

### **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 version 1 posted on November 6, 2006.
2. SAR version 1 comment period closed on December 5, 2006.
3. SAR version 2 and comment responses for SAR version 1 posted on February 8, 2007.
4. SAR version 2 comment period closed on March 9, 2007.
5. SAR version 3 and comment responses for SAR version 2 accepted by SC and SDT appointed on April 9, 2007.

#### **Proposed Action Plan and Description of Current Draft:**

The SDT began meeting in mid-April 2007 immediately following the approval of the SAR by the SC with the goal of completing work in approximately one year's time. The current draft is the first posting of the proposed standards. Only the requirements and measures have been completed at this time. Violation risk factors, time horizons, and all compliance elements will be completed after the requirements have been reviewed. Requirements in EOP-007 and EOP-009 have been incorporated into the revised EOP-005 and EOP-006. Therefore, EOP-007 and EOP-009 will be retired when this project is approved and EOP-005-2 and EOP-006-2 go into effect.

#### **Future Development Plan:**

<b>Anticipated Actions</b>	<b>Anticipated Date</b>
1. Second posting of draft standards.	December 10, 2007
2. Standards posted for first ballot.	February 18, 2008
3. Standards posted for second ballot.	March 17, 2008
4. Standards sent to BOT for approval.	April 1, 2008

**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.*

**Blackstart Capability Plan:** Existing definition is retired.

**Blackstart Resource:** A generation Facility and set of equipment under the control of the Generator Operator with the basic ability to start itself without support from the System or to automatically remain energized without connection to the remainder of the System, with the ability to energize a dead bus, and meeting the Transmission Operator's restoration plan needs for real and reactive power capability.

## A. Introduction

1. **Title:** System Restoration and Blackstart — Operations
2. **Number:** EOP-005-2
3. **Purpose:** Ensure plans, Facilities, and personnel are available to restore the Bulk Electric System (BES) to its normal state following an event that requires the utilization of Blackstart Resources.
4. **Applicability:**
  - 4.1. Transmission Operators
  - 4.2. Generator Operators with Blackstart Resources
5. **Proposed Effective Date:** TBD

## B. Requirements

- R1. Each Transmission Operator shall have a restoration plan approved by its Reliability Coordinator to restore its System to its normal state following an event that requires the utilization of Blackstart Resources. The restoration plan shall have a priority of restoring the integrity of the Interconnection under the direction of the Reliability Coordinator. The restoration plan shall include the following: [Violation Risk Factor = xxx] [Time Horizon = xxx]
  - R1.1. Identification of the authority and tasks of the Transmission Operator's control room and field switching personnel assigned to participate in restoration activities including the responsibility of the Transmission Operator to work with its Reliability Coordinator and with other Transmission Operators and the responsibility of the Transmission Operator to coordinate its restoration activities with the entities operating within its area.
  - R1.2. Documented coordination with applicable Blackstart Resource Facility Plans (BRFP) to ensure the ability of the Blackstart Resource to control and maintain voltage and frequency within acceptable limits.
    - R1.2.1. Identification of each Blackstart Resource and its characteristics including the following: the name of the Blackstart Resource, location, megawatt and megavar capacity, type of unit, latest date of test, test results and starting method.
  - R1.3. Cranking Paths diagrams, including initial switching requirements, between each Blackstart Resource and the unit(s) to be started.
  - R1.4. Identification of acceptable operating voltage and frequency limits during restoration.
  - R1.5. A statement indicating that in situations where the actual conditions do not match the studied conditions, the System Operator shall use professional judgment to modify the System restoration plan.
  - R1.6. Operating Procedures to re-establish connections within the Transmission Operator's System for areas that have become separated.

