Standard Development Roadmap

This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.

Development Steps Completed:

1. SAR posted for comment (April 20–May 21, 2007).
2. Revised SAR and response to comments posted.
3. Revised SAR and response to comments approved by SC (June 14, 2007).
4. SDT appointed (August 18, 2007).
5. First Draft of MOD-024-2 was posted for comment January 18 – February 18, 2010. MOD-024-2 was later combined with MOD-025-1 to form MOD-025-2.
6. Posted first draft of standard for a 30 day comment period June 15 –July 15, 2011
6.7. Posted second draft of standard for 45-day concurrent formal comment period and initial ballot February 29 – March 16, 2012.

Proposed Action Plan and Description of Current Draft:

This is the second third draft of the proposed standard including Time Horizons, Data Retention, Violation Risk Factors, and Violation Severity Levels; and is being submitted for a 4530-day concurrent formal comment period and initial successive ballot.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Develop responses to comments and develop second version draft standard.	July 2011 – February 2012
2. Post response to comments and conduct a formal 45 day comment period with concurrent initial ballot for the revised standard.	March - April 2012
31. Develop responses to ballot comments and develop third version of standard.	April – July ne 2012
24. Post response to comments and conduct successive ballot.	June October – November 2012
35. Develop responses to ballot comments.	June – July December 2012 – January 2013
46. Post responses to comments and conduct recirculation ballot.	August February 2013 2012
57. BOT adoption.	March 2013 September

	~~2012~~
~~6~~8. File with regulatory authorities.	April 2013~~November 2012~~

A. Introduction

1. **Title:** Verification and Data Reporting of Generator Real and Reactive Power Capability and Synchronous Condenser Reactive Power Capability

2. **Number:** MOD-025-2

3. **Purpose:** 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.

4. **Applicability:**

   4.1. Functional entities

   4.1.1 Generator Owner

   4.1.2 Transmission Owner ~~with~~ that owns synchronous condenser(s)

   4.2. Facilities:

   For the purpose of this standard, the term, "applicable Facility" shall mean any one of the following:

   4.2.1 Individual generating unit greater than 20 MVA (gross nameplate rating) directly connected to the B~~b~~ulk Electric ~~power~~ S~~s~~ystem.

   4.2.2 Synchronous condenser greater than 20 MVA (gross nameplate rating) directly connected to the ~~b~~Bulk Electric~~power~~ S~~s~~ystem.

   4.2.3 Generating plant/Facility greater than 75 MVA (gross aggregate nameplate rating) directly connected to the ~~b~~Bulk Electric~~power~~ S~~s~~ystem.

5. **Effective Date:**

   5.1. In those jurisdictions where regulatory approval is required[1]:

   5.1.1 ~~By the first day of the first calendar quarter, one calendar year following applicable regulatory approval, each Generator Owner and Transmission Owner shall have verified at least 20 percent of its applicable Facilities~~.

   By the first day of the first calendar quarter, two calendar years following applicable regulatory approval, each Generator Owner and Transmission Owner shall have verified at least 40 percent of its applicable Facilities.

[1] Wind Farm Verification - If an entity has two wind sites, and verification of one site is complete, the entity is 50% complete regardless of the number of turbines at each site. A wind site is a group of wind turbines connected at a common point of interconnection or utilizing a common aggregate control system.

5.1.2 By the first day of the first calendar quarter, three calendar years following applicable regulatory approval, each Generator Owner and Transmission Owner shall have verified at least 60 percent of its applicable Facilities.

5.1.3 By the first day of the first calendar quarter, four calendar years following applicable regulatory approval, each Generator Owner and Transmission Owner shall have verified at least 80 percent of its applicable Facilities.

5.1.4 By the first day of the first calendar quarter, five calendar years following applicable regulatory approval, each Generator Owner and Transmission Owner shall have verified 100 percent of its applicable Facilities.

