



Alberta Utilities Commission
In the Matter of the Need for the Addition of Voltage Support at
Rycroft 730S Substation

**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 Needs Identification Document for the
Addition of Voltage Support at Rycroft 730S Substation**

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PART A – APPLICATION

1 Introduction

1.1 Application

Pursuant to Section 34 of the *Electric Utilities Act* (Act), the Independent System Operator, operating as the Alberta Electric System Operator (AESO), applies to the Alberta Utilities Commission (“Commission” or “AUC”) for approval of this Needs Identification Document, *Addition of Voltage Support at Rycroft 730S Substation* (Application).

1.2 Application Overview

This Application seeks approval of the need to alleviate identified constraints on the 144 kV and 72 kV network within the AESO’s Peace River Planning Area (Area 19) and Grande Prairie Planning Area (Area 20) (the Study Area), and approval of the AESO’s transmission development option described in Section 4 to address this need (Preferred Development Option).

This Application is organized as follows.

Part A – Application	
Section 1 – Introduction	Describes the Application, its organization, and the AESO directions that were issued to the legal owner of transmission facilities in the Study Area.
Section 2 – Existing Transmission System and Forecast	Describes the Study Area transmission network and the AESO’s load and generation forecast for the area.
Section 3 – Need for Transmission System Reinforcement	Describes the existing system adequacy and reliability requirements in the Study Area and the basis for the milestone related to the timing of the need for transmission system reinforcement.
Section 4 – Preferred Development Option	Describes the Preferred Development Option and its estimated capital cost.
Section 5 – Evaluation of Options and Selection of the Preferred Development Option	Describes the options evaluated to reinforce the local transmission network in the Study Area in terms of technical performance, capital costs and the conclusions of the report (Appendix E) provided in accordance with AUC Rule 007, Section 6.1, NID7(9); and provides a comparison to support the AESO’s selection of a Preferred Development Option.
Section 6 – Participant Involvement Program	Describes the AESO’s Participant Involvement Program.
Section 7 – Milestone and Milestone Monitoring	Defines the milestone and the milestone monitoring process requirements proposed in accordance with Section 11(4) of the <i>Transmission Regulation</i> .

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Section 8 – Schedules	Describes the estimated implementation schedule for the Preferred Development Option following the milestone being met, including information consistent with AUC Rule 007, Section 6.1, NID 9(2) and NID10.
Section 9 – Long-term Transmission Plans	Describes the alignment between the Preferred Development Option and the AESO’s long-term plans, and interdependencies between any planned developments and this Application.
Section 10 – Relief Requested	Describes the relief requested by the AESO.
Part B - References	
For information purposes, certain legislative provisions applicable to the AESO’s transmission system planning duties are briefly described, together with a description of the scope of this Application.	
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1.3 AESO Direction to the Transmission Facility Owner (“TFO”)

Pursuant to Section 39 of the Act and Section 14 of the *Transmission Regulation*, the AESO directed ATCO Electric Ltd., in its capacity as the legal owner of transmission facilities (TFO) in the Study Area, to assist the AESO in preparing this Application.¹

¹ The directions are described in more detail in the following sections of this Application and in Part C, note iv.

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2 Existing Transmission System and Forecast

2.1 Study Area

The Study Area used as the basis for planning studies (Appendix A) consists of a local 144 kV and 72 kV network within the AESO's Peace River Planning Area (Area 19) and Grande Prairie Planning Area (Area 20). The Study Area encompasses the 144 kV and 72 kV transmission facilities between the Clairmont Lake 811S and West Peace River 793S substations, but excludes the Clairmont Lake 811S and West Peace River 793S substations, as depicted in Figure 1.

