



Distribution Point-of-Delivery Interconnection Process Guideline

Upgrades to Existing Substations

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1.0 Introduction

1.1 Purpose

This guideline defines the process by which a Distribution Facility Owner and a Transmission Facility Owner (DFO/TFO) can evaluate a proposed upgrade to an existing substation. It is intended to provide a uniform and consistent approach in support of these upgrades. This guideline is not intended for use to justify new point of delivery substations.

This guideline is intended solely for the purpose of supporting the AESO's customer interconnection process to arrive at proposed interconnection concepts that are optimized on a technical and economic basis. It will not in any way address or determine the AESO's facility cost allocation between system and customer, nor will it be used in any way as a guideline in applying the AESO approved tariffs and investment policy.

This guideline is intended to facilitate documentation of the project need and the evaluation done to support the need, in alignment with the interconnection process. The interconnection process has a requirement for AESO endorsement and AEUB approval of the project need.

1.2 Application of Guideline

This guideline applies only to upgrades to existing distribution point of delivery substations. Upgrades include, but not limited to:

- high voltage circuit breaker additions;
- supply transformer upgrades or addition;
- communication and or protection upgrades;
- bus work upgrades/reconfiguration.

It is recommended that this guideline be used in conjunction with the other AESO Interconnection Process Guideline documents to assist in developing the project need. The documents are entitled: Standards of Service; Drivers of Need; and Economic Evaluation.

1.3 Modifications

In respect to this guideline the AESO will:

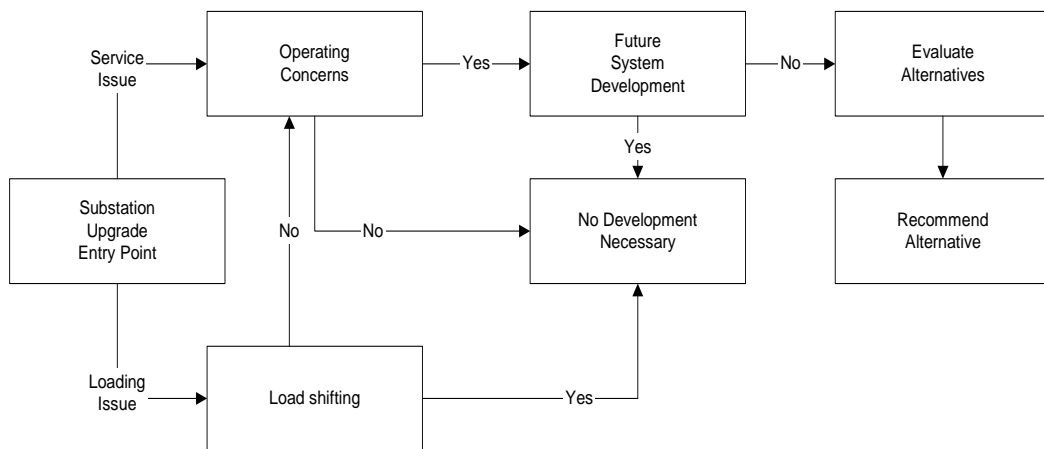
- a) seek and consider the input and feedback of affected parties prior to making changes or additions to the guideline;
- b) make and manage all changes to this guideline;
- c) make this guideline publicly available via the AESO website;
- d) periodically and within five (5) years of the effective date shown on the cover page review this guideline.

2.0 Substation Upgrade Need Evaluation Flowchart

In order to facilitate the application of this guideline, a “decision tree” format was developed and shown in Figure 2-1, “Substation Upgrade Need Evaluation Flowchart”. The various flowchart components are defined in Section 3.0, “Guide to Flowchart Components”.

For concerns emanating on the Distribution System, the DFO will take the lead working with the TFO in developing the Interconnection Proposal. For concerns emanating within a substation, the TFO will take the lead in preparing an interconnection proposal with the involvement of the DFO. The DFO will provide load forecasts and assess distribution alternatives for the interconnection proposal.

Figure 2-1 Substation Upgrade Need Evaluation Flowchart



3.0 Guide to Flowchart Components

3.1 Substation Upgrade Entry Point

Generally, substation upgrades are driven by a concern around the quality of service or transmission capacity. Therefore, the entry points to the flowchart are either related to a service issue or a load issue and are more thoroughly described in the AESO Interconnection Process Guideline - Drivers of Need.

