



Distribution Point-of-Delivery Interconnection Process Guideline

New Point of Delivery Substations

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Delivery Substations**

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1.0 Introduction

1.1 Purpose

This guideline defines the process by which the AESO, a Distribution Facility Owner (DFO), and a Transmission Facility Owner (TFO) can evaluate the need for a new substation. It is intended to provide a uniform and consistent approach.

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 new distribution point of delivery substations.

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 titled: AESO Interconnection Process Guidelines: 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.

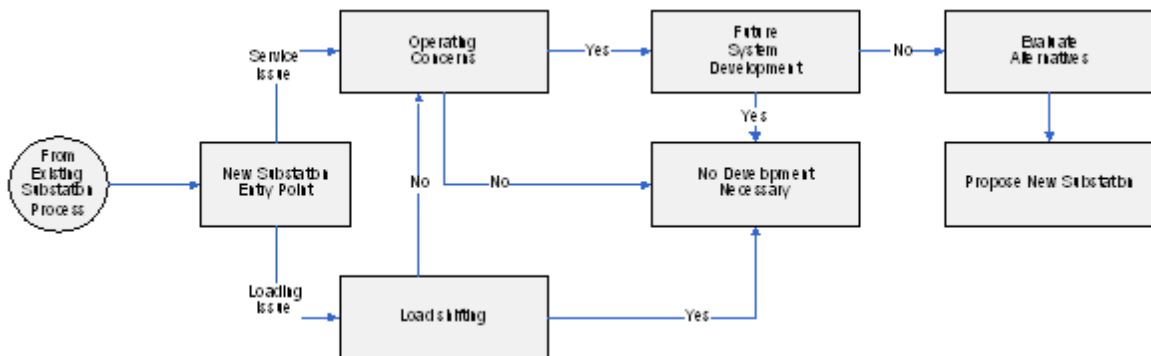
2.0 New Substation Addition Flowchart

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

The application of this Guideline will normally follow the use of the existing substation processes and associated guidelines (AESO Interconnection Process Guidelines - Distribution Point-of-Delivery Circuit Breaker Addition, and/or Upgrades to Existing Substations).

As in the other guidelines, the DFO will take the lead role in providing load forecasts and assessing distribution alternatives, and will request a planning study by the AESO. TFOs should make the AESO aware of any service, operational or loading issues not identified by the DFO that may warrant consideration of a new Point of Delivery substation addition. The AESO is accountable for preparing an interconnection proposal with the involvement of the DFO and TFO.

Figure 2-1 New Substation Addition Flowchart



3.0 Guide to Flowchart Components

3.1 New Substation Entry Point

Generally, the need for a new substation is driven by a concern around the quality of service or distribution/transmission capacity in an area, which cannot be economically resolved by additions to or upgrades of existing substations or distribution facilities. Therefore, the entry points to the flowchart are related to a service issue or a loading issue, or in some cases both, and are more thoroughly described in the AESO Interconnection Process Guideline - Drivers of Need.

3.1.1 *Service Issue*

A service issue occurs when there are:

- power quality issues;
- distribution system operating concerns;
- frequent outages;
- significant repair times due to location and availability of crews;
- reliability concerns of the transmission supply (including lines serving the substation); or
- recently identified 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 element within the substation or on the distribution system 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 station transformer;
- loss of the largest transformer at the substation;
- loss of interconnected distribution lines; and
- loss of transformers at adjacent substations.

The DFO must provide a detailed load forecast for existing facilities including adjacent substations in accordance with the AESO Interconnection Process Guideline – Standards of Service. Deficiencies in the backup capability of the existing system including adjacent substations must also be illustrated.

3.2 Operational Concerns

Operating concerns include but are not limited to the following:

- number of connected customers;
- power quality issues (e.g. voltage flicker and low or high operating voltages);
- number of unmitigated 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); and
- potential equipment or element overload.

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 will normally have been examined in the preceding existing substation processes and associated guidelines. It should be re-examined in evaluating how best to integrate the new substation into the system.

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 distance between service centres and distribution operations.

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 proposed existing substation upgrade, new distribution lines, system re-configuration and distribution system automation are to be considered if they occur within a reasonable timeframe (< 2 years).

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

3.5 Evaluate Alternatives

If there are no system projects being planned within the area to address the needs, the AESO, with support and involvement of the DFO and TFO, will evaluate alternatives to alleviate the DFO concern. In the evaluation, the DFO is accountable for the identification and evaluation of distribution alternatives. These alternatives would consider either distribution or transmission solutions or a combination of both. The evaluation work should explore and articulate all reasonable alternatives that would not require a new substation along with all reasonable alternatives that include a new substation.

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

- load forecast by feeder and substation, including adjacent substations;
- the optimal geographic location of a new substation in relation to the load and existing facilities;
- assessment of the transmission system's ability to deliver service;
- performance assessment;
- estimated restoration and repair/replacement times;
- capital cost;
- operational flexibility;
- cost of transmission and distribution losses; and
- economic evaluation (as per the AESO Interconnection Process Guideline – Economic Evaluation).

The evaluation must demonstrate that a new substation is preferred for economic, technical or other reasons, rather than making upgrades to existing substation(s) and/or to the distribution system.

3.6 Propose New Substation

This guideline assumes the recommended alternative is to develop a new substation. The DFO is accountable to develop the distribution need. The AESO, in conjunction with the TFO and DFO, is accountable to assess transmission alternatives and prepare an Interconnection Proposal for the new substation. The TFO is accountable to develop and file a Facilities

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Application (with the AESO Interconnection Proposal included) for the new substation.

4.0 Need Evaluation Process for New Substation Addition

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

The submission of a request for transmission assessment to the AESO should include supporting documentation based on the various components of need. Table 4-1 can be used to facilitate compiling the applicable documentation for the Interconnection Proposal prepared by the AESO.

Table 4-1 New Substation Addition Need Evaluation

Need Trigger	Flowchart Component	Documentation
Service Issue or Loading 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 the new substation.
	Load Shifting	Explain why load shifting alone is not a viable option without a new substation, and explain the load shifting analysis done to integrate the new substation.
	Future System Development	Explain why no other planned future system development can influence the need for the new substation, or alternatively, how a new substation would fit into the currently planned development.
	Evaluate Alternatives	A load forecast for the existing system and the proposed new substation development must be provided in accordance with the AESO Interconnection Process Guideline – Standards of Service. The evaluation should build on that done in the preceding existing substation processes and associated guidelines (breaker additions and upgrades to existing substations), looking at substation alternatives. Describe the various alternatives, costs, capability; pros and cons. The ability of an alternative (or lack thereof) to provide adequate backup should be documented where appropriate.
	Propose New Substation	Explain why this alternative addresses the current concern and quantify expected benefits. Explain why this alternative is superior to the other alternatives.