company

The AESO used a variety of methods to notify Stakeholders on the need for the Colinton 159S Substation upgrade. The AESO developed a one-page Need Overview document that described the need for the proposed transmission development. A copy of this document was posted to the AESO website at http://www.aeso.ca/transmission/32058.html on May 27, 2015 and a notice was published in the Stakeholder Newsletter on May 28, 2015. Copies of the need overview and the Stakeholder Newsletter posting have been included as Attachment 1 and 2, respectively.

The need overview was also included with AltaLink's project-specific information package mailed on May 27, 2015 to the Stakeholders noted above. Attachment 3 includes a copy of AltaLink's brochure.

To ensure that Stakeholders had the opportunity to provide feedback, the AESO also provided Stakeholders with a dedicated, toll-free telephone line (1-888-866-2959) and a dedicated email address (stakeholder.relations@aeso.ca). AESO contact information, along with the AESO's mailing address (2500, 330 5th Ave. SW, Calgary) and website address (www.aeso.ca), and a privacy statement that described how the AESO is committed to protecting Stakeholders' privacy were included on the need overview related to this application.

As directed by the AESO, the TFO was prepared to direct any inquiries or concerns about the project need to the AESO. The TFO has indicated that Stakeholders have not identified any concerns or objections with the need for the proposed transmission development.

1.2 Public Notification

Most recently, the AESO published a Public Notification of NID Filing to the AESO website and in the Stakeholder Newsletter at http://www.aeso.ca/transmission/32058.html on July 30, 2015. Copies of the Public Notification of NID Filing and the Stakeholder Newsletter posting have been included as Attachment 4 and 5, respectively.

1.3 Concerns and Objections Raised

The AESO has received no indication of concern or objections from any party about the need for the proposed transmission development.

1.4 List of Attachments

- Attachment 1 – AESO Need Overview
- Attachment 2 – AESO Stakeholder Newsletter Need Overview Notice
- Attachment 3 – AltaLink's Information Brochure – *Colinton 159S Transformer Replacement (*May 2015)
- Attachment 4 – AESO Public Notice of NID Filing (AESO Website Posting)
- Attachment 5 – AESO Stakeholder Newsletter NID Filing Notice

Attachment 1 – AESO Need Overview

Need for the Colinton 159S Substation Upgrade in the Colinton area

Transmission Development Information for Stakeholders

FortisAlberta Inc. (FortisAlberta) has applied to the Alberta Electric System Operator (AESO) for transmission system access to improve reliability in the Colinton area. FortisAlberta's request can be met by upgrading the existing Colinton 159S substation, including replacing a 138/25 kV transformer with one of higher capacity, and adding four 25 kV breakers and associated equipment.

The AESO is processing FortisAlberta's request, including providing information to landowners, occupants, residents and agencies that may be near the proposed transmission development. The AESO intends to apply to the Alberta Utilities Commission (AUC) for approval of this need in mid-2015. The AESO's needs identification document (NID) application will be available on the AESO's website at www.aeso.ca/nid at the time of its application to the AUC.

Who is the AESO?

Alberta's transmission system, sometimes referred to as the Alberta Interconnected Electric System (AIES), is planned and operated by the AESO. The transmission system comprises the high-voltage lines, towers and equipment (generally 69 kV and above) that transmit electricity from generators to lower voltage systems that distribute electricity to cities, towns, rural areas and large industrial customers.

The AESO's role is to maintain safe, reliable and economic operation of the AIES. The AESO's planning responsibility includes determining the need for transmission system development and the manner in which that need is met. The AESO is also mandated to facilitate the interconnection of qualified market participants to the AIES. The AESO is regulated by the AUC and must apply to the AUC for approval of its NID application.

How is AltaLink Management Ltd. (AltaLink) involved?

AltaLink is the transmission facility owner (TFO) in the Colinton area. While the AESO is responsible for identifying that transmission system development is needed, AltaLink is responsible for detailed siting and routing, constructing, operating and maintaining the associated transmission facilities. The AESO has directed AltaLink to provide information to stakeholders on this need and to file a facility proposal application with the AUC which will include a detailed description and location of the proposed transmission development.

Further Information

The AESO appreciates your views on the need for transmission system development and your comments are encouraged. If you have any questions or comments regarding the need for the proposed transmission system development in the Colinton area or the AESO's application regarding this need, please contact:

Susan Haider
AESO Stakeholder Relations
1-888-866-2959
stakeholder.relations@aeso.ca
2500, 330 – 5th Avenue SW
Calgary, Alberta T2P 0L4

If you have any questions or concerns, please contact us at 1-888-866-2959 or at stakeholder.relations@aeso.ca. The AESO is committed to protecting your privacy. Your feedback, comments and/or contact information collected by the AESO will be used to respond to your inquiries and/or to provide you with further information about the project. The AESO will not use your personal information for any other purposes and will not disclose your information without consent or a legal obligation. If you choose to communicate by email, please note, email is not a secure form of communication. Security of your communication while in transit cannot be guaranteed.

2500, 330-5th Avenue SW, Calgary, Alberta T2P 0L4 Phone: 403-539-2450 Fax: 403-539-2949
www.aeso.ca www.poweringalberta.com

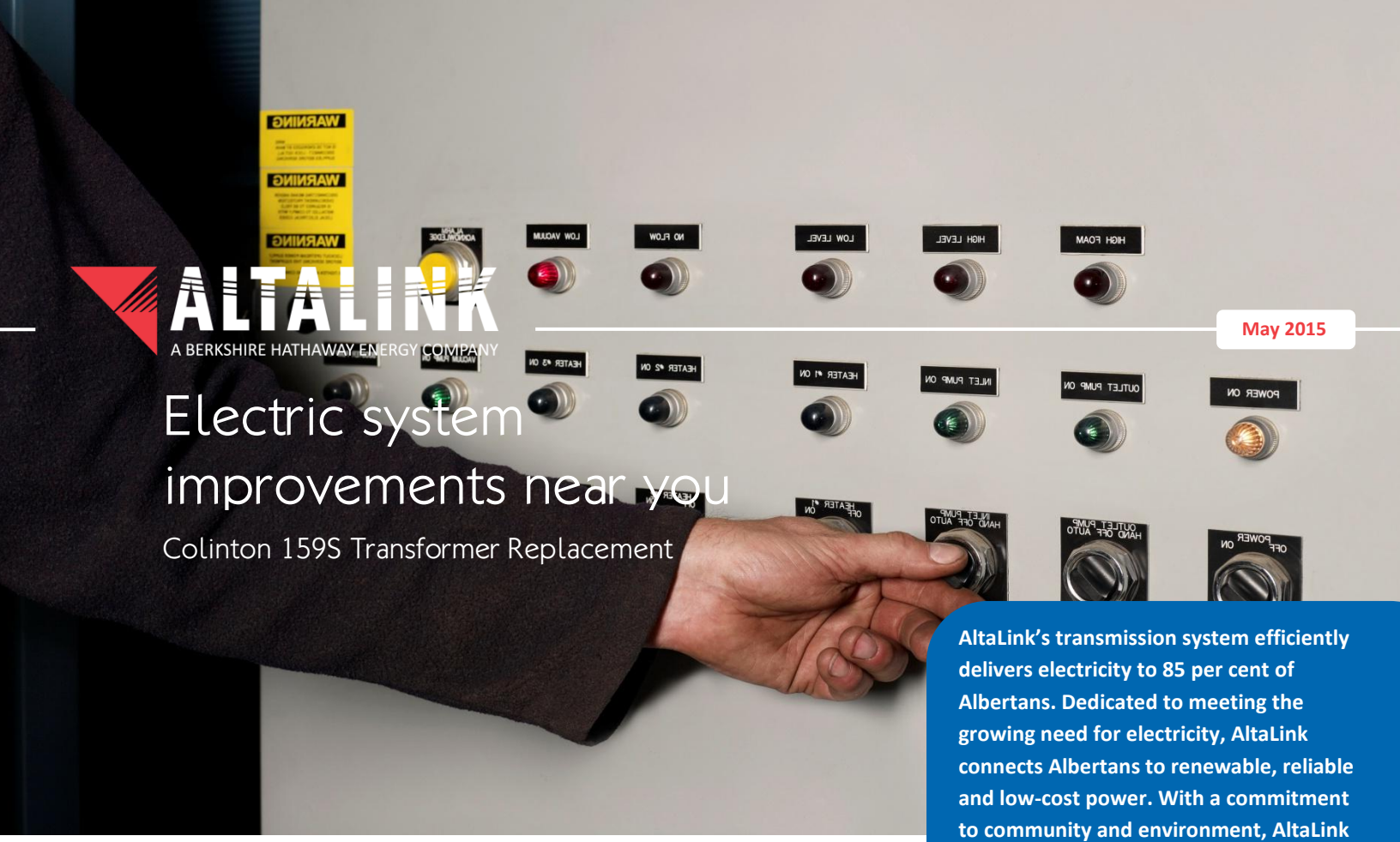
Attachment 2 – AESO Stakeholder Newsletter Need Overview Notice

