ATTACHMENT - AESO CONNECTION ASSESSMENT

Engineering Connection Assessment

ENMAX Power Corporation North 69 kV Subsystem Reliability Project

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Contents

1 Introduction

This AESO Engineering Connection Assessment describes the AESO's assessment of the Project (as defined below), the connection alternatives considered, and the AESO's recommendations on applicable minimum transmission facility ratings.

1.1 Project Overview

ENMAX Power Corporation (EPC) (Market Participant), in its capacity as the legal owner of an electric distribution system (DFO), has submitted a request for system access service to the Alberta Electric System Operator (AESO) to improve the reliability of electricity services in Northwest Calgary.

The DFO's request includes a request for transmission development (the Project). Specifically, the DFO requested an upgrade to the existing the SS-36 substation.[1] Details on the need for enhancement are provided in the DFO's Statement of Need (SON). The DFO's request does not include a requested Rate DTS, *Demand Transmission Service*, contract capacity increase.

The scheduled in-service date (ISD) for the Project is December 14, 2018.

[1] EPC refers to this substation as SS-36.

2 Assessment Scope

2.1 Objectives

The objectives of this AESO Engineering Connection Assessment are as follows:

- Evaluate Project connection alternatives and identify the AESO's preferred alternative.
- Recommend minimum transmission facility ratings.

2.2 Existing System

Geographically, the Project is in DFO's North 69 kV Subsystem located in the AESO planning area Calgary (Area 6), which is part of the AESO Calgary planning region.

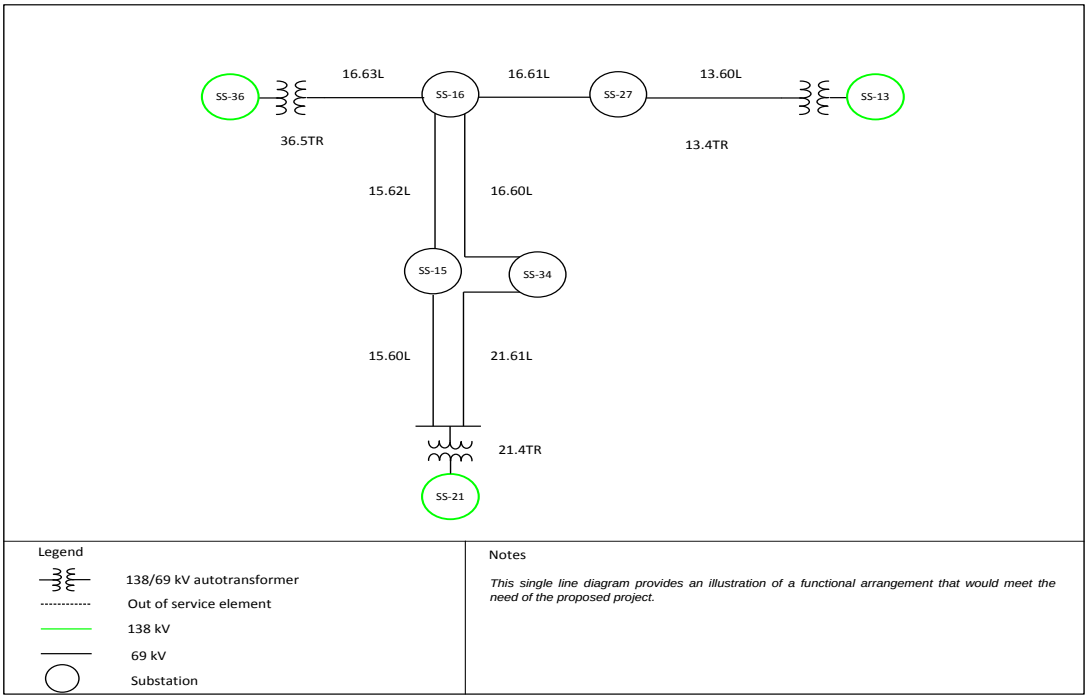
From a transmission system perspective, DFO's North 69 kV Subsystem serves the distribution load through the 138/69 kV transformers 36.5TR at SS-36, 13.4TR at SS-13, and 21.4TR at SS-21.[2] The North 69 kV Subsystem comprises four 69/13.8 kV point of delivery (POD) substations, SS-15, SS-16, SS-27, and SS-34.[3]

Existing constraints in the Calgary planning region are managed in accordance with the procedures set out in Section 302.1 of the ISO rules, *Real Time Transmission Constraint Management* (TCM Rule).

[2] EPC refers to these substations as No. 36, No. 13, and No. 21, respectively.

