Facility Design

P[0000] [Project Name]

[Market Participant Name]

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| --- | --- |
| **Date:** | [Month DD, YYYY] |
| **Version:** | [e.g., V1D1] |
| **Classification:** | Choose an item. |

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| --- | --- | --- | --- |
| Role | Name | Date | Signature |
| Prepared | [Consultant Engineer, P. Eng.] |  |  |
| Reviewed | [Consultant Engineer, P. Eng.] |  |  |
| Approved | [Consultant Engineer, P. Eng.] |  |  |

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# Proposed Facility Additions/Upgrades

This section is compiled by the Market Participant and is to describe the following:

* SASR applicant
* SASR request (load DTS, generation STS, transformer addition, breaker addition, new POD, etc.) and why needed (load growth, new load, new generator, DFO reliability N-1, feeder loading, etc.)
* Location
* Requested In-Service Date (ISD)

For generation projects, describe the following:

* Type of generation
* Maximum authorized real power (MARP) of every individual generating unit or aggregated generating facility
* How many pool assets will there be?
* Where will the dispatch of the asset(s) be located? For example, gross generation, net generation or net-to-grid?
* Maximum capability (MC) of every pool asset

If the preferred alternative requires any of the following facilities, list the facilities in this section as well:

* Transmission line nominal voltage, minimum capacity, and approximate length
* Transformer voltage (high/low voltage), minimum capacity and the type of tap changer (on-load or off-load)
* Salvage of any existing transmission facilities
* Bus arrangement and breakers (25 kV or higher voltage)
* Line airbreak requested at T-tap configuration, if required.
* Tele-protection requirement to meet the Stage 2 Engineering Study Results (stability) and AESO (protection rule) fault clearing requirements
* Remedial Action Schemes (RAS), if needed, for the preferred alternative
* Anything else (incl. SVC or other voltage control devices, etc.)

Include a relevant single line diagram (SLD) including transmission facility and market participant’s facility for the existing transmission system in the project area.

Note: If this Facility Design is not prepared by the legal owner of a transmission facility, any proposed transmission facility and ratings are subject to change in Stage 3.

# Scope of Work

* 1. Standard Compliance

All work undertaken by TFOs or Market Participants must be designed, constructed, and operated to meet the standards, guidelines, codes and regulations governing such installations including, but not limited to those listed below. All AESO documentation can be found on the AESO website.

List any anticipated technical variance to Section 304.3, Section 304.9, and Division 502 of the ISO rules applicable to the project. Note: The process to apply for a technical variance is described in Section 103.14 of the ISO rules.

* 1. Substation Equipment Specifications

All proposed new transmission equipment must meet the minimum specifications provided below:

* Maximum Fault Level as indicated in Section 2.3
* Maximum and minimum continuous voltage ratings as indicated in Section 2.4
* Minimum continuous current ratings as indicated in Section 2.5

Describe any exceptions from the Alberta Reliability Standards. (e.g., there may be different temperature rating for the north region vs. the south region, exceptions to line and tower design, exceptions to protection requirements, etc.)

* 1. Maximum Fault Level

Provide the maximum fault level for the nominal voltage. The Alberta standard fault duty levels are: 31.5 kA for 138/144 kV, and 40 kA for 240 kV. These values may need to be changed, depending on the short circuit study results.

* 1. Maximum and Minimum Continuous Voltage Ratings

Provide appropriate nominal voltages in Table 2-1 based on the connection area and modify the column headers accordingly.

Table 2‑1: Equipment Maximum and Minimum Continuous Voltage Ratings (kV)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Area | 25 kV | 69/72 kV | 138/144 kV | 240 kV | 500 kV |
| Minimum |  |  |  |  |  |
| Maximum |  |  |  |  |  |

* 1. Minimum Continuous Current Ratings

Provide appropriate values in Table 2-2 based on the connection area and modify the column headers accordingly.

If the project involves an existing bus extension at a brown field substation, please provide the existing bus ampacity rating.

Table 2‑2: Equipment Minimum Continuous Current Ratings (A)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Area | 25 kV | 69/72 kV | 138/144 kV | 240 kV | 500 kV |
| Main Bus |  |  |  |  |  |
| Cross Bus |  |  |  |  |  |
| Feeder |  |  |  |  |  |

Provide SLD of the proposed facilities showing substation ampacities and other information as follows.

* 1. Insulation Level

Table 2‑3: Basic Insulation Level (kV)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Area | 25 kV | 69/72 kV | 138/144 kV | 240 kV | 500 kV |
| Station Post Insulators and Airbreaks |  |  |  |  |  |
| Circuit Breakers |  |  |  |  |  |
| Current and Potential Transformers |  |  |  |  |  |
| Transformer Windings |  |  |  |  |  |

* 1. Facilities and Equipment Details for the Preferred Alternative

Describe the preferred alternative. Include the pre- and post-Project diagrams.

