


# System Operating Procedures

SOP-RTMKTS.0180.0080

Process Black Start Unit Testing

Effective Date: February 16, 2011  
Revision No. 9

	© ISO New England Inc. 2011	<b>Procedure: Process Black Start Unit Testing</b>
	Process Name: Monitor Resource Performance	
	Procedure Number: RTMKTS.0180.0080	Revision Number: 9
	Procedure Owner: Kory Haag	Effective Date: February 16, 2011
	Approved By: Director, Operations Support Services	Valid Through: February 16, 2013

# SOP- RTMKTS.0180.0080


## Process Black Start Unit Testing

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## 1. Objective

The objective of this procedure is to document the internal ISO process within System Operations including data submittals for Settlements for Black Start Capability Testing.


## 2. Background

Schedule 16 of the Open Access Transmission Tariff and ISO New England Operating Procedure No. 11 Black Start Capability Testing Requirements (OP-11) govern the processing and reporting of Black Start Capability Testing.

Black Start Generators shall perform an actual black start of the Generator without dependency on the interconnected system or other unrelated unit support as described in NPCC Directory #8 System Restoration. Testing of Black Start Generators will also be assessed under NPCC Reliability Compliance and Enforcement Program, A-08. Each individual Black Start Generator that is part of a multi-unit station must perform a separate Black Start test. Each designated Black Start Generator receives a monthly System Restoration and Planning Service From Generators Credit (Black Start payment). Each designated Black Start Generator is paid monthly based on its Claimed Capability for the month and on the proxy rate in Schedule 16 of the Open Access Transmission Tariff.

## 3. Responsibilities


1. In accordance with Schedule 16 of the ISO New England Open Access Transmission Tariff, ISO is responsible for the designation of generators as Black Start Capable. The ISO Chair of the System Restoration Working Group (SRWG), considering input provided by the SRWG, is responsible for designating Black Start Generators.
2. The Market Participant is responsible for logging the Black Start Capability Test requests in the ISO Outage Scheduling software.

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3. The applicable LCC is responsible for reviewing and studying the Black Start Capability Test requests and determining if the Black Start Capability Test request is approved or denied.
  - If the Black Start Capability Test request is approved, the applicable LCC is responsible for submitting the request to ISO.
  - If the Black Start Capability Test request is denied, the applicable LCC is responsible for working with the Market Participant to find a suitable date and time to conduct the test.
4. The ISO Outage Coordinator is responsible for recording Black Start Capability Test requests that occur during the Annual Maintenance Scheduling process.
5. The Black Start Administrator is responsible for communicating Black Start Capability Test results to Settlements by maintaining the Black Start contract status through the SMS UI “Black Start Program Admin.”

#### 4. Controls

- Only designated personnel authorized by the Director, Operations Support Services shall be allowed to process Black Start Capability Testing documents
- Black Start Capability Testing results received by Market Participants shall be archived in accordance with the ISO data retention policies

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## 5. Instructions

### 5.1 Request to Perform Testing

#### 5.1.1 Determining Black Start Generators

#### NOTE

Market Participants submit requests for black start Generator status through Market Support.

As prescribed by Schedule 16 of the Open Access Transmission Tariff, one (1) year's advanced notice is required by Market Participants to withdraw a Generator from black start Generator status and the minimum commitment period is three (3) years.

In order to receive compensation for Black Start Capability Testing a Generator shall conduct a successful physical black start test annually. Black Start Capability Test requests, which occur during an Annual Inspection outage, are included in the Generator Annual Maintenance Scheduling process through the ISO Outage Coordination Engineer at <mailto:opamoreq@iso-ne.com>.

1. Market Support shall forward requests for Black Start Generator status to the ISO Chair of the SRWG for evaluation.

#### NOTE


Attachment D - Requirements for Black Start Restoration Plan Resources outlines the basic physical requirements of Black Start resources that are used by the SRWG to evaluate new and existing Black Start resources.

2. The ISO Chair of the SRWG, with input from the SRWG members, shall determine whether the Generator provides significant benefit to Local Control Center (LCC) and ISO system restoration plans in its evaluation of whether or not to designate it as a Black Start Capable Generator that could become a Black Start Restoration Plan resource.