5.2. In those jurisdictions where regulatory approval is not required[2]:

~~**5.2.1** By the first day of the first calendar quarter, one calendar year following Board of Trustees approval, each Generator Owner and Transmission Owner shall have verified at least 20 percent of its applicable Facilities.~~

~~**5.2.2**~~**5.2.1** By the first day of the first calendar quarter, two calendar years following Board of Trustees approval, each Generator Owner and Transmission Owner shall have verified at least 40 percent of its applicable Facilities.

~~**5.2.3**~~**5.2.2** By the first day of the first calendar quarter, three calendar years following Board of Trustees approval, each Generator Owner and Transmission Owner shall have verified at least 60 percent of its applicable Facilities.

~~**5.2.4**~~**5.2.3** By the first day of the first calendar quarter, four calendar years following Board of Trustees approval, each Generator Owner and Transmission Owner shall have verified at least 80 percent of its applicable Facilities.

~~**5.2.5**~~**5.2.4** By the first day of the first calendar quarter, five calendar years following Board of Trustees approval, each Generator Owner and Transmission Owner shall have verified 100 percent of its applicable Facilities.

~~**5.3.** Wind Farm Verification - If an entity has two wind sites, and verification of one site is complete, the entity is 50% complete regardless of the number of turbines at each site.~~

[2] Wind Farm Verification - If an entity has two wind sites, and verification of one site is complete, the entity is 50% complete regardless of the number of turbines at each site. A wind site is a group of wind turbines connected at a common point of interconnection or utilizing a common aggregate control system.

B. Requirements

R1. Each Generator Owner shall provide its Transmission Planner with verification of the Real Power capability of its applicable Facilities as follows: *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*

1.1. Verify the Real Power capability of its generating units in accordance with Attachment 1.

1.2. Submit a completed Attachment 2 (or a form containing the same information as identified in Attachment 2) to its Transmission Planner within 90 calendar days of either the date the data is recorded for a staged test or the date the data is selected for verification using historical operational data.

R2. Each Generator Owner shall provide its Transmission Planner with verification of the Reactive~~l~~ Power capability of its applicable Facilities as follows: *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*

2.1. Verify the Reactive Power capability of its generating units and shall verify the Reactive Power capability of its synchronous condenser units in accordance with Attachment 1.

2.2. Submit a completed Attachment 2 (or a form containing the same information as identified in Attachment 2) to its Transmission Planner within 90 calendar days of either the date the data is recorded for a staged test or the date the data is selected for verification using historical operational data.

R3. Each Transmission Owner shall provide its Transmission Planner with verification of the ~~Real~~ Reactive Power capability of its applicable Facilities as follows: *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*

3.1. Verify the Reactive Power capability of its synchronous condenser units in accordance with Attachment 1.

3.2. Submit a completed Attachment 2 (or a form containing the same information as identified in Attachment 2) to its Transmission Planner within 90 calendar days of either the date the data is recorded for a staged test or the date the data is selected for verification using historical operational data.

C. Measures

M1. Each Generator Owner will have evidence that it performed the verification, such as a completed Attachment 2 or the Generator Owner form with the same information or dated information collected and used to complete attachments, and will have evidence that it submitted the information ~~and a correction for ambient conditions, if requested,~~ within 90 days to its Transmission Planner; such as dated electronic mail messages~~,~~ or mail receipts~~, or dated information collected and used to complete attachments,~~ in accordance with Requirement R1.

M2. Each Generator Owner will have evidence that it performed the verification, such as a completed Attachment 2 or the Generator Owner form with the same information or

dated information collected and used to complete attachments, and will have evidence that it submitted the information within 90 days to its Transmission Planner; such as dated electronic mail messages or~~,~~ mail receipts, ~~or dated information collected and used to complete attachments,~~ in accordance with Requirement R2.

M3. Each Transmission Owner will have evidence that it performed the verification, such as a completed Attachment 2 or the Transmission Owner form with equivalent information or dated information collected and used to complete attachments, and will have evidence that it submitted the information within 90 days to its Transmission Planner; such as dated electronic mail messages or~~,~~ mail receipts~~, or dated information collected and used to complete attachments,~~ in accordance with Requirement R3.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority

The Regional Entity shall serve as the Compliance enforcement authority unless the applicable entity is owned, operated, or controlled by the Regional Entity. In such cases the ERO or a Regional entity approved by FERC or other applicable governmental authority shall serve as the CEA. ~~Regional Entity~~

1.2. Evidence Retention

The following evidence retention periods identify a period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention specified below is shorter than the time since the last compliance audit, the Compliance Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full time period since the last audit.

