Alberta Utilities Commission

In the Matter of the Need for the Provost to Edgerton and Nilrem to Vermilion Transmission System Reinforcement

and

In the matter of the *Electric Utilities Act*, S.A. 2003, c. E-5.1, the *Alberta Utilities Commission Act*, S.A. 2007, c. A-37.2, the *Hydro and Electric Energy Act*, R.S.A. 2000, c. H-16, the *Transmission Regulation*, AR 86/2007 and Alberta Utilities Commission Rule 007, all as amended

Amended Application of the Alberta Electric System Operator for Approval of the Needs Identification Document for the Provost to Edgerton and Nilrem to Vermilion Transmission System Reinforcement

PART A - APPLICATION

1 Introduction

1.1 Background - In the AESO's original Provost to Edgerton and Nilrem to Vermilion ("PENV") Transmission System Reinforcement Needs Identification Document application, which was filed with the Alberta Utilities Commission ("Commission") on December 16, 2016 ("2016 Application"),[1] the Independent System Operator, operating as the Alberta Electric System Operator ("AESO"), submitted that there is a need to expand and enhance the transmission system in the PENV area to alleviate identified constraints and accommodate load growth, and also to provide options for future generation system access in the area.

1.2 On January 12, 2018, following a full written proceeding, in Decision 22274-D01-2018 ("Decision"),[2] the Commission decided to refer the 2016 Application back to the AESO in accordance with Subsection 34(3)(b) of the *Electric Utilities Act* ("Act"). In the Decision, the Commission directed the AESO:

> *… to incorporate the most current load and generation forecast into its analysis of the need in the PENV area and, if necessary, adjust its preferred solution to address the updated need. Should the AESO's reassessment of the need in the PENV area result in material changes to the need identified, the Commission expects that the AESO will adapt its preferred alternative accordingly and consider whether project staging based on established milestones is necessary in the circumstances.* [3]

1.3 In response to the Decision, the AESO has reassessed the need for transmission reinforcement in the PENV area based upon the AESO's most current load and generation forecast information, and amended the 2016 Application pursuant to Subsection 34(2) of the Act.

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1 Exhibits 22274-X0001-X0023.

2 Decision 22274-D01-2018, *Alberta Electric System Operator, Provost to Edgerton and Nilrem to Vermilion Transmission System Reinforcement Needs Identification Document* (January 12, 2018).

3 Ibid. at paragraph 66.

1.4 Application – Pursuant to Section 34 of the Act, the AESO applies to the Commission for approval of this amended PENV Transmission System Reinforcement Needs Identification Document ("2018 Application").

1.5 Application Overview – The 2018 Application seeks approval of the need to alleviate identified constraints in the PENV area.[4] The 2018 Application also seeks approval of the AESO's Preferred Transmission Development to meet the need for both load and the provision of access to generation in the PENV area and the Central East Sub-region.

The 2018 Application also seeks approval to amend the Central East Transmission Development ("CETD") Approval No. U2013-130 ("CETD NID Approval") to cancel certain approved developments, as more particularly described in Section 9.

The 2018 Application is organized as follows.

Part A – Application	
Section 1 – Introduction	Describes the 2018 Application, its organization, and AESO directions that were issued to legal owners of transmission facilities in the PENV area.
Section 2 – PENV Area Transmission Network	Describes the PENV area transmission network and the AESO's load and generation forecast in the PENV area.
Section 3 – Need for PENV Area Transmission System Reinforcement	Describes existing system adequacy and reliability concerns in the PENV area and timing of the need for transmission system reinforcement including the basis for the milestone related to the timing of the need for a component of the Preferred Transmission Development.

[4] The PENV area is described in Section 2

Section 4 – Preferred Transmission Development	Describes the Preferred Transmission Development and its estimated cost, and provides an explanation of the need for the new Drury 2007S substation.
Section 5 – Evaluation of Options and Selection of the Preferred Transmission Development	Addresses the transmission development options evaluated in the 2016 Application.;
Section 6 – Participant Involvement Program (“PIP”)	Addresses the PIP undertaken by the AESO.
Section 7 – Proposed Development Schedule	Describes the proposed development schedule and estimated in-service date including information consistent with Commission Rule 007, Section 6.1, NID10. Defines the milestone and the milestone monitoring process requirements proposed for a component of the Preferred Transmission Development, in accordance with Subsection 11(4) of the *Transmission Regulation*.
Section 8 – Long-term Transmission Plans	Describes the alignment between the Preferred Transmission Development and the AESO’s long-term plans, and interdependencies between any planned developments and the 2018 Application.
Section 9 – CETD NID Approval Amendment	Describes the background and proposed amendments to the CETD NID Approval.
Section 10 – Relief Requested	Describes the relief requested by the AESO.

Part B – 2018 Application Appendices	
Appendices A to G	A list of all appendices to the 2018 Application and a brief description of each are provided in Part B. These appendices provide all of the supporting materials for the 2018 Application.
Part C - References	
For information purposes, certain legislative provisions applicable to the AESO's transmission system planning duties are briefly described.	

1.6 AESO Directions – Pursuant to Section 39 of the Act and Section 14 of the *Transmission Regulation*, the AESO directed ATCO Electric Ltd. ("ATCO") and AltaLink Management Ltd. ("AltaLink"), in their separate capacities as the legal owners of transmission facilities ("TFOs") in the PENV area, to assist the AESO in preparing the 2016 Application. No further directions were issued by the AESO for the 2018 Application.