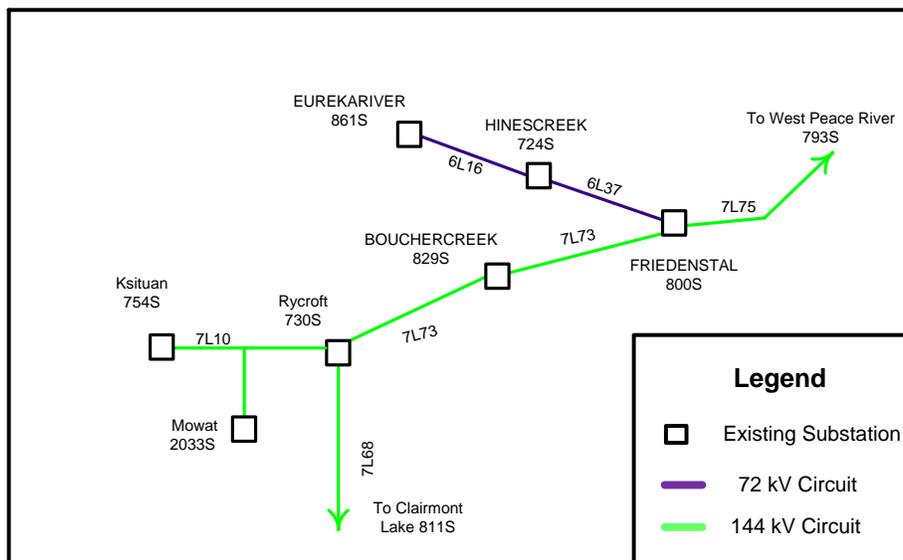


Figure 1. Existing transmission network in the Study Area
(Simplified single line diagram)

Pursuant to Section 34(1)(c) of the Act, two other needs identification documents (NIDs) have been filed with, and approved by, the Commission to connect loads in the Study Area: the *Eureka River 861S Substation Upgrade NID*² and the *Mowat 2033S Substation NID*.³ The

² The *Eureka River 861S Substation Upgrade NID* was approved by the Commission in Needs Identification Document Approval 22123-D02-2016 and Decision 22123-D01-2016 (December 20, 2016). The Eureka River 861S substation upgrade was energized in June 2017.

³ The *Mowat 2033S Substation NID* was approved by the Commission in Needs Identification Document Approval 21781-D02-2016 and Decision 21781-D01-2016 (September 7, 2016). The Mowat 2033S substation was energized in June 2017.

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AESO is currently planning to file another NID application to facilitate an increase in contract capacity under Rate DTS of the ISO tariff, *Demand Transmission Service* at the existing Ksituan River 754S substation. Collectively, these three NID applications are expected to significantly increase demand for electricity in the Study Area.

Demand for electricity in the Study Area is chiefly served by the two 144 kV transmission lines 7L68 (between Clairmont Lake 811S and Rycroft 730S) and 7L75 (between West Peace River 793S and Friedenstal 800S). The 144 kV transmission lines 7L68 and 7L75 connect the Study Area to the source substations, Clairmont Lake 811S and West Peace River 793S, respectively. Under a contingency that takes either one of these transmission lines out of service, the local area load is radially supplied entirely by the remaining transmission line. This situation creates a long radial path that could result in low voltage violations and eventually voltage collapse under certain contingency conditions in the area as demand for electricity rises.

2.2 AESO Load Forecast and Generation Assumptions

Pursuant to its responsibilities under Section 33 of the Act and Part 2, Section 8 of the *Transmission Regulation*, the AESO forecasts the need for transmission development based on load growth in the Northwest Region, including within the Study Area (Appendix B).

Load transfers into the area are increasing, and are expected to increase further over the near-term planning horizon following the energization of the Mowat 2033S substation, which occurred in June 2017. This substation was energized to accommodate proposed load transfer from the Saddle Hills 865S, Ksituan River 754S, and Rycroft 730S substations. The Mowat 2033S substation is also planned to serve new load from unconventional oil and gas developments within the Study Area.

The AESO forecasts significant load growth from 2017 to 2021 in the Study Area as each of the above-described Eureka River, Ksituan River, and Mowat NID projects ramp up. The AESO then forecasts minimal load growth from 2021 to 2036 (9 MW of winter peak load growth) based on conservative assumptions regarding future development in the Study Area (Appendix B).

The AESO currently has no existing projects in response to requests for new or increased system access service from generation in the Study Area, nor has the AESO received any requests from generation facilities for system access service in the Study Area.

Hydroelectric resources may lead to future generation projects in the vicinity of the Study Area. However, due to long lead times associated with these types of developments, hydroelectric

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developments were only considered at the end of the 20-year planning horizon. Specifically, a 350 MW hydroelectric facility was included in the long-term study cases. This facility is assumed to be on the 240 kV bus at Wesley Creek 834S, as there is not enough transmission capacity within the Study Area for connecting such a generator.