The Generator Owner and Transmission Owner shall each keep the ~~latest~~ data or~~and~~ evidence to show compliance as identified below, ~~and the previous set of evidence if updated since the last compliance audit~~ unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation:

- The Generator Owner shall retain the latest MOD-025 Attachment 2 and the data behind Attachment 2 or Generator Owner form with equivalent information and submittal evidence for Requirements R1 and R2, Measures M1 and M2 for the time period since the last compliance audit.
- The Transmission Owner shall retain the latest MOD-025 Attachment 2 and the data behind Attachment 2 or Transmission Owner form with equivalent information and submittal evidence for Requirement R3, Measure M3 for the time period since the last compliance audit.

If a Generator Owner or Transmission Owner is found noncompliant, it shall keep information related to the noncompliance until mitigation is complete~~found compliant~~ or for the time specified above, whichever is longer.

The Compliance Enforcement Authority shall keep the last audit records and all requested and submitted subsequent audit records.

1.3. Compliance Monitoring and Assessment Processes

Compliance Audit

Self-Certification

Spot Checking

Compliance Investigation

Self-Reporting

Complaint

1.4. Additional Compliance Information

None

2. Violation Severity Levels

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1	The Generator Owner verified and recorded the Real Power capability of its applicable generating unit, but submitted the data to its Transmission Planner more than 90 calendar days, but within 120 calendar days, ~~from~~ of the ~~date of verification by staged test or the date of the historical operating data that was selected for verification.~~date the data is recorded for a staged test or the date the data is selected for verification using historical operational data. OR The Generator Owner verified the Real Power capability, per Attachment 1 and submitted the data	The Generator Owner verified and recorded the Real Power capability of its applicable generating unit, but submitted the data to its Transmission Planner more than 120 calendar days, but within 150 calendar days, ~~from~~ of the date the data is recorded for a staged test or the date the data is selected for verification using historical operational data.~~of verification by staged test or the date of the historical operating data that was selected for verification~~. OR The Generator Owner verified the Real Power capability, per Attachment 1 and submitted the data but was ~~missing~~ missing more	The Generator Owner verified and recorded the Real Power capability of its applicable generating unit, but submitted the data to its Transmission Planner more than 150 calendar days, but within 180 calendar days, of the date ~~date~~ the data is recorded for a staged test or the date the data is selected for verification using historical operational data.~~of verification by staged test or the date of the historical operating data that was selected for verification.~~ OR The Generator Owner verified the Real Power capability, per Attachment 1 and submitted the data but was missing from 67 to 99 percent of the data.	The Generator Owner verified and recorded the Real Power capability of its applicable generating unit, but submitted the data to its Transmission Planner more than 180 calendar days ~~from~~ of the date ~~date~~ the data is recorded for a staged test or the date the data is selected for verification using historical operational data.~~of verification by staged test or the date of the historical operating data that was selected for verification.~~ OR The Generator Owner failed to verify the Real Power capability, per Attachment 1 of an applicable generating unit. OR

	but was missing 1 to less than or equal to 33 percent of the data. OR The Generator Owner performed the Real Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1 or item 2 (5 year requirement) but did so in more than 66 calendar months but less than or equal to 69 months. OR The Generator Owner performed the Real Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1, 2 or 3 (12 calendar month requirement) but did so in more than 12 calendar months but less than or	than 33 to 66 percent of the data. OR The Generator Owner performed the Real Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1 or item 2 (5 year requirement) but did so in more than 69 calendar months but less than or equal to 72 months. OR The Generator Owner performed the Real Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1, 2 or 3 (12 calendar month requirement) but did so in more than 13 calendar months but less than or equal to 14 calendar months.	OR The Generator Owner performed the Real Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1 or item 2 (5 year requirement) but did so in more than 72 calendar months but less than or equal to 75 months. OR The Generator Owner performed the Real Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1, 2 or 3 (12 calendar month requirement) but did so in more than 14 calendar months but less than or equal to 15 calendar months.	The Generator Owner performed the Real Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1 or item 2 (5 year requirement) but did so in more than 75 calendar months. OR The Generator Owner performed the Real Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1, 2 or 3 (12 calendar month requirement) but did so in more than 152 ~~2~~ calendar ~~months but less than or equal to 13 calendar~~ months.