2 PENV Area Transmission Network

2.1 Existing PENV Area Transmission Network – The PENV area is one of three load zones in the Central East Sub-region, each of which is served by local transmission networks. The PENV area includes the following five AESO planning areas.

- Vegreville (Area 56)
- Lloydminster (Area 13)
- Wainwright (Area 32)
- Provost (Area 37)
- Alliance/Battle River (Area 36)

The existing PENV area load is chiefly served by three local 138 kV/144 kV transmission lines - 7L701/701L, 7L50/7L129 and 749L/7L749 - that supply power from the Battle River 240 kV system in the south and the Cold Lake area in the north. Loading on transmission lines 749L/7L749 is surpassing thermal limits under Category B contingency conditions (one transmission element out of service), resulting in thermal overloads and local voltage violations. The AESO currently manages constraints in the PENV area by operational procedures such as line reconfigurations, forming radials, and remedial action schemes ("RAS"). There are currently five RASs in the Central East Sub-region that are relied upon to maintain reliable system operation and mitigate local thermal overloads by curtailing generation south of the PENV area. [5] In several instances in the past few years, load shedding has been required to maintain system reliability in the PENV area.[6] Additionally, as previously noted in the 2016 Application, several recent generation projects in the PENV area have reduced their capacity, as a result of the limited capacity in the PENV area.[7]

[5] These RASs are: Battle River 7L50 and 7L701 Thermal Protection Scheme (TPS); RAS #134: 174L-395S North Holden overload mitigation scheme; RAS #138: 7L50-526S Buffalo Creek overload mitigation scheme; RAS #139: 901T-766S Nevis overload mitigation scheme; and HVDC RAS: EATL RAS for 912L and 9L20 contingencies.

[6] As indicated in Exhibit 22274-X0162: On August 13, 2013, approximately 80 MW of load was lost due to an outage of 7L50 out of Buffalo Creek; On January 12, 2017, directives were issues to shed 35 MW for real time overloads on 7L130 due to the loss of 749L. 7L130 was closed at the time of the event; and on May 15, 2017, 108 MW of load was lost due to the tripping of 715AL (between Hansman Lake 650S and Metiskow 648S), followed by the opening of 7L42 (between Hill 751S and Lloydminster 716S).

[7] See Exhibits 22274-X0162 at paragraph 6; and Exhibit 22274-X0163.

2.2 AESO Load Forecast and Generation Assumptions – In response to the Decision, the AESO has created a current load forecast for the PENV area. This load forecast is based upon the *AESO 2017 Long-term Outlook* ("2017 LTO"), which was released by the AESO on July 20, 2017, as well as the AESO's consideration of historical load and the latest load forecast information including past projects, current load connection projects, and the substation-level forecasts from the legal owners of electric distribution systems in the PENV area, FortisAlberta Inc. ("FortisAlberta") and ATCO. Additionally, for the 2018 Application, the AESO relied upon PENV area load data at time of PENV area peak and minimum load, rather than PENV area load data at time of Central East Sub-region peak, in order to more accurately reflect the PENV area. As a result, the load data in the 2018 Application reflects the latest, most relevant information available to the AESO for the PENV area.

The PENV area load peaks in the winter season and is comprised primarily of manufacturing, pipeline pump stations and oil storage facilities. The Compound Annual Growth Rate ("CAGR") from 2012-2017 was approximately 1.4% for summer peak and 1.1% for winter peak and is forecast to be 3.0% for summer peak and winter peak from 2017-2021. From 2021-2037, summer and winter peak load in the PENV area is forecast to grow at a CAGR of 0.8%.

The 2017 LTO was also used as a basis to create a current generation forecast for the PENV area. Existing PENV area generation includes the 689 MW Battle River coal-fired units and a 29 MW distribution-connected wind generator at Bull Creek. In the PENV area planning studies ("2018 Planning Studies"), attached as Appendix A, the AESO considered existing generation, in conjunction with anticipated Battle River coal unit retirements, to assess the capability of the transmission system for load serving in the area.

The 2017 LTO forecast for the PENV area assumes the development of 455 MW combined-cycle gas-fired generation to replace retiring coal, and new wind generation, attracted by wind resources that are very suitable for development.

Since the 2017 LTO was released, the Government of Alberta on December 13, 2017 announced the results of Round 1 of the Renewable Electricity Program ("REP"), pursuant to which four renewable generation projects totaling approximately 600 MW in aggregate were awarded renewable electricity support agreements. The PENV area forecast assumes the energization of the REP Round 1 winners in 2019 followed by approximately 400 MW of system-wide renewable additions per year from 2020 until 2030. Renewable additions will be supported through future rounds of the REP, which is intended to encourage the development of 5,000 MW of renewable electricity generation capacity by 2030. The AESO has estimated that the PENV area and the adjacent AESO planning area of Hanna (Area 42) have high potential for the development of renewables.

Details of the AESO's current PENV area load and generation forecast ("PENV area forecast") are set out in Appendix B to the 2018 Application, *Amended Provost to Edgerton and Nilrem to Vermilion Transmission Reinforcement Load and Generation Forecast*.

3 Need for PENV Area Transmission System Reinforcement

This section describes the transmission system adequacy and reliability requirements, and the need for, and timing of, transmission reinforcement in the PENV area.

3.1 PENV Area Transmission System Adequacy Assessment for Load - As described further in the 2018 Planning Studies, the AESO re-assessed the adequacy of the PENV area transmission network to supply load using the PENV area forecast.