- R1.7.** Operating Procedures to restore Loads, including identification of any critical Load requirements that require high priority including off-site power for nuclear Facilities, and Facilities required to restore the BES.
- R1.8.** Procedures to coordinate its restoration plan with the applicable Generator Owners, Generator Operators, Load-Serving Entities, Distribution Providers, and Balancing Authorities within its area, its Reliability Coordinator, and neighboring Transmission Operators and Balancing Authorities.
- R2.** Each Transmission Operator shall review its restoration plan at least annually and update it within ninety calendar days after completing permanent modifications that would change the planned Cranking Paths or after detecting deficiencies in the restoration plan. [Violation Risk Factor = xxx] [Time Horizon = xxx]
  - R2.1.** The Transmission Operator shall submit its revised restoration plan to the Reliability Coordinator within the same ninety day period.
  - R2.2.** Each Transmission Operator shall confirm annually to its Reliability Coordinator that it has reviewed its restoration plan.
- R3.** Each Transmission Operator shall verify every five years at a minimum through a combination of analysis of actual events, steady state and dynamic simulations or testing that its documented restoration plan accomplishes its intended function. Such simulations or testing shall include: [Violation Risk Factor = xxx] [Time Horizon = xxx]
  - R3.1.** Ability of Blackstart Resources to meet the Reactive Power requirements of the Cranking Paths and to supply initial Loads.
  - R3.2.** Loads required to stabilize the Blackstart Resources.
  - R3.3.** Loads and generating resources required to control voltages and frequency within acceptable steady-state and dynamic limits (documented in Requirement R1.4) as the BES is restored.
- R4.** Following a Disturbance in which one or more areas of the BES shuts down and the use of Blackstart Resources is required to restore the shut down area to service, each affected Transmission Operators shall implement its restoration plan. [Violation Risk Factor = xxx] [Time Horizon = xxx]
  - R4.1.** Each affected Transmission Operator shall work in conjunction with its Reliability Coordinator(s) to determine the extent and condition of the isolated area(s).
  - R4.2.** Each affected Transmission Operator shall give high priority to restoration of off-site power to nuclear stations.
  - R4.3.** Each affected Transmission Operator must notify its Reliability Coordinator of restoration progress as required in the Reliability Coordinator's restoration plan.
- R5.** Each affected Transmission Operator shall resynchronize islanded area(s) with neighboring area(s) only with the authorization of the Reliability Coordinator and in

accordance with the established procedures of the Reliability Coordinator. [Violation Risk Factor = xxx] [Time Horizon = xxx]

- R6.** Each Transmission Operator shall have Blackstart Resource testing requirements to verify that each Blackstart Resource is capable of meeting the requirements of its restoration plan. These Blackstart Resource testing requirements shall include, but are not limited to: [Violation Risk Factor = xxx] [Time Horizon = xxx]
  - R6.1.** Frequency of testing with every Blackstart Resource tested at least once every three years.
  - R6.2.** Type of test required, including but not limited to:
    - R6.2.1.** Ability to start the unit when isolated with no support from the BES.
    - R6.2.2.** Ability to energize a dead bus. If it is not possible to energize a dead bus during the test, the testing entity must affirm that the unit has the capability to energize a dead bus.
    - R6.2.3.** Ability to remain stable and control voltage as indicated by the restoration plan while isolated from the BES and supplying minimum Load level as defined in the restoration plan.
    - R6.2.4.** Ability to maintain acceptable frequency during the test as indicated in the restoration plan.
  - R6.3.** Minimum duration of tests.
- R7.** Each Transmission Operator shall only include, in its restoration plan, those Blackstart Resources that have met the Transmission Operator's Blackstart Resource testing requirements.
- R8.** Each Transmission Operator shall distribute its Blackstart Resource testing requirements to each Generator Operator in its area that operates a Blackstart Resource.
- R9.** Each Transmission Operator shall provide training within its existing emergency operations topics training program to its control room personnel identified in its restoration plan to ensure the proper execution of its restoration plan. This training program shall include the following: [Violation Risk Factor = xxx] [Time Horizon = xxx]
  - R9.1.** System restoration philosophy.
  - R9.2.** Restoration priorities.
  - R9.3.** Building of cranking paths.
  - R9.4.** Synchronizing.
  - R9.5.** Review of the restoration plan.
- R10.** Each Transmission Operator shall provide a minimum of two hours of System restoration training per year for each of its authorized transmission field switching personnel for the tasks identified in its restoration plan.

- R11.** Each Transmission Operator shall participate in its Reliability Coordinator's restoration drills, exercises, or simulations as requested by its Reliability Coordinator. [Violation Risk Factor = xxx] [Time Horizon = xxx]
- R12.** Each Transmission Operator and Generator Operator with a Blackstart Resource shall have a documented Blackstart Resource agreement specifying the terms and conditions of their arrangement. Within ninety days of a Blackstart Resource's acceptance as such into a Transmission Operator's restoration plan, the Generator Operator with the Blackstart Resource must provide its BRFP to the Transmission Operator. The BRFP shall include at a minimum: the name of the Blackstart Resource, location, megawatt and megavar capacity, type of unit, fuel type, latest date of test, test results, starting method and procedures for the startup of the Blackstart Resource. [Violation Risk Factor = xxx] [Time Horizon = xxx]
- R13.** Each Generator Operator with a Blackstart Resource included in a Transmission Operator's restoration plan shall review its BRFP at least annually and update, if necessary, within ninety calendar days after completing modifications that would change the BRFP or after detecting deficiencies in the BRFP. [Violation Risk Factor = xxx] [Time Horizon = xxx]
- R14.** Each Generator Operator of a Blackstart Resource included in the Transmission Operator's restoration plan shall perform Blackstart Resource tests in accordance with the requirements set by the Transmission Operator to verify that that Blackstart Resource can perform as specified in the restoration plan. [Violation Risk Factor = xxx] [Time Horizon = xxx]
- R14.1.** The Generator Operator shall provide documentation of its Blackstart Resource test results to its Reliability Coordinator and Transmission Operator. Testing records shall include at a minimum: name of the Blackstart Resource, unit tested, date of the test, duration of the test, time required to start the unit, an indication of any testing requirements not met under Requirement R6, the voltage profile during the test including time correlation to Loads applied (if any), and the unit frequency profile during the test including time correlation to Loads applied (if any).
- R15.** Each Generator Operator shall provide a minimum of four hours of training per year to its operating personnel responsible for the startup and synchronization of its Blackstart Resource generation units identified in the BRFP. The training program shall include the following: [Violation Risk Factor = xxx] [Time Horizon = xxx]
- R15.1.** System restoration philosophy including coordination with the Transmission Operator.
- R15.2.** Special actions required to enable blackstart and synchronization to the System.
- R15.3.** Restoration priorities.
- R16.** Each Generator Operator shall participate in the Reliability Coordinator's restoration drills, exercises, or simulations as requested by the Reliability Coordinator.

