Alberta Utilities Commission

In the Matter of the Need for the
Ksituan River 754S 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 Regulations made thereunder, and
Alberta Utilities Commission Rule 007

Application of the Alberta Electric System Operator for Approval of the Ksituan River 754S 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 *Ksituan River 754S Substation Upgrade Needs Identification Document* (Application).

1.2 Application Overview – ATCO Electric Ltd. (ATCO),[2] as the legal owner of an electric distribution system (DFO), has requested system access service to serve new and growing demand for electricity in the Spirit River area (AESO Planning Area 20, Grande Prairie). ATCO's request includes a Rate DTS, *Demand Transmission Service*, contract capacity increase of 11.71 MW, from 26.29 MW to 38 MW, for the system access service provided at the existing Ksituan River 754S substation. ATCO's request can be met by upgrading the existing Ksituan River 754S substation, including adding one 144/25 kV transformer and one 144 kV circuit breaker (the "Proposed Transmission Development", as further described in Section 2.2). The scheduled in-service date for the Proposed Transmission Development is February 1, 2019.

This Application describes the need to respond to the DFO's request for system access service. Having followed the AESO Connection Process,[3] the AESO has determined that the Proposed Transmission Development provides a reasonable opportunity for the DFO to exchange electric energy and ancillary services. The Proposed Transmission Development is consistent with the AESO's long-term plans for the Northwest Planning Region, which includes the Spirit River area. The AESO, in accordance with its

[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 Regulations made thereunder, and Alberta Utilities Commission Rule 007 (AUC Rule 007).

[2] In this Application, ATCO acts as both the legal owner of the electric distribution system (DFO) and the legal owner of transmission facilities (TFO) as applicable to its specific business functions.

[3] For information purposes, refer to note iv of Part C of this Application for more information on the AESO Connection Process.

responsibility to respond to requests for system access service, submits this Application to the Commission for approval.[4,5]

1.3 AESO Directions to the TFO – During the AESO Connection Process, the AESO issued various directions to the legal owner of transmission facilities (TFO), in this case ATCO Electric Ltd., including direction to assist the AESO in preparing this Application.[6]

[4] 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.

[5] Note v of Part C of this Application describes the Application scope in more detail.

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

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 AESO, in consultation with the DFO and the TFO, has determined that the Proposed Transmission Development is the preferred option to meet the DFO's request for system access service. The DFO, in executing its duties as defined under Section 105(1)(b) of the Act, has determined that the Proposed Transmission Development will meet its distribution planning criteria and will serve new and growing demand for electricity in and around the Spirit River area. The DFO has made the appropriate applications to the AESO to obtain transmission system access service.[7]

Through the AESO Connection Process, the AESO, in consultation with the DFO and the TFO, has determined the characteristics of the Proposed Transmission Development and assessed the impacts that the Proposed Transmission Development and the associated load would have on the transmission system. The AESO has issued directions to the TFO to prepare a transmission facility proposal[8] (Facility Proposal) to meet the DFO's request.

2.2 Proposed Transmission Development – The Proposed Transmission Development involves upgrading the Ksituan River 754S substation, including the following elements:

1. Add one 144/25 kV transformer with a rating of 41.6 MVA;
2. Add one 144 kV circuit breaker; and
3. Modify, alter, add or remove equipment, including switchgear, and any operational, protection, control and telecommunication devices required to

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

[8] Also referred to as facility application under AUC Rule 007.

undertake the work as planned and ensure proper integration with the transmission system. [9,10]

2.3 Proposed Transmission Development Cost Estimate – 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 $8 million. In accordance with the ISO tariff, the AESO has determined that all costs associated with the Proposed Transmission Development will be classified as participant-related.[11]

2.4 Transmission Development Alternatives – In addition to the Proposed Transmission Development, the AESO, in consultation with the DFO and TFO, examined two other transmission alternatives to respond to the DFO's request for system access service:

1. **Upgrade the Ksituan River 754S substation** – This alternative involves upgrading the existing Ksituan River 754S substation by replacing the existing 144/25 kV transformer with a transformer of a higher capacity, adding a 144 kV circuit breaker and associated equipment. This alternative was ruled out as the AESO determined that the addition of a 50 MVA transformer would not be consistent with good electric industry practice. The addition of a transformer with a capacity greater than 50 MVA was ruled out by the TFO due to its asset management and inventory practices.

[9] 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.

[10] 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.

[11] The cost is in nominal dollars using a base year of 2016 with escalation considered. Further details of this cost estimate, which has an accuracy level of +10% to +30%/-10% to -20%, can be found in Appendix B.