This re-assessment includes studying load-stressed scenarios and contingencies[8] similar to those listed in Appendix A to the 2016 Application, *AESO PENV Area Transmission Reinforcement Planning Studies* ("2016 Planning Studies").[9]

These load-stressed scenarios included various combinations of forecast load, including summer and winter peak periods, and several generation dispatch scenarios to assess the performance of the transmission system in the PENV area.

Thermal and voltage criteria violations (constraints) under Category B contingencies were observed for both summer and winter peak load under several scenarios and contingencies. These thermal constraints were observed primarily when a PENV area transmission element was taken out of service, forming long radial lines from the otherwise networked 138 kV/144 kV transmission system. Under these conditions, the lines remaining in service have limited capacity to serve local load.

The 2018 Planning Studies demonstrate that, under load-stressed scenarios, Reliability Criteria violations in the form of thermal criteria and low voltage violations occur in the near and long term under Category B contingency conditions.

Thermal criteria violations were observed on the 7L50/7L129 and 749L/7L749[10] in the near term peak study scenarios (i.e., 2021 summer peak ("SP") and 2021 winter peak ("WP")), under various studied Category B contingencies. Thermal overloads of up to

[8] As defined in the AESO's *Consolidated Authoritative Document Glossary*, a contingency means the unexpected failure or outage of a system component, such as a generating unit, transmission line, circuit breaker, switch or electrical element. Appendix 1 to each of the Transmission Planning (TPL) standards, within the Alberta Reliability Standards, explains the contingency conditions through categories of events and their expected performance requirements. Additionally, the AESO's Transmission Reliability Criteria are referenced in Part C of this 2018 Application.

[9] Exhibits 22274-X0003-X0017.

[10] These are two of the three main 138/144 kV transmission lines in the PENV area.

107% of rated line capacity were observed. Studies indicate that these near term thermal criteria violations will be exacerbated as load increases and as demonstrated by the long term (2037) planning studies.

In addition, in both near term and long term study scenarios, low voltage violations occur near the Lloydminster 716S and Edgerton 899S substations following the loss of 749L.

In view of the aforementioned Reliability Criteria violations, the AESO has determined that transmission reinforcement continues to be needed in the PENV area in the near term to reliably serve the forecast load growth, in accordance with Alberta Reliability Standard TPL-002-AB1-0, *System Performance Following Loss of a Single BES Element*.

3.2 PENV Area Transmission System Adequacy for Generation Integration - The 2016 Application described a need for transmission development to serve generation locally in the PENV area, specifically along the existing 7L50 and 7L749/749L transmission paths. The 2016 Planning Studies were intended to provide a comprehensive assessment of local generation integration capability in the PENV area and incremental local generation integration capability that would result from the Preferred Transmission Development. The 2018 Planning Studies further expand on the 2016 Planning Studies by accounting for forecasted generation developments in Hanna (Area 42).

As described further in the 2018 Planning Studies, the need reassessment was expanded by studying new generation scenarios to address the addition of anticipated renewables onto the transmission system. These new scenarios complement the generation capability studies previously provided as part of the 2016 Planning Studies. To study the new generation scenarios, the AESO re-assessed the adequacy of the PENV area transmission network under generation-stressed scenarios in the immediate term (following REP Round 1 project energization in 2019), near term (2021 WP, 2021 SP, and 2021 SL), and long term (2037 WP and 2037 SP). The immediate term scenarios consider all the wind projects that are currently operational plus REP Round 1 winners assumed to be energized by 2019 on the Alberta interconnected electric

system (“AIES”). One of the REP Round 1 winners, EDP Renewables SH Project GP Ltd. (“EDPR”) Sharp Hills Wind Farm, was awarded a contract for 248.5 MW and is located in the Central East Sub-region just south of the PENV area. The near term generation scenarios undertaken as part of the 2018 Planning Studies consider generation projects to be integrated from 2020-2021 in addition to REP Round 1 and existing wind projects and thus these scenarios stress the system to assess the capability of the existing system to enable integration of new generation into the Central East Sub-region, including the PENV area.

The 2018 Planning Studies confirm the following:

- Thermal criteria violations under Category B contingencies were observed for 2019 SP, 2019 WP, 2021 SP, and 2021 WP under several studied Category B contingencies.
- These thermal violations reach as high as 112% (immediate term after REP Round 1) and with additional generation additions as a result of the upcoming second and third rounds of REP (assuming 200 MW in Hanna, 300 MW in Southwest and 300 MW in Southeast), these overloads further increase to as high as 126% along 7L50 line in the near term under an Eastern Alberta Transmission Line contingency condition. These overloads further increase to as high as 143% on 7L50 line for EATL contingency in 2022.
- The most critical contingencies that cause severe thermal over loads would be the loss of internal transmission paths within PENV area 749L/7L749, 7L50 or transfer out paths out of the southern and Central East Sub-regions EATL, 9L20, 912L.
- There continues to be capacity left in the PENV area to enable the connection of new generation. However, this capacity is limited, and those generation projects that are able to connect in the PENV area or the Central East Sub-region will be subject to a RAS and further limited by constraints under Category A (N-0) conditions. The Preferred Transmission Development will provide additional capacity for the connection of new generation in the PENV area and the Central East Sub-region.

- With the connection of the EDPR Sharp Hills Wind Farm project, 400 MW of generation will be tied to RAS #137 and #138, leaving approximately 66 MW of capacity remaining before reaching the AESO's current most severe single contingency ("MSSC")[11] threshold of 466MW. By 2021, the AESO anticipates, based on the PENV area forecast, that the amount of RAS-tripped generation in the PENV area will increase to 590 MW, thereby exceeding the current MSSC and potentially resulting in the need for pre-contingency curtailments and constraints under Category A conditions. This is a further indication of the limited amount of capacity that currently exists to integrate generation in the PENV area.