	equal to 13 calendar months.			
R2	The Generator Owner verified and recorded the Reactive Power capability of its applicable generating unit or applicable synchronous condenser, but submitted the data to its Transmission Planner more than 90 calendar days, but within 120 calendar days, from the date of verification by staged test or the date of the historical operating data that was selected for verification. OR The Generator Owner verified the Reactive Power capability, per Attachment 1 and submitted the data but was missing 1 to up to and including 33 percent of the data. OR	The Generator Owner verified and recorded the Reactive Power capability of its applicable generating unit or applicable synchronous condenser, but submitted the data to its Transmission Planner more than 120 calendar days, but within 150 calendar days, from the date of verification by staged test or the date of the historical operating data that was selected for verification. OR The Generator Owner verified the Reactive Power capability, per Attachment 1 and submitted the data but was missing 34 to 66 percent of the data. OR The Generator Owner performed the Reactive	The Generator Owner verified and recorded the Reactive Power capability of its applicable generating unit or applicable synchronous condenser, but submitted the data to its Transmission Planner more than 150 calendar days, but within 180 calendar days, of the date of verification by staged test or the date of the historical operating data that was selected for verification. OR The Generator Owner verified the Reactive Power capability, per Attachment 1 and submitted the data but was missing 67 to 99 percent of the data. OR The Generator Owner performed the Reactive Power	The Generator Owner verified and recorded the Reactive Power capability of its applicable generating unit or applicable synchronous condenser, but submitted the data to its Transmission Planner more than 180 calendar days from the date of verification by staged test or the date of the historical operating data that was selected for verification. OR The Generator Owner failed to verify the Reactive Power capability, per Attachment 1 of an applicable generating unit or synchronous condenser unit. OR The Generator Owner performed the Reactive Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1 or item 2 (5 year requirement) but did so in more than 75 calendar months.

	The Generator Owner performed the Reactive Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1 or item 2 (5 year requirement) but did so in more than 66 calendar months but less than or equal to 69 months. OR The Generator Owner performed the Reactive Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1, 2 or 3 (12 calendar month requirement) but did so in more than 12 calendar months but less than or equal to 13 calendar months.	Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1 or item 2 (5 year requirement) but did so in more than 69 calendar months but less than or equal to 72 months. OR The Generator Owner performed the Reactive Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1, 2 or 3 (12 calendar month requirement) but did so in more than 13 calendar months but less than or equal to 14 calendar months.	verification per Attachment 1, "Periodicity for conducting a new verification" item 1 or item 2 (5 year requirement) but did so in more than 72 calendar months but less than or equal to 75 months. OR The Generator Owner performed the Reactive Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1, 2 or 3 (12 calendar month requirement) but did so in more than 14 calendar months but less than or equal to 15 calendar months.	OR The Generator Owner performed the Reactive Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1, 2 or 3 (12 calendar month requirement) but did so in more than 15~~2~~ calendar months ~~but less than or equal to 13 calendar months~~.
R3	The Transmission Owner verified and recorded the Reactive Power capability	The Transmission Owner verified and recorded the Reactive Power capability of	The Transmission Owner verified and recorded the Reactive Power capability of	The Transmission Owner verified and recorded the Reactive Power capability of its applicable

