In the Matter of the Need for the Transmission Enhancements in the Northeast Edmonton Area

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

Transmission Enhancements in the Northeast Edmonton Area

Needs Identification Document

Date: September 29, 2022

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 *Transmission Enhancements in the Northeast Edmonton Area Needs Identification Document* (Application). This application is submitted in accordance with AUC Rule 007, Section 7.1.2, *Abbreviated needs identification document application information requirements*.

1.2 Application Overview – EPCOR Distribution & Transmission Inc. (EDTI)[2], as the legal owner of an electric distribution system (DFO), has requested system access service to serve a new industrial demand for electricity in the Northeast Edmonton area (AESO Planning Area 60, Edmonton). Air Products Canada Ltd. (Air Products) has also submitted a request for system access service to connect its proposed Edmonton 3 H2 Plant industrial system[3] (the ISD) in the City of Edmonton area. Air Products expects the ISD to be commercially operational by Q3 2024.

The EDTI request includes a new Rate DTS, *Demand Transmission Service*, contract capacity of 50 MW and the Air Products request includes a new Rate STS, *Supply Transmission Service*, contract capacity of 20 MW. The EDTI and Air Products requests can be met by adding one 240 kilovolt (kV) circuit to connect the proposed ISD to the existing Clover Bar 987S substation using a radial configuration, and modifying the Clover Bar 987S substation, including adding two 240 kV circuit breakers (the Proposed

[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, EDTI 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] Proceeding 27380, Application 27380-A001.

Transmission Development, as further described in Section 2.2). The scheduled in-service date for the Proposed Transmission Development is November 20, 2023.

This Application describes the need to respond to the EDTI and Air Products requests for system access service, and the AESO's determination of the manner in which to respond to the requests. Having followed the AESO Connection Process,[4] the AESO has determined that the Proposed Transmission Development provides a reasonable opportunity for EDTI and Air Products to exchange electric energy and ancillary services. The Proposed Transmission Development is consistent with the AESO's long-term plans for the Edmonton Planning Region. The AESO submits this Application to the Commission for approval in accordance with the AESO's responsibility to respond to requests for system access service and having determined that transmission development is required and is in the public interest.[5,6]

1.3 AESO Directions to the TFO – During the AESO Connection Process, the AESO issued various directions to the legal owner of transmission facility (TFO), in this case EDTI, including a direction to submit, for Commission approval under the HEEA, a Facility Proposal for the Proposed Transmission Development, as defined in Section 2.2.[7]

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

[5] 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.

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

[7] 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 a reasonable opportunity to exchange electric energy and ancillary services.

The AESO, in consultation with the TFO, EDTI and Air Products, has determined that the Proposed Transmission Development is the preferred option to provide EDTI and Air Products with a reasonable opportunity to exchange electric energy and ancillary services. The Proposed Transmission Development will also address the distribution deficiencies that EDTI has identified pursuant to its obligation and duties as defined under section 105(1)(b) of the Act.[8] In accordance with Section 34 of the Act, the AESO has determined that the Proposed Transmission Development will result in an expansion or enhancement of the transmission system thereby establishing the need for this Application.

Through the AESO Connection Process, the AESO, in consultation with the TFO, EDTI and Air Products, has determined the Proposed Transmission Development and has assessed the impacts that the Proposed Transmission Development and the associated generation and load would have on the Alberta interconnected electric system.

2.2 Proposed Transmission Development – The Proposed Transmission Development involves connecting the ISD to the transmission system, and consists of:[9]

