

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 on (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.

Proposed Action Plan and Description of Current Draft:

This is the first draft of the proposed revision to this standard including Time Horizons, Data Retention, Violation Risk Factors, and Violation Severity Levels. This first posting is for a 30-day comment period.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Post first draft revision of standard.	April-May 2011
2. Post response to comments and second version draft revision of standard.	July – August 2011
3. Post response to comments and request authorization to ballot the revised standard.	September - October 2011
4. Conduct initial ballot.	November 2011
5. Post response to comments.	December 2011
6. Conduct recirculation ballot.	January 2012
7. BOT adoption.	February 2012
8. File with regulatory authorities.	March 2012

A. Introduction

1. **Title:** Verification and Data Reporting of Generator Real and Reactive Power Capability
2. **Number:** MOD-025-2
3. **Purpose:** To ensure that planning entities have accurate generator Real and Reactive Power capability data when assessing Bulk Electric System (BES) reliability.
4. **Applicability:**
 - 4.1. Functional entities
 - 4.1.1 Generator Owner
 - 4.1.2 Transmission Owner
 - 4.2. Facilities:
 - 4.2.1 Individual generating unit or synchronous condenser > 20 MVA (gross nameplate rating) in a generating Facility connected at the point of interconnection at 100 kV or above.
 - 4.2.2 Generating plant/Facility > 75 MVA (gross aggregate nameplate rating) and connected at the point of interconnection at 100 kV or above.
 - 4.2.3 Blackstart units, regardless of size that are included in a Transmission Operator's restoration plan.
5. **Effective Date:**
 - 5.1. In those jurisdictions where regulatory approval is required:
 - 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% of its applicable units.
 - 5.1.2 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% of its applicable units.
 - 5.1.3 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% of its applicable units.
 - 5.1.4 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% of its applicable units.
 - 5.1.5 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% of its applicable units.
 - 5.2. In those jurisdictions where regulatory approval is not required:

- 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% of its applicable units.
- 5.2.2 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% of its applicable units.
- 5.2.3 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% of its applicable units.
- 5.2.4 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% of its applicable units.
- 5.2.5 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% of its applicable units.

B. Requirements

- R1. Each Generator Owner shall: [*Violation Risk Factor: Lower*] [*Time Horizon: Long-term Planning*]
 - 1.1. Verify the Real and Reactive Power capability of its generating units and shall verify the Reactive Power capability of its synchronous condenser units in accordance with Attachment 1 –.
 - 1.2. Record the information on Attachment 2 (or on the Generator Owner’s form that contains the same information as Attachment 2);
 - 1.3. Submit within 90 calendar days of the date the data is recorded to its Transmission Planner.
- R2. Each Transmission Owner shall: [*Violation Risk Factor: Lower*] [*Time Horizon: Long-term Planning*]
 - 2.1. Verify the Reactive Power capability of its synchronous condenser units in accordance with Attachment 1 ;
 - 2.2. Record the information on Attachment 2 (or on the Transmission Owner’s form that contains the same information as Attachment 2)
 - 2.3. Submit within 90 calendar days of the verification to its Transmission Planner.

C. Measures

- M1. Each Generator Owner has evidence that it performed the verification, such as a completed MOD-025 Attachment 2 or Generator Owner form with equivalent information, and has evidence that it submitted the information, such as dated electronic mail messages or mail receipts, in accordance with Requirement R1.
- M2. Each Transmission Owner has evidence that it performed the verification, such as a completed MOD-025 Attachment 2 or Transmission Owner form with equivalent

information, and has evidence that it submitted the information, such as dated electronic mail messages or mail receipts, in accordance with Requirement R2.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority

Regional Entity

1.2. Data Retention

The Generator Owner and Transmission Owner shall each keep the latest data or 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 or Generator Owner form with equivalent information and submittal evidence for Requirement 1, Measure 1.
- The Transmission Owner shall retain the latest MOD-025 Attachment 2 or Transmission Owner form with equivalent information and submittal evidence for Requirement 2, Measure 2.

If a Generator Owner or Transmission Owner is found non-compliant, it shall keep information related to the non-compliance until 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 Audits

Self-Certifications

Spot Checking

Compliance Violation Investigations

Self-Reporting

Complaints

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 and 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 100 calendar days from the date the data was recorded.	The Generator Owner verified and recorded the Real and Reactive Power capability of its applicable generating unit or applicable synchronous condenser, but submitted the data to its Transmission Planner more than 100 calendar days but within 110 calendar days from the date the data was recorded.	The Generator Owner verified and recorded the Real and Reactive Power capability of its applicable generating unit or applicable synchronous condenser but submitted the data to its Transmission Planner more than 110 calendar days but within 120 calendar days of the date the data was recorded.	<p>The Generator Owner verified and recorded the Real and 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 from the date the data was recorded.</p> <p>OR</p> <p>The Generator Owner failed to verify the Real and Reactive Power capability of an applicable generating unit.</p> <p>OR</p> <p>The Generator Owner failed to verify the Reactive Power capability of an applicable synchronous condenser unit.</p>

