

MOD-025-2

Reliability Objective

To ensure that accurate information on generator gross and net Real and Reactive Power capability and synchronous condenser Reactive Power capability is available for planning models used to assess Bulk Electric System (BES) reliability

WECC Intent

The potential failure points and guidance questions give general direction to registered entities for assessing risk while designing internal controls specific to NERC Reliability Standards and Requirements. The Registered Entity may use this document as a starting point to determine entity risk and it is not WECC's intent to establish a standard or baseline for entity risk assessment or controls design.

***Note:** Guidance Questions help an entity understand and document its controls. Any responses, including lack of affirmative feedback, will have no effect on an entity's demonstration of compliance at audit.*

**Please send feedback to ICE@WECC.org with suggestions on Potential Failure Points & Guidance Questions.*

Potential Failure Points/Guidance Questions

MOD-025-2 R1 R2 R3

Potential Failure Point (R1, R2, R3): Failure to develop to process to document unit capability

1. How does the plan provide guidance on documenting unit capability?

Potential Failure Point (R1, R2, R3): Failure to develop to process to perform verification

1. How do you provide guidance to conduct verification of Reactive Power capability of all applicable Facilities, other than wind and photovoltaic, for maximum overexcited (lagging) and under-excited (leading) reactive capability?
 - a. How does your guidance specify verifications under the following conditions?
 - i. At the minimum Real Power output at which they are normally expected to operate collect maximum leading and lagging reactive values as soon as a limit is reached.

- ii. At maximum Real Power output collect maximum leading reactive values as soon as a limit is reached.
 - iii. Nuclear Units are not required to perform Reactive Power verification at minimum Real Power output.
2. How does your guidance for hydrogen-cooled generators, specify verifications be performed at normal operating hydrogen pressure?
3. How does your guidance provide method to calculate the Generator Step-Up (GSU) transformer losses if the verification measurements are taken from the high side of the GSU transformer?
 - a. How does your guidance provide criteria to follow to determine if GSU transformer real and reactive losses may be estimated, based on the GSU impedance, if necessary?

Potential Failure Point (R1, R2, R3): Failure to develop an overall process to provide verification in accordance to attachment 1

1. How does your entity document overall process to provide verifications?

Potential Failure Point (R1, R2, R3): Failure to develop a process to produce complete data for submission

1. How does your plan ensure data supplied is complete?

Potential Failure Point (R1, R2, R3): Failure to clearly define or communicate start/end dates used to establish timeframe(s) for verifications.

1. How do you for each new applicable Facility establish start/end dates used ensure verification occurs within 12 calendar months of its commercial operation date?
2. How do you for existing units that have been in long term shut down and have not been tested for more than five years establish start/end dates used to ensure verification occurs within 12 calendar months?

Potential Failure Point (R1, R2, R3): Failure to develop a process to perform a staged test

1. How does your plan outline how to perform a staged test?

Potential Failure Point (R1, R2, R3): Failure to develop a process to obtain the logs

1. How does your plan outline how to obtain logs?

Potential Failure Point (R1, R2, R3): Failure to develop a testing plan

1. How has your entity developed testing plans for use in MOD-025-2?



Potential Failure Point (R1, R2, R3): Failure to develop a plan to use operational or historical data in verification

1. How does your plan outline the use of operational or historical data in verification process?

MOD-025-2 (Attachment 1)

Potential Failure Point (Attachment 1): Failure to clearly define or communicate start/end dates used to establish timeframe(s) for verifications.