3 Need for Transmission System Reinforcement

3.1 Transmission System Adequacy and AESO Reliability Requirements

As further described in Appendix A, the AESO assessed the adequacy of the Study Area transmission network to supply load using the forecast winter peak load for 2017 under various transmission contingencies⁴ (Need Assessment). The Need Assessment confirmed that additional investigation was warranted to determine when and under what circumstances reliability criteria violations occur. Detailed planning studies were conducted to consider transmission development options to address the need (Appendix A).

Study scenarios were based on stressed transmission system conditions. Winter peak load is higher than summer peak load in the Study Area and results in lower transmission voltage. A steady-state power flow solution was not found under a Category B contingency (outage of 144 kV transmission line 7L75 or line 7L68) when the Study Area load is above 80 MW, due to extreme low voltages. The study results indicate voltage below acceptable limits under Category B contingency conditions for load levels beyond 75 MW in the Study Area. Therefore, the existing load serving capability⁵ of the Study Area is approximately 75 MW (Appendix A).

In order to meet the forecasted area peak load of 96 MW over the long-term, the AESO has determined that transmission reinforcement is needed in the Study Area, in accordance with Alberta Reliability Standards TPL-001-AB-0, *System Performance Under Normal Conditions* and TPL-002-AB-0, *System Performance Following Loss of a Single Bulk Electric System (BES) Element*. Without transmission reinforcement in the Study Area, the system cannot be utilized to its thermal capability. Dynamic reactive power enhancements are required to ensure that the transmission system can meet voltage performance requirements over a 20-year planning horizon.

⁴ A contingency means the unexpected failure or outage of a system component, such as a generating unit, transmission line, circuit breaker, switch or electrical element. Each of the Transmission Planning (TPL) standards, within the *Alberta Reliability Standards*, explains contingency conditions, categories of events and performance requirements. That explanation is provided here for reference as Appendix G.

⁵ The maximum load that can be reliably supplied by the transmission network in the Study Area without causing a performance violation following a Category B contingency is defined as the area's load serving capability.

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3.2 Timing of Transmission System Reinforcement

The AESO's planning study results (Appendix A) demonstrate that identified constraints may arise as early as winter 2017 under contingency conditions based on the forecast load growth. However, as discussed in Section 7 below, the AESO has determined that it is appropriate to specify a milestone due to uncertainties associated with the exact timing of load growth that are beyond the AESO's control.

4 Preferred Development Option

This section describes the Preferred Development Option included in this Application to alleviate the reliability violation described in Section 3.

4.1 Description

Based on the identified constraints in the Study Area, the AESO's Preferred Development Option is to improve voltage by:

1. adding a 144 kV dynamic reactive power support device, of approximately 50 MVAR, at the existing Rycroft 730S substation; and
2. performing any required modifications, alterations, additions or removal of equipment, including switchgear, and any operational, protections, control and telecommunication devices as necessary to undertake the work as planned and ensure reliable integration of the Preferred Development Option with the transmission system.⁶

The electrical conceptual configuration of the AESO's Preferred Development Option (addition to the existing Rycroft 730S substation) is provided as a single line diagram in Appendix F. This addition will not change the existing transmission network configuration shown in Figure 1.

The Preferred Development Option will accommodate up to approximately 35% load increase in the area, which is sufficient to address the identified need beyond the medium-term planning horizon (i.e., 2026) based on the planning assessment. This option has sufficient flexibility to

⁶ Details and configuration of equipment required for the Preferred Development Option, including substation single line diagrams are more specifically described in the AESO's functional specifications that will be included in TFOs' Facility Application. Specific configurations will be determined as detailed engineering progresses. Routing and siting of the transmission facilities are not part of the AESO's NID Application and will be addressed in the TFO's Facility Application.

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accommodate forecast load growth for the long-term planning horizon (i.e., 2036) by adding a 25 kV capacitor bank, of approximately 4.8 MVar, to the existing Ksituan River 754S substation. The Preferred Development Option does not include this long-term reinforcement; it is only described in this Application for information purposes to provide a means for comparing the identified transmission development options in the medium-term and long-term planning horizons.⁷ Additional transmission enhancements that the AESO determines could be needed in the future will be addressed by way of a separate NID application, if and when required.