**C. Measures**

- M1.** Each Transmission Operator shall have a documented System restoration plan developed in accordance with Requirement R1 that has been approved by its Reliability Coordinator as shown with evidence such as a written approval letter from its Reliability Coordinator.
- M2.** Each Transmission Operator shall have documentation that it has annually reviewed and updated its restoration plan in accordance with Requirement R2.
- M3.** Each Transmission Operator shall have documentation, such as load flow outputs or similar programmatic printouts, that it has verified that its restoration plan accomplishes its intended function in accordance with Requirement R3.
- M4.** If there has been a Disturbance in which Blackstart Resources have been utilized in restoring the shut down area of the System to service, each Transmission Operator involved shall have evidence, that could include, but is not limited to, operator logs, voice recordings or transcripts of voice recordings, electronic communications, or computer printouts, that it implemented its restoration plan in accordance with Requirement R4.
- M5.** If there has been a Disturbance in which Blackstart Resources have been utilized in restoring the shut down area of the System to service, each Transmission Operator involved in such an event shall have evidence, that could include, but is not limited to, operator logs, voice recordings or transcripts of voice recordings, electronic communications, or computer printouts, that it resynchronized isolated areas in accordance with Requirement R5.
- M6.** Each Transmission Operator shall have documented Blackstart Resource testing requirements in accordance with Requirement R6.
- M7.** Each Transmission Operator shall have documentation such as test results showing that all Blackstart Resources included in its restoration plan have met its Blackstart Resource testing requirements in accordance with Requirement R7.
- M8.** Each Transmission Operator shall have evidence such as e-mail logs that it has distributed its Blackstart Resource testing requirements to each Generator Operator in its area that operates a Blackstart Resource in accordance with Requirement R8.
- M9.** Each Transmission Operator shall have a copy of its training records available showing that they have provided training in accordance with Requirements R9 and R10.
- M10.** Each Transmission Operator shall have evidence that it participated in the Reliability Coordinator's restoration drills, exercises, or simulations as requested in accordance with Requirement R11.
- M11.** Each Transmission Operator shall have available its Blackstart Resource agreements with all Generator Operator's with Blackstart Resources included in its restoration plan in accordance with Requirement R12.
- M12.** Each Generator Operator with a BRFP included in a Transmission Operator's restoration plan shall have documentation that it has reviewed and updated, if necessary, its BRFP in accordance with Requirement R13.

**M13.** Each Generator Operator with a BRFP included in the Transmission Operator’s restoration plan shall have evidence that it has tested its Blackstart Resources in accordance with Requirement R14.

**M14.** Each Generator Operator shall have a copy of its training records available showing that it has provided training in accordance with Requirement R15.

**M15.** Each Generator Operator shall have evidence that it participated in the Reliability Coordinator’s restoration drills, exercises, or simulations if requested to do so in accordance with Requirement R16.

**D. Compliance**

**1. Compliance Monitoring Process**

**1.1. Compliance Monitoring Responsibility**

**1.2. Compliance Monitoring Period and Reset**

**1.3. Data Retention**

**1.4. Additional Compliance Information**

**2. Violation Severity Levels**

**2.1. Lower:**

**2.2. Moderate:**

**2.3. High:**

**2.4. Severe:**

**E. Regional Variances**

None.

**F. Associated Documents**

None.

**Version History**

<b>Version</b>	<b>Date</b>	<b>Action</b>	<b>Change Tracking</b>
0	April 1, 2005	Effective Date	New
0	August 8, 2005	Removed “Proposed” from Effective Date	Errata
1	May 2, 2007	Approved by Board of Trustees	Revised
2	April 18, 2007	Revisions pursuant to Project 2006-03	Updated testing requirements Incorporated Attachment 1 into the requirements Updated Measures and

**Standard EOP-005-2 — System Restoration and Blackstart — Operations**

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			Compliance to match new Requirements Added Associated Standards
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