

**In the Matter of the Need for the Estuary Solar Project Connection**

**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  
Estuary Solar Project Connection  
Needs Identification Document

**Date:** April 25, 2024

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**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,<sup>1</sup> the Alberta Electric System Operator (AESO) applies to the Alberta Utilities Commission (Commission) for approval of the *Estuary Solar Project Connection 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** – The market participant, Greencells Indygen Alberta Ltd. (market participant), requested system access service to connect its approved Estuary Solar Project (the Facility)<sup>2</sup> to the transmission system in the Empress area (AESO Planning Area 48). The Facility includes an approved collector substation, to be designated the Greencells Facility 1006S substation<sup>3</sup>. The market participant expects the Facility to be commercially operational in June 2025.

The market participant's request includes a new Rate STS, *Supply Transmission Service*, contract capacity of 200 MW and a new Rate DTS, *Demand Transmission Service*, contract capacity of 1.5 MW. The market participant's request can be met by adding one 138 kilovolt (kV) transmission line to connect the Facility to the existing Empress 394S substation in a radial configuration; modifying the Empress 394S substation, including adding one 138 kV circuit breaker and increasing the capacity of a section of the existing 138 kV transmission line 760L (the Proposed Transmission Development, as further

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<sup>1</sup> 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).

<sup>2</sup> Power Plant Approval 27862-D03-2023, Appendix 2 to Decision 27862-D01-2023, Greencells Indygen Alberta Ltd. 200-Megawatt Estuary Solar Power Plant (July 11, 2023).

<sup>3</sup> Substation Permit and License 27862-D02-2023, Appendix 1 to Decision 27862-D01-2023, Greencells Indygen Alberta Ltd. New Estuary Solar 1006S Substation (June 1, 2023).

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described in Section 2.2). The scheduled in-service date for the Proposed Transmission Development is June 30, 2025.

This Application describes the need to respond to the market participant's request for system access service, and the AESO's determination of the manner in which to respond to the request. Having followed the AESO Connection Process,<sup>4</sup> the AESO has determined that the Proposed Transmission Development provides a reasonable opportunity for the market participant to exchange electric energy and ancillary services. The Proposed Transmission Development is consistent with the AESO's long-term plans for the South Planning Region, which includes the Empress area. 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.<sup>5,6</sup>

**1.3 AESO Directions to the TFO** – During the AESO Connection Process, the AESO issued various directions to the legal owner of the transmission facility (TFO), in this case AltaLink Management Ltd., in its capacity as general partner of AltaLink L.P., (AltaLink), including a direction to submit, for Commission approval under the *Hydro and Electric Energy Act*, a Facility Proposal<sup>7</sup> for the Proposed Transmission Development, as defined in Section 2.2.<sup>8</sup>

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<sup>4</sup> For information purposes, refer to note iv of Part C of this Application for more information on the AESO Connection Process.

<sup>5</sup> 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.

<sup>6</sup> Note v of Part C of this Application describes the Application scope in more detail.

<sup>7</sup> Also referred to as facility application, or FA, under AUC Rule 007.

<sup>8</sup> The directions are described in more detail in the following sections of this Application and in Part C, note vi.

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## **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 market participant and the TFO, has determined that the Proposed Transmission Development is the preferred option to provide the market participant with a reasonable opportunity to exchange electric energy and ancillary services. 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 capability of the transmission system thereby establishing the need for this Application. The market participant has made the appropriate applications to the AESO to obtain transmission system access service.

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

**2.2 Proposed Transmission Development** – The Proposed Transmission Development, as shown in Figure 2-1, involves connecting the Facility to the transmission system and consists of:<sup>9</sup>

1. Add one 138 kV circuit, approximately 4 km in length, to connect the Facility to the existing Empress 394S substation using a radial configuration;

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<sup>9</sup> Details and configuration of equipment required for the Proposed Transmission Development 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 the market participant's 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. Line numbering and substation names provided here are for ease of reference and are subject to change as engineering and design progresses. The market participant's facilities that may subsequently be connected to the Proposed Transmission Development are the responsibility of the market participant and are not included in the Application.

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2. Modify Empress 394S substation, including adding one 138 kV circuit breaker;
3. Increase the capacity of the existing 138 kV transmission line 760L (between Empress 394S and Amoco Empress 163S substations); and
4. 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.



