APPENDIX B

Provost to Edgerton and Nilrem to Vermilion Transmission Reinforcement

Amended Load and Generation Forecast

1 Introduction

1.1 Load and generation forecasts are an essential input to the AESO's transmission planning process. This document describes the forecast used in the 2018 Provost to Edgerton and Nilrem to Vermilion (PENV) Transmission Reinforcement planning studies (2018 Planning Studies) described in the *2018 Provost to Edgerton and Nilrem to Vermilion Planning Studies Supplemental Report*.[1]

1.2 The 2018 Planning Studies are focused on the PENV area, which consists of the following AESO planning areas: Lloydminster (Area 13), Wainwright (Area 32), Battle River (Area 36), Provost (Area 37), and Vegreville (Area 56). Accordingly, the information and data presented in this document provides load growth forecasts in the PENV area and related generation forecasts over the 20-year planning horizon.

1.3 In Decision 22274-D01-2018, the Alberta Utilities Commission (Commission) referred the PENV needs identification document application (2016 Application) back to the AESO in accordance with Subsection 34(3)(b) of the *Electric Utilities Act*. As a result, this document presents the most current load and generation data for the PENV area.[2] In addition, the PENV area load peak/minimum data presented reflects load peak/minimum at time of PENV area peak rather than the load peak/minimum PENV area at time of Central East Sub-region peak, in order to more accurately reflect the local PENV area where transmission development is being considered. The load and generation data is based on the *AESO 2017 Long-term Outlook* (2017 LTO); however, the forecast has been revised to create a project-specific forecast that reflects the latest

[1] Filed under a separate cover.

[2] The AESO updates its corporate load and generation forecast annually. The AESO's latest corporate load forecast and associated forecast scenarios released July 2017, are found in the 2017 Long-term Outlook, also referred to as the 2017 LTO. This forecast is available online on the AESO forecasting page found at: https://www.aeso.ca/download/listedfiles/AESO-2017-Long-term-Outlook.pdf

information available to the AESO. Details and clarifications around the use of the 2017 LTO, for the purpose of assessing the PENV area transmission adequacy and planning for respective transmission system reinforcement in this area, are included within this document.

2 Historical Load

2.1 Tables 2-1, 2-2, and 2-3 provide historical load levels for the PENV area at the summer peak, winter peak, and summer minimum loading levels.

Table 2-1: Historical Summer Peak Loads (MW)

Year	PENV Area
2007	366
2008	366
2009	363
2010	371
2011	376
2012	394
2013	418
2014	404
2015	426
2016	420
2017	423

Table 2-2: Historical Winter Peak Loads (MW)[3]

Year	PENV Area
2007	410
2008	421
2009	422
2010	431
2011	446
2012	451
2013	478
2014	486

[3] Winter peak load is the peak load that was observed over the course of a continuous winter season that starts on November 1st of the year identified and runs to April 30th of the following year. For the 2017 winter peak, the load value provided is the peak load observed between November 1, 2017 and December 31, 2017.

2015	480
2016	491
2017	477

Table 2-3: Historical Summer Light Loads[4] (MW)

Year	PENV Area
2007	258
2008	252
2009	241
2010	237
2011	260
2012	266
2013	266
2014	255
2015	264
2016	256
2017	232

2.2 The summer peak load compound annual growth rate (CAGR) for the PENV area from 2012-2017 is 1.4 percent. The winter peak load CAGR for the PENV area over the same time period is 1.1 percent. Load in the PENV area is primarily comprised of manufacturing, pipeline pumping and oil storage facilities.

2.3 The growth rates presented in this document are different from the previously filed PENV load and generation forecast appendix for two reasons. First, as already noted above, the peak load presented in this document is PENV area at time of PENV peak rather than PENV area at time of Central East Sub-region peak. Second, new historical load information is available and the 5 year CAGR calculation was shifted to reflect the latest 5 years of growth. It is important to note, however, that historical growth rates are provided for reference only and do not inform the need for this project.

2.4 It is the general practice of the AESO to use the last 6 years of data to calculate a 5 year CAGR. However, loads in the PENV area fluctuate from year

[4] The Summer Light load represents the minimum loading observed in the summer period.

to year due to temperature, variable pipeline pumping loads, and other factors. Therefore, the CAGR calculation with regards to historical peaks can be a misleading representation of growth depending on the years chosen for the calculation. When examining the CAGR from 2012-2017, the starting year of 2012 has a higher summer and winter peak than any previously recorded peak prior to 2012 and the 2017 end year is not the highest summer and winter peak ever recorded. This is a good indication that the 5 year CAGR presented here and the AESO's general practice to use the last 6 years of data to calculate a 5 year CAGR are reasonably conservative.

3 Load Forecast

3.1 While developing the load forecast for the PENV area, the AESO considered historical load and reviewed 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. and ATCO Electric Ltd. As a result of reviewing load in the PENV area the AESO made changes to the PENV area load forecast including adding the approved Vincent 2019S Substation,[5] removing an expired substation (less than a MW of load), and aligning several other substations with historical load.