#### NOTE

Provisional Black Start Generator status is subject to: (1) successful completion of a Black Start Capability Test and: (2) the submittal to ISO of a Signature Page documenting the execution of an agreement between the Black Start Generator Owner and ISO for the generator to provide System Restoration and Planning Service.

3. The ISO Chair of the SRWG (or designee) shall notify the Black Start Administrator whether or not the Generator has been given provisional Black Start Generator status.
4. The Black Start Administrator shall notify Market Support to request that the Market Participant revise their NX-12 data.

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### 5.1.2 Initiating the Test Process

**NOTE**

The Black Start Administrator emails Attachments A and B of this procedure to the Market Participants to facilitate Black Start testing and obtain the necessary data regarding Black Start Capability Test results.

1. At the beginning of each calendar year, the Black Start Administrator shall email to the Market Participants the following:
  - Attachment A - Black Start Generator Test Log
  - Attachment B - Instructions for Filling Out the Black Start Generator Test Log

**NOTE**


Planned Outages for annual maintenance include Black Start Capability Tests and are submitted in accordance with ISO New England Operating Procedure No. 5 Generator and Dispatchable Asset Related Demand Maintenance and Outage Scheduling (OP-5)

2. The ISO Outage Coordination Engineer shall record planned Outages for annual maintenance including Black Start Capability Tests on the Annual Maintenance Schedule (AMS).

**NOTE**

Black Start Capability Test requests may come through the generator outage request process or through the transmission outage coordination process depending on the lines of demarcation for switching authority.

3. The Market Participant shall enter a Black Start Capability Test request in the ISO Outage Scheduling software.
- 
4. When a Black Start Capability Test request is entered in the ISO Outage Scheduling software by a Market Participant and ISO and the applicable LCC have reviewed, studied and approved the Black Start Capability Test request, ISO and the applicable LCC shall perform the following:
    - A. Verify the Generator is redeclared during the time of the test
    - B. Assist the Black Start Administrator in determining when test results should arrive at the ISO.
  5. The Senior Outage Coordinator shall notify the Black Start Administrator when requests for Black Start Capability Testing are received.

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### 5.1.3 Processing and Notification of Test Results

#### NOTE


Once Black Start Capability Testing is completed the Market Participant has 24 hours to verbally notify ISO and their Local Control Center indicating the success or failure of the test.

Black Start Capability Test failures require a successful retest within 30 days or by December 31<sup>st</sup> (whichever is most limiting) in order to continue receipt of Black Start payments.

If there is a Black Start Capability Test failure in a given year (year “Y”) and the retest is conducted in the following year (Year “Y+1”), that Retest cannot also be used for that year’s (year (“Y+1”) annual Black Start Capability Test (Example: A Generator tests in December 2008 resulting in failure, but retests successfully in January 2009. An additional Black Start Capability Test for the Generator is required in order to meet the 2009 calendar year requirements for Black Start Capability Testing).

Within 30 days of performing the Black Start Capability Test (success or failure) the Market Participant shall complete Attachment A - Black Start Generator Test Log and submit it to the ISO and their Local Control Center for review. Each Market Participant’s report will include a description of any problems that were encountered and remedial actions, if any, needed to correct those problems reported. The completed Attachment A can be sent to the ISO Black Start Administrator by email or fax.

1. **For New Black Start Generators:** the Black Start Administrator shall perform the following when the Market Participant notifies ISO of the success or failure of a Capability Test for a New Black Start Generator:
  - A. **Test-Pass.** If the Market Participant notifies ISO of the success of a Black Start Capability Test then the Black Start Administrator shall perform the following:
    - (1) Record the Black Start Capability Test results in Attachment C - Yearly Black Start Log.
    - (2) Revise as necessary when Attachment A - Black Start Generator Test Log is submitted to ISO.
    - (3) Request the Market Participant to submit the form known as the Signature Page.
    - (4) Upon receipt of the completed Signature Page, provide an approved change request to the Operations Business Process Analyst to update OP-11 Appendices to incorporate any

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Generator changes per SOP-RTMKTS.0125.0050 - Develop, Revise and Control ISO New England Operating Procedures.