4.2 Development Schedule and Costs

The earliest estimated in service date (ISD) for the purpose of preparing cost estimates for the Preferred Development Option is Q3 2021; however, as discussed in Section 7 below, the AESO is specifying a milestone to manage the timing for construction of the Preferred Development Option. The total capital cost of the Preferred Development Option is estimated to be in the order of \$40 million (+/-30%).⁸ The Preferred Development Option does not include any costs that are classified as participant-related in accordance with the ISO tariff.

⁷ The identified transmission development options in addition to the Preferred Development Option are described in Section 5.

⁸ The cost is in nominal dollars using a base year of 2017 with escalation considered. Refer to the TFO's capital cost estimates included as Appendix C of this Application for further details. While the earliest ISD for the purpose of preparing the cost estimates is Q3 2021, the ISD for the Preferred Development Option will ultimately be determined in accordance with the milestone described in this Application.

5 Evaluation of Options

This section explains the transmission development options that were evaluated by the AESO and all factors that were taken into consideration in the process of selecting the Preferred Development Option.

5.1 Transmission Development Options

In addition to the AESO's Preferred Development Option (**Option 1**, as explained in Appendix A), the AESO evaluated two other transmission development options.

Option 2: New 144 kV Circuit from Rycroft 730S to Clairmont Lake 811S

Option 2 involves construction of one new 144 kV single circuit transmission line between the existing Clairmont Lake 811S and Rycroft 730S substations with an approximate capacity in the order of 114 MVA, and installing a 144 kV capacitor bank, of approximately 10 MVAR, at the existing Ksituan River 754S substation.

Based on the planning assessment, Option 2 would require the following additions to reliably supply the forecast load over the long-term planning horizon (i.e., 2036):

- a 25 kV capacitor bank, of approximately 7.2 MVAR, at the existing Ksituan River 754S substation, and
- a 25 kV capacitor bank, of approximately 2.4 MVAR, at the existing Eureka River 861S substation.

Option 3: New 144 kV Circuit from Mowat 2033S to Saddle Hills 865S

Option 3 involves construction of one new 144 kV single circuit transmission line between the existing Mowat 2033S and Saddle Hills 865S substations⁹ with an approximate capacity of 114 MVA. In addition, this option would require installing two 144 kV capacitor banks, of approximately 10 MVAR each, one at the existing Rycroft 730S substation, and the other one at the existing Ksituan River 754S substation, and a 25 kV capacitor bank, approximately in the order of 7.2 MVAR, at the Ksituan River 754S substation. Similar to Option 2, Option 3 would require addition of a 25 kV capacitor bank, of approximately 2.4 MVAR, at the Eureka River 861S substation to reliably supply the forecast load over the long-term planning horizon (i.e., 2036).

⁹ See Figure 5-3 for the Saddle Hills 865S substation in Appendix A.

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5.2 Development Schedules and Estimated Costs of the Options 2 and 3

The earliest estimated ISD for the purpose of preparing cost estimates is Q2 2021 for Option 2 and Q1 2021 for Option 3, similar to the estimated ISD for the Preferred Development Option. The total capital costs of Option 2 and Option 3 are estimated to be in the order of \$55 million and \$52 million (+/-30%), respectively. Like the Preferred Development Option, the cost estimates for Option 2 and Option 3 do not include any costs that are classified as participant-related in accordance with the ISO tariff.

5.3 Transmission System Performance Study Results

Planning studies were conducted to evaluate transmission system performance under certain assumptions for the Preferred Development Option (Appendix A). The same studies were conducted for Option 2 and Option 3. Results demonstrate that all three options could alleviate the reliability violations described in Section 3 for the medium-term planning horizon (i.e., 2026).

Although the load serving capability of all three options was approximately the same, the Preferred Development Option exhibited superior performance as the study results did not indicate low voltage violations and adverse voltage deviations¹⁰ in the 2036 study year. The Preferred Development Option has a 5% voltage stability margin in the 2026 study year; however, this option could potentially require an additional capacitor bank to maintain this margin in the long-term planning horizon. In comparison, the Option 2 study results indicated marginal adverse voltage deviations under Category B contingency conditions using the 2036 winter peak study scenario. Similar to the Preferred Development Option, there is a 5% voltage stability margin for Option 2 in the 2026 study year and additional capacitor banks should be added to this option to maintain the margin in the long-term planning horizon. The recorded voltage violations were also resolved by adding approximately 10 MVAR capacitor banks in total to this option, while a marginal adverse voltage deviation was still observed for the 2036 winter peak study scenario.

