Generating unit functional document submission form

The below form must be completed and returned to generator.reports@aeso.ca. Supporting information to assist generating unit owners to complete this form can be found after the form, starting on page four. Any questions on completing this form can be directed to generator.reports@aeso.ca.

Legal owner	
Generating unit	
Element Code	

Functional Information

Maximum authorized real power (MARP)		**MW**
Lagging reactive power capability at MARP		**MVAr**
Leading reactive power capability at MARP		**MVAr**
Stator terminal voltage		**kV**
Voltage at the high side of transmission system step-up transformer		**kV**
Reactive current compensation setting	**+/-**	**%**
Transmission system step-up transformer capability		**MVA**
Loads tapped off between the stator terminals and the transmission system step-up transformer	**MW**	**MVAr**
Voltage ride-through capability	☐ 15% Voltage	☐ 0% Voltage
Date of last model validation test		

Attachments

☐ Reactive capability curve (D-curve) comes with	☐ Exciter nameplate
☐ Under excitation limiter	☐ VEE curves
☐ Over excitation limiter	☐ Single line diagram

Gas Turbines Only

Elevation:	Metres	☐ Elevation versus output curve attached	☐ Ambient temperature versus output curve attached

Engineering Stamp

The values reported in this engineering document reliably reflect the real-time operational characteristics of the identified generator. APEGA Permit to Practice: _____	Engineering Stamp Required

Supporting Information

1. Maximum Authorized Real Power Limiting Factor. Reference: ISO Rules section 502.5, subsection 4. Please provide a description of the limiting factor for MARP.

2. Leading Reactive Power: Reference: ISO Rules section 502.5, subsection 5(5).

   Please provide a description of the stability concern. Attach the supporting engineering document.

3. Reactive Current Compensation. Reference: ISO Rules section 502.5, subsection 8(2).

   A positive (+) value places the point of control into the transmission system step-up transformer. A negative (-) value places the point of control into the stator winding.

   Please provide a reason for the point of control to be other than the stator winding terminals.

4. Transmission System Step-up Transformer Capability. Reference: ISO Rules section 502.5, subsection 11. Please provide the basis for transformer capability. If other than nameplate, attach the supporting engineering document.

5. Over and Under Excitation Limiters. Reference: ISO Rules section 502.5, subsection 5.

   Not all generating units have over and under excitation limiters, however, if the generating unit is equipped with these limiters please indicate the setting by over laying those limits on the reactive capability curve, and attach the curve to this document.

Variances

Please provide a description of any variances previously granted by the ISO that remain in effect and attach the supporting documentation.

1.	
2.	
3.	
4.	

Additional Information and Comments

Please provide any additional information or comments that are relevant to this submission.

Details on form fields

Maximum Authorized Real Power (“MARP”)

Provide the real power capability of the generating unit in MW. This may not be the nameplate value of the generator stator, as many parameters can influence this value, including:

- the maximum real power capability of the combination of the generator stator, electrical rotor and
- exciter ratings, which allows the generating unit to meet the reactive power requirements of
- Section 502.5;
- the turbine capability under optimum conditions, which may be significantly different that the nameplate, in particular for gas turbines or generating units that have been uprated;
- the transformer capability in MVA, which may limit of the real power output of the generating unit
- and the reactive power output to the transmission system; or
- other miscellaneous items, such as the coupling from the turbine to the generator.

Describe the limiting factor for the MARP on the second page of the form.

Leading and Lagging Reactive Power at MARP

Provide values that reflect the 0.90 lagging and 0.95 leading power factor requirements of Section 502.5 inclusive of the limiters. If legal owner is making a submission under subsection 5(5) of Section 502.5, provide the following information:

- the desired level of under-excited reactive power; :
- a brief description of the stability concern on the second page of the form; and
- an engineering report detailing the stability concern and the supporting calculations.

Stator Terminal Voltage

This would typically be the generator stator nameplate voltage. The AESO does not approve this voltage but will use this value when reviewing the capability of the generating unit.