2. **Modify the Mowat 2033S substation –** This alternative involves modifying the existing Mowat 2033S substation, including adding a 25 kV circuit breaker to accommodate the addition of a 25 kV distribution feeder. This alternative was ruled out as the DFO determined that it was not technically acceptable from a distribution system perspective. The DFO advised that this alternative would not meet its capacity planning criteria.

The Proposed Transmission Development was selected as the preferred transmission alternative and forms the basis of the cost estimates and connection assessment described herein.[12]

2.5 Connection Assessment – Power flow and voltage stability were conducted to assess the impact that the Proposed Transmission Development and the associated load would have on the transmission system. Power flow analysis and voltage stability analysis were conducted prior to and following connection of the Proposed Transmission Development. Transient voltage recovery studies were conducted following connection of the Proposed Transmission Development to assist with the development and assessment of post-connection mitigation measures.[13]

The pre-connection assessment identified system performance issues. Under certain Category B conditions, thermal criteria violations and voltage range criteria violations were observed. Real-time operational practices and capacitor overvoltage protection schemes can be used to mitigate the pre-connection system performance issues.

The post-connection assessment identified some of the same system performance issues that were identified in the pre-connection assessment, as well as additional system performance issues. Under certain Category B conditions, some of the thermal criteria violations and voltage range criteria violations that were observed in the pre-connection assessment were exacerbated. New thermal criteria violations, voltage

[12] The DFO also examined and ruled out load shifting and distribution system upgrades, as detailed in Section 5 of the DFO's Distribution Deficiency Report, which is included as Appendix E.

[13] The connection assessment is included as Appendix A.

range criteria violations, voltage stability criteria violations, and transient voltage recovery violations, were also observed in the post-connection assessment under certain Category B conditions.

Real-time operational practices and capacitor overvoltage protection schemes can be used to manage the post-Project thermal criteria violations and voltage range criteria violations. A new RAS, hereafter referred to as "new Ksituan River RAS", is required to mitigate the voltage stability criteria violations and transient voltage recovery violations observed following connection of the Proposed Transmission Development.

The AESO's *Addition of Voltage Support at Rycroft 730S Substation Needs Identification Document* includes plans to add voltage support equipment in the Rycroft area (hereafter referred to as the Rycroft System Developments).[14] Additional voltage recovery, power flow, and voltage stability studies were performed to assess the impact of the Rycroft System Developments on the post-connection scenarios. The Rycroft System Developments can address the voltage stability criteria violations and transient voltage recovery violations observed in the post-connection assessment. The remaining voltage range criteria violations that were observed after the Rycroft System Developments are in service can be managed by using real-time operational practices and capacitor overvoltage protection schemes.

The mitigation measures described above are sufficient to mitigate the post-connection system performance issues, prior to the energization of the Rycroft System Developments, the Proposed Transmission Development. Therefore, the Proposed Transmission Development is not dependent on the completion of the Rycroft System Developments in order for the connection to proceed. Once the Rycroft System Developments are in service, the new Ksituan River RAS will no longer be required.

2.6 AESO Forecast and Transmission System Plans – The AESO's corporate forecast for the Northwest Planning Region is consistent with the load associated with

[14] The *Addition of Voltage Support at Rycroft 730S Substation Needs Identification Document* application was filed with the Commission on December 15, 2017 in Proceeding 23105 and Application 23105-A001.

the Proposed Transmission Development.[15] The AESO's corporate forecasts are used by the AESO to assess the adequacy of the regional transmission system and as a basis for identifying the need for transmission system expansion or enhancement. Therefore, the need associated with the Proposed Transmission Development is consistent with the AESO's long-term plans for this region.

2.7 Transmission Dependencies – As discussed in Section 2.5, the Proposed Transmission Development is not dependent on the Rycroft System Developments. The Proposed Transmission Development does not require the completion of any other AESO plans to expand or enhance the transmission system prior to connection.

2.8 AESO Participant Involvement Program – The AESO directed the TFO to assist the AESO in conducting a participant involvement program (PIP). In January 2017, the TFO and the AESO used various methods to notify stakeholders about the need for development and the AESO's preferred option to respond to the system access service request. In May 2018, the AESO notified stakeholders of its intention to file this Application with the Commission. There are no outstanding concerns or objections regarding the need for the Proposed Transmission Development or the AESO's preferred option to respond to the system access service request.[16]

2.9 Information Regarding AUC Rule 007, Section 6.2.1, NID15(2) – The AESO has been advised that the TFO's Facility Proposal addresses the requirements of AUC Rule 007, Section 6.2.1, NID15(2).[17] 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 AUC Rule 007, Section 6.2.1, NID15(2).

2.10 Confirmation Date – In the event that the proposed facilities are not in service by August 1, 2019, which is six months following the scheduled in-service date of

[15] The *AESO 2017 Long-term Outlook* provides forecasting information for the Northwest Planning Region, which includes the Proposed Transmission Development area.