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

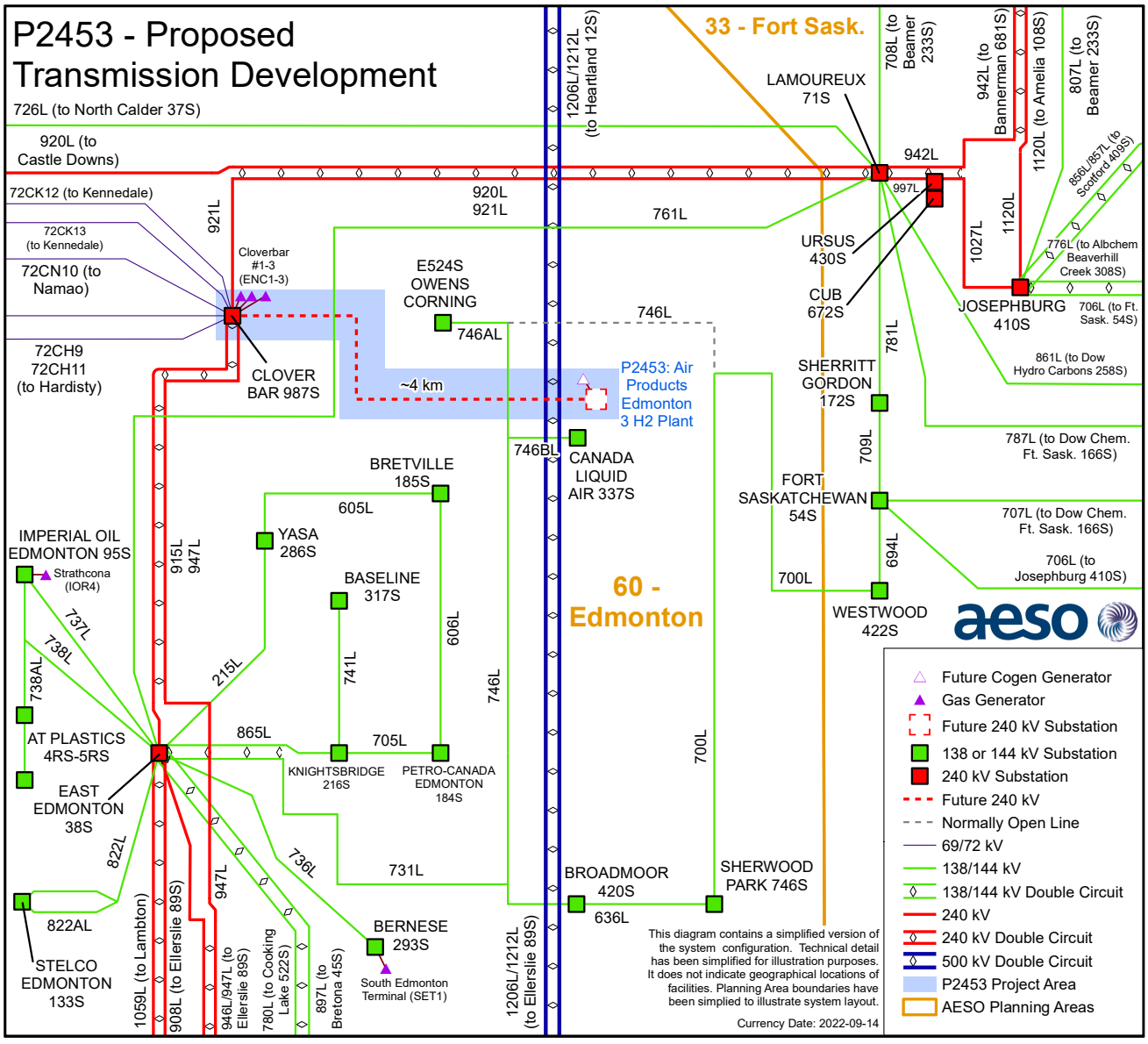
[9] Details and configuration of equipment required for the Proposed Transmission Development, including substation single-line diagrams, are more specifically described in the AESO's Functional Specification included in the TFO's Facility Proposal. Also, further details will be determined as detailed engineering progresses. Routing and/or siting of transmission facilities do not form part of this Application and are addressed in the TFO's Facility Proposal. Line numbering and substation names provided here are for ease of reference and are subject to change as engineering and design progresses.

1. Add one 240 kV circuit, approximately 4 kilometers in length, with a minimum capacity no less than 487 MVA, to connect the ISD to the existing Clover Bar 987S substation;[10]
2. Modify the existing Clover Bar 987S substation, including adding two 240 kV circuit breakers; 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.

The scope of the Proposed Transmission Development is described further below and shown in Figure 2-1.

[10] The 240 kV circuit will connect to the proposed Aurum Park 1007S substation, which is part of the ISD. The TFO has estimated that the 240 kV circuit will have a length of approximately 4 kilometers. This is subject to change as routing and/or siting is finalized by the TFO.

Figure 2-1: Proposed Transmission Development



2.3 Proposed Transmission Development Cost Estimate – The AESO directed the TFO to prepare a cost estimate for the Proposed Transmission Development described in Section 2.2. The TFO has estimated the cost of the Proposed Transmission Development to be approximately $27 million.[11]

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.

2.4 Transmission Development Alternatives – In addition to the Proposed Transmission Development, the AESO, in consultation with the TFO, EDTI and Air Products, examined eight other transmission development alternatives to respond to the EDTI and Air Products requests for system access service:

1. **Upgrade Clover Bar 987S substation** – This alternative involves upgrading Clover Bar 987S substation, including the addition of one 240/25 kV transformer, two 240 kV circuit breakers, and one 25 kV circuit breaker.

   This alternative was ruled out due to Air Products operational requirements.

2. **T-tap Connection to 138 kV Transmission Line 700L** – This alternative involves connecting the ISD to the existing 138 kV transmission line 700L using a T-tap configuration. This alternative would require the addition of one 138 kV circuit, approximately 3 kilometers in length.