3.1.1 *Service Issue*

A service issue occurs within a substation when there are power quality complaints, distribution system operating concerns, frequent outages, significant repair times due to location and availability of crews or reliability concerns of the transmission supply or identification of a non compliance with industry or utility standards. Please refer to the AESO Interconnection Process Guideline – Standards of Service.

3.1.2 *Loading Issue*

A loading issue occurs when the capacity of any elements at the substation cannot supply the load on a forecast basis or where the DFO/TFO N-1 contingency restoration practices are not met. A contingency includes, but is not limited to the following:

- loss of the transmission line supply;
- loss of the largest station transformer;
- loss of distribution breaker and/or distribution bus;
- loss of interconnected distribution lines; and
- loss of transformers at adjacent substations.

3.2 Operational Concerns

Operating concerns include but are not limited to the following:

- number of connected customers impacted;
- power quality complaints (e.g. voltage flicker and low or high operating voltages);
- number of substation outages required for maintenance work;
- supply restoration time to customers following loss of a transmission element;
- significant momentary or sustained outages due to transmission line configuration (e.g. T-tap connection).

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The above issues are further described in the AESO Interconnection Process Guideline - Standards of Service document. These operational concerns may be present for both service and loading issues.

3.3 Load shifting

Load shifting involves the re-arrangement of normally open points to transfer line segments or taps to feeders supplied from adjacent substations, thereby redistributing the feeder load to the available transformation capacity at each substation.

Careful consideration must go into load shifting as there are optimal normally open points on the distribution system that are determined by:

- evaluating distribution losses;
- reliability issues;
- service level requirements to sensitive and/or large customers; and
- operating issues such as distances between service centers and switching configuration.

3.4 Future System Development

Future transmission or distribution system development within the area may negate the requirement for additional transmission facilities. Factors such as the impact of a new substation, system re-configuration, and distribution system automation are to be considered if they occur within a reasonable timeframe (< 2 years).

The TFO and DFO should communicate with the AESO Regional Planners in assessing the need for more transmission development. Additional information on future system development can be found in the AESO Regional Transmission Plans, Facility Applications filed with the AEUB, and DFO distribution plans.

3.5 Evaluate Alternatives

If there are no system projects within the area as described in Section 3.4, the DFO and TFO would evaluate different alternatives to alleviate the DFO and/or TFO concern. These alternatives would consider either distribution or transmission solutions or a combination of both.

The following are some of the factors to be considered in doing the evaluation:

- load forecast of the feeder and the substation and those for adjacent substations;
- assessment of the transmission systems ability to deliver;

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- performance assessment;
- estimated restoration and repair/replacement times;
- capital cost;
- operational flexibility;
- cost of distribution losses;
- economic evaluation (as per the AESO Interconnection Process Guideline – Economic Evaluation).

3.6 Recommended Alternative

The recommended alternative can range from implementing operational measures to a large capital project. The TFO is accountable to develop an “Interconnection Proposal” for any transmission system upgrades.

4.0 Substation Upgrade Need Evaluation Process

The substation upgrade need evaluation should follow the steps as outlined in Sections 2.0 and 3.0.

The submission of an Interconnection Proposal to the AESO for endorsement should include supporting documentation based on the various components of need and the proposed logic and discussion of the preferred development. Table 4-1 may provide assistance in completing this task and can be used to facilitate capturing the applicable documentation.

Table 4-1 Existing Substation Upgrade Evaluation

Need Trigger	Flowchart Component	Documentation
Service Issue		Describe the issue
	Operating Concerns	Explain the operational problems associated with this issue. If applicable, include reliability statistics, customer service complaints, system configuration constraints or any other documentation which can support the need for substation development.
	Future System Development	Explain why no planned future system development can influence the need for the substation upgrade.
	Evaluate Alternatives	Describe various alternatives; costs; capability; pros and cons.
	Recommended Alternative	Explain why this alternative addresses the current concern and quantifies future benefits. Why is this alternative superior to the other alternatives?
Loading Issue		Describe the issue.
	Load Shifting	Explain why load shifting is not a viable option.
	Operating Concerns	Explain the operational problems associated with this issue. If applicable, include reliability statistics, customer service complaints, system configuration constraints or any other documentation which can support the need for substation development.
	Future System Development	Explain why no planned future system development can influence the need for the substation upgrade.
	Evaluate Alternative	Describe various alternatives; costs; capability; pros and cons.
	Recommended Alternative	Explain why this alternative addresses the current concern and quantifies future benefits. Why is this alternative superior to the other alternatives?