1. How does the plan define or communicate start/end dates used to establish timeframe(s) for verifications?
2. How does it specify capture of the date and time of the verification period, including start and end time in hours and minutes? (Attachment 1, Sec 3.5)

Potential Failure Point (Attachment 1): Failure to develop data recording guidance

1. How do you provide data recording guidance to ensure earliest recorded dates serve as the verification date on Attachment 2
2. Does guidance include time stamping of operational data (two years prior to the verification date) and criteria (data meets the criteria in 2.1 through 2.4) used to verify its acceptability for use in verification of either the Real Power or the Reactive Power capability?
3. Does guidance include verification that operational data demonstrates at least 90 percent of a previously staged test that demonstrated at least 50 percent of the Reactive capability shown on the associated thermal capability curve (D-curve)?
 - a. Does guidance include check of the previously staged test for verification if it was unduly restricted (so that it did not demonstrate at least 50 percent of the associated thermal capability curve) by unusual generation or equipment limitations (e.g., capacitor or reactor banks out of service), then the next verification will be by another staged test, not operational data?
4. Does guidance include verification of Real Power capability and Reactive Power capability over-excited (lagging) of all applicable Facilities at the applicable Facilities' normal (not emergency) expected maximum Real Power output at the time of the verifications?
 - a. Does guidance include verification that synchronous generating unit's maximum real power and lagging reactive power for a minimum of one hour?



- b. Does guidance include verification that variable generating units, such as wind, solar, and run of river hydro, at the maximum Real Power output the variable resource can provide at the time of the verification?
- c. Does guidance include verification of Reactive Power capability of wind turbines and photovoltaic inverters with at least 90 percent of the wind turbines or photovoltaic inverters at a site on-line?
 - i. Does guidance include if verification of wind turbines or photovoltaic inverter Facility cannot be accomplished meeting the 90 percent threshold, document the reasons the threshold was not met and test to the full capability at the time of the test?
 - ii. Does guidance include requirement to reschedule the test of the facility within six months of being able to reach the 90 percent threshold. Maintain, as steady as practical, Real and Reactive Power output during verifications.

Potential Failure Point (Attachment 1): Failure to develop a process to track changes to facilities

- 1. How have you developed a process to ensure the first verification for each applicable Facility under this standard conducts a staged test?
- 2. How have you developed a process to monitor Real Power or Reactive Power capability to discover it has changed by more than 10 percent of the last reported verified capability?
- 3. How have you developed a process to understand if change is expected to last more than six months?

Potential Failure Point (Attachment 1): Failure to provide guidance on development of testing plan(s)

- 1. How have you outlined testing strategy that reflects entity choice for testing where options are allowed by standard? (Real Power testing be performed at the same time as full load Reactive Power testing or separate testing)
- 2. How does the plan for synchronous condensers, where verified through test, ensure test it is to be scheduled at a time advantageous for the unit being verified to demonstrate its Reactive Power capabilities while the Transmission Operator takes measures to maintain the plant's system bus voltage at the scheduled value or within acceptable tolerance of the scheduled value?
- 3. How does the plan for generating units of 20 MVA or less that are part of a plant greater than 75 MVA in aggregate, specify if data is recorded either on an individual unit basis or as a group?



- a. How does the plan specify that verification be performed individually for every generating unit or synchronous condenser greater than 20 MVA (gross nameplate rating)?

Potential Failure Point (Attachment 1): Failure to develop a process to identify all auxiliary equipment needed for expected normal operation in service for both the Real Power and Reactive Power capability verification.

1. How does the plan provide guidance on how to identify all auxiliary equipment needed for expected normal operation in service for both the Real Power and Reactive Power capability verification?

Potential Failure Point (Attachment 1): Failure to develop a process to verify automatic voltage regulator in-service status

1. How do you ensure to perform verification with the automatic voltage regulator in service for the Reactive Power capability verification?

Potential Failure Point (Attachment 1): Failure to develop methods to record the following data for the verifications specified Attachment 1 (sec 3.1)

1. How do you plan to acquire the value of the gross Real and Reactive Power generating capabilities at the end of the verification period?
2. How does your plan provide guidance on acquiring the voltage schedule provided by the Transmission Operator, if applicable?
3. How does your plan provide guidance on acquiring the voltage at the high and low side of the GSU and/or system interconnection transformer(s) at the end of the verification period?
 - a. How does the plan specify determining if one or both of these values is metered?
 - b. Does the plan provide method to calculate voltage at the high and low side of the GSU and/or system interconnection transformer(s) at the end of the verification period?
4. How does your plan provide guidance on factoring the ambient conditions, if applicable, at the end of the verification period that the Generator Owner requires to perform corrections to Real Power for different ambient conditions such as:
 - Ambient air temperature
 - Relative humidity
 - Cooling water temperature
5. How does your plan provide guidance on ascertaining other data applicable by the Generator Owner to perform corrections for ambient conditions?