- (5) If the Black Start resource is eligible for Schedule 16 compensation, create a contract in SMS “Black Start Program Admin User Interface” (UI).

B. **Test-Fail.** If the Market Participant verbally notifies of the failure of a Black Start Capability Test perform the following:

- (1) Record the test failure date in Attachment C - Yearly Black Start Log.
- (2) Notify the Market Participant (email or written notice) that they must perform a successful test in order to qualify to receive Black Start payments.


2. **For Existing Black Start Generators:** the Black Start Administrator shall perform the following when the Market Participant notifies ISO of the success or failure of the Capability Test for an Existing Black Start Generator:

A. **Test-Pass.** If the Market Participant notifies ISO of the success of a Black Start Capability Test then the Black Start Administrator shall perform the following:


- (1) Record the Black Start Capability Test results in Attachment C - Yearly Black Start Log.
- (2) Revise as necessary when Attachment A - Black Start Generator Test Log is submitted to ISO.

B. **Test\_Fail.** If the Market Participant verbally notifies the failure of a Black Start Capability Test then perform the following:


- (1) Record the test failure date in Attachment C - Yearly Black Start Log.
- (2) Notify the Market Participant (email or written notice) that they have 30 days to perform a retest or until December 31<sup>st</sup> (whichever is most limiting) in order to continue receipt of Black Start payments.
- (3) Change the contract status for the calendar month(s) for which the Black Start resource is ineligible for compensation from ACTIVE to SUSPENDED in the SMS UI “Black Start Program Admin”.
  - a. In comments enter date of failed black start date, and the date of re-test.

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- C. **Retest-Pass.** If the retest is successful within the 30-day or December 31<sup>st</sup> deadline (whichever is most limiting) then record the Black Start Capability Test results in Attachment C - Yearly Black Start Log. Revise as necessary when Attachment A - Black Start Generator Test Log is submitted to the ISO.
- (1) Reverse the change of contract status for the calendar month(s) that the Black Start resource is re-eligible for compensation from “SUSPENDED” to “ACTIVE”, in the SMS UI “Black Start Program Admin.” and in “Comments” add an explanation that status was reversed to active and the date of re-test.
  - (2) Notify Settlements (email) to restart the monthly Black Start payments.
  - (3) Notify the Market Participant (email or written notice) that the monthly Black Start payments have been restarted.
- D. **Retest-Fail.** If the retest is unsuccessful within the 30-day or December 31<sup>st</sup> deadline (whichever is most limiting) then perform the following:
- (1) Notify Settlements (email) to discontinue the monthly Black Start payments.
  - (2) Notify the Market Participant (email or written notice) that the monthly Black Start payments have been stopped until notification of a successful Black Start Capability Test is received.
  - (3) Change the contract status for all calendar month(s) for which the Black Start resource is ineligible for compensation from ACTIVE to SUSPENDED in the SMS UI “Black Start Program Admin” and in “Comments” add an explanation of status change
3. Each year the Black Start Administrator shall:
- A. Complete the data fields contained in the Attachment C - Yearly Black Start Log as follows:
    - (1) Compare the Yearly Black Start Log with the Generators considered eligible for Black Start payments listed in OP-11 to ensure comprehensive testing has occurred. Resolve any discrepancies with the ISO Chair of the SRWG.
    - (2) Compare the Yearly Black Start Log with the contract information entered in SMS UI “Black Start Program Admin” to ensure settlement contract information is accurate.
  - B. Send the updated Yearly Black Start Log to Settlements indicating which Generators Passed and Failed.

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4. The Black Start Administrator shall archive Black Start Generator Test Logs and the Yearly Black Start Log for future.
5. Black Start Contract Termination
  - A. If and when the Black Start contract between ISO and the Black Start Generator is terminated, the Black Start Administrator shall do the following:
    - (1) Change the contract status for the month of termination from SUSPENDED to TERMINATED in the AMS UI “Black Start Program Admin” and in “Comments” add an explanation that contract was terminated.
    - (2) Provide an approved change request to the Operations Business Process Analyst to update OP-11 Appendices to incorporate any Generator changes per SOP- RTMKTS.0125.0050 - Develop, Revise and Control ISO New England Operating Procedures.