   This alternative was ruled out as technical performance was determined to be inferior to the Proposed Transmission Development.

3. **In-and-Out Connection to 138 kV Transmission Line 700L** – This alternative involves connecting the ISD to the existing 138 kV transmission line 700L using an in-and-out configuration. This alternative would require the addition of a switching

[11] The cost is in nominal dollars using a base year of 2023 with escalation considered. Further details of this cost estimate, which has an accuracy level of +20%/-10%, can be found in Appendix B.

station, including three 138 kV circuit breakers and the addition of one 138 kV circuit, approximately 3 kilometers in length.

This alternative was ruled out due to increased transmission development, and hence overall increased cost, compared to the Proposed Transmission Development.

4. **T-tap Connection to 138 kV Transmission Line 746L** – This alternative involves connecting the ISD to the existing 138 kV transmission line 746L using a T-tap configuration. This alternative would require the addition of one 138 kV circuit, approximately 2 kilometers in length.

   This alternative was ruled out as technical performance was determined to be inferior to the Proposed Transmission Development.

5. **In-and-Out Connection to 138 kV Transmission Line 746L**– This alternative involves connecting the ISD to the existing 138 kV transmission line 746L using an in-and-out configuration. This alternative would require the addition of a switching station, including three 138 kV circuit breakers and the addition of one 138 kV circuit, approximately 2 kilometers in length.

   This alternative was ruled out due to increased transmission development, and hence overall increased cost, compared to the Proposed Transmission Development.

6. **T-tap Connection to 240 kV Transmission Line 921L** – This alternative involves connecting the ISD to the existing 240 kV transmission line 921L using a T-tap configuration. This alternative would require the addition of one 240 kV circuit, approximately 6 kilometers in length.

   This alternative was ruled out as the lower reliability offered by the T-tap configuration was not acceptable to Air Products.

7. **In-and-Out Connection to 240 kV Transmission Line 921L** – This alternative involves connecting the ISD to the existing 240 kV transmission line 921L using an in-and-out configuration. This alternative would require the addition of a switching

station, including five 240 kV circuit breakers and the addition of one 240 kV circuit, approximately 6 kilometers in length.

This alternative was ruled out due to increased transmission development, and hence overall increased cost, compared to the Proposed Transmission Development.

8. **Radial 72 kV Connection to Clover Bar 987S substation** – This alternative involves connecting the ISD to the existing Clover Bar 987S substation using a radial configuration. This alternative would require the modification of Clover Bar 987S substation, including adding one 72 kV circuit breaker. This alternative also involves adding one 72 kV circuit, approximately 4 kilometers in length to connect the ISD to the Clover Bar 987S substation.

   This alternative was ruled out as the TFO advised expansion of the 72 kV side of the Clover Bar 987S substation would be more challenging than expanding the 240 kV side due to siting constraints.

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

2.5 Connection Assessment – Power flow, voltage stability, transient stability, short-circuit, and motor starting studies were conducted to assess the impact that the Proposed Transmission Development and the associated generation would have on the transmission system. Power flow and short-circuit studies were conducted prior to and following the connection of the Proposed Transmission Development. Voltage stability,

[12] EPCOR also examined and ruled out distribution system upgrades, as detailed in EPCOR's Distribution Deficiency Report, which is included as Appendix D. The AESO, having assessed the information in EPCOR's Distribution Deficiency Report, has determined that distribution system upgrades would not provide EPCOR with system access service on the transmission system in a manner that would give it a reasonable opportunity to exchange electric energy and ancillary services.

transient stability and motor starting studies were performed following the connection of the Proposed Transmission Development.[13]

The pre-connection assessment identified system performance issues. Under certain Category B conditions, thermal criteria violations were observed. Real-time operational practices and a planned RAS[14] can be used to mitigate the pre-connection system performance issues.

The post-connection assessment identified the same system performance issues as the pre-connection assessment. Most thermal criteria violations observed in the pre-connection assessment were reduced in the post-connection assessment; while the remaining thermal criteria violations were marginally exacerbated. Real-time operational practices and the planned RAS can also be used to mitigate the post-connection system performance issues observed under Category B conditions.

2.6 Transmission Dependencies – The Proposed Transmission Development does not require the completion of any other AESO plans to expand or enhance the transmission system prior to connection.

2.7 AESO Participant Involvement Program – The AESO directed the TFO to assist the AESO in conducting the AESO's participant involvement program (PIP).

Between February and September 2022, the TFO and the AESO used various methods to notify stakeholders and Indigenous Groups about the need for development and the AESO's preferred option to respond to the system access service requests.