[3] EPC refers to these substations as No. 15, No. 16, No. 27, and No. 34, respectively.

Figure 2-1: ENMAX North 69 kV Subsystem



3 Connection Alternatives

3.1 Overview

The AESO, in consultation with the TFO in the Study Area and the DFO, examined 6 alternatives to meet the DFO's request for system access service, as detailed in Section 3.2.[4]

3.2 Alternatives Examined

Below is a description of the developments associated with the transmission alternatives that were examined for the Project. Alternatives 1, 2, and 3 involve operational measures only. They do not involve transmission development. Alternatives 4, 5 and 6 involve transmission development.

Alternative 1 – Open 15.62L and 16.6L before any planned outages

This alternative does not include transmission development. This alternative involves opening the 69 kV transmission lines, 15.62L and 16.60L before a planned outage such as a maintenance outage to the 138/69 kV transformer at SS-13, 13.4TR, to prepare for a possible forced outage. This alternative will split the North 69 kV Subsystem into two radially fed systems. One will supply two substations, SS-16 and SS-27 through the 138/69 kV transformer 36.5TR; the other will supply two substations, SS-15 and SS-34 through the 138/69 kV transformer 21.4TR.

Alternative 2 – Add a N-1-1 Remedial Action Scheme (RAS) on 36.5TR

This alternative does not include transmission development. This alternative involves adding a RAS on 36.5TR to monitor the thermal loading on 36.5TR under N-1-1 contingencies. The RAS will trip selected loads in the North 69 kV Subsystem when a thermal violation is observed on 36.5TR under an N-1-1 contingency. The tripped loads will be transferred to substations outside of the North 69 kV Subsystem.

Alternative 3 – Transfer selected loads to surrounding substations, before any planned outages

This alternative does not include transmission development. This alternative involves transferring loads from the North 69 kV Subsystem to substations outside of the Subsystem, before any planned outages, such as a maintenance outage of 13.4TR to prepare for possible forced outages such as a forced outage of 21.4TR.

Alternative 4 – Add a second transformer at SS-21

This alternative includes adding a second 138/69 kV transformer and associated equipment at SS-21 including bus tie breakers at the 138 kV and 69 kV buses.

Alternative 5 – Replace the existing transformer at SS-36 with one of higher capacity

This alternative involves replacing the existing 138/69 kV transformer 36.5TR with a transformer of higher capacity.

[4] These alternatives reflect alternatives examined by the AESO for connection assessment purposes. EPC's distribution planning alternatives can be found in ENAMX Statement of Need *North 69 kV Subsystem Reliability Project*, which is provided under a separate cover.

Alternative 6: Add a second transformer at SS-36 of similar capacity and operate it in parallel

This alternative involves adding a second 138/69 kV 50 MVA transformer at SS-36 and running it in parallel with the existing 36.5TR.

3.3 Alternatives Selected for Further Consideration

Alternative 5 and 6 are considered technically feasible and were selected for further consideration.

3.4 Alternatives Not Selected for Further Consideration

The DFO has advised that Alternative 1, Alterative 2, and Alternative 3 are in violation of the DFO's Distribution System Performance Standard. Therefore, these alternatives were not selected for further consideration.

Alternative 4 would involve increased transmission development, and hence overall increased cost, compared to Alternative 5. Therefore, Alternative 4 was not selected for further consideration.

4 Assessment Approach

Engineering studies are not required for the Project as there is no change to the Rate DTS or transmission system topology.

5 Project Dependencies

The Project does not require the completion of any other AESO plans to expand or enhance the transmission system prior to connection.

6 Conclusions and Recommendations

Both Alternative 5 and Alternative 6 are technically viable. The connection of the Project with either Alternative 5 or Alternative 6 will not adversely affect the performance of the AIES.

Cost estimates prepared by the TFO and DFO indicate that Alternative 5 has a lower estimated total cost than Alternative 6[5]. While both Alternative 5 and Alternative 6 are technically viable, Alternative 5 is the preferred alternative based on total cost.

It is recommended to proceed with the Project using Alternative 5 as the preferred option to respond to the DFO's request for system access service to improve the reliability of electricity services in Northwest Calgary. Alternative 5 involves replacing the existing 138/69 kV transformer 36.5TR with a transformer of higher capacity.

A minimum transformation capability of 92 MVA is recommended based on the DFO's forecasted 2018 winter peak load on the EPC North 69 kV Subsystem and the DFO's System Performance Standard.

[5] Cost estimates for Alternative 5 and Alternative 6 are provided under separate cover.