Alberta Utilities Commission

In the Matter of the Need for the Hughes 2030S 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 Regulations made thereunder, and Alberta Utilities Commission Rule 007, all as amended

Application of the Alberta Electric System Operator for Approval of the Hughes 2030S Substation 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 *Hughes 2030S Substation Needs Identification Document* (Application).

1.2 Application Overview – ATCO Electric Ltd. (ATCO)[2], as the legal owner of electric distribution facilities (DFO) in the City of Grande Prairie area (AESO Planning Area 20, Grande Prairie), has requested system access service to reliably meet growing demand for electricity in the area. ATCO's request includes a Rate DTS, *Demand Transmission Service*, contract capacity of approximately 15.5 MW for new system access service in the area. ATCO's request can be met by adding a new 144/25 kV point of delivery (POD) substation, to be designated the Hughes 2030S substation, and two 144 kV circuits connecting the Hughes 2030S substation to the existing 144 kV transmission line 7L22 using an in-and-out configuration (the "Proposed Transmission Development", as further described in Section 2.2). The scheduled in-service date for the Proposed Transmission Development is December 1, 2018.

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 electricity. The Proposed Transmission Development is consistent with the AESO's long-term plans for the Northwest Region, which includes the City of Grande Prairie area. The AESO, in accordance with its responsibility to respond to

[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 Regulation made thereunder, and Alberta Utilities Commission Rule 007, all as amended.

[2] In this Application, ATCO acts as both the legal owner of distribution facilities (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's Connection Process.

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 ATCO, as the legal owner of transmission facilities (TFO), 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 collaboration 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 reliably meet growing demand for electricity in the City of Grande Prairie 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, the DFO, and the TFO have collaborated to determine the characteristics of the Proposed Transmission Development and to assess 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 (Facility Proposal)[8] to meet the DFO's request.

2.2 Proposed Transmission Development – The Proposed Transmission Development includes the following elements:

1. Adding a new 144/25 kV substation, designated the Hughes 2030S substation, with one 144/25 kV transformer rated at approximately 50 MVA,[9] three 144 kV circuit breakers, and seven 25 kV circuit breakers;[10]

[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, or FA, under Commission Rule 007.

[9] A transformer size of 50 MVA would be recommended based on good electric industry practice and under advisement from the TFO regarding its asset management and inventory practices.

2. Adding two 144 kV circuits to connect the proposed Hughes 2030S substation to the existing 144 kV transmission line 7L22 using an in-and-out configuration; [11] 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.[12]

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 $39 million.[13] 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 Hughes 2030S substation, two transmission alternatives were examined, and five other alternatives were examined to connect the proposed Hughes 2030S substation. All of these are further described in the following.

In addition to the proposed Hughes 2030S substation, the two transmission alternatives examined were:

[10] The proposed Hughes 2030S substation includes provision to connect a second transformer and 25 kV bus.

[11] The two 144 kV circuits will have an approximate length of 15 kilometres.

[12] 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. Line numbering and substation names provided here are for ease of reference and are subject to change as engineering and design progresses.

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

1. **Upgrade the Crystal Lake 722S substation** – This alternative involves adding a third 144/25 kV LTC transformer with a minimum transformation capacity of 17.22 MVA and provision for four additional feeders. According to the DFO, this alternative would result in high-capacity distribution feeder corridors resulting in an unacceptable reliability risk. As a result, this alternative was ruled out.
2. **Upgrade the Flyingshot Lake 749S substation** - This alternative entails adding a third 144/25 kV LTC transformer with a minimum transformation capacity of 17.22 MVA and provision for four additional feeders. According to the DFO, this alternative would result in high-capacity distribution feeder corridors resulting in an unacceptable reliability risk. As a result, this alternative was ruled out.

The proposed Hughes 2030S substation was selected as the preferred transmission alternative.

In addition to the proposed in-and-out configuration on the 144 kV transmission line 7L22, the following five alternatives were identified to connect the proposed Hughes 2030S substation:

1. **In-and-out connection configuration on the 144 kV transmission line 7L39 –** This alternative involves connecting the proposed Hughes 2030S substation to the 144 kV transmission line 7L39 using an in-and-out configuration. This would require the addition of two 144 kV circuits, each approximately 9 km long. This alternative was ruled out by the TFO due to routing constraints.
2. **T-tap configuration on the 144 kV transmission line 7L03 –** This alternative involves connecting the proposed Hughes 2030S substation to the 144 kV transmission line 7L03 using a T-tap configuration. This would require the addition of on 144 kV circuit, approximately 10 km long. This alternative was ruled out because T-tap configurations do not satisfy the DFO's reliability criteria.
3. **Radial configuration to the existing Mercer Hill 728S substation using one circuit –** This involves connecting the proposed Hughes 2030S substation to the Mercer Hill 728S substation. This would require the addition of one 144 kV circuit, approximately 14 km long, and a 144 kV breaker at the Mercer Hill 728S

substation. This alternative was ruled out because single-circuit radial configurations do not satisfy the DFO's reliability criteria.

4. **In-and-out configuration on the 144 kV transmission line 7L03** – This involves connecting the proposed Hughes 2030S substation to the 144 kV transmission line 7L03 using an in-and-out configuration. This would require the addition of two 144 kV circuits, each approximately 12 km long. This alternative was ruled out by the TFO due of routing constraints.
5. **Radial configuration to the existing Flyingshot Lake 749S substation using two circuits –** This involves connecting the proposed Hughes 2030S substation radially to the existing Flyingshot Lake 749S substation. This would require the addition of two 144 kV circuits, each approximately 21 km long, and two 144 kV breakers at the Flyingshot Lake 749S substation. The Flyingshot Lake 749S substation would need to be expanded to accommodate the additional breakers. This alternative involves increased transmission development compared to the proposed connection configuration for the Proposed Transmission Development; therefore, this alternative was ruled out.