Colinton 159S Substation Upgrade – Need for Transmission System Development in the Athabasca/Lac La Biche Area

FortisAlberta Inc. has applied to the AESO for transmission system access to improve reliability in the Athabasca/Lac La Biche area. FortisAlberta's request can be met by upgrading the existing Colinton 159S substation, including replacing a 138/25 kV transformer with one of higher capacity, adding four 25 kV breakers and associated equipment.

The AESO has posted a Need Overview for this project on its website. Please click here to view the document or visit the AESO website at www.aeso.ca and follow the path Transmission > Needs Identification Documents > Colinton 159S Substation Upgrade.

Attachment 3 – AltaLink's Information Brochure – *Colinton 159S Transformer Replacement (*May 2015)



ALTALINK
A BERKSHIRE HATHAWAY ENERGY COMPANY

May 2015

Electric system improvements near you

Colinton 159S Transformer Replacement

AltaLink's transmission system efficiently delivers electricity to 85 per cent of Albertans. Dedicated to meeting the growing need for electricity, AltaLink connects Albertans to renewable, reliable and low-cost power. With a commitment to community and environment, AltaLink is ensuring the transmission system will support Albertans' quality of life for years to come. Learn more at www.altalink.ca.

You are receiving this newsletter because you are near the Colinton 159S Transformer Replacement project and we want your input.

AltaLink is proposing **substation** upgrades to improve the reliability of the electric system in your area.

We are providing you with:

- project details
- maps of the proposed project sites
- information about how you can provide your input
- the project schedule

DEFINITION:

Substation

Substations are the connection points between power lines of varying voltages and contain equipment that controls and protects the flow of power. Substations include transformers that step down and step up the voltage so power can be transmitted through transmission lines or distributed to your community through distribution lines.

CONTACT US

1-877-267-1453
stakeholderrelations@altalink.ca
www.altalink.ca/regionalprojects

Above: the existing Colinton Substation

Above: example of a 138/25 kV transformer

Project details

The proposed project involves adding new equipment to the Colinton Substation, located approximately five kilometres (three miles) west of the Town of Colinton in Athabasca County (in SE-18-65-22-W4). We are proposing to add the equipment within our existing substation, and no new land will be required. This proposed project will increase the reliability of the Colinton Substation and the electric system in the area.

If approved, the upgrades to the Colinton Substation involve replacing the transformer at the site with a new, higher capacity 138/25 kV transformer and its associated equipment . Transformers reduce the voltage of a connected transmission line so that electricity can be distributed safely to nearby communities.

We are also proposing to install a switchgear building at the site. The proposed switchgear building will occupy an area of approximately five by eight metres (15 by 25 feet) and will be approximately five metres (15 feet) tall. Additionally, four circuit breakers will be installed and energized inside the building.

A switchgear building houses electrical equipment such as cables, switches and breakers and ensures that electrical equipment is protected.

Please note that if approved, a mobile substation may be used during this project. The mobile station may be temporarily placed outside of the existing substation fence on AltaLink-owned land.

Electric and Magnetic Fields (EMF)

AltaLink recognizes that people have concerns about exposure to Electric and Magnetic Fields (EMF) and we take those concerns very seriously. Everyone in our society is exposed to EMF from many sources, including:

- power lines and other electrical facilities
- electrical appliances in your home
- building wiring

National and international organizations such as Health Canada and the World Health Organization have been conducting and reviewing research about EMF for more than 40 years. Based on this research, these organizations have not recommended the general public take steps to limit their everyday exposure to EMF from high voltage transmission lines. If you have any questions about EMF please contact us.

Website: www.altalink.ca/emf
Email: emfdialogue@altalink.ca
Toll-free phone number: 1 -866-451-7817

Providing your input

We will contact landowners, residents and occupants near the proposed transmission line project to gather input and address questions or concerns.

After the consultation process is complete we will file an application with the Alberta Utilities Commission (AUC). The AUC will review the application through a process in which stakeholders can participate.

We will notify stakeholders when we file the application and again once the AUC has reached a decision about the project. To learn more about the AUC process and how you can become involved, please refer to the brochure included in this package titled *Public Involvement in Needs or Facilities Applications*.

Anticipated project schedule

Notify and consult with stakeholders	Spring 2015
File application with Alberta Utilities Commission (AUC)	Summer 2015
Start construction if project is approved	Spring 2016
Construction completed	Summer 2016

Although we attempt to follow the anticipated project schedule it is subject to change. We will continue to provide you with updated schedule information if required as the project progresses.

ALTALINK
A BERKSHIRE HATHAWAY ENERGY COMPANY

Contact us

To learn more about the proposed project please contact:

ALTALINK
1-877-267-1453 (toll free)
E-mail: stakeholderrelations@altalink.ca
Website: www.altalink.ca/regionalprojects

To learn more about Alberta's electric system and the need for the project, please contact:

ALBERTA ELECTRIC SYSTEM OPERATOR (AESO)
1-888-866-2959
E-mail: stakeholder.relations@aeso.ca

The Alberta Electric System Operator (AESO) is an independent, not-for-profit organization responsible for the safe, reliable and economic planning and operation of the provincial transmission grid. For more information about why this project is needed, please refer to the AESO's Need Overview included with this package, or visit www.aeso.ca. If you have any questions or concerns about the need for this project you may contact the AESO directly.

To learn more about the application and review process, please contact:

ALBERTA ULTILITIES COMMISSION (AUC)
780-427-4903 (toll-free by dialing 310-0000 before the number.)
E-mail: consumer-relations@auc.ab.ca

INCLUDED IN THIS INFORMATION PACKAGE:

- Project map
- AUC brochure: *Public Involvement in Needs or Facilities Applications*
- AESO Need Overview Document

PRIVACY COMMITMENT

AltaLink is committed to protecting your privacy. Collected personal information will be protected under AltaLink's Privacy Policy and the Freedom of Information and Protection of Privacy Act. As part of the regulatory process for new transmission projects, AltaLink may provide your personal information to Alberta Utilities Commission (AUC). For more information about how AltaLink protects your personal information, visit our website at www.altalink.ca/privacy or contact us directly via e-mail privacy@altalink.ca or phone at 1-877-267-6760.

DID YOU KNOW?