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## 6. Performance Measures

This procedure is deemed to be properly followed as evidenced by the following:

- Goal for Corporate Customer Satisfaction Rating met

## 7. References

NPCC Directory #8 System Restoration

NPCC Reliability Compliance and Enforcement Program, A-08

Schedule 16 of the Open Access Transmission Tariff

ISO New England Operating Procedure No. 5 Generator and Dispatchable Asset Related Demand Maintenance and Outage Scheduling (OP-5)


ISO New England Operating Procedure No. 11 Black Start Capability Testing Requirements (OP-11)

SOP-RTMKTS.0125.0050 - Develop, Revise and Control ISO New England Operating Procedures


ISO-NE User Guide: Black Start Program Admin User Interface

## 8. Revision History

Rev. No.	Date	Reason	Contact
0	09/20/05	Initial procedure	Rich Berryman
1	03/8/06	Revised to clarify when Black Start unit payments are stopped	Donna Horkun
2	05/10/07	Revised Procedure Owner and responsible personnel as part of the annual review	Crystal Jackson
3	06/18/07	Added that Generator needs to submit a form known as the Signature Page to ISO in order to receive proper settlement	Crystal Jackson
4	09/14/07	Changed who is recipient of Signature page	Crystal Jackson
5	03/03/08	Annual Review completed 02/28/08 with no changes required..	Crystal Jackson
6	03/16/09	Periodic review required	Crystal Jackson

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7	06/16/09	Modified Section 3 Step 4; Added new sub-step 5.1.3.1.B.(3); Added new sub-step 5.1.3.1.C.(3); Added new sub-steps 5.1.3.1.D.(1) & 5.1.3.1.D.(1) a.; Added new sub-steps 5.1.3.1.E.(4) & 5.1.3.1.E.(4) a.; Added new sub-steps 5.1.3.1.F.(4) & 5.1.3.1.F.(5); Added new sub-step 5.1.3.1.G.; Added new sub-step 5.1.3.1.A.(5); Added new Reference	Crystal Jackson
8	08/05/09	Modified Section 2.; Modified Section 3.1; Modified Steps 5.1.1.1.1, 5.1.1.2., 5.1.1.3., 5.1.2.2., 5.1.2.3., 5.1.3. & NOTEs, 5.1.3.1.A.(4) & B.(2), 5.1.3.1.C., 5.1.3.1.D and sub-steps, 5.1.3.1.E, 5.1.3. 5.1.3.5, 5.1.3.1.F. & G. 5.1.3.2., 5.1.3.3.A., 5.1.3.5; Section 7 added OP-5; Added new Attachment D	Crystal Jackson
9	0216/11	Biennial review by procedure owner; Globally in Footer replaced page numbers with Page X of Y format; Globally in Header changed Procedure Owner and updated copyright date; Globally changed all references for SAM to ISO Facility Outage Scheduling software; Globally changed Resource Audit Coordinator to Black Start Administrator; Section 3 modified and moved former step 3.2 to be new step 3.4, modified new step 3.2, and added new step 3.3; Step 5.1 NOTE modified; Converted part of former step 5.1.1.2 to be a new preceding NOTE; Converted part of former step 5.1.1.3 to be a new preceding NOTE; Converted part of former step 5.1.2.1 to be a new preceding NOTE; Modified Step 5.1.2.1 & step 5.1.2.2 Converted part of former step 5.1.2.3 to be a new preceding NOTE; Added new step 5.1.2.3 Modified Step 5.1.2.4 Step 5.1.3.1 Removed sub-steps C and D; Step 5.1.3.3 changed yearly task; Section 7 added SOP-RTMKTS.0125.0050 Attachment B modified	Kory Haag

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## 9. Attachments


Attachment A - Black Start Generator Test Log

Attachment B - Instructions for Filling Out the Black Start Generator Test Log

Attachment C - Yearly Black Start Log

Attachment D - Requirement for Black Start Restoration Plan Resources




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## Attachment B - Instructions for Filling Out the Black Start Generator Test Log


The following is an explanation of the data field requirements for the Black Start Generator Test Log. If you have any questions regarding this procedure, please contact Kory Haag at 413-535-4064 or Blackstart@iso-ne.