	of its applicable synchronous condenser, but submitted the data to its Transmission Planner more than 90 calendar days, but within 120 calendar days, from the date the of verification by staged test or the date of the historical operating data that was selected for verification. OR The Transmission Owner verified the Reactive Power capability, per Attachment 1 and submitted the data but was missing 1 to up to and including 33 percent of the data. OR The TransmissionGenerator Owner performed the Reactive Power verification per Attachment 1, "Periodicity for	its applicable synchronous condenser, but submitted the data to its Transmission Planner more than 120 calendar days, but within 150 calendar days, from the date of verification by staged test or the date of the historical operating data that was selected for verification. OR The Transmission Owner verified the Reactive Power capability, per Attachment 1 and submitted the data but was missing 34 to 66 percent of the data. OR The Transmission Generator Owner performed the Reactive Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1 or item 2 (5 year requirement)	an applicable synchronous condenser unit, but submitted the data to its Transmission Planner more than 150 calendar days, but within 180 calendar days, of the date of verification by staged test or the date of the historical operating data that was selected for verification. OR The Transmission Owner verified the Reactive Power capability, per Attachment 1 and submitted the data but was missing 67 to 99 percent of the data. OR The Transmission Generator Owner performed the Reactive Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1 or item 2 (5 year requirement) but did so in	synchronous condenser, but submitted the data to its Transmission Planner more than 180 calendar days from the date of verification by staged test or the date of the historical operating data that was selected for verification. OR The Transmission Owner failed to verify the Reactive Power capability, per Attachment 1 of an applicable synchronous condenser unit. OR The Generator Transmission Owner performed the verification per Attachment 1, "Periodicity for conducting a new verification" item 1 or item 2 (5 year requirement) but did so in more than 75 calendar months. OR The Transmission Generator Owner performed the Reactive Power verification per Attachment 1, "Periodicity for conducting a new

	conducting a new verification" item 1 or item 2 (5 year requirement) but did so in more than 66 calendar months but less than or equal to 69 months. OR The Transmission ~~Generator~~ Owner performed the Reactive Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1, 2 or 3 (12 calendar month requirement) but did so in more than 12 calendar months but less than or equal to 13 calendar months.	but did so in more than 69 calendar months but less than or equal to 72 months. OR The Transmission ~~Generator~~ Owner performed the Reactive Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1, 2 or 3 (12 calendar month requirement) but did so in more than 13 calendar months but less than or equal to 14 calendar months.	more than 72 calendar months but less than or equal to 75 months. OR The Transmission ~~Generator~~ Owner performed the ~~v~~ Reactive Power verification per Attachment 1, "Periodicity for conducting a new verification" item 1, 2 or 3 (12 calendar month requirement) but did so in more than 14 calendar months but less than or equal to 15 calendar months.	verification" item 1, 2 or 3 (12 calendar month requirement) but did so in more than 1~~52 calendar months but less than or equal to 13~~ calendar months.

E. Regional Variances

None

F. Associated Documents

Version History

Version	Date	Action	Change Tracking
Version 1	12/1/2005	1. Changed tabs in footer. 2. Removed comma after 2004 in "Development Steps Completed," #1. 3. Changed incorrect use of certain hyphens (-) to "en dash" (–) and "em dash (—)." 4. Added "periods" to items where appropriate. 5. Changed apostrophes to "smart" symbols. 6. Changed "Timeframe" to "Time Frame" in item D, 1.2. 7. Lower cased all instances of "regional" in section D.3. 8. Removed the word "less" after 94% in section 3.4. Level 4.	01/20/06
Version 2	TBD	Revised per SAR for Project 2007-09 and combined with MOD-024-1	TBD

MOD-025 Attachment 1 – Verification of Generator Real and Reactive Power Capability and Synchronous Condenser Reactive Power Capability

Periodicity for conducting a new verification:

The periodicity for performing Real and Reactive Power capability verification is as follows:

1. For staged verification; verify each applicable Facility at least every five years (with no more than 66 calendar months between verifications), or within 12 calendar months of the discovery of a change that ~~is expected to~~ affects its Real Power or Reactive Power capability by more than 10 percent of the last reported verified capability and is expected to last more than six months.
2. For verification using operational data; verify each applicable Facility at least every five years (with no more than 66 calendar months between verifications), or within 12 calendar months following the discovery that its Real Power or Reactive Power capability has changed by more than 10 percent of the last reported verified capability and is expected to last more than six months. If data for different points is recorded on different days, designate the earliest of those dates as the verification date, and report that date as the verification date on MOD-025, Attachment 2 for periodicity purposes.
3. For either verification method, verify each new applicable Facility within 12 calendar months of its commercial operation date.