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

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

February 1, 2019, the AESO will inform the Commission in writing if the need to expand or enhance the transmission system described in this Application continues, and if the technical solution described in this Application approval continues to be the AESO's preferred technical solution.[18]

2.11 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 DFO's request for system access service;
- the DFO's Need for Development report and associated Supplemental document;
- the AESO's connection assessment;
- the TFO's cost estimate for the Proposed Transmission Development;
- information obtained from AESO PIP activities; and
- the AESO's long-term transmission system plans;

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

[18] A detailed project schedule, which includes potential limitations or constraints as contemplated in AUC Rule 007, NID17(2), can be found in the TFO's Facility Proposal.

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.[19] 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 AUC 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.

[19] The AESO understands that the TFO intends to file a Facility Proposal relating to this Application to be titled *Ksituan River 754S Substation Capacity Increase Project*.

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 In the event that the proposed facilities are not in service by August 1, 2019, which is six months following the scheduled in-service date of February 1, 2019, the AESO will inform the Commission in writing if the need to expand or enhance the transmission system described in this Application continues, and if the technical solution described in this Application approval continues to be the AESO's preferred technical solution.

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 for transmission developments at the Ksituan River 754S substation, as follows:

1. Add one 144/25 kV transformer;
2. Add one 144 kV circuit breaker; and
3. 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 18th day of May 2018.

Alberta Electric System Operator

"Electronically submitted by"

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Robert Davidson
Director, Transmission Connection Projects

PART B – APPLICATION APPENDICES

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

APPENDIX A **Connection Assessment –** Appendix A contains the AESO *Engineering Connection Assessment – Ksituan River 754S Capacity Upgrade* that assesses the transmission system performance prior to and following the connection of the Proposed Transmission Development.

APPENDIX B **TFO Capital Cost Estimate –** Appendix B contains a detailed cost estimate corresponding to the Proposed Transmission Development. This estimate has been prepared by the TFO at the direction of the AESO, to an accuracy level of +20%/-10%, which exceeds the accuracy required by AUC Rule 007, NID16.

APPENDIX C **AESO PIP –** Appendix C contains a summary of the PIP activities conducted, in accordance with requirement NID19 and Appendix A2 of AUC Rule 007, regarding the need to respond to the market participant's request for system access service. Copies of the relevant materials distributed during the PIP are attached for reference.

APPENDIX D **TFO Information Regarding AUC Rule 007, Section 6.2.1, NID15(2) –** Appendix D contains a letter provided by the TFO confirming that the requirements of AUC Rule 007, NID15(2) will be addressed within the TFO's Facility Proposal.

APPENDIX E **DFO Distribution Deficiency Report –** Appendix E contains the DFO's *Distribution Deficiency Report KsituanRiver 754S Capacity Upgrade* that provides information in support of the DFO's request for system access service, including describing the need for development.

APPENDIX F **AESO Transmission Planning Criteria – Basis and Assumptions –** Appendix F contains the *Transmission Planning Criteria – Basis and Assumptions,* Version 1, which includes the applicable thermal and voltage limits in support of the Transmission Planning (TPL) standards.[20] Planning studies that are included in this Application meet the relevant performance requirements of the specified TPL standards (TPL-001-AB-0 and TPL-002-AB-0).

[20] TPL Standards are included in the current Alberta Reliability Standards.

PART C – REFERENCES

i. **AESO Planning Duties and Responsibilities –** 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 the general planning duties of the AESO.[21] 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 Planning Criteria –** In accordance with the Act, the AESO is required to plan a transmission system that satisfies applicable reliability standards. Transmission Planning (TPL) standards are included in the Alberta Reliability Standards, and are generally described at: https://www.aeso.ca/rules-standards-and-tariff/alberta-reliability-standards/[22]

In addition, the AESO's *Transmission Planning Criteria – Basis and Assumptions* is included in Appendix F.

[21] 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.

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

iv. **AESO Connection Process –** For information purposes, the AESO Connection Process, which changes from time to time, is generally described at: https://www.aeso.ca/grid/connecting-to-the-grid/connection-process/[23]

v. **Application for Approval of the Need to Respond 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 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.

vi. **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 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. 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.

vii. **Duties of DFOs –** The duties of DFOs 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, review

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

the DFO forecasts that are submitted to the AESO, which may be considered in the preparation of the AESO's corporate forecasts.

viii. **Capital Cost Estimates –** The provision of capital costs estimates in the Application is for the purposes of relative comparison and context only. The requirements applicable to cost estimates that are used for transmission system planning purposes are set out in Section 25 of the *Transmission Regulation*, AUC Rule 007, and Section 504.5 of the ISO rules, *Service Proposals and Cost Estimating*.