The Proposed Transmission Development was selected as the preferred transmission alternative and forms the basis of the cost estimates and the Connection Assessment described herein.[14]

2.5 Connection Assessment – Power flow and voltage stability analyses were conducted to assess the impact that the Proposed Transmission Development and the associated load would have on the transmission system. Power flow analysis was conducted prior to and following the connection of the Proposed Transmission Development and voltage stability analysis was performed following the connection of the Proposed Transmission Development.

[14] The DFO also examined and ruled out a distribution-based solution, as detailed in Section 4 of the DFO's Need for Development Report, which is included as Appendix E.

The pre-connection assessment identified system performance issues. Under certain Category B conditions, thermal criteria violations were observed for the 2019 summer peak (SP) scenario on the 144 kV transmission line 7L32. Real-time operational practices can be used to mitigate the pre-connection system performance issues.

The post-connection assessment identified the same system performance issues that were identified in the pre-connection assessment. Under Category B conditions, the thermal criteria violations that were observed in the pre-connection assessment were slightly intensified. Real time operational practices can be used to mitigate these post-connection system performance issues.[15]

2.6 AESO Forecast and Transmission System Plans – The AESO's corporate forecast for the region is consistent with the load associated with the Proposed Transmission Development.[16] 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 the region.

Future AESO needs identification documents in the Grande Prairie area will assume the Proposed Transmission Development will be in service for the date specified, unless new information indicates otherwise.

2.7 Transmission Dependencies – The Proposed Transmission Development is not dependent on the AESO's plans to expand or enhance the transmission system.

2.8 AESO Participant Involvement Program – The AESO directed the TFO to assist the AESO in conducting a participant involvement program (PIP). Between November 2015 and June 2016, the TFO and the AESO used various methods to notify stakeholders, including occupants, residents, landowners, government bodies, agencies

[15] The Connection Assessment is included as Appendix A.

[16] Section 5 of the *AESO 2016 Long-term Outlook* discusses the Northwest Planning Region, which includes the Proposed Transmission Development area.

and stakeholder groups in the area where the AESO has reasonably determined that transmission facilities could be installed to implement the Proposed Transmission Development. Additionally, the AESO notified the public in the area where transmission facilities could be installed to implement the Proposed Transmission Development, of its intention to file this Application with the Commission for approval. No outstanding concerns or objections have been raised regarding the need for the Proposed Transmission Development.[17]

2.9 Information Regarding Rule 007, Section 6.2.1 – NID15(2) – The AESO has been advised that the TFO's Facility Proposal addresses the requirements of Commission Rule 007, Section 6.2.1 – NID15(2).[18] 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 6.2.1 – NID15(2).

2.10 Confirmation Date – In the event that the proposed facilities are not in-service by June 1, 2019, which is six months following the scheduled in-service date of December 1, 2018, 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.[19]

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 request for system access service;
- the DFO's Distribution Deficiency Report;

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

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

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

- the Connection Assessment;
- 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 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.[20] 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.

[20] The AESO understands that the TFO intends to file a Facility Proposal relating to this Application to be title *Grande Prairie New Point of Delivery (POD) Transmission 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 June 1, 2019, which is six months following the scheduled in-service date of December 1, 2018, 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 as follows:

A. Add a new 144/25 kV substation, designated the Hughes 2030S substation, with one 144/25 kV transformer, three 144 kV circuit breakers, and seven 25 kV circuit breakers;

B. Add two new 144 kV circuits to connect the proposed Hughes 2030S substation to the existing 144 kV transmission line 7L22 using an in-out configuration; and

C. 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 24th day of June 2016.

Alberta Electric System Operator

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Warren Clendining
Manager, Transmission Regulation Projects

PART B – APPLICATION APPENDICES

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

APPENDIX A **Connection Assessment –** Appendix A contains the *Engineering Study Report for AUC Application ATCO City of Grande Prairie New POD* that assesses the transmission system performance prior to and following the connection of the Proposed Transmission Development. As part of the AESO Connection Process, the DFO engaged a consultant to conduct the connection assessment (Study). The AESO defined the Study scope, and provided the system models and Study assumptions. The AESO also reviewed this report and its conclusions, and finds the Study acceptable for the purposes of assessing the impacts of the Proposed Transmission Development on the transmission system.

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, NID16.

APPENDIX C **AESO PIP –** Appendix C contains a summary of the PIP activities conducted, in accordance with requirement NID19 and Appendix A2 of Commission 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 **Information Regarding Rule 007, Section 6.2.1 - NID15(2) –** Appendix D contains a letter provided by the TFO confirming that the requirements of Commission 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, City of Grande Prairie New POD* 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 – The AESO has revised the *Transmission Reliability Criteria, Part II Transmission System Planning Criteria,* Version 0, dated March 11, 2005 primarily to remove criteria that are now included in the Transmission Planning (TPL) Standards.[21] Appendix F contains the *Transmission Planning Criteria – Basis and Assumptions,* Version 1, which includes the applicable thermal and voltage limits in support of the TPL standards. 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).

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

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.[22] 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 –** 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: http://www.aeso.ca/rulesprocedures/17006.html[23]

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

iv. **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[24]

[22] 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.

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

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

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 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.

vii. **Duties of owners of electric distribution systems –** 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 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 AESO's responsibilities in respect of project cost reporting are described in the *Transmission Regulation*, including Section 25, and Section 9.1 of the ISO rules.