It is intended that Real Power testing be performed at the same time as full Load Reactive Power testing, however separate testing is allowed for this standard. For synchronous condensers, perform only the Reactive Power capability verifications as specified below. ~~If an applicable Facility is operated in synchronous condenser mode as well as generation mode, the unit should be verified in both modes.~~

If the Reactive Power capability is verified through test, the Generator Owner shall schedule the test with its Transmission Operator. The test shall 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.

Verification specifications for applicable Facilities:

1. For generating units of 20 MVA or less that are part of a plant greater than 75 MVA in aggregate, record data either on an individual unit basis or as a group. Perform verification individually for every generating unit or synchronous condenser greater than 20 MVA (gross nameplate rating).

2. Verify with all auxiliary equipment needed for expected normal operation in service for both the Real Power and Reactive Power capability verification. Perform verification with the automatic voltage regulator in service for the Reactive Power capability

verification (see Note 3 if the automatic voltage regulator is not available). Operational data from within the two years prior to the verification date is acceptable for the verification of either the Real Power or the Reactive Power capability, as long as a) that operational data meets the criteria in 2.1 through 2.4~~5~~ below and b) the operational data demonstrates ~~is~~ 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). If the previously staged test 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 shall be by another staged test, not operational data:

2.1. Verify 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.

2.1.1 Verify synchronous generating unit's maximum real power and lagging reactive power for a minimum of one hour~~and Reactive Power capability under-excited (leading) of all applicable Facilities at the applicable Facilities' normal (not emergency) expected maximum Real Power at the time of the verifications~~.

~~**2.1.1**~~**2.1.2** Verify 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. Perform 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. 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. 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.

2.2. Verify Reactive Power capability of all a~~A~~pplicable Facilities, other than wind and photovoltaic, for maximum overexcited (lagging) and under-excited (leading) reactive capability for the following conditions:

2.2.1 A~~a~~t 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~~. Nuclear Units are not required to perform Reactive Power verification at minimum Real Power output~~.

2.2.2 At maximum Real Power output collect maximum leading reactive values as soon as a limit is reached.

~~**2.1.2**~~**2.2.3** Nuclear Units are not required to perform Reactive Power verification at minimum Real Power output.

~~2.2. Conduct the maximum Real Power and over-excited Reactive Power verifications required in 2.1 for a minimum of one continuous hour.~~

~~2.3. Collect the under-excited Reactive Power capability verification data identified in 2.1 and 2.2, and the over-excited Reactive Power capability verification data identified in 2.2 as soon as a limit is reached.~~

~~2.4.~~2.3. For hydrogen-cooled generators, perform the verification at normal operating hydrogen pressure.

~~2.5.~~2.4. Calculate ~~ollect~~ the Generator Step-Up (GSU) transformer losses if the verification measurements are taken from the high side of the GSU transformer. GSU transformer real and reactive losses may be estimated, based on the GSU impedance, if necessary.

3. Record the following data for the verifications specified above:

3.1. The value of the gross Real and Reactive Power generating capabilities at the end of the verification period.

3.2. The voltage schedule provided by the Transmission Operator, if applicable.

3.3. The voltage at the high and low side of the GSU and/or system ~~Interconnection~~ interconnection transformer(s) at the end of the verification period. If only one of these values is metered, the other may be calculated.

3.4. 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
- Other data as applicable

3.5. The date and time of the verification period, including start and end time in hours and minutes.

3.6. The existing GSU and/or system ~~Interconnection~~ interconnection transformer(s) tap setting.

3.7. The GSU transformer losses (real or reactive) if the verification measurements were taken from the high side of the GSU transformer.

3.8. Whether the test data is a result of a staged test or if it is operational data.

4. Develop a simplified key one-line diagram (refer to MOD-025, Attachment 2) showing sources of auxiliary Real and Reactive Power and associated system connections for each unit verified. Include GSU and/or system Interconnection and auxiliary transformers. Show Reactive Power flows, with directional arrows.

