

**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.*

This proposed standard is the Version 0 EOP-005 modified to include a translation of planning measures IV.A.M2 and IV.A.M3, which were not included in the approval Version 0 reliability standards because they required further work.

**Development Steps Completed:**

1. A SAR was posted from December 2, 2004, through January 7, 2005.
2. The SAC appointed a standard drafting team on January 13, 2005.
3. The drafting team posted its response to SAR comments and all other historical comments on April 19, 2005.
4. The drafting team posted ~~D~~raft 1 of the standard from April 21, 2005 through June 13, 2005.
5. The drafting team has reviewed comments on ~~D~~raft 1, prepared a consideration of those comments and incorporated conforming changes into ~~D~~raft 2.
6. The drafting team posted ~~D~~raft 2 of the standard from October 17 through December 3, 2005.
7. The drafting team has reviewed comments on ~~D~~raft 2, prepared a consideration of those comments and incorporated conforming changes into ~~D~~raft 3.

**Description of Current Draft:**

This is the third draft of the standard to be posted for industry review prior to ballot.

**Future Development Plan:**

<b>Anticipated Actions</b>	<b>Anticipated Date</b>
1. Conduct <del>1</del> <sup>st</sup> - <del>first</del> ballot.	March 20 <del>—</del> <u>30</u> , 2006
2. Consider comments submitted with <del>1</del> <sup>st</sup> - <del>first</del> ballot; post consideration of comments	April 3 <del>—</del> <u>7</u> , 2006
3. Conduct <del>2</del> <sup>nd</sup> - <del>second</del> ballot.	April 10 <del>—</del> <u>20</u> , 2006
4. Post standards and implementation plan for 30-day review by <del>B</del> oard.	April 1, 2006
5. Board adoption date.	May 2, 2006
6. Proposed <del>E</del> ffective date.	<del>1</del> <u>One</u> year after BOT adoption

### Definitions of Terms Used in Standard

*This section includes all newly defined or revised terms used in the proposed standard. Terms already defined in the Reliability Standards Glossary of Terms are not repeated here. New or revised definitions listed below become approved when the proposed standard is approved. When the standard becomes effective, these defined terms will be removed from the individual standard and added to the Glossary.*

**Cranking Path:** A portion of the electric system that can be isolated and then energized to deliver electric power from a generation source to enable the startup of one or more other generating units.

**A. Introduction**

1. **Title:** System Restoration Plans
2. **Number:** EOP-005-1
3. **Purpose:** To ensure plans, procedures, and resources are available to restore the electric system to a normal condition in the event of a partial or total shut down of the system.
4. **Applicability**
  - 4.1. Transmission Operators.
  - 4.2. Balancing Authorities.
5. **Proposed Effective Date:** ~~August 1~~One year after BOT adoption, 2007.

**B. Requirements**

- R1. Each Transmission Operator shall have a restoration plan to reestablish its electric system in a stable and orderly manner in the event of a partial or total shutdown of its system, including necessary operating instructions and procedures to cover emergency conditions, and the loss of vital telecommunications channels. Each Transmission Operator shall include the applicable elements listed in Attachment 1-EOP-005 in developing a restoration plan.
- R2. Each Transmission Operator shall review and update its restoration plan at least annually and whenever it makes changes in the power system network, and shall correct deficiencies found during the simulated restoration exercises.
- R3. Each Transmission Operator shall develop restoration plans with a priority of restoring the integrity of the Interconnection.
- R4. Each Transmission Operator shall coordinate its restoration plans with the Generator Owners and Balancing Authorities within its area, its Reliability Coordinator, and neighboring Transmission Operators and Balancing Authorities.
- R5. Each Transmission Operator and Balancing Authority shall periodically test its telecommunication facilities needed to implement the restoration plan.
- R6. Each Transmission Operator and Balancing Authority shall train its operating personnel in the implementation of the restoration plan. Such training shall include simulated exercises, if practicable.
- R7. Each Transmission Operator and Balancing Authority shall verify the restoration procedure by actual testing or by simulation.
- R8. Each Transmission Operator shall verify that the number, size, availability, and location of system blackstart generating units are sufficient to meet Regional Reliability Organization restoration plan requirements for the Transmission Operator's area.
- R9. The Transmission Operator shall document the Cranking Paths, including initial switching requirements, between each blackstart generating unit and the unit(s) to be started and shall provide this documentation for review by~~to~~ the Regional Reliability Organization upon request. Such documentation may include Cranking Path diagrams.