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**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 \$14.3 million.<sup>10</sup> In accordance with the ISO tariff, the AESO has determined \$9.7 million of the costs associated with the Proposed Transmission Development will be classified as participant-related. The remaining \$4.7 million of the costs will be classified as system-related. The system-related scope includes implementation of RAS and other protection and control upgrades at Empress 394S and Amoco Empress 163S substations, and as well as increasing the capacity of 760L.

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

1. **T-tap connection to existing 138 kV transmission line 760L**– This alternative involves connecting the Facility to the existing 138 kV transmission line 760L using a T-tap configuration. This alternative involves adding one 138 kV circuit. This alternative involves increasing the capacity of the 138 kV transmission line 760L (between Oyen 767S and Amoco Empress 163S). This alternative was ruled out due to protection coordination issues.
2. **In-and-out connection to 138 kV transmission line 760L** – This alternative involves connecting the Facility to the 138 kV transmission line 760L using an in-and-out configuration. This alternative requires adding a substation, including three 138 kV circuit breakers, connected to the existing 138 kV

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<sup>10</sup> 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.

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- transmission line 760L. This alternative requires adding one 138 kV circuit, to connect the Facility to the substation. This alternative also involves increasing the capacity of the existing 138 kV transmission line 760L (between Oyen 767S and Amoco Empress 163S). This alternative was also ruled out due to protection coordination issues.
3. **Radial 138 kV connection to Amoco Empress 163S substation** – This alternative involves connecting the Facility to the existing Amoco Empress 163S substation using a radial configuration. This alternative requires adding one 138 kV circuit and modifying the Amoco Empress 163S substation, including adding one 138 kV circuit breaker. This alternative was ruled out because the TFO has advised that expansion of Amoco Empress 163S substation is limited due to space restrictions, and the substation cannot accommodate the additional 138 kV circuit breaker. A 240 kV radial connection to Amoco Empress 163S was considered but also ruled out as expansion of the 240 kV ring bus is also limited due to space restrictions.
  4. **Radial 240 kV connection to Cypress 562S substation** – This alternative involves connecting the Facility to the existing Cypress 562S substation using a radial configuration. This alternative requires adding one 240 kV circuit, which would require crossing the 138 kV transmission line 760L and the 240 kV transmission lines 1002L and 1011L. This alternative also requires modifying the Cypress 562S substation, including adding one 240 kV circuit breaker. This alternative involves increased transmission development, and hence increased cost, compared to the Proposed Transmission Development and was ruled out.

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



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**2.5 Connection Assessment** – Power flow, transient stability, and short-circuit 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. Transient stability studies were conducted following the connection of the Proposed Transmission Development.<sup>11</sup>

### *Pre-Connection Assessment Results*

The pre-connection assessment identified system performance issues under Category A and Category B conditions. Category A thermal criteria violations were observed on the 138/144 kV transmission lines 7L159 and 7L171, and the 240 kV transmission lines 912L, 9L20, 924L, 927L, and 935L.

These pre-connection Category A thermal criteria violations are expected to arise following the connection of additional generation projects in the Study Area. Thermal and voltage criteria violations were also observed under certain Category B conditions in the pre-connection assessment.

### *Post-Connection Assessment Results*

All of the system performance issues identified in the pre-connection assessment were also identified in the post-connection assessment, and additional system performance issues were observed. All of the Category A thermal criteria violations observed in the pre-connection assessment were exacerbated following the connection of the Proposed Transmission Development, and new Category A thermal criteria violations were observed on 138/144 kV transmission lines 760L, 7L16, 7L760, and 240 kV transmission line 923L.

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<sup>11</sup> The connection assessment is included as Appendix A.

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Most thermal criteria violations observed in the pre-connection assessment under Category B conditions were exacerbated in the post-connection assessment, and additional Category B thermal criteria violations were observed. The voltage criteria violations observed in the pre-connection assessment under Category B conditions also seen in the post-connection assessment.