				<p>OR</p> <p>The Generator Owner failed to submit its verified Real or Reactive Power capability for an applicable generating unit or an applicable synchronous condenser unit to its Transmission Planner.</p>
R2	<p>The Transmission Owner verified and recorded the Reactive Power capability of its applicable applicable synchronous condenser, but submitted the data to its Transmission Planner more than 90 calendar days but within 100 calendar days from the date the data was recorded.</p>	<p>The Transmission Owner verified and recorded the Reactive Power capability of its applicable applicable synchronous condenser, but submitted the data to its Transmission Planner more than 100 calendar days but within 110 calendar days from the date the data was recorded.</p>	<p>The Transmission Owner verified and recorded the Reactive Power capability of an applicable synchronous condenser unit but submitted the data to its Transmission Planner more than 110 calendar days but within 120 calendar days of the date the data was recorded.</p>	<p>The Transmission Owner failed to verify the Reactive Power capability of an applicable synchronous condenser unit.</p> <p>OR</p> <p>The Transmission Owner failed to submit its verified Reactive Power capability for an applicable synchronous condenser unit to its Transmission Planner.</p>

E. Regional Variances

None

F. Associated Documents

Version History

Version	Date	Action	Change Tracking
Version 1	12/1/2005	<ol style="list-style-type: none"> 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

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

1. For units of less than 20 MVA 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 greater than 20 MVA (gross nameplate rating).
2. Perform verification with all auxiliary equipment needed for expected normal operation in service for both the Real Power and Reactive Power capability verification, and the automatic voltage regulator in service for the Reactive Power capability verification. Operational data from within the year prior to the verification date is acceptable for the verification as long as it meets the criteria in 2.1 through 2.5 below and is within 20% of the expected value:
 - 2.1. Perform verification of Real and Reactive Power capability of all generating units at maximum over-excited (lagging) and under-excited (leading) reactive capability at rated gross Real Power capability¹. 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 capability of wind turbines and photovoltaic inverters with ninety percent of the wind turbines or photovoltaic inverters at a site on line. Maintain as steady as possible Real and Reactive Power output during verification.
 - 2.2. Verify Reactive Power of all generating units other than wind and photovoltaic for maximum overexcited (lagging) and under-excited (leading) reactive capability at the minimum Real Power output at which they could normally be expected to operate. Nuclear Units are not required to perform Reactive Power verification at minimum Real Power output.
 - 2.3. Conduct the rated Real Power and overexcited Reactive Power verifications required in 2.1 for a minimum of one continuous hour.
 - 2.4. Record the under-excited reactive capability verification data required in 2.1 and 2.2 and the over-excited reactive capability verification data required in 2.2 as soon as a limit is reached.
 - 2.5. For hydrogen-cooled generators, perform the verification at normal operating hydrogen pressure.
3. Record the following data for the verification 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.

¹ The generating unit's normal expected maximum Real Power at the time of the verification.

- 3.3. The voltage at the high and low side of the generator step-up and/or system interconnection transformer(s) at the end of the verification period.
 - 3.4. The ambient air temperature at the end of the verification period and a correction factor, if any, to allow the Transmission Owner to correct the Real Power rating to a different ambient temperature if needed.
 - 3.5. The date and time of the verification period, including start and end time in hours and minutes.
 - 3.6. The existing generator step-up and/or system interconnection transformer(s) tap setting.
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 generator step-up 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.
5. The periodicity for performing Real and Reactive Power generating capability verification is as follows:
 - 5.1. For staged verification; verify each generator and/or synchronous condenser or plant/facility at least every five years, (with no more than 66 calendar months between verifications), or within one year of the discovery of a change that is expected to affect its Real Power or Reactive Power capability by more than 10% of the last reported verified capability and is expected to last more than six months.
 - 5.2. For verification using operational data; verify each generator and/or synchronous condenser or plant/facility at least every five years, within 66 calendar months between verifications, or within one year following the discovery of a change that is expected to affect its Real Power or Reactive Power capability by more than 10% 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, the Generator Owner shall designate one of the dates as the verification date, and report that date as the verification date on MOD-025- Attachment 2 for periodicity purposes.
 - 5.3. For either verification method, new units shall be verified within one year of their commercial operation date.

Note 1: The data points obtained by the MVAR verification required by the standard may not duplicate the manufacturer supplied thermal capability curve (D-curve) due to transmission system conditions. However, the verification required by the standard may be able to uncover unit limitations such as rotor thermal instability, improper tap settings, inaccurate AVR operation, etc. which could be further analyzed for resolution. For any verification limited by transmission system conditions, 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 the MOD-010 standard.