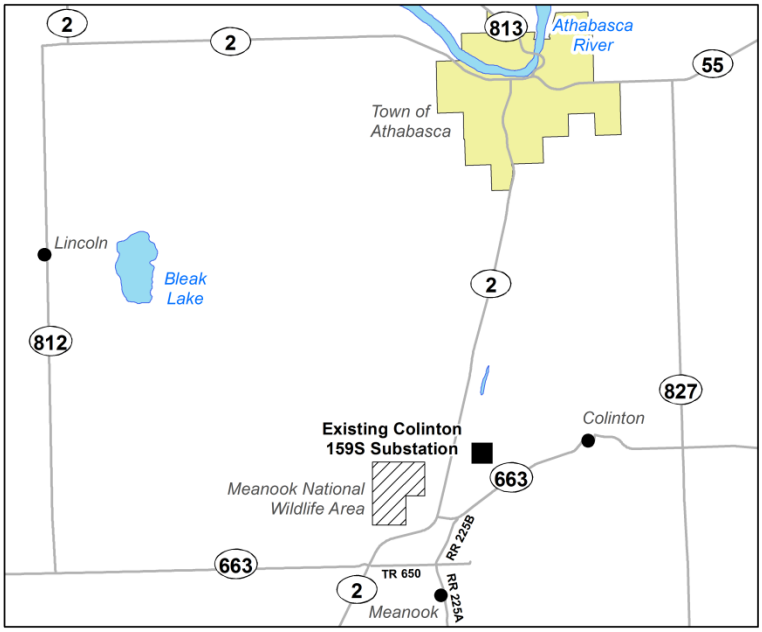
According to the Canadian Electricity Association, Canada's electricity grid was built for a population of about 20 million, but is today servicing around 35 million people. Provinces across Canada, including Alberta, are working to reinforce their aging electric systems so they can continue to provide customers with reliable power.

Attachment 4 – AESO Public Notice of NID Filing (AESO Website Posting)

AESO Public Notification of Regulatory Filing
Addressing the Need for the Colinton 159S Substation Upgrade in the Athabasca/Lac La Biche Area

The Alberta Electric System Operator (AESO) advises you that it intends to file a Needs Identification Document (NID) for the Colinton substation upgrade with the Alberta Utilities Commission (AUC) on or after August 14, 2015.

FortisAlberta Inc. (FortisAlberta) has applied to the Alberta Electric System Operator (AESO) for transmission system access to improve reliability in the Athabasca / Lac La Biche area. FortisAlberta's request can be met by upgrading the existing Colinton 159S substation, including replacing a 138/25 kV transformer with one of higher capacity, and adding associated equipment.



The black square on the map indicates the approximate location of the Colinton 159S Substation, which is at 18-65-22-W4 or about five kilometres west of the Town of Colinton. In a separate application called a Facility Application, AltaLink Management Ltd. (AltaLink) the transmission facility owner (TFO) in the Athabasca/Lac La Biche area, will describe the specific upgrades to be performed and request AUC approval to construct and operate the specific transmission facility.

The AESO and AltaLink presented this need to stakeholders, including residents, occupants and landowners, from May 2015 to July 2015. The AESO has considered feedback gathered from stakeholders, and technical and cost considerations, and will apply to the AUC for approval of the need for this transmission development. Once filed, the NID will be posted on the AESO website at http://www.aeso.ca/transmission/32058.html

Please visit our website, www.aeso.ca for more information, or contact the AESO at 1-888-866-2959 or stakeholder.relations@aeso.ca

Attachment 5 – AESO Stakeholder Newsletter NID Filing Notice

Colinton 159S Substation Upgrade – Notice of NID Filing

FortisAlberta Inc. has applied to the AESO for transmission system access to improve reliability in the Athabasca / Lac La Biche area. FortisAlberta's request can be met by upgrading the existing Colinton 159S substation, including replacing a 138/25 kV transformer with one of higher capacity, and adding associated equipment.

The AESO will be filing the Colinton 159S substation upgrade Needs Identification Document (NID) application with the Alberta Utilities Commission on or after August 14, 2015 and requesting that the Commission approve this NID**.**

The AESO has posted the public notification for its NID filing on its website for the Colinton 159S substation upgrade. Please click here to view the document or visit the AESO website at www.aeso.ca and follow the path Transmission > Needs Identification Documents > Colinton 159S Substation Upgrade to see all the relevant documents, including the NID application once it is filed with the Commission.

APPENDIX D INFORMATION REGARDING RULE 007, SECTION 6.1 – NID13

July 10, 2015

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

Attention: Susan Haider

Dear Susan Haider:

RE: Confirmation that the seven AUC Rule 007 NID 13 aspects are being addressed in AltaLink's Fortis Colinton 159S Transformer Replacement Facility Application

The 7 major aspects of AUC Rule 007 NID 13 are addressed throughout AltaLinks' Facility Application (FA) where applicable, and each major aspect is specifically addressed in the sections of the Facility Application outlined below:

1. **Agricultural Impact**
   Is addressed in the FA in Section 8 (Environmental Evaluation)
2. **Residential Impact**
   Is addressed in the FA in Section 7 (Project Consultation) and Section 10 (Visual Impact).
3. **Environmental Impact**
   Is addressed in the FA in Section 8 (Environmental Evaluation).
4. **Cost**
   Is addressed in the FA in Section 13 (Economic Assessment).
5. **Electrical Considerations**
   Is addressed in the FA in Section 5 (Project Details) and 11 (Electrical Considerations).
6. **Visual Impact**
   Is addressed in the FA in Section 10 (Visual Impact).
7. **Special Constraints**
   Is addressed in the FA in Section 11 (Electrical Considerations).

This Project is not located within the plan boundaries of a regional land use plan in force.

If you have any questions or require clarification regarding the information contained herein, please contact me by telephone at (403) 267-4474, or by email to afshana.dhanji@altalink.ca

Sincerely

Afshana Dhanji
Right-of-Way Planner
AltaLink Management Ltd.

APPENDIX E NEED FOR DEVELOPMENT

Need for Development

Colinton 159S Substation Upgrade

July 30, 2015

	Name	Signature	Date
Prepared:	Zurex Fontanilla Sr. Distribution Planning Engineer		2015.07.30
Reviewed:	Grant Wiens Manager, Distribution Planning		2015.07.30
Approved:	Richard Bahry Director, Engineering		2015-07-30

Executive Summary

FortisAlberta Inc. (FortisAlberta) is requesting for system access service to address a distribution system reliability concern at the Colinton 159S substation.

The load served by the Colinton 159S substation and the distribution system in the area is comprised of small towns with residential, commercial, farm, and oil and gas services. This load is subject to a concern related to the adequacy of the existing transmission and distribution facilities to provide reliability to meet customer needs.

Load studies indicate that under N-1 contingency, unsupplied load is predicted:

- At levels of 19.1 MVA in 2015 and increasing to 21.7 MVA by 2024.

This exceeds FortisAlberta planning criteria for electrical load restoration.

Potential solutions were assessed for this reliability concern. Based on technical merit and lowest estimated distribution capital cost, the preferred solution involves transmission upgrades at the Colinton 159S substation: the addition of a 25 kV 25 MVA voltage regulator, VR2, to be paired with the existing supply transformer, T2, and move two existing feeders to the resulting supply transformer/new voltage regulator pair, T2/VR2.

The estimated distribution capital cost associated with this preferred alternative is $0.4 million (±30%, 2016$).

The requested completion date for the preferred Colinton 159S facility upgrade is June 1, 2016.

The existing Demand Transmission Service (DTS) contract at the Colinton 159S substation is 17.7 MW. No DTS change is requested.

Table of Contents

List of Tables and Figures

1. Background

The Colinton 159S substation is located 12 km south of the Town of Athabasca. The components of the substation includes: one 138/24.9 kV 15/20/25/28.1 MVA de-energized tap changer (DETC) transformer, T1; one 132/22.9 kV 25 MVA DETC transformer, T2; one 24.94 kV 15/20/25 MVA voltage regulator, VR1; and three 25 kV circuit breakers.

The source transformer, T2, normally does not supply load; however, it is connected to the voltage regulator, VR1. As a result, in the event of the T1 supply transformer outage, T2 will become operational and supply transformation capacity to the Colinton 159S substation load.

The Colinton 159S substation supplies three 25 kV distribution feeders with load comprising of small towns with residential, commercial, farm, and oil and gas services.