4.1. If metering does not exist to measure specific Reactive auxiliary Load(s), provide an engineering estimate and associated calculations. Transformer Real and

Reactive Power losses will also be estimates or calculations. Only output data are required when using a computer program to calculate losses or loads.

~~4.1.~~4.2. If an adjustment is requested by the TP develop the relationships between test conditions and generator output so that the amount of Real Power that can be expected to be delivered from a generator at different conditions, such as peak summer conditions, can be determined. Adjust MW values tested to ambient conditions specified by the TP upon request and submit them to the TP within 90 days of the request or the date the data was recorded/selected whichever is later.

Note 1: Under some transmission system conditions, the data points obtained by the ~~MVAR~~ Mvar verification required by the standard will not duplicate the manufacturer supplied thermal capability curve (D-curve). However, the verification required by the standard, even when conducted under these transmission system conditions, may uncover applicable Facility limitations; such as rotor thermal instability, improper tap settings, inaccurate AVR operation, etc., which could be further analyzed for resolution. The M~~VAR~~var 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. See Note 2.~~Observe auxiliary bus voltage limits. The verified MVAR value obtained most likely will not be the value entered into the Transmission Planner's database; nor is it likely this value will agree with data required to be submitted by MOD-010.~~

Note 2: While not required by the standard, it is desirable to perform engineering analyses to determine expected applicable Facility capabilities under less restrictive system voltages than those encountered during the verification. Even though this analysis will not verify the complete thermal ~~MVAR~~ capability curve (D-curve), it provides a reasonable estimate of applicable Facility capability that the Transmission Planner can use for modeling.

Note 3: It is desired that the automatic voltage regulator be in service when testing a generator's reactive capability. If an automatic voltage regulator is not installed on the unit to be tested, or is not available at the time of the test, exercise extra caution not to exceed the operating limits of the generator.

Note 4: The Reactive Power verification is intended to define the limits of the unit's Reactive Power capabilities. If a unit has no leading capability, then it should be reported with no leading capability; or the minimum lagging capability at which it can operate.

Note 5: Synchronous Condensers only need to be tested at two points (one over-excited point and one under-excited point) since they have no Real Power output.

MOD-025 Attachment 2

One-line Diagram, Table, and Summary for Verification Information Reporting

Note: If the configuration of the applicable Facility does not lend itself to the use of the diagram, tables, or summaries for reporting the required information, changes may be made to this form, provided that all required information (identified in MOD-025, Attachment 1) is reported.