Study results for Option 3 indicate lower performance compared with the other options. Low voltage violations and adverse voltage deviations that were observed for Option 2 were worse

¹⁰ Post-contingency voltage deviation guidelines for low voltage buses are included in the Rycroft area planning studies, attached at Appendix A. While such guidelines were used to compare technical performance of the options, no transmission developments were recommended solely as a result of these guidelines.

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for Option 3 using the 2036 winter peak study scenario. Similarly, adding reactive power support to Option 3 could resolve the reported voltage violations; however, adverse voltage deviations were still observed in the long-term planning horizon. Planning studies show a 5% voltage stability margin for Option 3 in study years 2026 and 2036.

Planning studies for the Preferred Development Option, Option 2 and Option 3 did not indicate any thermal overloads in the study year 2026. However, Option 3 studies revealed thermal overloads on a section of the 144 kV transmission line 7L10 between Mowat 2033S and Rycroft 730S substations, which is currently de-rated, under Category B contingency conditions in the 2036 summer peak study scenario. Thermal overloads were also observed on the 144 kV transmission line 7L73 (between Rycroft 730S and Friedenstal 800S) for the year 2036 under Category B contingency conditions, for all the options.

At this time, line 7L73 is de-rated due to a current transformer limit. The identified thermal overload on the 7L73 line is due to the forecast load growth in the long-term planning horizon. Restoring this line to its full thermal rating will remove these constraints; however, considering the timeframe of the constraints, restoration of this line is beyond the scope of this application.

The AESO will continue to monitor the Study Area and will recommend suitable mitigation measures in a timely manner should low voltage and/or thermal overloads become concerns over the long term.

In summary, while all three studied options could resolve the identified reliability violations in the medium-term planning horizon, the Preferred Development Option exhibits superior technical performance considering overall voltage and thermal results in the medium-term and long-term planning horizons, and would involve significantly less transmission development.

5.4 Land Impacts under AUC Rule 007, Section 6.1, NID7(9)

The AESO directed the TFO to prepare a report comparing transmission options according to the major aspects listed in AUC Rule 007, Section 6.1, NID7(9). In response to this direction, the TFO submitted a preliminary assessment of land impacts based on a desktop review of available information, which is provided in Appendix E.

The TFO's report concludes that:

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1. Each of the Preferred Development Option, Option 2 and Option 3 are feasible from a land impact perspective. No potential environmental or other land impacts were identified that would preclude developments outlined in the NID Specification.
2. Impacts on habitat, terrain, land use and heritage resources can be avoided or mitigated during the routing and siting process.
3. The Preferred Development Option (Option 1) is more favorable than Option 2 and Option 3 because it has:
 - the smallest area of ground disturbance;
 - lower potential for impact to wetlands, waterbodies and wildlife habitat (greater avoidance of Environmentally Significant Areas, the Saddle River valley and Saddle Hills area); and
 - the least potential to impact heritage resources.

5.5 Selection of the Preferred Development Option

The AESO has compared the Preferred Development Option and the other two options by considering transmission system performance, expandability, capital cost estimates, and land impacts as required by AUC Rule 007, Section 6.1, NID7(9), all as presented in the following table.

Merits	Option 1 (Preferred Development Option)	Option 2	Option 3
Transmission System Performance	Meets Alberta Reliability Standards for medium-term planning horizon (2026). Provides the best overall technical performance as compared to Option 2 and Option 3 in the long-term planning horizon. Provides expandability to meet long term needs. Does not limit options to address needs in the areas adjacent to the Study Area in the future.	Meets Alberta Reliability Standards for medium-term planning horizon (2026). Overall technical performance is better than Option 3 in the long-term planning horizon. Provides expandability to meet long-term needs. Does not limit options to address needs in the areas adjacent to the Study Area in the future.	Meets Alberta Reliability Standards for medium-term planning horizon (2026). Provides expandability to meet long-term needs. Does not limit options to address needs in the areas adjacent to the Study Area in the future.