The Colinton 159S substation has no three-phase distribution feeder ties to other adjacent distribution systems. In the event that the Colinton 159S substation voltage regulator VR1 goes out of service, the substation will not have back up supply for the load it serves.

Load studies indicate that under N-1 contingency, unsupplied load is predicted:

- At levels of 19.1 MVA in 2015 and increasing to 21.7 MVA by 2024.

This exceeds FortisAlberta planning criteria for electrical load restoration.

2. Criteria

The analysis for the preferred development in the Colinton area has been conducted based upon the following criteria:

- The maximum normal loading of FortisAlberta 25 kV distribution feeders is 13.0 MVA.

- FortisAlberta planning criteria for electrical load restoration requires that adequate backup supply for contingency situations be available subject only to switching time. Backup capability refers to the ability to restore service after an interruption without necessarily first repairing the cause of the interruption.

- Transmission equipment must not be operated at load levels in excess of the equipment ratings.

3. Existing System Assessment

The existing substations and distribution systems in the Athabasca area are shown in Figure A-1 in Appendix A.

3.1 Load Forecast

Table 3-1 provides FortisAlberta historical and forecast peak load levels for the substations and feeders in the study area. The load forecast is based on historical data, expected development trends, and contracted new loads. This load forecast was used to assess all the alternatives presented in this Need for Development document.

Table 3-1: FortisAlberta Historical and Forecast Load: Existing System

					MVA LOADING - RECORDED					PREDICTED - MVA LOADING									
		2014	W	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Fore-
SUB	CAPACITY	Peak	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	cast
No Feeder	T/R MVA	PF	S	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	Growth
159S Colinton	T1 15/20/25/ 28.1																		
159S	VR1 15/20/ 25.0	99%	W	**16.6**	**16.3**	**16.4**	**17.4**	**17.3**	**19.11**	**19.38**	**19.65**	**19.93**	**20.21**	**20.49**	**20.78**	**21.07**	**21.36**	**21.66**	**1.4%**
159S 232LN		98%	W	8.1	10.6	10.7	11.1	9.9	10.22	10.35	10.48	10.62	10.76	10.90	11.04	11.18	11.33	11.48	1.3%
159S 389LE-231LS		100%	W	3.7	3.8	3.8	4.1	4.1	4.33	4.38	4.43	4.48	4.53	4.58	4.63	4.68	4.74	4.80	1.2%
159S 469LN-227LN		99%	W	5.4	2.3	2.2	2.4	5.4	5.56	5.65	5.74	5.83	5.92	6.01	6.11	6.21	6.31	6.41	1.6%
056S Boyle	T2 15/20/ 25	92%	W	**15.5**	**13.8**	**13.4**	**15.4**	**14.3**	**21.42**	**22.41**	**23.42**	**24.45**	**24.91**	**25.38**	**25.86**	**26.35**	**26.85**	**27.36**	**1.9%**
056S 134LN		97%	W	7.7	7.6	7.0	7.7	7.2	11.81	12.02	12.24	12.46	12.68	12.91	**13.14**	**13.38**	**13.62**	**13.87**	1.8%
056S 380LW		88%	W	6.1	6.1	6.1	6.5	5.9	8.54	9.40	10.28	11.19	11.51	11.84	12.18	12.53	12.89	**13.26**	2.9%
056S 439LS		99%	W	2.7	2.6	2.6	3.4	3.3	4.10	4.12	4.14	4.16	4.18	4.20	4.22	4.24	4.26	4.28	0.5%
150S Clyde	T1 15// 16.8																		
150S	VR1 20// 22.4	97%	W	**10.2**	**8.5**	**8.8**	**9.1**	**8.6**	**13.08**	**13.23**	**13.38**	**13.53**	**13.69**	**13.85**	**14.01**	**14.17**	**14.33**	**14.49**	**1.2%**
150S 35LN		99%	W	4.7	2.9	2.9	2.8	2.7	4.06	4.12	4.18	4.24	4.30	4.36	4.43	4.50	4.57	4.64	1.5%
150S 35LS		93%	W	6.0	6.3	6.1	6.5	6.2	9.43	9.52	9.62	9.72	9.82	9.92	10.02	10.12	10.22	10.32	1.0%
438S Westlock	T1 15/20/25// 28.1																		
438S	VR1 15/20/ 25	97%	W	**14.3**	**16.4**	**16.5**	**17.2**	**17.1**	**21.46**	**21.61**	**21.76**	**21.91**	**22.06**	**22.21**	**22.37**	**22.53**	**22.69**	**22.85**	**0.7%**
438S 329LW		97%	W	8.6	6.5	6.2	6.3	6.3	7.64	7.68	7.72	7.76	7.80	7.84	7.88	7.92	7.96	8.00	0.5%
438S 330LE		97%	W	5.9	6.9	6.5	6.5	6.4	7.04	7.12	7.20	7.28	7.36	7.44	7.52	7.60	7.69	7.78	1.1%
438S 2013LW		97%	W		4.3	4.0	4.7	4.6	7.19	7.23	7.27	7.31	7.35	7.39	7.43	7.47	7.51	7.55	0.5%
500S Flatbush	T1 10/13.3// 15																		
500S	VR1 10	100%	W	**3.5**	**3.1**	**3.1**	**3.1**	**2.6**	**4.57**	**4.59**	**4.61**	**4.63**	**4.65**	**4.67**	**4.69**	**4.71**	**4.73**	**4.75**	**0.5%**
500S 119LN (AESO direct-connect)		99%	W	2.1	1.5	1.5	1.4	1.6	2.67	2.68	2.69	2.70	2.71	2.72	2.73	2.74	2.75	2.76	0.5%
500S 119LX		99%	W	1.8	1.8	1.7	1.8	1.6	2.41	2.42	2.43	2.44	2.45	2.46	2.47	2.48	2.49	2.50	0.5%
Total Area Load				**60.1**	**58.1**	**58.2**	**62.2**	**59.9**	**79.6**	**81.2**	**82.8**	**84.5**	**85.5**	**86.6**	**87.7**	**88.8**	**90.0**	**91.1**	

Load Additions (MW)	2015	2016	2017	2018
159S 232LN	0.22			
056S 134LN	3.84			
056S 380LW	1.17	0.54	0.54	0.54
150S 35LN	1.02			
150S 35LS	2.88			
438S 329LW	0.81			
438S 330LE	0.34			
438S 2013LW	2.57			

N-1	159S (MVA)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	159S Total Load	17.30	19.11	19.38	19.65	19.93	20.21	20.49	20.78	21.07	21.36	21.66
	159S N-1 Capacity	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Back-up from other substations	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	N-1 Unsupplied Load	**17.30**	**19.11**	**19.38**	**19.65**	**19.93**	**20.21**	**20.49**	**20.78**	**21.07**	**21.36**	**21.66**

Notes:
* - Committed customer load additions and respective year expected.

In the event that the voltage regulator VR1 goes out of service at Colinton 159S substation, there will be no available firm transformation capacity for the entire station load it serves. Therefore, under N-1 contingency at the Colinton 159S substation exceeds FortisAlberta planning criteria for electrical load restoration.

4. Alternatives Analysis

A number of alternatives were considered and based on both technical merit and cost, three alternatives are presented in this document. These three alternatives have either the least distribution system development or the lowest estimated distribution capital cost.

4.1 Alternative 1: Distribution Upgrades

4.1.1 Description

In 2016, between Colinton 159S and the adjacent substations:

- **Build approximately 37 km of three-phase distribution feeder tie between distribution systems supplied by Colinton 159S and Flatbush 500S;**
- **Build approximately 32 km of three-phase distribution feeder ties between distribution systems supplied by Colinton 159S and Boyle 56S;**
- **Build approximately 26 km of three-phase distribution feeder ties between distribution systems supplied by Colinton 159S and Westlock 438S.**

Refer to Appendix B, Figure B-1, for the simplified single line diagram (SLD) showing the system development for Alternative 1.