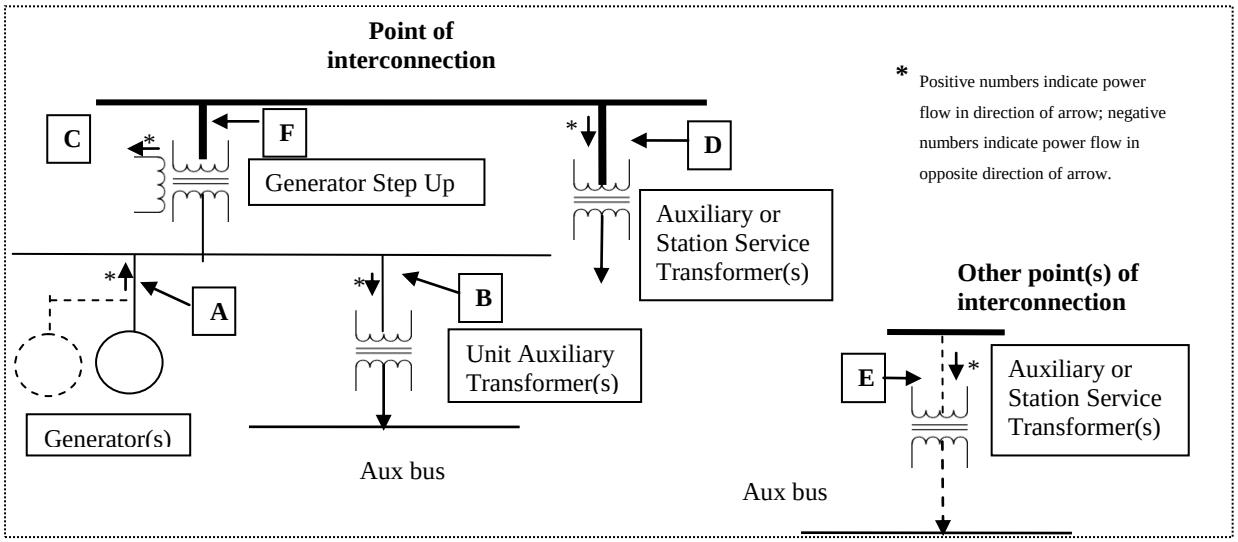
Company: **Reported By (name):**

Plant: **Unit No.:** **Date of Report:**

Check all that apply:

- ☐ Over-excited Full Load Reactive Power Verification
- ☐ Under-excited Full Load Reactive Power Verification
- ☐ Over-excited Minimum Load Reactive Power Verification
- ☐ Under-excited Minimum Load Reactive Power Verification
- ☐ Real Power Verification
- ☐ Staged Test Data
- ☐ Operational Data

Simplified one-line diagram showing plant auxiliary Load connections and verification data:



Point	Voltage	Real Power	Reactive Power	Comment

A	**kV**	**MW**	**Mvar**	Sum multiple generators that are verified together or are part of the same unit. Report individual unit values separately whenever the verification measurements were taken at the individual unit. Individual values are required for units or synchronous condensers > 20 MVA.
Identify calculated values, if any:				
B	**kV**	**MW**	**Mvar**	Sum multiple unit auxiliary transformers.
Identify calculated values, if any:				
C	**kV**	**MW**	**Mvar**	Sum multiple tertiary Loads, if any.
Identify calculated values, if any:				
D	**kV**	**MW**	**Mvar**	Sum multiple auxiliary and station service transformers.
Identify calculated values, if any:				
E	**kV**	**MW**	**Mvar**	If multiple points of Interconnection, describe these for accurate modeling; report points individually (sum multiple auxiliary tyransformers).
F	**kV**	**MW**	**Mvar**	Net unit capability
Identify calculated values, if any:				

MOD-025 -Attachment 2 (continued)

Verification Data

Provide data by unit or Facility, as appropriate

Data Type	Data Recorded	Last Verification (Previous Data)
Gross Reactive Power ~~Generating~~ Capability (*Mvar)		
Aux Reactive Power (*Mvar)		
Net Reactive Power Capability (*Mvar) equals Gross Reactive Power Capability (*Mvar) minus Aux Reactive Power connected at the same bus (*Mvar) minus tertiary Reactive Power connected at the same bus(*Mvar)		
Gross Real Power ~~Generating~~ Capability (*MW)		~~N/A~~
Aux Real Power (*MW)		~~N/A~~
Net Real Power Capability (*MW) equals Gross Real Power Capability (*MW) minus Aux Real Power connected at the same bus (*MW) minus tertiary Real Power connected at the same bus(*MW)		~~N/A~~
* Note: Enter values at the end of the verification period.		
GSU losses (only required if verification measurements are taken on the high side of the GSU - Mvar)		

Summary of Verification

- Date of Verification _____,Verification Start Time _____, Verification End Time _____
- Scheduled Voltage _____
- Transformer Voltage Ratio~~Tap Settings~~: GSU _____, Unit Aux _____, Station Aux _____, Other Aux _____
- Ambient conditions at the end of the verification period:

  Air temperature: _____

  Humidity: _____

  Cooling water temperature: _____

  Other~~s~~ data as applicable: _____
- The recorded Mvar values were adjusted to rated generator voltage, where applicable.
- Generator hydrogen pressure at time of test (if applicable) _____

Date that data shown in last verification column in table above was taken _____

Remarks :

Note: If the verification value did not reach the tThermal Ccapability Ccurve (D-Ccurve), describe the reason.