The AESO has not received any indication of concerns or objections regarding the need for the Proposed Transmission Development or the AESO's preferred option to respond

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

[14] The Planned RAS was included in the approved *Transmission Enhancements in the West Edmonton Area Needs Identification Document.*

to the system access service requests. In September 2022, the AESO notified stakeholders of its intention to file this Application with the Commission.[15]

2.8 Environmental and Land Use Effects – The TFO has advised that the Proposed Transmission Development is not expected to result in significant environmental effects.

2.9 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 EDTI and Air Products requests for system access service and the AESO's assessment thereof;
- EDTI's Distribution Deficiency Report;
- the AESO's connection assessment;
- the TFO cost estimates for the Proposed Transmission Development;
- confirmation from the TFO that no significant environmental effects are expected;
- 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 EDTI and Air Products 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.

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

3 Request to Combine this Application with the Facility Proposals 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 corresponding with this Application.

The AESO understands that the TFO's Facility Proposal will be filed shortly.[16] The AESO requests, and expects the TFO will request, that this Application be combined with the Facility Proposal for consideration by the Commission in a single process. This request is consistent with Section 15.4 of the *Hydro and Electric Energy Act* and Section 7.1 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 each, 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 EDTI and Air Products requests for system access service and provide a preliminary description of the manner proposed to meet that need, having regard for the AESO's determination that the Proposed Transmission Development is required to provide EDTI and Air Products with a reasonable opportunity to exchange electric energy and ancillary services. In contrast, the Facility Proposal will contain more detailed engineering and designs for the Proposed Transmission Development and seek approval for the construction and operation of specific facilities.

[16] The AESO understands that EPCOR intends to file a Facility Proposal relating to this Application to be titled *Clover Bar Interconnection Project Facility Application for the Edmonton Net-Zero Hydrogen Energy Complex*.

4 Relief Requested

4.1 The AESO submits that its assessment of the need to meet the EDTI and Air Products requests for system access service is technically complete and that approval is in the public interest.

4.2 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 EDTI and Air Products requests for system access service, and to connect the Facility to the transmission system, by means of the following transmission development:

A. Add one 240 kV circuit to connect the proposed ISD to the existing Clover Bar 987S substation using a radial configuration;

B. Modify the Clover Bar 987S substation, including adding two 240 kV circuit breakers; 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 29th day of September, 2022.

Alberta Electric System Operator

"Electronically Submitted by"

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Amir Motamedi, P.Eng.
Director, Customer Grid Access

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 – P2453 EDTI Edmonton 3 H2 Plant Cogen* 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 AESO defined the study scope, and provided the system models and study assumptions to EDTI and Air Products who engaged a consultant to conduct the connection assessment studies. The AESO reviewed the results of the connection assessment studies prepared by the consultant, and found the results acceptable for the purposes of assessing the impacts of the Proposed Transmission Development on the transmission system.

APPENDIX B **Capital Cost Estimates –** Appendix B contains detailed cost estimates corresponding to the Proposed Transmission Development. These estimates have been prepared for the TFO at the direction and request of the AESO, to an accuracy level of +20%/-10% which exceeds the accuracy required by AUC Rule 007, Section 7.1.2, NID 11.

APPENDIX C **AESO PIP –** Appendix C contains a summary of the PIP activities conducted, in accordance with requirements of NID12 and Appendix A2 of AUC Rule 007, regarding the need to respond to the EDTI and Air Products requests for system access service. Copies of the relevant materials distributed during the PIP are attached for reference.

APPENDIX D **Distribution Deficiency Report –** Appendix D contains EDTI's *Distribution Deficiency Report (DDR) for Air Products* that provides information in support of EDTI's request for system access service, including describing the need for transmission development. The AESO reviews and assesses this information as part of its process to

determine the reasonableness of EDTI's opportunity to exchange electric energy and ancillary services.

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.[17] Section 33 of the Act states that the AESO "must forecast the needs of Alberta and develop plans for the transmission system to provide efficient, reliable, and non-discriminatory system access service and the timely implementation of required transmission system expansions and enhancements." Where, as in this case, EDTI and Air Products Canada Ltd. (refer to note ii below) are requesting system access service, and the AESO has determined that 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 [EDTI and Air Products Canada Ltd. in this case] wishing to exchange electric energy and ancillary services a reasonable opportunity to do so."

iii. **AESO Transmission 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 on the AESO website.

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

iv. **AESO Connection Process** – For information purposes, the AESO Connection Process, which changes from time to time, is generally described on the AESO website.

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

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* and the AESO's determination of the manner in which to respond to the request. 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 EDTI, in its capacity as a legal owner of transmission facilities, 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 EDTI, pursuant to Section 39 of the Act and Section 14 of the *Transmission Regulation*, to assist in the preparation of the AESO's Application. EDTI 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 whether it will apply to the AESO for changes to its 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 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*.