Distribution upgrades alone will not be sufficient to completely address the reliability concern at the Colinton 159S substation:

- If 37 km of three-phase distribution feeder tie between Colinton 159S-232LN and Flatbush 500S-119LX is built in 2016, there will be 4.54 MVA of remaining unsupplied load at Colinton 159S-232LN feeder. The remaining unsupplied load is expected to increase to 6.23 MVA, in 2024. Therefore, this distribution feeder tie is not sufficient to completely address the reliability concern at the Colinton 159S-232LN feeder.
- If 32 km of three-phase distribution feeder tie between Colinton 159S-469LN and Boyle 56S-380LW is built in 2016, there will be 3.06 MVA of remaining unsupplied load at Colinton 159S-469LN feeder. The remaining unsupplied load is expected to increase to 6.41 MVA, in 2024. Therefore, this distribution feeder tie is not sufficient to completely address the reliability concern at the Colinton 159S-469LN feeder.
- If 26 km of three-phase distribution feeder tie between Colinton 159S-389LE and Westlock 438S-329LW is built in 2016, there will be 0.99 MVA of remaining unsupplied load at Colinton 159S-389LE feeder. The remaining unsupplied load is expected to increase to 2.65 MVA, in 2024.

Therefore, this distribution feeder tie is not sufficient to completely address the reliability concern at the Colinton 159S-389LE feeder.

The three described distribution upgrades will result to remaining unsupplied load of 8.59 MVA in 2016 and increasing to 15.29 MVA by 2024. As a result, detailed load forecasts were not included in this document.

4.1.2 Costs Estimate

The distribution capital cost for Alternative 1 is estimated to be $18.1 million (2013$, ±30%).

4.2 Alternative 2: Add a 25 kV voltage regulator at Colinton 159S substation

4.2.1 Description

In 2016, at the Colinton 159S substation:

- **Add a 25 kV voltage regulator;**
- **Move two of the existing 25 kV feeder breakers from transformer, T1, to the resulting transformer/voltage regulator pair, T2/V2.**

Refer to Appendix C, Figure C-1, for the simplified SLD showing the system development for Alternative 2.

All 25 kV overhead conductors, new and existing, exiting the substation and distribution feeder ties shall be 477 MCM. All underground feeder cables, new and existing, shall be 750 MCM. All transmission components on the secondary side of the 25 kV source transformers, new and existing, shall be sized to enable the feeders to simultaneously supply 26 MVA per feeder. All 25 kV feeder breakers shall be equipped with associated equipment to enable under-frequency load shedding.

Transmission facilities must be equipped with the appropriate equipment for interconnection with FortisAlberta's Automated Metering system. Provisions must be available to interconnect the substation transformer neutrals and the distribution line neutrals, as per AltaLink Management Ltd. (AltaLink) standards.

4.2.2 Load Forecast

The load forecast resulting from Alternative 2 is provided in Table 4-1.

Table 4-1: FortisAlberta Load Forecast for Alternative 2 – add a 25 kV voltage regulator at Colinton 159S substation

SUB No	Feeder	CAPACITY T/R	MVA	2014 Peak PF	W or S	MVA LOADING - RECORDED 2010 Peak MVA	2011 Peak MVA	2012 Peak MVA	2013 Peak MVA	2014 Peak MVA	PREDICTED - MVA LOADING 2015 Year 1 MVA	2016 Year 2 MVA	2017 Year 3 MVA	2018 Year 4 MVA	2019 Year 5 MVA	2020 Year 6 MVA	2021 Year 7 MVA	2022 Year 8 MVA	2023 Year 9 MVA	2024 Year 10 MVA	Fore-cast Growth
159S	Colinton	T1	15/20/25/ 28.1																		
159S		VR1	15/20/ 25.0	99%	W	**16.6**	**16.3**	**16.4**	**17.4**	**17.3**	**19.11**	**10.35**	**10.48**	**10.62**	**10.76**	**10.90**	**11.04**	**11.18**	**11.33**	**11.48**	**1.4%**
159S	232LN			98%	W	8.1	10.6	10.7	11.1	9.9	10.22	10.35	10.48	10.62	10.76	10.90	11.04	11.18	11.33	11.48	1.3%
159S	389LE			100%	W	3.7	3.8	3.8	4.1	4.1	4.33										1.2%
159S	469LN			99%	W	5.4	2.3	2.2	2.4	5.4	5.56										1.6%
159S	Colinton	T2 (See Note 1)	25.0																		
159S		VR2 (new)	15/20/ 25.0									**9.03**	**9.17**	**9.31**	**9.45**	**9.59**	**9.74**	**9.89**	**10.03**	**10.18**	**1.4%**
159S	389LE (moved to T2 in 2016)			100%	W							4.38	4.43	4.48	4.53	4.58	4.63	4.68	4.74	4.80	1.2%
159S	469LN (moved to T2 in 2016)			99%	W							5.65	5.74	5.83	5.92	6.01	6.11	6.21	6.31	6.41	1.6%
159S	Total Station					**16.6**	**16.3**	**16.4**	**17.4**	**17.3**	**19.11**	**19.38**	**19.65**	**19.93**	**20.21**	**20.49**	**20.78**	**21.07**	**21.36**	**21.66**	
056S	Boyle	T2	15/20/ 25	92%	W	**15.5**	**13.8**	**13.4**	**15.4**	**14.3**	**21.42**	**22.41**	**23.42**	**24.45**	**24.91**	**25.38**	**25.86**	**26.35**	**26.85**	**27.36**	**1.9%**
056S	134LN			97%	W	7.7	7.6	7.0	7.7	7.2	11.81	12.02	12.24	12.46	12.68	12.91	**13.14**	**13.38**	**13.62**	**13.87**	1.8%
056S	380LW			88%	W	6.1	6.1	6.1	6.5	5.9	8.54	9.40	10.28	11.19	11.51	11.84	12.18	12.53	12.89	**13.26**	2.9%
056S	439LS			99%	W	2.7	2.6	2.6	3.4	3.3	4.10	4.12	4.14	4.16	4.18	4.20	4.22	4.24	4.26	4.28	0.5%
150S	Clyde	T1	15// 16.8																		
150S		VR1	20// 22.4	97%	W	**10.2**	**8.5**	**8.8**	**9.1**	**8.6**	**13.08**	**13.23**	**13.38**	**13.53**	**13.69**	**13.85**	**14.01**	**14.17**	**14.33**	**14.49**	**1.2%**
150S	35LN			99%	W	4.7	2.9	2.9	2.8	2.7	4.06	4.12	4.18	4.24	4.30	4.36	4.43	4.50	4.57	4.64	1.5%
150S	35LS			93%	W	6.0	6.3	6.1	6.5	6.2	9.43	9.52	9.62	9.72	9.82	9.92	10.02	10.12	10.22	10.32	1.0%
438S	Westlock	T1	15/20/25// 28.1																		
438S		VR1	15/20/ 25	97%	W	**14.3**	**16.4**	**16.5**	**17.2**	**17.1**	**21.46**	**21.61**	**21.76**	**21.91**	**22.06**	**22.21**	**22.37**	**22.53**	**22.69**	**22.85**	**0.7%**
438S	329LW			97%	W	8.6	6.5	6.2	6.3	6.3	7.64	7.68	7.72	7.76	7.80	7.84	7.88	7.92	7.96	8.00	0.5%
438S	330LE			97%	W	5.9	6.9	6.5	6.5	6.4	7.04	7.12	7.20	7.28	7.36	7.44	7.52	7.60	7.69	7.78	1.1%
438S	2013LW			97%	W		4.3	4.0	4.7	4.6	7.19	7.23	7.27	7.31	7.35	7.39	7.43	7.47	7.51	7.55	0.5%
500S	Flatbush	T1	10/13.3// 15																		
500S		VR1	10	100%	W	**3.5**	**3.1**	**3.1**	**3.1**	**2.6**	**4.57**	**4.59**	**4.61**	**4.63**	**4.65**	**4.67**	**4.69**	**4.71**	**4.73**	**4.75**	**0.5%**
500S	119LN (AESO direct-connect)			99%	W	2.1	1.5	1.5	1.4	1.6	2.67	2.68	2.69	2.70	2.71	2.72	2.73	2.74	2.75	2.76	0.5%
500S	119LX			99%	W	1.8	1.8	1.7	1.8	1.6	2.41	2.42	2.43	2.44	2.45	2.46	2.47	2.48	2.49	2.50	0.5%
Total Area Load						**60.1**	**58.1**	**58.2**	**62.2**	**59.9**	**79.6**	**81.2**	**82.8**	**84.5**	**85.5**	**86.6**	**87.7**	**88.8**	**90.0**	**91.1**	

Notes

1. 159S-T2 is the existing spare transformer at the Colinton 159S substation.
2. High equipment and feeder load levels at the Boyle 56S substation will be addressed in a separate upgrade application.