- By 2022, regardless of generation curtailment due to RAS, the AESO anticipates that overloads will be observed on 7L50 under Category A (N-0) conditions.

3.3 Timing of Transmission System Reinforcement - The AESO has re-evaluated the PENV area historical peak load and transmission system performance and determined that the local transmission system has limited remaining capacity to serve summer load above 400 MW under several single contingencies. The recorded PENV area summer peak load was greater than 400 MW for the past five years and is forecast to increase further, therefore, the AESO continues to conclude that there is an immediate need for transmission reinforcement in the PENV area.

In addition, the AESO has determined that there will be limited opportunities to connect renewable generation in the local PENV area and the greater Central East Sub-region moving forward. Given the high renewable resource potential in the area, such a constraint is expected to have an adverse impact on integrating future generation in the Central East Sub-region beyond 2021/22.

The anticipated lack of system capability for satisfying both the forecasted load in the PENV area and forecasted generation in the PENV area and the Central East Sub-region, in combination with the magnitude of the observed violations in both 2021 SP

[11] The Most Severe Single Contingency refers to the largest loss of generation capacity under a single contingency which could be either the largest generator on the system or the largest amount of generation curtailment by RAS due to a transmission contingency.

and 2021 WP study scenarios, collectively indicate that there continues to be a need to reinforce the PENV area transmission network before 2021.

Since the earliest estimated in-service date ("ISD") for the Preferred Transmission Development is June 30, 2022, the AESO will continue to rely upon existing operational procedures including existing and planned RAS to manage the PENV area transmission network reliability in real-time prior to transmission reinforcement being placed into service.

Notwithstanding the foregoing, the transmission development proposed in the AESO's *Transmission Enhancements in the Municipal Districts of Provost and Wainwright Needs Identification Document*, which was filed with the Commission on February 13, 2018[12] ("AESO Project 1782"), is anticipated to delay the need for the segment of the Preferred Transmission Development between the Edgerton 899S substation and the Killarney Lake 267S substation tap-point (the "Edgerton Component"). AESO Project 1782 was initiated by the AESO in response to a system access service request received by the AESO from FortisAlberta, and is currently scheduled to enter into service on or around May 1, 2020. As further discussed in Section 7 below, the AESO has consequently determined that it is appropriate to specify a milestone for the Killarney Tap to Edgerton Component.

[12] AUC Proceeding No. 23339.

4 Preferred Transmission Development

This section describes the AESO's Preferred Transmission Development to address the need described in Section 3.

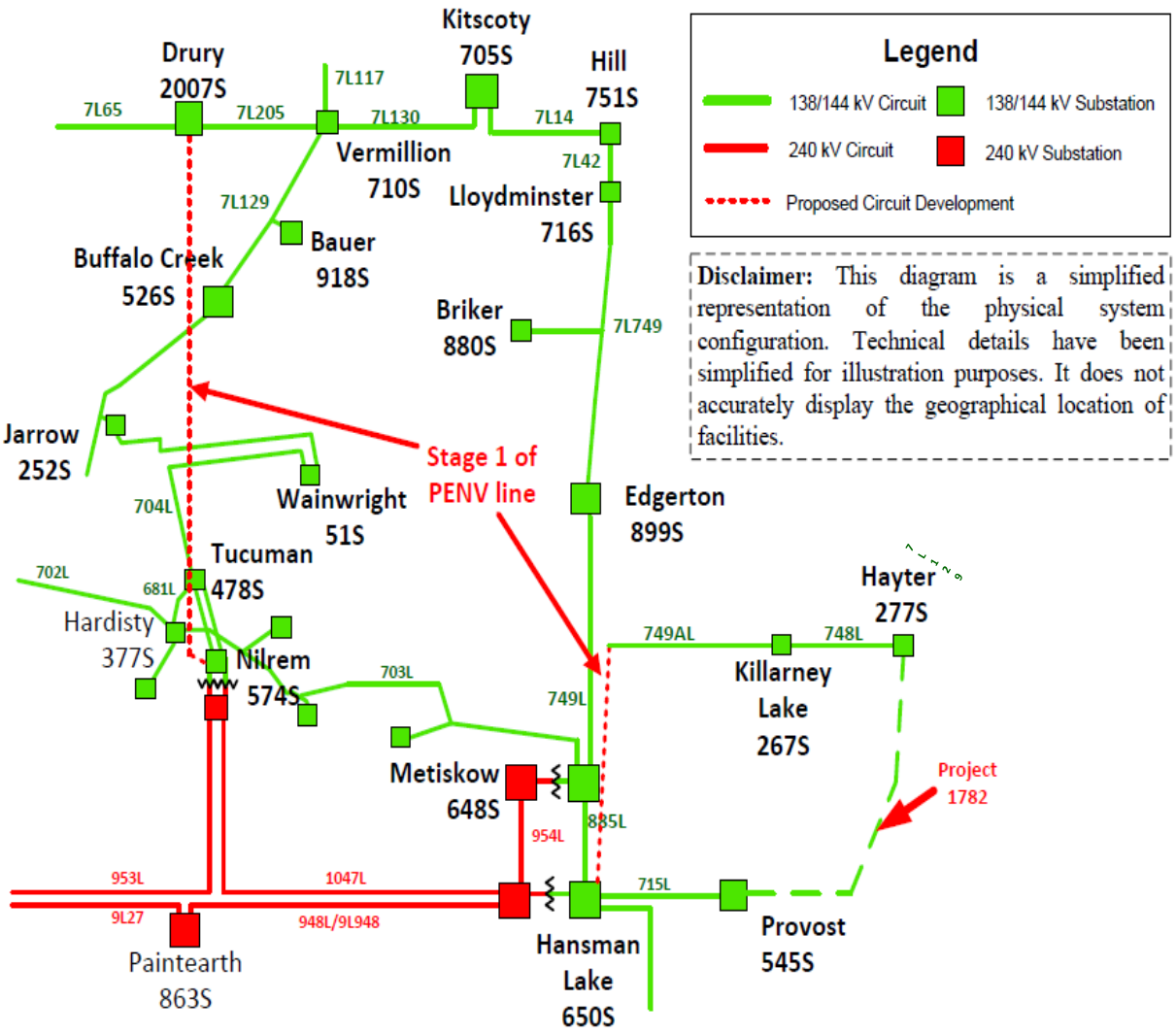
4.1 Preferred Transmission Development– Figures 1 and 2 illustrate the transmission system in the PENV area following the energization of the Preferred Transmission Development which includes the following major elements:

1. One new 144 kV Drury 2007S substation, expandable to 240 kV/144 kV, in the vicinity of the existing Vermilion 710S substation.
2. One new 240 kV single circuit from the existing 240/138 kV Nilrem 574S substation to the Drury 2007S substation with a minimum capacity of 485 MVA.[13] The new 240 kV circuit to be initially operated at a nominal voltage of 138 kV.
3. One new 240 kV single circuit from the existing 240/138/25 kV Hansman Lake 650S substation to the Killarney Lake 267S substation t-tap point (749AL) with a minimum capacity of 485 MVA. The new 240 kV circuit to be initially operated at a nominal voltage of 138 kV.
4. Relocate the connection of the 749Al T-Tap from 749L to the new line described above (#3).
5. The Edgerton Component, consisting of one new 240 kV single circuit from the existing 240/138/25 kV Edgerton 899S substation to the Killarney Lake 267S substation t-tap point (749AL) with a minimum capacity of 485 MVA ("Edgerton Component"). The new 240 kV circuit to be initially operated at a nominal voltage of 138 kV.
6. Connection of the existing 7L65 line in an in/out configuration to the Drury 2007S substation; rename the segment of 7L65 between Drury 2007S and Vermilion 710S substation as 7L205.
7. Modification, alteration, addition or removal of certain equipment, including switchgear, and any operational, protections, control and telecommunication devices required to

[13] Studied transmission circuit ratings have been approximated to the accuracy level required by the AESO for transmission planning purposes. Minimum circuit ratings specified by the AESO are consistent with ratings of the existing circuits. Actual ratings of constructed facilities may vary.

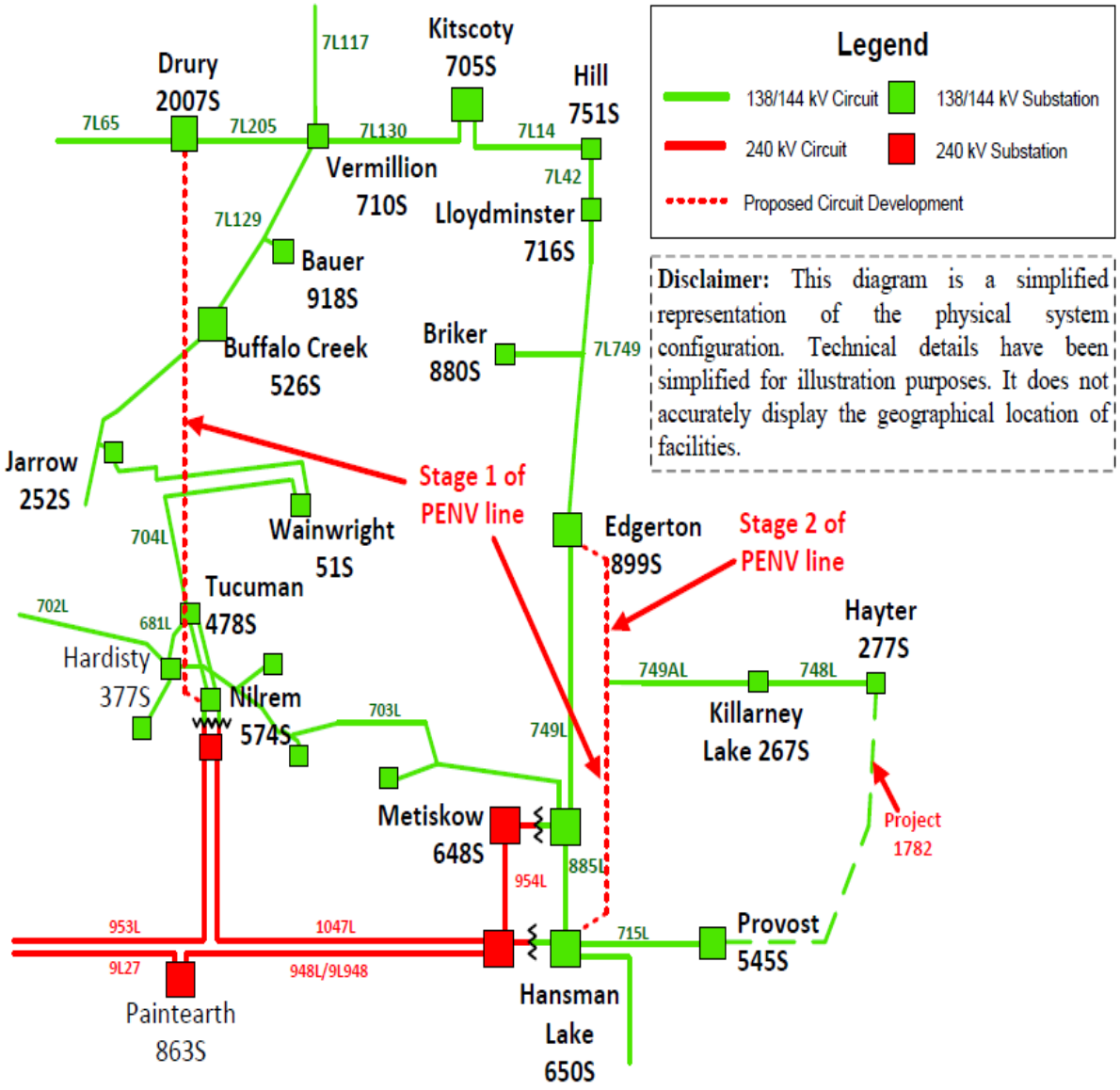
undertake the work as planned and ensure reliable integration of the Preferred Transmission Development with the transmission system.[14]