- R10.** The Transmission Operator shall demonstrate, through simulation or testing, that the blackstart generating units in its restoration plan can perform their intended functions as required in the ~~Regional~~regional restoration plan.
- R10.1.** The Transmission Operator shall perform this simulation or testing at least once every five years.
- R11.** Following a disturbance in which one or more areas of the Bulk Electric System become isolated or blacked out, the affected Transmission Operators and Balancing Authorities shall begin immediately to return the Bulk Electric System to normal.
- R11.1.** The affected Transmission Operators and Balancing Authorities shall work in conjunction with their Reliability Coordinator(s) to determine the extent and condition of the isolated area(s).
- R11.2.** The affected Transmission Operators and Balancing Authorities shall take the necessary actions to restore Bulk Electric System frequency to normal, including adjusting generation, placing additional generators on~~line~~line, or load shedding.
- R11.3.** The affected Balancing Authorities, working with their Reliability Coordinator(s), shall immediately review the Interchange Schedules between those Balancing Authority Areas or fragments of those Balancing Authority Areas within the separated area and make adjustments as needed to facilitate the restoration. The affected Balancing Authorities shall make all attempts to maintain the adjusted Interchange Schedules, whether generation control is manual or automatic.
- R11.4.** The affected Transmission Operators shall give high priority to restoration of off-site power to nuclear stations.
- R11.5.** The affected Transmission Operators may resynchronize the isolated area(s) with the surrounding area(s) when the following conditions are met:
- R11.5.1.** Voltage, frequency, and phase angle permit.
- R11.5.2.** The size of the area being reconnected and the capacity of the transmission lines effecting the reconnection and the number of synchronizing points across the system are considered.
- R11.5.3.** Reliability Coordinator(s) and adjacent areas are notified and Reliability Coordinator approval is given.
- R11.5.4.** Load is shed in neighboring areas, if required, to permit successful interconnected system restoration.

### **C. Measures**

- M1.** The Transmission Operator shall, within 30 calendar days of a request, provide its Regional Reliability Organization with documentation of simulations or tests that demonstrate the blackstart units and Cranking Paths identified in the Transmission Operator's restoration plan can perform their intended functions as required in the ~~R~~regional restoration plan.
- M2.** The Transmission Operator shall, within 30 calendar days of a request from its Regional Reliability Organization, make available documentation showing the number, size, and location of system blackstart generating units and the associated Cranking Paths for review at the Transmission Operator's location.

### **D. Compliance**

#### **1. Compliance Monitoring Process**

**1.1. Compliance Monitoring Responsibility**

Regional Reliability Organization.

**1.2. Compliance Monitoring Period and Reset Timeframe**

One calendar year.

**1.3. Data Retention**

The Transmission Operator must have its plan to reestablish its electric system available for review by the Regional Reliability Organization at all times.

The Compliance Monitor shall retain any audit data for three years.

**1.4. Additional Compliance Information**

Self-Certification: Each Transmission Operator shall annually self-certify to the Regional Reliability Organization that the following criteria have been met:

- 1.4.1 The necessary operating instructions and procedures for restoring loads, including identification of critical load requirements.
- 1.4.2 A set of procedures for annual review for simulating and, where practical, actual testing and verification of the restoration plan resources and procedures.
- 1.4.3 Documentation must be retained in the personnel training records that operating personnel have been trained annually in the implementation of the plan and have participated in restoration exercises.
- 1.4.4 Any significant changes to the restoration plan must be reported to the Regional Reliability Organization.
- 1.4.5 The number, size, availability, and location of system blackstart generating units are sufficient to meet Regional Reliability Organization restoration plan requirements for the Transmission Operator's area
- 1.4.6 The Cranking Paths, including initial switching requirements, between each blackstart generating unit and the unit(s) to be started have been documented and this documentation is available for the Regional Reliability Organization's review.
- 1.4.7 The blackstart generating units in its restoration plan can perform their intended functions as required in the Regional restoration plan.