<b>ASSET ID</b>	Blackstart Generator's ISO-Issued Asset ID.
<b>ASSET NAME</b>	Asset name registered with the ISO.
<b>UNIT NUMBER</b>	If asset is part of a multiple unit station, indicate the unit being tested.
<b>COMPANY</b>	Lead Market Participant for the Black Start Generator.
<b>CONTACT PERSON</b>	Person to be contacted on matters pertaining to the Black Start Generator.
<b>PHONE NUMBER/EMAIL ADDRESS</b>	Contact Person information.
<b>PRIME FUEL TYPE</b>	The primary fuel used by the Black Start Generator.
<b>TYPE OF STARTING</b>	Air start, emergency generator, electric start, pony motor; etc.
<b>MIN. AMT OF ON-SITE PRIMARY FUEL ALWAYS AVAIL (MWH)</b>	<p>The minimum amount of primary on-site fuel that will always be available for the Black Start Generator reported in Mega Watt Hours (MWH).</p> <p>For hydro Generators, the data reflects "best estimates" due to the nature of water resources.</p> <p>For gas Generators, rather than a minimum amount available, indicate in the comments column whether or not an on-site compressor exists to raise/maintain gas pressure.</p>
<b>ALT FUEL TYPE</b>	If available, identify any alternate fuel that can be used by the Black Start Generator.
<b>MIN AMT OF ON-SITE ALT FUEL ALWAYS AVAIL (MWH)</b>	The minimum amount of alternate on-site fuel that will always be available for the Black Start Generator reported in Mega Watt Hours (MWH).

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<b>DATE OF TEST</b>	The day that the Black Start Capability Test was actually performed.
<b>STARTED WITHOUT ASSISTANCE</b>	Unit was capable of starting without assistance from systems external to the station.
<b>PASSED, FAILED</b>	Check whether the Generator passed or failed its Black Start Capability Test.
<b>24 HOUR VERBAL NOTICES, ISO, LCC</b>	Include Time, Date and person contacted.
<b>30 DAY WRITTEN REPORT</b>	Check if the required 30-day report was given to the ISO. If not provide explanation in Comments section.
<b>TIME REQ'D TO BLACK START</b>	Indicate the total amount of time required to black start the Generator from assumed initial request from the Local Control Center to being ready to energize transmission out of the station.
<b>LCC COMMUNICATION CHECKED</b>	Verified that Communications to LCC outside of Public Switched Network are available and operational.
<b>CIRCUIT BREAKER</b>	Verify that the unit has the ability to shut circuit breaker onto a dead bus.
<b>VOLTAGE AND FREQUENCY</b>	Verify the unit has the ability to control voltage (lead and lag) and frequency.
<b>PREP FOR XMSN EGRESS</b>	Check if the capability to perform switching operations that are under the Generator owner's authority and within the station were verified by assessment and visual inspection of station equipment or actual operation (actual isolation and switching of transmission equipment shall not be performed as part of the test without prior approval of, and coordination with, the respective Local Control Center and ISO).
<b>COMMENTS</b>	Enter any comments warranted to clarify unique aspects of the Black Start Capability Test.




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## Attachment D - Requirements for Black Start Restoration Plan Resources


In accordance with Schedule 16 of the ISO New England Open Access Transmission Tariff (OATT), ISO New England (ISO-NE) is responsible for the designation of generators as Black Start Capable. The Chair of the System Restoration Working Group (SRWG) and the SRWG members are responsible for determining whether a new or existing Black Start resource provides significant benefit to the system restoration plans of the Local Control Center and ISO-NE. This Attachment D outlines the basic physical requirements used by the System Restoration Working Group (SRWG) to evaluate new and existing Black Start resources providing System Restoration Service under Schedule 16 of the ISO New England Open Access Transmission Tariff (OATT). The specific physical characteristics are organized under the following categories of requirements:

- (i) Starting up without support from the system (black start)
- (ii) Operating and Control
- (iii) Frequency and Voltage Control
- (iv) Location, Egress Outlet Connection, and Cranking
- (v) Fuel Capability and Storage
- (vi) Procedure, Documentation and Training

New Black Start resources seeking compensation under Schedule 16 of the OATT must meet these basic physical unit requirements as a first step. If such requirements are met, the next step for the new Black Start resource owner is to complete and submit detailed generator information to the SRWG Chair on the M/LCC 11 Attachment A - New Black Start Generator (BSG) Capability, Assessment and Selection check list.