Figure 1: Simplified Single-Line Diagram of the PENV Area Transmission Network Following Implementation of the Preferred Transmission Development without the Edgerton Component



[14] Details and configuration of equipment required for the Preferred Transmission Development, including substation single line diagrams will be more specifically described in the AESO's functional specifications, that will be included in TFOs' transmission facility proposals. Also, further specifics will be determined as detailed engineering progresses. Routing and/or siting of the transmission facilities do not form part of this Application and will be addressed in the TFOs' transmission facility proposals.

Figure 2: Simplified Single-Line Diagram of the PENV Area Transmission Network Following Implementation of the Complete Preferred Transmission Development)



4.2 Proposed Drury 2007S Substation – As stated in the 2016 Application, the AESO initially considered terminating the proposed 138 kV transmission line from the existing Nilrem 574S substation at the existing Vermilion 710S substation. By way of letter dated May 24, 2016, attached as Appendix F to the 2016 Application, ATCO advised the AESO that adding a new line at existing Vermillion 710S substation would not be feasible due to right of way constraints. Consequently, a new substation is deemed necessary to terminate line from Nilrem to the Vermilion area, and the AESO is continuing to propose to develop the Drury 2007S substation to terminate the new 240 kV single circuit from Nilrem 574S substation.

Expansion of the Drury 2007S substation may in the future be required and applied for by the AESO, depending on the need to connect generation projects in the area.

4.3 Preferred Transmission Development Costs – The total capital cost of the Preferred Transmission Development continues to be estimated to be in the order of $240 million (+/-30%), assuming an in-service date (including for the Edgerton Component) of June 30, 2022.[15] In accordance with the ISO tariff, the Preferred Transmission Development does not include any costs classified as participant-related.

[15] The TFOs' have confirmed that, when accounting for the changes resulting from staging the Preferred Transmission Development and the ISD, the costs remain in the +30/-30% range of the cost estimate submitted with the 2016 Application. The cost is in nominal dollars using a base year of 2016 with escalation considered. Refer to the TFOs' capital cost estimates included as Appendix C of this Application for further details. Also, note iv of Part C of this Application describes the AESO's responsibilities with respect to transmission cost estimates and reporting.

5 Evaluation of Options and Selection of the Preferred Transmission Development

The reasons for the AESO's selection of the Preferred Transmission Development as the AESO's preferred option to meet the need remain as described in Section 5 of the 2016 Application.[16]

[16] Exhibit 22274-X0002 at Section 5.0.

6 Participant Involvement Program

The participant involvement program ("PIP") conducted by the AESO for the Preferred Transmission Development remains as described in Section 6 of the 2016 Application.[17]

[17] Exhibit 22274-X0002 at Section 6.0.

7 Proposed Development Schedule

7.1 Information Regarding Rule 007, Section 6.1 – NID9(2) – For the 2018 Application, the TFOs provided a revised approximate implementation schedule for the Preferred Transmission Development that results in an estimated earliest ISD of June 30, 2022, taking into account the requirements of Rule 007, Section 6.1, NID9(2). The AESO considers this ISD to be acceptable in the circumstances; however, the TFOs have advised the AESO that because their schedules necessarily contain numerous assumptions, the estimated ISD is subject to change as more detailed engineering and project planning is undertaken and regulatory and permitting activities are conducted.

7.2 Milestone - The AESO has determined it to be appropriate to specify the following milestone, in accordance with Subsection 11(4) of the *Transmission Regulation*, for the purpose of triggering construction of the Edgerton Component:

- The AESO's coincident summer aggregate peak load forecast reaching the existing capacity of the transmission line 749L (Edgerton 899S to the Killarney Lake 267S substation tap-point), which is approximately 83 MW, measured at the Edgerton 898S, Briker 880S, Lloydminster 716S, Hill 751S and Kitscoty 705S substation; or
- Construction commencing for generation projects that will connect along the transmission 749L path (from Hansman Lake 650S to Vermillion 710S) and that the AESO anticipates will give rise to congestion under Category A conditions on the transmission line 749L (Edgerton 899S to the Killarney Lake 267S substation tap-point); or
- The withdrawal or cancellation of FortisAlberta's system access service request for AESO Project 1782.

7.3 Milestone Monitoring Process - The AESO will monitor load forecast and generation projects along the Hayter to Provost loop as well as the Vermilion to Hansman Lake path and issue status report to the TFO and Commission on or before mid-December of each year to communicate whether the milestone for the Edgerton Component has been met.