6. How does your plan provide guidance on ascertaining the existing GSU and/or system interconnection transformer(s) voltage ratio and tap setting?
7. How does your plan provide guidance on calculation of the GSU transformer losses (real or reactive) if the verification measurements were taken from the high side of the GSU transformer?
8. How does your plan specify documenting whether the test data is a result of a staged test or if it is operational data?

Potential Failure Point (Attachment 1): Failure to develop guidance on development of a simplified key one-line diagram

1. How does guidance specify showing sources of auxiliary Real and Reactive Power?
2. How does guidance specify showing associated system connections for each unit verified?
3. How does guidance specify Including and showing GSU and/or system Interconnection and auxiliary transformers?
4. How does guidance specify showing Reactive Power flows, with directional arrows?
5. How does guidance specify verification of metering?
6. If no metering exist, how does guidance specify methods to measure specific Reactive auxiliary load(s)?
7. How does guidance specify provide methods to perform an engineering estimate?
8. How does guidance identify applicable associated calculations?
9. How does guidance outline using a computer program to calculate losses or loads?
 - a. If so, does it require output data recording?

Potential Failure Point (Attachment 1): Failure to develop a process to manage request by Transmission Planner(s)

1. How does the plan provide guidance on management of TP request?
2. How does the plan define or communicate start/end dates used for TP request?
3. How does the plan ensure request of fulfilled within 90 days of the request or the date the data was recorded/selected whichever is later?

Potential Failure Point (Attachment 1): Failure to develop guidance on how to incorporate adjustments from TP

1. How does your plan provide direction of how to incorporate adjustments?
 - a. How does your plan provide direction on making adjustments of MW values tested to the ambient conditions specified by the Transmission Planner?



Potential Failure Point (Attachment 1): Failure to develop cases to be used in determining amount of Real Power that can be expected to be delivered from a generator in different conditions

1. How does the cases include peak summer conditions?

MOD-025-2 (Attachment 1, Notes 1 – 4)

Potential Failure Point (Attachment 1, Note 1): Failure to develop guidance on use of operational data points or those obtained from staged test

1. Does the plan provide guidance on handling scenarios where the Mvar verification required by the standard does not duplicate the manufacturer supplied thermal capability curve (D-curve)?
2. Does the plan provide guidance on cases where Mvar limit level(s) achieved during a staged test or from operational data may not be representative of the unit's reactive capability for extreme system conditions?

Potential Failure Point (Attachment 1, Note 1): Failure to develop process to further analyze discovered Facility limitations

1. How does the plan document Facility limitations discovered from operational data or during testing?
2. How does the plan outline methods to further analyze Facility limitations?

Potential Failure Point (Attachment 1, Note 2): Failure to develop process to perform engineering analyses to determine expected applicable Facility capabilities under less restrictive system voltages than those encountered during the verification.

1. How does your plan outline engineering analyses to determine expected applicable Facility capabilities under less restrictive system voltages than those encountered during the verification?

Potential Failure Point (Attachment 1, Note 3): Failure to develop process to determine if unit has leading capability

1. How does the plan outline reporting no leading capability; or the minimum lagging capability at which it can operate?

Potential Failure Point (Attachment 1, Note 4): Failure to develop process to test Synchronous Condensers at two points (one over-excited point and one under-excited point)

1. How does the plan specify testing Synchronous Condensers at over-excited and under-excited?



MOD-025-2 (Attachment 2)

Potential Failure Point (Attachment 2): Failure to develop a process to document all required information within form of Attachment 2

1. Has the entity communicated the choice selected in regard to use of attachment 2 form?