* 1. Transmission Lines

Specify number of circuits, the facility code for the proposed new line(s), the approximate length of the new line(s) to be constructed and the minimum capacity (summer/winter) requirement. If the preferred alternative involves a T-tap, please indicate how many line airbreaks will be required at the T-tap structure.

* 1. Substations

If the substation is new provide the substation name and facility code.

Itemize all major equipment as follows for both transmission substations and market participant’s substations:

* Bus arrangement
* Transformer winding configuration on both sides, size and type of tap changer
* Number of breakers at ≥25 kV
* Number of motor operated disconnect (MOD) switches at 138 kV or higher voltage
* Cap banks (if any and if at or higher than 25 kV voltage)
* Transformer neutral reactor/resistor
  1. Protection & Control Requirements

All protection and control requirements will be designed as per ISO Rules.

If the proposed fault clearing time on the transmission line is longer than the fault clearing time specified in AESO’s Transmission Planning Criteria – Basis and Assumptions (see Appendix A of the [Connection Study Requirements](https://www.aeso.ca/assets/Uploads/Connection-Study-Requirements.pdf)), AESO approval will be required.

* 1. SCADA

All SCADA requirements will be designed as per ISO Rules.

* 1. Synchrophasor Measurement Unit

All PMU requirements will be designed as per ISO Rules.

* 1. Telecommunication

All Telecommunication requirements will be designed as per ISO Rules.

* 1. Revenue Metering

The Revenue metering will be designed to meet section 502.10 of the ISO rules, Revenue Metering System Technical and Operating Requirements.

* 1. Effective Grounding

For generation connection projects, provide an effectively grounded source for the transmission system.

# Transmission System Operation Requirements

In the following sections provide brief descriptions to outline the need for mitigation measures to connect, commission and operate the new connection as per the electrical environment in which the facilities outlined in this document will operate.

* 1. Short Circuit Current Levels

Summarize the short circuit current levels from the Stage 2 Engineering Study Results, pre- and post-Project, and 10 years into the future.

Highlight the short circuit current levels which are above 90% of equipment rating. Market Participants can approach the AESO for advice with respect to long-term anticipated short circuit levels and can collaborate with the AESO on a system-based solution if a more locally based solution does not work.

* 1. Operational Constraints

The following sections identify the need for new or potential changes to existing mitigation measures to successfully commission and operate the new connection to meet AESO reliability standards in the operations domain.

* 1. Remedial Action Schemes (RAS)

Provide a brief description of the identified constraints as identified in the Stage 2 Engineering Study Results. Briefly describe the new RAS requirement, or the necessary changes to existing RAS schemes or procedures for the project or in the project area.

* 1. Generator Synchronization

Provide detailed information of any generation synchronization plan including generator synchronization point. Generator synchronizer is required to be installed at the generator’s synchronization point.

* 1. Sync-Check or Islanding Operation

Provide detailed information if the market participant plans to do islanding operation including separation point and synchronization point. Sync-Check is required to be installed at the separation point and synchronizer is required to be installed at the synchronization point. If the transmission facility is involved in islanding operation, AESO approval will be required in Stage 3.

* 1. Anti-islanding

Provide detailed information of proposed mitigation solution for anti-islanding for possible islanding scenarios. If anti-islanding scheme is required by the market participant, the AESO will do follow-up with the market participant and the legal owner of a transmission facility in Stage 3.

* 1. Self-start capability

Confirm whether the proposed generating facility has self-start capability.

# Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| Revision | Issue Date | Author | Change Tracking |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Attachment A: Preferred Alternative

**A.1 Preferred Connection Alternative**

Provide a drawing showing the proposed area transmission system including the preferred alternative for the project.

**A.2 Single Line Diagram – ###S Substation**

See the AESO’s [Single Line Diagram (SLD) Guideline for Projects](https://www.aeso.ca/assets/Uploads/SLD-Guideline-for-Projects.pdf) which outlines the requirements for SLDs.

**A.3 Telecommunication Connection**

Provide drawing(s) showing the proposed area telecommunication system. Each drawing should clearly indicate the following at a minimum:

* Proposed connection and upgrades to existing telecommunication system.
* Proposed type (microwave, fiber, etc.) of new and upgraded telecommunication systems.
* Specify for all new and upgraded telecommunication systems what (if any) TPR or protection applications will be carried.

Note: RAS requirements determined at a later date may modify the telecommunication requirement