~~The Transmission Operator shall demonstrate compliance through self-certification or audit (periodic, as part of targeted monitoring or initiated by complaint or event), as determined by the Compliance Monitor.~~

**2. Levels of Non-Compliance**

- 2.1. Level 1: Plan exists but is not reviewed annually.
- 2.2. Level 2: Plan exists but does not address one of the elements listed in Attachment 1-EOP-005.
- 2.3. Level 3: Did not make available documentation showing the number, size, and location of system blackstart generating units and the associated Cranking Paths.
- 2.4. Level 4: There shall be a level four non-compliance if any of the following conditions exist:

## Standard EOP-005-1 — System Restoration Plans

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- 2.4.1 Plan exists but does not address two or more of the requirements in Attachment 1—EOP-005.
- 2.4.2 No restoration plan in place.
- 2.4.3 ~~No~~ ~~ss~~ simulation or test results as required in Requirement 10.

### E. Regional Differences

None identified.

### Version History

Version	Date	Action	Change Tracking
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Attachment 1 ~~-EOP-005-0~~

**Elements for Consideration in Development of Restoration Plans**

The Restoration Plan must consider the following requirements, as applicable:

1. Plan and procedures outlining the relationships and responsibilities of the personnel necessary to implement system restoration.
2. The provision for a reliable black-start capability plan including: fuel resources for black start power for generating units, available cranking and transmission paths, and communication adequacy and protocol and power supplies.
3. The plan must account for the possibility that restoration cannot be completed as expected.
4. The necessary operating instructions and procedures for synchronizing areas of the system that have become separated.
5. The necessary operating instructions and procedures for restoring loads, including identification of critical load requirements.
6. A set of procedures for simulating and, where practical, actually testing and verifying the plan resources and procedures ~~(at least every three years)~~.
7. Documentation must be retained in the personnel training records that operating personnel have been trained annually in the implementation of the plan and have participated in restoration exercises.
8. The functions to be coordinated with and among Reliability Coordinators and neighboring Transmission Operators. (The plan should include references to coordination of actions among neighboring Transmission Operators and Reliability Coordinators when the plans are implemented.)
9. Notification shall be made to other operating entities as the steps of the restoration plan are implemented.

**Standard Development Roadmap**

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This proposed standard is the Version 0 MOD-013 modified to include a translation of a part of planning measure II.B.M6, which was not included in the approval Version 0 reliability standards because it required further work.

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5. Board adoption date.	May 2, 2006
6. Proposed <del>E</del> ffective date.	<del>6</del> <u>Six</u> months after BOT adoption



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**No new definitions are proposed for this standard.**

**A. Introduction**

1. **Title:** Maintenance and Distribution of Dynamics Data Requirements and Reporting Procedures
2. **Number:** MOD-013-1
3. **Purpose:** To establish consistent data requirements, reporting procedures, and system models to be used in the analysis of the reliability of the interconnected transmission systems.
4. **Applicability:**
  - 4.1. Regional Reliability Organization.
5. **Effective Date:** ~~February 1, 2007~~ Six months after BOT adoption