N-1	159S (MVA)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	159S Total Load	17.30	19.11	19.38	19.65	19.93	20.21	20.49	20.78	21.07	21.36	21.66
	159S N-1 Capacity	0.0	0.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
	Back-up from other substations	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	N-1 Unsupplied Load	**17.30**	**19.11**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

4.2.3 Cost Estimate

If Alternative 2 is considered, AltaLink will prepare a facility application for the requested transmission upgrades. This facility application will include an estimate of the transmission capital cost.

The distribution capital cost for Alternative 2 is estimated to be $0.4 million (2016$, ±30%).

4.3 Alternative 3: Replace T2 with a 138/25 kV 25/33/42 MVA LTC source transformer at Colinton 159S substation

4.3.1 Description

In 2016, at the Colinton 159S substation:

- **Replace the existing T2 transformer with a 138/25 kV 25/33/42 MVA LTC source transformer;**
- **Move two of the existing 25 kV feeder breakers from transformer, T1, to the new LTC source transformer, T2.**

Refer to Appendix D, Figure D-1, for the simplified SLD showing the system development for Alternative 3.

All 25 kV overhead conductors, new and existing, exiting the substation and distribution feeder ties shall be 477 MCM. All underground feeder cables, new and existing, shall be 750 MCM. All transmission components on the secondary side of the 25 kV source transformers, new and existing, shall be sized to enable the feeders to simultaneously supply 26 MVA per feeder. All 25 kV feeder breakers shall be equipped with associated equipment to enable under-frequency load shedding.

Transmission facilities must be equipped with the appropriate equipment for interconnection with FortisAlberta's Automated Metering system. Provisions must be available to interconnect the substation transformer neutrals and the distribution line neutrals, as per AltaLink standards.

4.3.2 Load Forecast

The load forecast resulting from Alternative 3 is provided in Table 4-2.

Table 4-2: FortisAlberta Load Forecast for Alternative 3 – Replace existing T2 with a new LTC source transformer at Colinton 159S substation

SUB No	Feeder	CAPACITY T/R	MVA	2014 Peak PF	W or S	MVA LOADING - RECORDED 2010 Peak MVA	2011 Peak MVA	2012 Peak MVA	2013 Peak MVA	2014 Peak MVA	PREDICTED - MVA LOADING 2015 Year 1 MVA	2016 Year 2 MVA	2017 Year 3 MVA	2018 Year 4 MVA	2019 Year 5 MVA	2020 Year 6 MVA	2021 Year 7 MVA	2022 Year 8 MVA	2023 Year 9 MVA	2024 Year 10 MVA	Fore-cast Growth
159S	Colinton	T1	15/20/25/ 28.1																		
159S		VR1	15/20/ 25.0	99%	W	**16.6**	**16.3**	**16.4**	**17.4**	**17.3**	**19.11**	**10.35**	**10.48**	**10.62**	**10.76**	**10.90**	**11.04**	**11.18**	**11.33**	**11.48**	**1.4%**
159S	232LN			98%	W	8.1	10.6	10.7	11.1	9.9	10.22	10.35	10.48	10.62	10.76	10.90	11.04	11.18	11.33	11.48	1.3%
159S	389LE			100%	W	3.7	3.8	3.8	4.1	4.1	4.33										1.2%
159S	469LN			99%	W	5.4	2.3	2.2	2.4	5.4	5.56										1.6%
159S	Colinton	T2 (NEW)	25/33/ 42									**9.03**	**9.17**	**9.31**	**9.45**	**9.59**	**9.74**	**9.89**	**10.03**	**10.18**	**1.4%**
159S	389LE (moved to T2 in 2016)			100%	W							4.38	4.43	4.48	4.53	4.58	4.63	4.68	4.74	4.80	1.2%
159S	469LN (moved to T2 in 2016)			99%	W							5.65	5.74	5.83	5.92	6.01	6.11	6.21	6.31	6.41	1.6%
159S	Total Station					**16.6**	**16.3**	**16.4**	**17.4**	**17.3**	**19.11**	**19.38**	**19.65**	**19.93**	**20.21**	**20.49**	**20.78**	**21.07**	**21.36**	**21.66**	
056S	Boyle	T2	15/20/ 25	92%	W	**15.5**	**13.8**	**13.4**	**15.4**	**14.3**	**21.42**	**22.41**	**23.42**	**24.45**	**24.91**	**25.38**	**25.86**	**26.35**	**26.85**	**27.36**	**1.9%**
056S	134LN			97%	W	7.7	7.6	7.0	7.7	7.2	11.81	12.02	12.24	12.46	12.68	12.91	**13.14**	**13.38**	**13.62**	**13.87**	1.8%
056S	380LW			88%	W	6.1	6.1	6.1	6.5	5.9	8.54	9.40	10.28	11.19	11.51	11.84	12.18	12.53	12.89	**13.26**	2.9%
056S	439LS			99%	W	2.7	2.6	2.6	3.4	3.3	4.10	4.12	4.14	4.16	4.18	4.20	4.22	4.24	4.26	4.28	0.5%
150S	Clyde	T1	15// 16.8																		
150S		VR1	20// 22.4	97%	W	**10.2**	**8.5**	**8.8**	**9.1**	**8.6**	**13.08**	**13.23**	**13.38**	**13.53**	**13.69**	**13.85**	**14.01**	**14.17**	**14.33**	**14.49**	**1.2%**
150S	35LN			99%	W	4.7	2.9	2.9	2.8	2.7	4.06	4.12	4.18	4.24	4.30	4.36	4.43	4.50	4.57	4.64	1.5%
150S	35LS			93%	W	6.0	6.3	6.1	6.5	6.2	9.43	9.52	9.62	9.72	9.82	9.92	10.02	10.12	10.22	10.32	1.0%
438S	Westlock	T1	15/20/25// 28.1																		
438S		VR1	15/20/ 25	97%	W	**14.3**	**16.4**	**16.5**	**17.2**	**17.1**	**21.46**	**21.61**	**21.76**	**21.91**	**22.06**	**22.21**	**22.37**	**22.53**	**22.69**	**22.85**	**0.7%**
438S	329LW			97%	W	8.6	6.5	6.2	6.3	6.3	7.64	7.68	7.72	7.76	7.80	7.84	7.88	7.92	7.96	8.00	0.5%
438S	330LE			97%	W	5.9	6.9	6.5	6.5	6.4	7.04	7.12	7.20	7.28	7.36	7.44	7.52	7.60	7.69	7.78	1.1%
438S	2013LW			97%	W		4.3	4.0	4.7	4.6	7.19	7.23	7.27	7.31	7.35	7.39	7.43	7.47	7.51	7.55	0.5%
500S	Flatbush	T1	10/13.3// 15																		
500S		VR1	10	100%	W	**3.5**	**3.1**	**3.1**	**3.1**	**2.6**	**4.57**	**4.59**	**4.61**	**4.63**	**4.65**	**4.67**	**4.69**	**4.71**	**4.73**	**4.75**	**0.5%**
500S	119LN (AESO direct-connect)			99%	W	2.1	1.5	1.5	1.4	1.6	2.67	2.68	2.69	2.70	2.71	2.72	2.73	2.74	2.75	2.76	0.5%
500S	119LX			99%	W	1.8	1.8	1.7	1.8	1.6	2.41	2.42	2.43	2.44	2.45	2.46	2.47	2.48	2.49	2.50	0.5%
Total Area Load						**60.1**	**58.1**	**58.2**	**62.2**	**59.9**	**79.6**	**81.2**	**82.8**	**84.5**	**85.5**	**86.6**	**87.7**	**88.8**	**90.0**	**91.1**	

Notes

1. High equipment and feeder load levels at the Boyle 56S substation will be addressed in a separate upgrade application.