3.2 The AESO's load forecast for summer peak and winter peak in the PENV area is forecast to grow at a CAGR of 1.2% from 2017 to 2037, which is consistent with the historical 5 year CAGR. For additional clarity, the AESO has separated the PENV area load forecast into two timeframes. In the near-term timeframe, from 2017 to 2021, summer peak and winter peak load in the PENV area is forecast to grow at a CAGR of 3.0 percent. This is higher than the historical 5 year CAGR because of the inclusion of the approved Vincent 2019S

[5] The *Vincent 2019S Substation Needs Identification Document* was originally approved by the Commission on April 26, 2016 in Decision 21166-D01-2016 and issued NID Approval No. 21166-D02- 2016.

Substation, ramping up of recently energized projects and assumed recovery of load in the PENV area due to increasing oil prices.

3.3 The medium to long-term timeframe is post-2021 where summer and winter peak load in the PENV area is forecast to grow at a CAGR of 0.8 percent (2021 to 2037). The lower growth rates post-2021 reflects the absence of known load projects and conservative assumptions regarding future oil market conditions and pipeline development and expansion. Tables 3-1, 3-2, and 3-3 provides the summer peak, winter peak and summer minimum load in the PENV area.

Table 3-1: Forecast Summer Peak Load (MW)

Year	PENV Area
2021	477
2027	494
2037	538

Table 3-2: Forecast Winter Peak Load (MW)

Year	PENV Area
2021	536
2027	545
2037	607

Table 3-3: Forecast Summer Light Load (MW)

Year	PENV Area
2021	274
2027	286
2037	317

4 Existing Generation

4.1 The PENV area contains the existing generating units shown in Table 4-1. Generation within the PENV area includes the distribution connected Bull Creek Wind generating facility and the Battle River Generating Station. Total existing generation in the PENV area is 718 MW.

Table 4-1: Existing PENV Generation

Generation Facility Name and Unit Number	Maximum Capability (MW)	AESO Planning Area	Generation Type
Bull Creek	29	Provost (Area 37)	Wind
Battle River No. 3	149	Battle River (Area 36)	Coal-fired
Battle River No. 4	155	Battle River (Area 36)	Coal-fired
Battle River No. 5	385	Battle River (Area 36)	Coal-fired
Total	718		

5 Generation Forecast

5.1 The generation forecast for the PENV area considers the potential for renewable generation development, the retirement of existing coal-fired generation by 2030, and the future conventional generation development.

5.2 On December 13, 2017, the Government of Alberta announced the results of Round 1 of the Renewable Electricity Program (REP),[6] which included approximately 600 MW of renewable generation.

5.3 The forecast assumes the energization of the REP Round 1 winners in 2019 followed by approximately 400 MW of renewable additions per year from 2020 until 2030. Renewable additions are supported through future rounds of

[6] More information on the Renewable Electricity Program can be found at: https://www.aeso.ca/market/renewable-electricity-program/

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 contains a significant amount of renewable resources that are suitable for development. The ultimate potential for renewable development in the PENV area is much greater than 860 MW, which is the generation integration capability of the PENV area under the AESO's preferred transmission development. There are also significant renewable resources suitable for development in Hanna (AESO Planning Area 42), which is adjacent to the PENV area.

5.4 As part of the AESO's *2017 Long-term Transmission Plan* (2017 LTP)[7], the AESO developed a strategy to integrate the addition of approximately 5,000 MW of renewable generation referenced above by utilizing capacity on the existing transmission system and the planned completion of a number of developments identified in the 2017 LTP. The PENV Transmission Reinforcement project has been identified in the 2017 LTP as a development that will provide generation collection capability and extend the 240 kV transmission system to Vermillion and Edgerton for renewable integration in the PENV area.

5.5 The AESO's March 2018 connection project list[8] contains 555 MW of renewable projects within the PENV area, which indicates active near-term interest that exceeds the current capability of the system in the PENV area. In addition, the AESO's March 2018 connection project list contains 2,175 MW of renewable projects in the neighbouring Hanna area south of the PENV area. However, uncertainties still exist around the timing, size and locations of renewable resources. As such, the AESO has not prepared a renewable forecast specific to the PENV area. Instead, as described further in the 2016 Planning

[7] AESO's 2017 Long-term Transmission Plan can be found at: https://www.aeso.ca/assets/Uploads/AESO-2017-Long-termTransmissionPlan-Final.pdf
[8] AESO project list: https://www.aeso.ca/grid/projects/project-reports/

Studies, the AESO instead assessed the capability of each of the studied PENV transmission options to directly connect potential future renewable generation.

5.6 The Government of Alberta recently announced a coal phase out plan to end coal power emissions on or before December 31, 2030. The exact timing of the retirements is unknown at this time. As listed in Table 4-1, the only coal-fired generation facility in the PENV area is the Battle River Generating Station. The AESO's forecast makes the following assumptions with respect to the timing of the Battle River coal-fired generating unit retirements, as shown in Table 5-1.

Table 5-1: Coal-fired Generating Unit Retirement Assumptions in the PENV Area

Generator Name and Unit Number	Assumed Retirement date by
Battle River No. 3	Dec 31, 2019
Battle River No. 4	Dec 31, 2025
Battle River No. 5	Dec 31, 2027

5.7 The forecast assumes 455 MW of combined-cycle gas-fired generation development in the PENV area after the retirement of the Battle River coal-fired generating units. The AESO recognizes the possibility that combined-cycle gas-fired generation developments in the PENV area could take the form of new greenfield developments or replacements for retiring coal-fired units at brownfield sites. It is also possible that one or more coal-fired units could be converted to gas-fired units.