**B. Requirements**

- R1.** The Regional Reliability Organization, in coordination with its Transmission Owners, Transmission Planners, Generator Owners, and Resource Planners, shall develop comprehensive dynamics data requirements and reporting procedures needed to model and analyze the dynamic behavior or response of each of the NERC Interconnections: Eastern, Western, and ERCOT. Within an Interconnection, the Regional Reliability Organizations shall jointly coordinate on the development of the data requirements and reporting procedures for that Interconnection. Each set of Interconnection-wide dynamics data requirements shall include the following dynamics data requirements:
- R1.1.** Design data shall be provided for new or refurbished excitation systems (for synchronous generators and synchronous condensers) at least ~~one year~~ three months prior to the ~~in-service~~ installation date. ~~with updated data provided once the unit is in service.~~
- R1.1.1.** If design data is unavailable from the manufacturer 3 months prior to the installation date, estimated or typical manufacturer's data, based on excitation systems of similar design and characteristics, shall be provided. at least one year prior to the in-service date with updated data provided once the unit is in service.
- R1.2.** Unit-specific dynamics data shall be reported for generators and synchronous condensers (including, as appropriate to the model, items such as inertia constant, damping coefficient, saturation parameters, and direct and quadrature axes reactances and time constants), excitation systems, voltage regulators, turbine-governor systems, power system stabilizers, and other associated generation equipment.
- R1.2.1.** Estimated or typical manufacturer's dynamics data, based on units of similar design and characteristics, may be submitted when unit-specific dynamics data cannot be obtained. In no case shall other than unit-specific data be reported for generator units installed after 1990.
- R1.2.2.** The Interconnection-wide requirements shall specify unit size thresholds for permitting:
- The use of non-detailed vs. detailed models,
  - The netting of small generating units with bus load, and
  - The combining of multiple generating units at one plant.

- R1.3.** Device specific dynamics data shall be reported for dynamic devices, including, among others, static VAR controllers, high voltage direct current systems, flexible AC transmission systems, and static compensators.
- R1.4.** Dynamics data representing electrical Demand characteristics as a function of frequency and voltage.
- R1.5.** Dynamics data shall be consistent with the reported steady-state (power flow) data supplied per Reliability Standard MOD-010 Requirement 1.
- R2.** The Regional Reliability Organization shall participate in the documentation of its Interconnection's data requirements and reporting procedures and, shall participate in the review of those data requirements and reporting procedures (at least every five years), and shall provide those data requirements and reporting procedures to Regional Reliability Organizations, NERC, and all users of the Interconnected systems on request (within five business days).

### **C. Measures**

- M1.** The Regional Reliability Organizations within each Interconnection shall have documentation of their Interconnection's dynamics data requirements and reporting procedures and shall provide the documentation as specified in ~~MOD-013~~ Requirement 2.

### **D. Compliance**

#### **1. Compliance Monitoring Process**

##### **1.1. Compliance Monitoring Responsibility**

Compliance Monitor: NERC.

##### **1.2. Compliance Monitoring Period and Reset Time Frame**

Data requirements and reporting procedures: on request (~~5~~five business days).

Periodic review of data requirements and reporting procedures: at least every five years.

##### **1.3. Data Retention**

None specified.

##### **1.4. Additional Compliance Information**

None.

#### **2. Levels of Non-Compliance**

**2.1. Level 1:** Data requirements and reporting procedures for dynamics data were provided, but were incomplete in one of the five areas defined in ~~MOD-013~~R1.

**2.2. Level 2:** Not applicable.

**2.3. Level 3:** Data requirements and reporting procedures provided were incomplete in two or more of the five areas defined in ~~MOD-013~~R1.

**2.4. Level 4:** Data requirements and reporting procedures for dynamics data were not provided, or the data requirements and reporting procedures provided were incomplete in three or more of the five areas defined in ~~MOD-013~~R1.

### **E. Regional Differences**

~~+~~None [identified](#).

**Standard MOD-013-1 — RRO Dynamics Data Requirements and Reporting Procedures**

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**Version History**

<b>Version</b>	<b>Date</b>	<b>Action</b>	<b>Change Tracking</b>
0	April 1, 2005	Effective Date	New

**Standard Development Roadmap**

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This proposed standard is the Version 0 MOD-016 modified to include a translation of planning measure II.D.M2, which was not included in the approval Version 0 reliability standards because it required further work.