N-1	159S (MVA)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	159S Total Load	17.30	19.11	19.38	19.65	19.93	20.21	20.49	20.78	21.07	21.36	21.66
	159S N-1 Capacity	0.0	0.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
	Back-up from other substations	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	N-1 Unsupplied Load	**17.30**	**19.11**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

4.3.3 Cost Estimate

If Alternative 3 is considered, AltaLink will prepare a facility application for the requested transmission upgrades. This facility application will include an estimate of the transmission capital cost.

The distribution capital cost for Alternative 3 is estimated to be $0.4 million (2016$, ±30%).

5. Alternatives Assessment

The following sections present the technical and economic analysis of the alternatives considered in this Need for Development for the Colinton area.

5.1 Technical and Economic Analysis

5.1.1 Alternative 1: Distribution Upgrades

As per section 4.1.1, distribution upgrades alone could not completely address the reliability concern at the Colinton 159S substation. In addition, Alternative 1 is expected to have no transmission capital cost and the highest distribution capital cost compared to the Alternative 2 or Alternative 3. Therefore, Alternative 1 is not technically acceptable solution and not the preferred alternative.

5.1.2 Alternative 2: Add a 25 kV voltage regulator at Colinton 159S substation

Installing a second 25 kV voltage regulator at the Colinton 159S substation will address the reliability concern at the Colinton 159S substation. In addition, Alternative 2 is expected to have lower transmission capital costs than Alternative 3. Therefore, Alternative 2 is technically acceptable solution and the preferred alternative.

5.1.3 Alternative 3: Replace T2 with a 138/25 kV 25/33/42 MVA LTC source transformer at Colinton 159S substation

Replacing the T2 source transformer at the Colinton 159S substation will address the reliability concern at the Colinton 159S substation. While Alternative 3 is technically acceptable solution, it is expected to have higher transmission capital costs than Alternative 2. Therefore, Alternative 3 is technically acceptable solution and not the preferred alternative.

6. Conclusion

After considering the alternatives to address the reliability concern at the Colinton 159S substation, Alternative 2 is preferred because it is expected to have the lowest capital cost. Alternative 2 involves:

- Add a 25 kV voltage regulator;
- Move two existing 25 kV feeder 159S-389LE and 159S-469LN breakers from transformer, T1, to the resulting transformer/voltage regulator pair, T2/V2.

An estimate for the transmission system capital cost will be provided by the AltaLink.

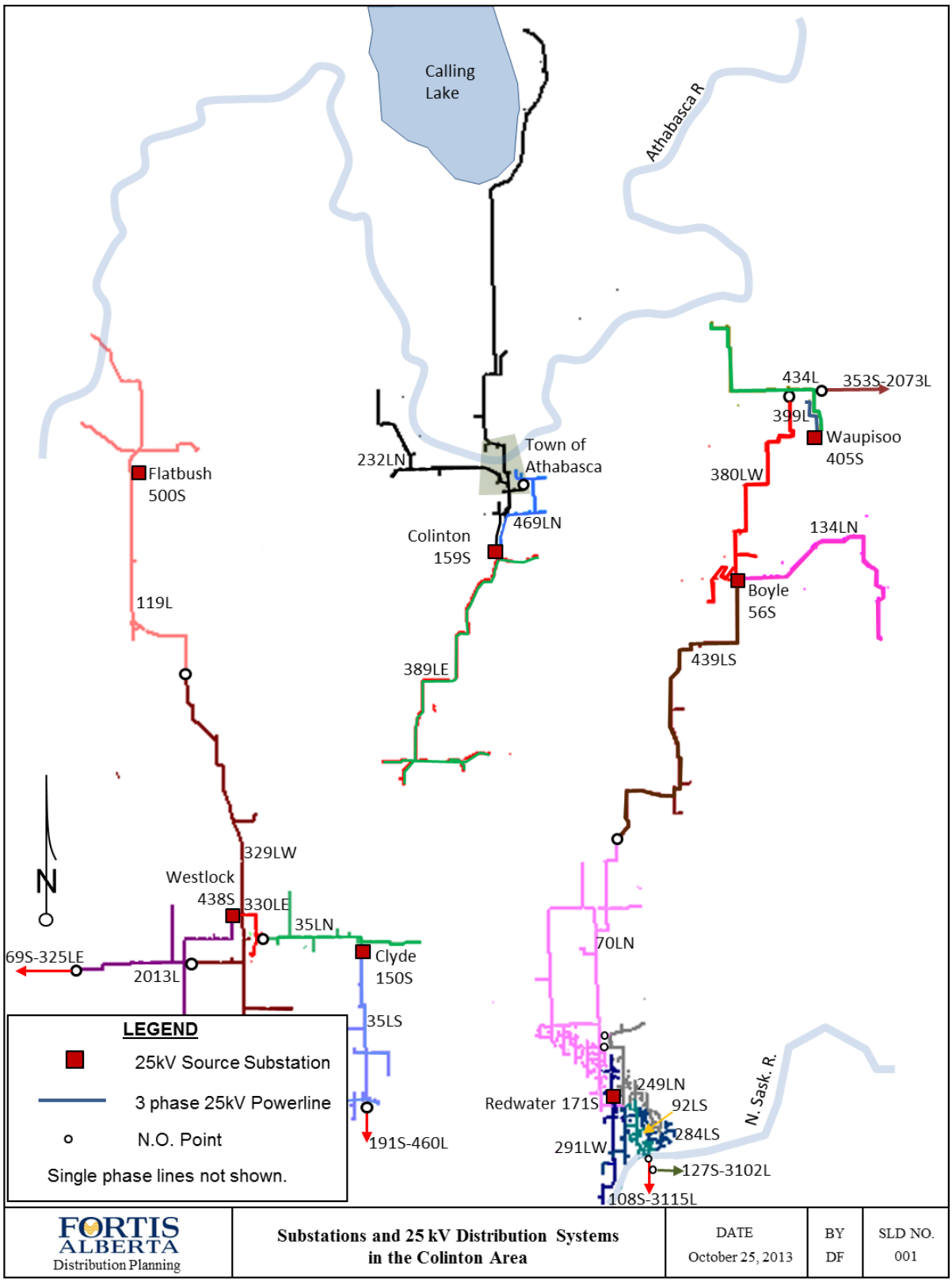
The estimated distribution costs associated with the requested alternative is $0.4 million (±30%, 2016$).

The requested completion date for the preferred Colinton 159S substation upgrade is June 1, 2016.

Upon completion of this transmission system upgrade, the existing Demand Transmission Service (DTS) contract at the Colinton 159S substation will not change.