Voltage at High Side of Transmission System Step-up Transformer

In Alberta, voltages may vary considerably from the nominal voltage. When determining the voltage ride-through capability for an existing generating unit, the legal owner should consider the voltage level at the point of connection, which would be used as the 100% voltage for the voltage ride-through requirements. The AESO will review this voltage to determine if it is appropriate for the location of the generating unit.

Reactive Current Compensation Setting

The AESO uses the term “point of control” to describe the electrical point controlled by the automatic voltage regulator. Generally, this is the same point as the voltage input to the automatic voltage regulator, which is typically the stator winding terminal of the generating unit. Automatic voltage regulators commonly have control features that allow the point of control to be moved away from voltage input to the automatic voltage regulator. This control feature is commonly referred to as reactive current compensation or, in some cases, voltage droop.

Report the setting of the reactive current compensator (zero means that is not used) and, on the second page, the reasoning behind the setting. In some cases the reactive current compensator setting is addressed in subsection 8 of Section 502.5 as there may be multiple generators connected to a common bus.

Transmission System Step-up Transformer Capability

The thermal capability of the transmission system step-up transformer may not be the nameplate rating of the transformer. In accordance with subsection 11 of Section 502.5, the legal owner may use a higher apparent power capability than the nameplate rating of the transformer. The AESO recommends that, in such cases, a report stamped by an accredited engineer documenting the basis for the higher capability be provided.

If there is an issue with the transmission system step-up transformer that reduces the capacity of the transformer (examples may include fan failure or blocked radiator), this should be reported to the AESO in accordance with subsection 3 of Section 502.6.

Loads Tapped Off Between Stator Terminals and Transmission System Step-up Transformer

In order to meet the requirements of subsection 11 of Section 502.5, the capability of the transformer must be equal to the apparent power of the generating unit (the vector addition of the maximum authorized real power and the reactive power obligation), minus any loads that may be tapped-off between the stator winding terminals and the transmission system step-up transformer.

Fill in the real and reactive power drawn by the loads when operating at MARP under normal operating conditions and attach a single line diagram to clarify load flows.

Voltage Ride-Through Capability

Pursuant to subsection 6 of section 502.5, existing generating units are required to ride through a voltage dip down to 15% of nominal. The 0% check box may be used in the future for new generating units that are brought forward as a project after the effective date of Section 502.5.

Date of Last Model Validation Test

Subsection 11 of Section 502.6 requires model validation testing every five years.

Some generating units may have a valid WECC certificate that extends past the five year testing requirement. Such a certificate does not relieve the legal owner of the requirement to test and report every five years.

Attachments

If the requested attachments are available as part of the most recently submitted model validation ("WECC") report, than the report can be provided rather than the individual attachments.

Gas Turbines only

Gas turbines have unique properties, as the output from the turbine can vary significantly with elevation and temperature. The AESO is requesting additional information regarding these variations.

Variances

The functional document will contain material variances the AESO approves in accordance with subsection 2(2) of Section 502.6. The AESO will review any waivers of the requirements of the Generation and Load Interconnection Standard that were previously granted, as well as any new variance requests, and will determine whether a variance to new Section 502.6 will granted.

Additional Comments by Legal Owner

A space has been provided for the legal owner of a generating unit to make any additional comments regarding a generating unit's performance.

In particular the AESO would like additional information on:

- Interdependencies between units:
  - For combined cycle facilities:
    - diverter availability;
    - minimum GT output for minimum ST operation; and
    - start-up sequence.
  - Hydro with common penstock and tail race effects
- Interdependencies with thermal processes in industrial plants

Additional information for completing the Generating Unit Functional Document Submission Form

Type of turbine using WECC's notation:

- Unknown, Type 0
- Non-reheat steam, Type 1
- Reheat steam, Type 2
- Steam cross-compound, Type 3
- Steam in combined cycle (separate shaft) , Type 4
- Hydro, Type 5
- Diesel non turbo charged, Type 6
- Diesel turbo charged, Type 7
- Industrial GT (single shaft), Type 11
- Aero derivative GT, Type 12
- Single shaft combined cycle, Type 13
- Other, Type 99