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Estimated Capital Cost +/- 30% (2021 ISD)	\$40 million	\$55 million	\$52 million
AUC Rule 007, Section 6.1, NID7(9) requirements	Feasible; avoidable or manageable impacts during routing and siting. Lower relative land impact due to less land disturbance and other factors described in Appendix E of this application.	Feasible; avoidable or manageable impacts during routing and siting. Higher relative land impact due to longer length, heritage resource value and other factors described in Appendix E of this application.	Feasible; avoidable or manageable impacts during routing and siting. Higher relative land impact due to longer length, heritage resource value and other factors described in Appendix E of this application.

There is no material difference among the options with respect to system performance or future expandability. Considering system losses, all three options have similar performance and the difference is negligible. However, the Preferred Development Option has a lower potential for environmental and land use impact compared with Option 2 and Option 3. Further, the estimated capital cost of the Preferred Development Option is lower than both Option 2 and Option 3.

For these reasons, the AESO selected Option 1 as the Preferred Development Option for transmission system reinforcement in the Study Area.

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6 Participant Involvement Program

The AESO conducted a participant involvement program (PIP), in accordance with the requirement of NID11 and Appendix A2 of AUC Rule 007. Between October and December 2017, the AESO utilized various methods to notify occupants, residents and landowners as well as stakeholder groups and appropriate government bodies, agencies and representatives (collectively, Stakeholders) of the need for transmission system reinforcement in the area where transmission facilities could be installed to address the identified need. Between November 28 and 29, 2017, the AESO advertised its intention to file this Application in a number of newspapers in the same Stakeholder notification areas.

The AESO believes that all comments and questions received from Stakeholders have been appropriately addressed. No concerns or objections to the need for transmission system reinforcement and/or the Preferred Development Option have been raised.

Further information regarding the AESO's PIP for this Application is included in Appendix D.

7 Milestones and Milestone Monitoring

This section describes the milestones to be followed assuming Commission approval of the Preferred Development Option, to determine the required ISD. This section also describes the process by which the AESO will monitor and determine when the specified milestone is met, as contemplated under Section 11(4) of the *Transmission Regulation*.

7.1 Milestones

The AESO has determined it to be appropriate to specify the following load growth milestone for the purpose of triggering construction of the Preferred Development Option, and based on the constraints identified in Section 2.1 and reliability criteria violations that are expected to occur in the Study Area as load increases:

- **Load Growth Milestone:** Coincident winter aggregate peak load reaching 75 MW, measured at the Rycroft 730S, Eureka River 861S, Ksituan River 754S, Boucher Creek 829S, Hines Creek 724S, Friedenstal 800S.

During 2016 the winter peak load level in the Study Area was approximately 68 MW and the peak load level up to date (2017) has been approximately 72 MW. To ensure that construction of the Preferred Development Option can begin in a timely manner after the milestone has been “met”, the AESO intends to direct the TFO: (i) on or before December 31, 2018, to file a transmission facility proposal to meet the identified need, and (ii) as part of the transmission facility proposal, to request that permits and licences in respect of the TFO’s facilities application be issued subject to appropriate terms and conditions restricting the commencement of construction and development activities until such time as the AESO has advised the TFO that the load growth milestone has been met.

The AESO will use operational measures, as necessary, including connection remedial action schemes, should constraints arise in the area prior to completion of the Preferred Development Option.

7.2 Milestone Monitoring Process

The AESO will monitor and issue reports to the TFO and Commission on or before June 30 of each year to communicate the recorded coincident winter aggregate peak load for the load growth milestone.

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Upon the AESO recording a coincident winter aggregate peak reaching the triggering load level of 75 MW, measured at the above specified substations, the AESO will:

- advise the TFO and the Commission that the load milestone has been met and that construction can commence; and
- issue a public posting on the AESO website to indicate the same.

Upon the AESO's completion of the above two actions, the TFO may commence construction activities on the Preferred Development Option, subject to the TFO having received the requisite permits and licences to construct and operate the Preferred Development Option.