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<b>Requirements for Becoming a Black Start Restoration Plan Resource</b>	
<b><i>Basic Unit Starting Characteristic Requirements</i></b>	
1	Has the ability to be started without support from the System or is designed to remain energized without connection to the remainder of the System (meets basic starting requirements for starting when isolated with no support from the Bulk Electric system or when designed to remain energized without connection to the rest of the system).
2	Notification time plus start time must be less than or equal to 90 minutes under hot, intermediate or cold conditions.
<b><i>Basic Unit Operating and Control Characteristic Requirements</i></b>	
3	Has demonstrated or affirmed the ability to energize a dead bus, including verifying that the breaker close coil relay can be energized with the voltage and frequency monitor controls disconnected.
4	Has capability to start up and shut down multiple times during restoration as required regardless of Minimum Run Time and Minimum Down Time.
<b><i>Basic Unit Frequency and Voltage Control Characteristic Requirements</i></b>	
5	Meets the Transmission Operator's restoration plan needs for reactive power capability (can provide leading and lagging VAR capability and voltage control during initial stages of transmission path energization and system restoration and remains stable in both frequency and voltage in a no-load condition or while supplying only its own auxiliary loads or loads in the immediate area).
6	Has the ability to start the unit to be cranked while continuing to remain stable and control voltage and frequency.
7	Governor control system has all the characteristic required to support the blackstart island to which it is assigned.
<b><i>Basic Unit Location, Egress Outlet Connection, and Cranking Characteristic Requirements</i></b>	
8	Located in sufficient proximity to be able to connect directly to one or more of the following (in order of preference): (1) Nuclear power plant(s) (2) Key Interconnection points (3) Basic Minimum Power System (4) Proximity to EHV.
9	Located in an ISO/LCC Restoration 345 kV Transmission Area or Zone where critical blackstart restoration station service cranking capability and/or redundancy is needed.

	© ISO New England Inc. 2011	<b>Procedure: Process Black Start Unit Testing</b>
	<b>Process Name: Monitor Resource Performance</b>	
	<b>Procedure Number: RTMKTS.0180.0080</b>	<b>Revision Number: 9</b>
	<b>Procedure Owner: Kory Haag</b>	<b>Effective Date: February 16, 2011</b>
	<b>Approved By: Director, Operations</b>	<b>Valid Through: February 16, 2013</b>

10	Located electrically close to unit(s) to be cranked and is able to energize the transmission lines connecting it to such unit(s) and control voltages at both ends.
11	Has sufficient capacity and ramping capability to be able to provide the restart power required by the unit to be cranked.
12	Has multiple transmission egress outlets, thus protecting against equipment single-source damage or failure.
<b><i>Basic Unit Fuel Capability and Storage Characteristic Requirements</i></b>	
13	Has dual fuel capability including a reliable and sustainable fuel storage and supply capability (Note: this is desired, but not required).
14	Has sufficient fuel to operate at maximum capability for a sustained period during restoration (meets basic load-carrying requirements).
<b><i>Basic Unit Staffing and Emergency Communication Characteristic Requirements</i></b>	
15	Has required Primary communication equipment for communication with its LCC: Direct non-public switched network communication.
16	Has continuous on-site BSR operator staffing ( <i>Note: this is desired, but not required</i> ) on site, part time, remote.
<b><i>Basic Unit Procedure, Documentation and Training Requirements</i></b>	
17	Has documented procedures for self-starting the blackstart unit and energizing a bus.
18	Operating personnel responsible for blackstart unit startup have a minimum of two hours of training every two years on how to perform startup functions.