**Development Steps Completed:**

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**No definitions are introduced in this standard.**

## A. Introduction

1. **Title:** Documentation of Data Reporting Requirements for Actual and Forecast Demands, Net Energy for Load, and Controllable Demand-Side Management
2. **Number:** MOD-016-1
3. **Purpose:** Ensure that accurate, actual Demand data is available to support assessments and validation of past events and databases. Forecast Demand data is needed to perform future system assessments to identify the need for system reinforcements for continued reliability. In addition, to assist in proper real-time operating, Load information related to controllable Demand-Side Management (DSM) programs is needed.
4. **Applicability:**
  - 4.1. Planning Authority.
  - 4.2. Regional Reliability Organization.
5. **Proposed Effective Date:** ~~November 1, 2006~~ Six months after BOT adoption.

## B. Requirements

- R1. The Planning Authority and Regional Reliability Organization shall have documentation identifying the scope and details of the actual and forecast (a) Demand data, (b) Net Energy for Load data, and (c) controllable DSM data to be reported for system modeling and reliability analyses.
  - R1.1. The aggregated and dispersed data submittal requirements shall ensure that consistent data is supplied for Reliability Standards TPL-005-0, TPL-006-0, MOD-010-0, MOD-011-0, MOD-012-0, MOD-013-0, MOD-014-0, MOD-015-0, MOD-016, MOD-017-0, MOD-018-0, MOD-019-0, MOD-020-0, and MOD-021-0.
  - ~~R1.2.~~ The data submittal requirements shall stipulate that the each Load-Serving Entity count each-its customer Demand within its service territory once and only once, on an aggregated and dispersed basis, in developing its actual and forecast customer Demand values.
- R2. The Regional Reliability Organization shall distribute its documentation required in ~~MOD-016 Requirement 1 for reporting customer Demand data~~ and any changes to that documentation, to all Planning Authorities that work within its Region.

The Regional Reliability Organization shall make this distribution within 30 calendar days of approval.

\_\_\_\_\_ The Planning Authority shall distribute its documentation required in ~~MOD-016~~R1 for reporting customer ~~Demand~~ data and any changes to that documentation, to its Transmission Planners and Load-Serving Entities that work within its Planning Authority Area. The Planning Authority shall make this distribution -within 30 calendar days of approval.

## C. Measures

- M1. The Planning Authority and Regional Reliability Organization's documentation for actual and forecast customer ~~Demand~~ data shall contain all items identified in ~~MOD-016~~R1.
- M2. The Regional Reliability Organization shall have evidence it provided its actual and forecast customer ~~Demand~~ data reporting requirements within 30 calendar days of approval to each Planning Authority that works within its Region as required in Requirement 2.

M3. The Planning Authority shall have evidence it provided ~~documentation for reporting customer Demand data and any changes to that documentation to its Transmission Planners and Load-Serving Entities~~its actual and forecast customer data and reporting requirements as required in ~~MOD-016 Requirement 3~~.

**D. Compliance**

**1. Compliance Monitoring Process**

**1.1. Compliance Monitoring Responsibility**

Compliance Monitor for Planning Authority: Regional Reliability Organization.  
Compliance Monitor for Regional Reliability Organization: NERC.

**1.2. Compliance Monitoring Period and Reset Time ~~f~~Frame**

One calendar year.

**1.3. Data Retention**

For the Regional Reliability Organization and Planning Authority: Current version of the documentation.

For the Compliance Monitor: Three years of audit information.

**1.4. Additional Compliance Information**

The Regional Reliability Organization and Planning Authority shall each demonstrate compliance through self-certification or audit (periodic, as part of targeted monitoring or initiated by complaint or event), as determined by the Compliance Monitor.

**2. Levels of Non-Compliance**

**2.1. Level 1:** Documentation does not address completeness and double counting of customer data.

**2.2. Level 2:** Documentation did not address one of the three types of data required in ~~MOD-016~~R1 (Demand data, Net Energy for Load data, and controllable DSM data).

**2.3. Level 3:** No evidence documentation was distributed as required.

**2.4. Level 4:** Either the documentation did not address two of the three types of data required in ~~MOD-016~~R1 (Demand data, Net Energy for Load data, and controllable DSM data) or there was no documentation.

**E. Regional Differences**

~~1~~.None identified.

**Version History**

Version	Date	Action	Change Tracking
0	April 1, 2005	Effective Date	New