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8 Schedules

8.1 Information Regarding AUC Rule 007, Section 6.1 – NID9(2)

The TFO has provided an approximate implementation schedule for the Preferred Development Option that results in an estimated earliest ISD of Q3 2021, taking into account the requirements of AUC Rule 007, Section 6.1, NID9(2). The TFO has advised the AESO that because their schedules necessarily contain numerous assumptions, the estimated ISD is subject to change as more detailed engineering and project planning is undertaken and regulatory and permitting activities are conducted.

8.2 Information Regarding AUC Rule 007, Section 6.1 – NID10

The AESO intends to issue an unconditional direction to the TFO for preparation and submission of a transmission facility proposal for the Preferred Development Option on or before December 31, 2018. If the load growth milestone has not been met by September 30, 2023, the AESO will inform the Commission in writing whether the need to expand or enhance the transmission system described in this Application continues, and whether the Preferred Development Option continues to be the AESO's preferred option for transmission reinforcement.

9 Long-term Transmission Plans

The AESO's long-term transmission plans are high-level assessments of transmission capability and required transmission system development in Alberta focusing on broad technical aspects. More detailed studies are performed in preparation of a NID application to ensure that the AESO's preferred development option will address the identified reliability criteria violations in the most efficient manner.

The *AESO 2015 Long-term Transmission Plan (2015 LTP)* recommended transmission development in the Study Area that is aligned with the Preferred Development Option.¹¹

9.1 Transmission Development Interdependencies

The Preferred Development Option will supply the Study Area load up to approximately 90 MW (about 35% growth), which is sufficient to address the need for the medium-term (10 years) based on the latest load forecast. This option is independent of any other transmission system reinforcements that are currently planned for the transmission system in this timeframe.

The need for transmission system reinforcement and its timing depend on load growth in the Study Area that is expected to materialize in the near term because of connection projects in the area. The AESO specifies a load growth milestone such that the coincident winter aggregate peak load for the Study Area must reach 75 MW before construction begins.

¹¹ The 2015 LTP can be found on the AESO's website: <https://www.aeso.ca/grid/long-term-transmission-plan/>

10 Relief Requested

10.1 Approval is in the Public Interest

Having regard to the factors set out in Section 38 of the *Transmission Regulation*, and in particular, Subsection 38(d) and (e), the AESO submits that:

- its assessment of the need for transmission system reinforcement in the Study Area is technically complete; and
- the Preferred Development Option (i) meets the identified need; (ii) satisfies Alberta Reliability Standards; (iii) is consistent with the AESO long-term forecasts and area transmission system plans; and (iv) is in the public interest.

Accordingly, the AESO respectfully submits that approval of the Application is in the public interest.

10.2 Request

For the reasons set out herein, and pursuant to Section 34 of the Act, the AESO respectfully requests that the Commission:

1. approve this Application subject to the load growth milestone described herein, including the Preferred Development Option comprising:
 - a. addition of a 144 kV dynamic reactive power support device, of approximately 50 MVAR, at the existing Rycroft 730S substation; and
 - b. any required modifications, alterations, additions or removal of equipment, including switchgear, and any operational, protections, control and telecommunication devices as necessary to undertake the work as planned and ensure reliable integration of the Preferred Development Option with the transmission system; and,
2. provide such further and other relief as the Commission may deem appropriate to give effect to the foregoing.

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If the load growth milestone has not been met by September 30, 2023, the AESO will inform the Commission in writing whether the need to expand or enhance the transmission system described in this Application continues, and whether the Preferred Development Option continues to be the AESO's preferred option for transmission reinforcement.

All of which is respectfully submitted this 15th day of December, 2017.