Upon the milestone for the Edgerton Component being met, the AESO will:

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

Upon the TFO being advised by the AESO that the milestone for the Edgerton Component has been met, the TFO may commence construction of the Edgerton Component subject to the TFO having received the requisite approvals from the Commission to construct and operate the Preferred Transmission Development.

7.4 Information Regarding Rule 007, Section 6.1 – NID10 – The AESO intends to issue an unconditional direction to the TFOs for preparation and submission of the TFOs' facilities applications to the Commission for the Preferred Transmission Development, including the Edgerton Component, by October 31, 2019. If the AESO has not issued such directions to the TFOs before October 31, 2020, the AESO will confirm to the Commission in writing whether the need to expand or enhance the transmission system described in the 2018 Application continues, and whether the Preferred Transmission Development continues to be the AESO's preferred option for transmission reinforcement.

To ensure that construction of the Edgerton Component can begin in a timely manner after the milestone has been "met", the AESO intends to direct the TFO, as part of the TFO's transmission facility proposal, to request that permits and licences in respect of the Edgerton Component be issued subject to appropriate terms and conditions restricting the commencement of construction and development activities until such time as the AESO has advised the TFO that the milestone for the Edgerton Component has been met.

8 Long-term Transmission Plans

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

The *AESO 2017 Long-term Transmission Plan*, released by the AESO in January 2018 ("2017 LTP") recommends the Preferred Transmission Development to address the needs in the PENV area and Central East Sub-region and highlights the importance of this development for addressing load-driven reliability constraints as well as efficiently integrating renewables onto the transmission system, in order to support the Government of Alberta's legislated target of 30% energy produced by renewable electricity generation by 2030. [18]

8.1 Transmission Development Interdependencies – In the near term, and as noted above, the transmission development proposed in AESO Project 1782 impacts the timing of the need for the Edgerton Component

The Preferred Transmission Development will alleviate the identified need in the 20-year planning horizon and, with the exception of AESO Project 1782, continues to be required independent of any other transmission developments that are currently planned within the AIES in this timeframe.

[18] The 2017 LTP can be found on the AESO's website at https://www.aeso.ca/grid/long-term-transmission-plan/

9 CETD NID Approval Amendment

As further described at Section 9 of the 2016 Application, the AESO continues to request that the unconstructed, approved components of the CETD NID Approval be cancelled.

Additionally, in January 2018, ATCO advised the AESO that it does not recommend re-building either 7L50 or 7L749 on the existing right-of-way ("ROW") as contemplated in the CETD NID Approval. ATCO advised the AESO that:

- the existing 7L50 ROW is narrow with the presence of numerous residential and environmental constraints;
- the current mid-field, diagonal alignment of 7L50 does not follow current accepted routing practices and building a new 7L50 complete within the existing ROW is not possible;
- an extended outage for re-building 7L50 in the existing ROW is not acceptable in either the summer peak or winter peak conditions; and
- the existing 7L749 ROW is also very narrow and would require numerous extended outages.

Similarly, AltaLink advised the AESO in January 2018 that rebuilding the portion of 749L that is located in AltaLink's service territory within the same ROW would require a series of extended (8-16 week) outages along 749L, and the placing of a number of loads (specifically, the 277S Hayter, 267S Killarney, 899S Edgerton, A716S Lloydminster, A751S Hill and A705S Kitscoty substations) during the outage periods.

9 Relief Requested

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

- its assessment of the need for transmission system reinforcement in the PENV area is technically complete;
- its assessment that certain CETD NID components are no longer needed is technically complete, and cancelling them is in the public interest; and
- the Preferred Transmission Development meets the identified need, satisfies Alberta Reliability Standards, is consistent with the AESO long-term forecasts and area transmission system plans, and is in the public interest.

As such, the AESO also submits that approval of the 2018 Application is in the public interest.

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

(a) approve the 2018 Application subject to the milestone for the Edgerton Component described herein, including the Preferred Transmission Development, which will be comprised of the following:

1. One new 144 kV Drury 2007S substation, expandable to 240 kV/144 kV, in the vicinity of the existing Vermilion 710S substation;
2. One new 240 kV single circuit from the existing 240/138 kV Nilrem 574S substation to the Drury 2007S substation with a minimum capacity of 485 MVA.[19] The new 240 kV circuit to be initially operated at a nominal voltage of 138 kV;
3. One new 240 kV single circuit from the existing 240/138/25 kV Hansman Lake 650S substation to the Killarney Lake 267S substation t-tap point (749AL) with a

[19] Studied transmission circuit ratings have been approximated to the accuracy level required by the AESO for transmission planning purposes. Minimum circuit ratings specified by the AESO are consistent with ratings of the existing circuits. Actual ratings of constructed facilities may vary.

minimum capacity of 485 MVA. The new 240 kV circuit to be initially operated at a nominal voltage of 138 kV;

4. Relocate the connection of the 749Al T-Tap from 749L to the new line described above (#3);

5. The Edgerton Component, consisting of one new 240 kV single circuit from the existing 240/138/25 kV Edgerton 899S substation to the Killarney Lake 267S substation t-tap point (749AL) with a minimum capacity of 485 MVA. The new 240 kV circuit to be initially operated at a nominal voltage of 138 kV;

6. Connection of the existing 7L65 line in an in/out configuration to the Drury 2007S substation; rename the segment of 7L65 between Drury 2007S and Vermilion 710S substation as 7L205;

7. Modification, alteration, addition or removal of certain equipment, including switchgear, and any operational, protections, control and telecommunication devices required to undertake the work as planned and ensure reliable integration of the Preferred Transmission Development with the transmission system;[20] and

(b) amend CETD NID Approval No. U2013-130 as described in Section 9.1 of the 2016 Application.