Note 2: While not required by the standard, it is desirable to perform engineering analysis to determine expected unit capabilities under less restrictive system conditions. Even though this analysis will not verify the complete MVAR capability curve, it provides a reasonable estimate of unit capability that the Transmission Planner can use for modeling.

MOD-025 Attachment 2

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

Note: If the configuration of the generation 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:

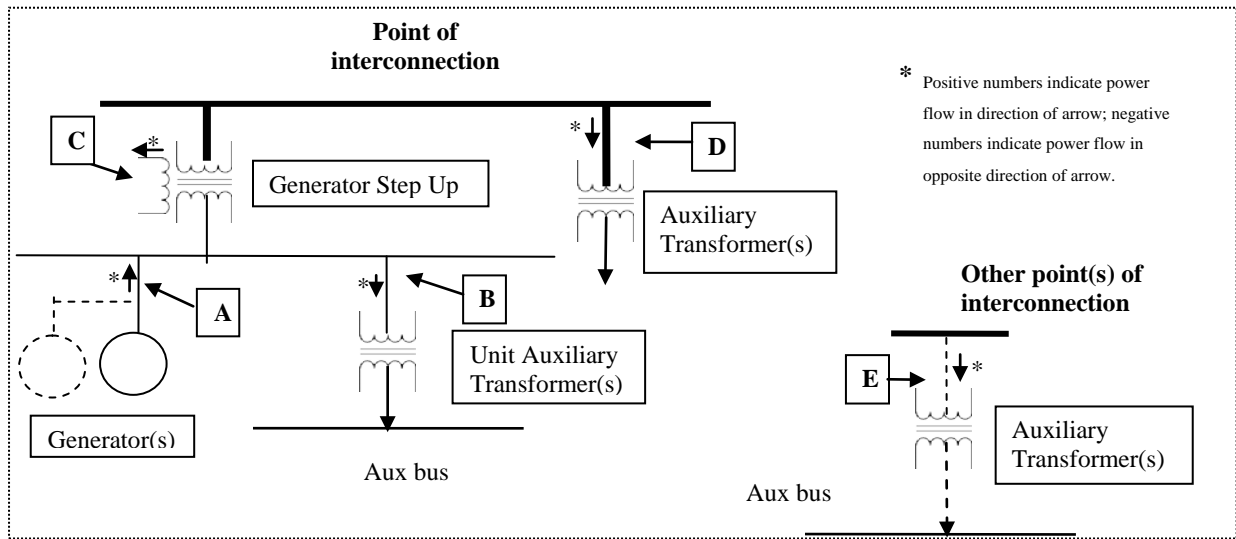
Reported By (name):

Plant:

Unit No.:

Date of Report:

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.
Identify values that are calculated if any:				
B	kV	MW	MVAR	Sum multiple Unit Auxiliary Transformers.
Identify values that are calculated if any:				
C	kV	MW	MVAR	Sum multiple tertiary load, if any.
Identify values that are calculated if any:				
D	kV	MW	MVAR	Sum multiple Auxiliary Transformers.
Identify values that are calculated if any:				
E	kV	MW	MVAR	If multiple points of interconnection describe these for accurate modeling; report points individually (Sum multiple Auxiliary Transformers).
Identify values that are calculated if any:				

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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 Capability (*MVAR) equals Gross Reactive Power Capability (*MVAR) minus Aux Reactive Power (*MVAR)		
Gross Real Power Generating Capability (*MW)		
Aux Real Power (*MW)		
Net Capability (*MW) equals Gross Real Power Capability (*MW) minus Aux Power (*MW)		

* Note: Enter values at the end of the verification period.

Summary of Verification

- Date of Verification _____, Verification Start Time _____, Verification End Time _____
- Scheduled Voltage _____
- Transformer Tap Settings: GSU _____, Unit Aux _____, Station Aux _____, Other Aux _____
- Ambient air temperature at the end of the verification period:
 Air temperature: _____°F Include in remarks below, any correction factor for different temperatures.
- The recorded MVAR values were adjusted to rated generator voltage, where applicable.
- Most recent verification Date used in table above _____

Check all that apply:

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- | | |
|--|---|
| <input type="checkbox"/> Overexcited Full Load Verification | <input type="checkbox"/> Underexcited Minimum Load Verification |
| <input type="checkbox"/> Underexcited Full Load Verification | <input type="checkbox"/> Real Power Verification |
| <input type="checkbox"/> Overexcited Minimum Load Verification | |

Remarks :

Note: If the verification value did not reach the Thermal Capability Curve (D-Curve), describe the reason.