Alberta Electric System Operator

<Electronically Submitted>

Sami Abdulsalam, Ph.D., P. Eng.
Director, Transmission System Projects

PART B – REFERENCES

- i. **AESO Planning Duties and Responsibilities and Duty to Forecast Need** – Certain aspects of the AESO’s 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 general planning duties of the AESO.¹² 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”. As stated in subsection 34(1) of the Act, when the AESO determines that an expansion or enhancement of the capability of the transmission system is or may be required to meet the needs of Alberta and is in the public interest, the AESO must prepare and submit to the Commission for approval a needs identification document that describes the constraint or condition affecting the operation or performance of the system and indicates the means by which or the manner in which the constraint or condition could be alleviated. Where, as in this case, the AESO has identified a need to reinforce the transmission system to relieve anticipated reliability violations, it has set about to determine a reasonable solution to meet the identified need. In determining the means by which, or the manner in which, the constraint or condition affecting the operation or performance of the transmission system could be alleviated, the AESO has applied engineering judgments and made assumptions as necessary. In accordance with Section 11 of the *Transmission Regulation*, the AESO has considered technical, economic, environmental and other factors as necessary in determining its preferred option for system expansion. Pursuant to subsection 11(4) of the *Transmission Regulation*, the AESO has determined it to be appropriate to specify milestones for the proposed transmission development.
- ii. **AESO Planning Criteria** – The AESO is required to plan a transmission system that satisfies applicable reliability standards. TPL standards are included in the Alberta Reliability Standards and are described at: <http://www.aeso.ca/rulesprocedures/17006.html>¹³
- In addition, the AESO’s *Transmission Planning Criteria – Basis and Assumptions* is included in Appendix G.

¹² 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.

¹³ This link is provided for ease of reference and does not form part of this Application.

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- iii. **Application for Approval of the Need for Expansion or Enhancement of the Capability of the Transmission System** – This Application is directed solely to the question of the need for expansion or enhancement of the capability of the transmission system 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 supporting appendices may refer to such other processes or information from time to time, the inclusion of such 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 is not intended to constitute an application for approval of such facilities, and the responsibility for seeking such regulatory or other approval remains the responsibility of such market participants or other parties.

- iv. **Directions to the TFOs** – The AESO has 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. The TFO has also been directed by the AESO under Section 39 of the Act to prepare a service proposal to address the need for the Proposed Transmission Development.
- v. **Capital Cost Estimates** – Capital costs estimates provided in the Application are planning cost estimates used by the AESO for the sole purpose of comparing transmission development options. Where only a single transmission development option has been studied, capital cost estimates are provided for context. Project costs will be determined by the TFOs as part of their transmission facility proposals. The AESO’s responsibilities with respect to project cost reporting are described in the *Transmission Regulation*, including Section 25, AUC Rule 007: *Applications for Power Plants, Substations, Transmission Lines, Industrial System Designations and Hydro Developments*, and Section 504.5 of the ISO rules, *Service Proposals and Cost Estimating*.

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PART C – APPENDICES

The following appendices support Part A (Application). They include work undertaken by the AESO and by the TFO, as directed by the AESO, in the execution of its duties to plan the transmission system and to establish the need for this proposed transmission development.

APPENDIX A: AESO Planning Studies – Appendix A contains the AESO engineering study report, *P1784 Addition of Voltage Support at Rycroft 730S Substation*, which describes the need for transmission system reinforcement in the Study Area.

APPENDIX B: AESO Load and Generation Forecast – Appendix B contains the AESO's load and generation forecast report, *P1784 Addition of Voltage Support at Rycroft 730S Substation Rycroft Area Load and Generation Forecasts*, which was used for the planning studies for this Application.

APPENDIX C: TFO Capital Cost Estimates – Appendix C contains the TFO's capital cost estimates referred to in this Application. The estimates have been prepared by the TFO according to the AESO's direction. The estimates are prepared to an approximate accuracy level of (+/-30), which meets the accuracy requirement of AUC Rule 007, NID8.

APPENDIX D: AESO Participant Involvement Program– Appendix D provides a summary of the PIP activities conducted regarding the need for the transmission reinforcement in the Study Area and the Preferred Development Option, all as described in this Application.

APPENDIX E: AUC Rule 007, Section 6.1, NID7(9) – Appendix E contains the NID7(9) reports provided by the TFOs in consideration of the aspects of AUC Rule 007, Section 6.1, NID7(9).

APPENDIX F: Rycroft 730S Substation Single Line Diagram – The electrical conceptual configuration of the AESO's Preferred Development Option (addition to the existing Rycroft 730S substation) is provided as a single line diagram in Appendix F.

APPENDIX G: AESO Transmission Planning Criteria – Basis and Assumptions (Version 1.0) – Appendix G contains the Transmission Planning Criteria – Basis and Assumptions, which include the applicable thermal and voltage limits in support of the revised the Transmission Reliability Criteria, Part II System Planning, Version 0 (March 11, 2005) and the TPL Standards. Planning studies were conducted in accordance with all the performance requirements of the specified TPL Standards (TPL-001-AB-0 and TPL-002-AB-0).