All of which is respectfully submitted this 26th day of March, 2018.

Alberta Electric System Operator

< Electronically Submitted >

Sami Abdulsalam, Ph.D., P. Eng.
Director, Transmission Planning

[20] Details and configuration of equipment required for the Preferred Transmission Development, including substation single line diagrams will be more specifically described in the AESO's functional specifications that will be included in TFOs' transmission facility proposals. Also, further specifics will be determined as detailed engineering progresses. Routing and/or siting of the transmission facilities do not form part of this Application and will be addressed in the TFOs' transmission facility proposals.

PART B – APPLICATION APPENDICES

The following appended documents support the 2018 Application (Part A). The appendices include work undertaken by the AESO in the execution of its duties to plan the transmission system and in the preparation of this Application.

APPENDIX A AESO PENV Area Transmission Reinforcement Planning Studies – Appendix A contains the *Supplemental Planning Studies Report* ("2018 Planning Studies") that is based on the most current load and generation forecast for the PENV area.

APPENDIX B AESO Load and Generation Forecast – Appendix B contains the *Amended Provost to Edgerton and Nilrem to Vermillion Transmission Reinforcement Load and Generation Forecasts* used in the planning studies report contained in Appendix A.

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

APPENDIX D AESO Participant Involvement Program (PIP) – Appendix D provides a summary of the PIP activities conducted regarding the need for the transmission reinforcement in the PENV area and the Preferred Transmission Development, and cancellation of certain approved CETD NID developments.

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

APPENDIX F ATCO Letter regarding Vermilion 710S Substation – Appendix F contains ATCO's letter stating that right of way constraints prevent expanding the

Vermilion 10S substation to accept termination of the new circuit from Nilrem 574S substation.

APPENDIX G AESO Transmission Planning Criteria – Basis and Assumptions

Appendix G contains the Transmission Planning Criteria – Basis and Assumptions, Version 1.0, which includes the applicable thermal and voltage limits in support of the Transmission Planning (TPL) standards. Planning studies that are included in the 2018 Application meet the relevant performance requirements of the specified TPL standards (TPL-001-AB-0 and TPL- 002-AB0).

PART C – REFERENCES

i. **AESO Planning Duties and Responsibilities and Duty to Forecast Need –** Certain aspects of the AESO's duties and responsibilities with respect to planning the transmission system are described in the Act. For example, Section 17, subsections (g), (h), (i), and (j), state the general planning duties of the AESO. Section 33 of the Act states that the AESO "must forecast the needs of Alberta and develop plans for the transmission system to provide efficient, reliable, and non-discriminatory system access service and the timely implementation of required transmission system expansions and enhancements". As stated in subsection 34(1) of the Act, when the AESO determines that an expansion or enhancement of the capability of the transmission system is or may be required to meet the needs of Alberta and is in the public interest, the AESO must prepare and submit to the Commission for approval a needs identification document that describes the constraint or condition affecting the operation or performance of the system and indicates the means by which or the manner in which the constraint or condition could be alleviated. Where, as in this case, the AESO has identified a need to reinforce the transmission system to relieve anticipated reliability violations, it has set about to determine a reasonable solution to meet the identified need. In determining the means by which, or the manner in which, the constraint or condition affecting the operation or performance of the transmission system could be alleviated, the AESO has applied engineering judgments and made assumptions as necessary. Such judgments and assumptions being required and permitted by its prescribed responsibilities and authorities under the Act. In accordance with Section 11 of the *Transmission Regulation*, the AESO has considered technical, economic, environmental and other factors as necessary in determining its preferred option for system expansion. Pursuant to Section 11(4) of the *Transmission Regulation*, the AESO has determined it to be appropriate to specify a milestone for the Edgerton Component.

ii. **AESO Planning Criteria -** The AESO is required to plan a transmission system that satisfies applicable reliability standards. TPL standards are included in the Alberta Reliability Standards and are described at: http://www.aeso.ca/rulesprocedures/17006.html

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

iii. **Application for Approval of the Need for Expansion or Enhancement of the Capability of the Transmission System –** This Application is directed solely to the question of the need for expansion or enhancement of the capability of the transmission system as more fully described in

the Act and the *Transmission Regulation*. This Application does not seek approval of those aspects of transmission development that are managed and executed separately from the needs identification document approval process. Other aspects of the AESO's responsibilities regarding transmission development are managed under the appropriate processes, including the ISO Rules, Alberta Reliability Standards and the ISO Tariff, which are also subject to specific regulatory approvals. While the Application or its supporting appendices may refer to such other processes or information from time to time, the inclusion of such information is for context and reference only**.**

Any reference within the Application to market participants or other parties and/or the facilities they may own and operate or may wish to own and operate is not intended to constitute an application for approval of such facilities, and the responsibility for seeking such regulatory or other approval remains the responsibility of such market participants or other parties.

iv. **Capital Cost Estimates** – Capital costs estimates provided in the Application are planning cost estimates used by the AESO for the sole purpose of comparing transmission development options. Where only a single transmission development option has been studied, capital cost estimates are provided for context. Project costs will be determined by the TFOs as part of their transmission facility proposals. The AESO's responsibilities with respect to project cost reporting are described in the *Transmission Regulation*, including Section 25, and Section 9.1 of the ISO rules.