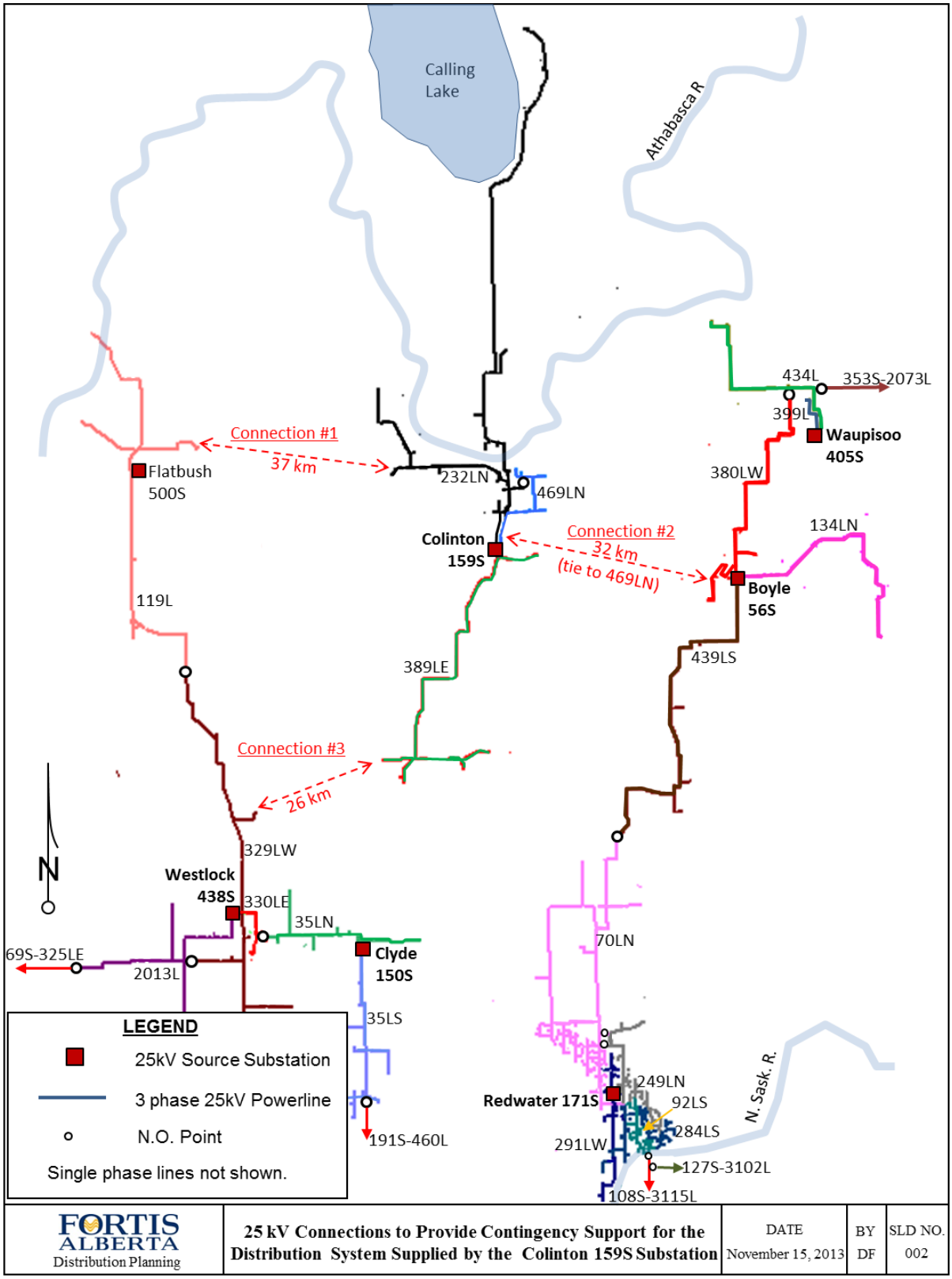
Appendix A – Existing System

Figure A-1: Existing system



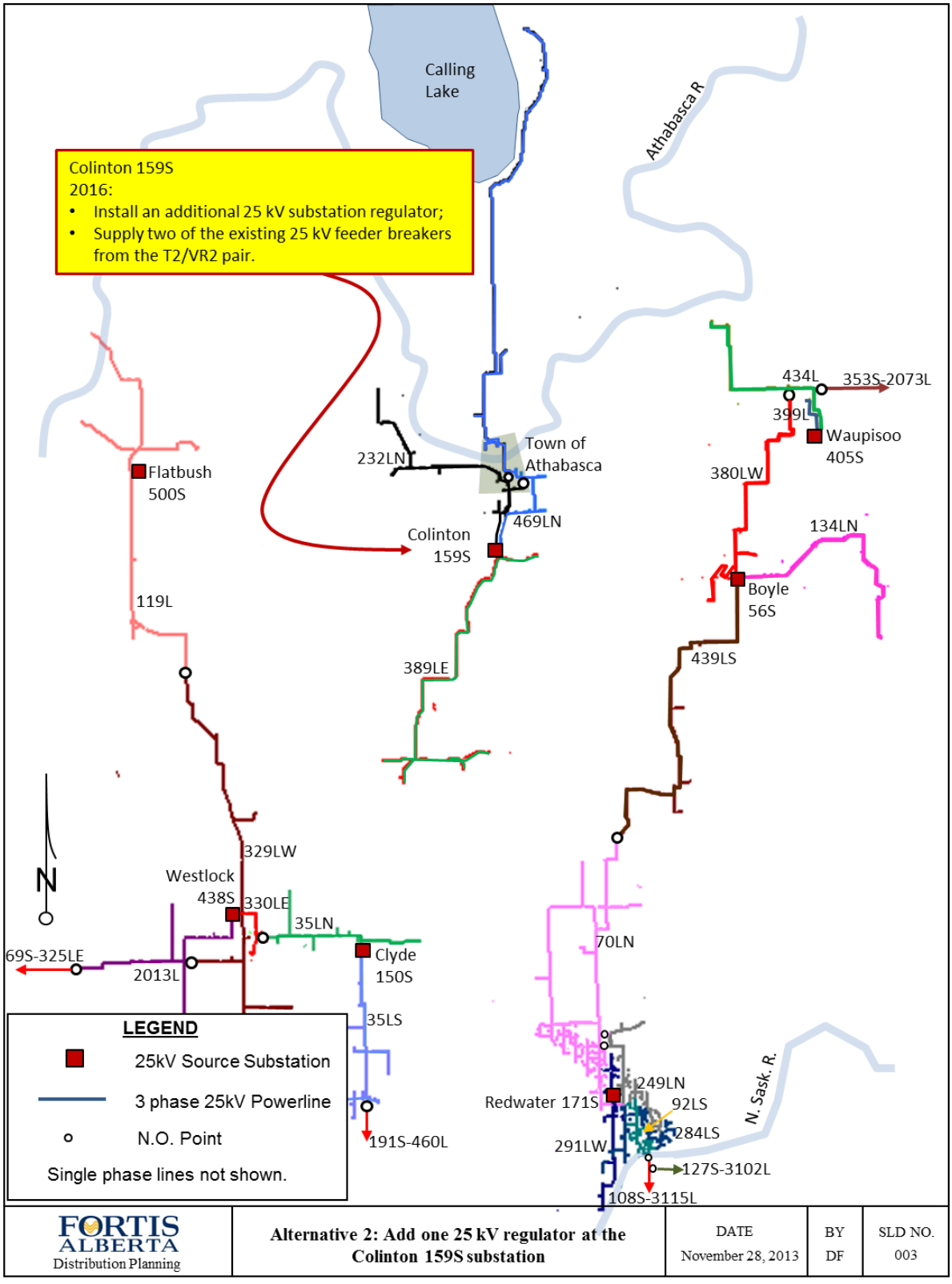
Appendix B – Alternative 1 – Distribution Upgrades

Figure B-1: Alternative 1 – Distribution Upgrades



Appendix C – Alternative 2 – Add a 25 kV voltage regulator at Colinton 159S substation

Figure C-1: Alternative 2 – Add a 25 kV voltage regulator at Colinton 159S substation



Appendix D – Alternative 3 – Replace T2 with a 138/25 kV 25/33/42 MVA LTC source transformer at Colinton 159S substation

Figure D-1: Alternative 3 – Replace T2 with a 138/25 kV 25/33/42 MVA LTC source transformer at Colinton 159S substation