### *Post-Connection Mitigation Measures*

The Category A violation on 760L can be mitigated by increasing the line rating to a minimum of 240 MVA as part of the Proposed Transmission Development (see Section 2.2). Increasing the rating of a section of 760L will address the Category A violations that occur on this line following the connection of the Project and provide capacity for future connections in the area. The remaining Category A thermal criteria can be managed by applying Section 302.1 of the ISO rules, *Real-Time Transmission Constraint Management* (TCM Rule) to curtail generation as required until such a time that system developments or operational measures are in place to alleviate congestion.

The approved Central East Transfer-out development project<sup>12</sup> will address the Category A thermal criteria violations on transmission lines 9L20 and 912L and will help to alleviate the remaining N-0 issues. The AESO is developing system plans to address thermal criteria violations on the 240 kV transmission lines in the South region, and the 138/144 kV system in the Hanna and Sheerness areas.<sup>13</sup>

The AESO will continue to monitor the pace of generation and transmission system development in the area and will notify market participants if it determines that it is necessary to obtain approval for a Section 15(2) exception.

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<sup>12</sup> Commission Decision 25469-D01-2021, Alberta Electric System Operator, Needs Identification Document Application, Central East Transfer-out Transmission Development Project, August 10, 2021. Approval 25469-D02-2021, Appendix 1 to Decision 25469-D01-2021.

<sup>13</sup> More information about this plan was provided at the Grid Reliability Update Stakeholder Session held on November 23, 2023; session materials are available on the AESO website.

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Real-time operational practices, existing RASs 164, 175, 201, 134, 202, planned RAS 204, new RAS 607, and a new RAS for 7L760 can be used to mitigate the post-connection system performance issues observed under certain Category B conditions. The new RAS for 7L760 could result in post-contingency generation curtailment by RAS in excess of the AESO's Maximum Severe Single Contingency (MSSC) limit of 466 MW. Therefore, pre-contingency generation curtailment under the Category A condition may be required using real-time operational practices to prevent generation curtailment above the MSSC limit during 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 capability of 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 2023 and April 2024, 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. This included a notification to market participants that may be affected by the Proposed Transmission Development.

No concerns or objections were raised regarding the need for the Proposed Transmission Development or the AESO's preferred option to respond to the system access service request. In April 2024, the AESO notified stakeholders of its intention to file this Application with the Commission.<sup>14</sup>

**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:

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<sup>14</sup> Further information regarding the AESO's PIP for this Application is included in Appendix C.

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- the transmission planning duties of the AESO as described in Sections 29, 33 and 34 of the Act;
- the market participant request for system access service and the AESO's assessment thereof;
- the AESO's connection assessment;
- the cost estimate 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 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.

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**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 corresponding with this Application. The AESO understands that the TFO's Facility Proposal will be filed shortly.<sup>15</sup> 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 market participant's request 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 the market participant 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.

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<sup>15</sup> The AESO understands that the TFO intends to file a Facility Proposal relating to this Application to be titled *Greencells Estuary Solar Project Connection*.

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#### **4 Relief Requested**

4.1 The AESO submits that its assessment of the need to meet the market participant's request 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 market participant's request for system access service, and to connect the Facility to the transmission system, by means of the following transmission development:

- A. Add one 138 kV transmission line, to connect the Facility to the existing Empress 394S substation in a radial configuration.
- B. Modify the Empress 394S substation, including adding one 138 kV circuit breaker.
- C. Increase the capacity of the 138 kV transmission line 760L (between Empress 394S and Amoco Empress 163S substations) from 120 MVA to 240 MVA.
- D. 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 25<sup>th</sup> day of April, 2024.

Alberta Electric System Operator

*"Electronically Submitted by"*

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

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**Alberta Electric System Operator**

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**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 – P2418 Estuary Solar Project Connection* 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 the market participant 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 Estimate** – Appendix B contains a detailed cost estimate corresponding to the Proposed Transmission Development. This estimate has been prepared by the TFO, 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 market participant's request for system access service. Copies of the relevant materials distributed during the PIP are attached for reference.

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### 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.<sup>16</sup> 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, 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 [Greencells Indygen Alberta Ltd.] 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.

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<sup>16</sup> 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.



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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 AltaLink, 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 AltaLink, pursuant to Section 39 of the Act and Section 14 of the *Transmission Regulation*, to assist in the preparation of the AESO's Application. AltaLink 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. **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*.