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| NPRR Number | [1164](https://www.ercot.com/mktrules/issues/NPRR1164) | NPRR Title | Black Start and Isochronous Control Capable Identification |
| Date Posted | February 21, 2023 |
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| Requested Resolution  | Normal  |
| Nodal Protocol Sections Requiring Revision  | 2.1, Definitions3.10.7.1.3, Transmission Breakers and Switches3.14.2, Black Start |
| Related Documents Requiring Revision/Related Revision Requests | Resource Registration Glossary Revision Request (RRGRR) 033, Related to NPRR1164, Black Start and Isochronous Control Capable Identification |
| Revision Description | This Nodal Protocol Revision Request (NPRR) requires that Resource Entities identify whether a physical Resource has the potential capability (even if unverified) to be called upon or used during a black start emergency or if it has the capability for isochronous control, and requires that Resource Entities and Transmission Service Providers (TSPs) identify if a breaker or switch has a Synchroscope or Synchronism Check Relay. This Revision Request defines the terms Black Start Capable Resource, Isochronous Control Capable Resource, Synchroscope, and Synchronism Check Relay. |
| Reason for Revision |  Addresses current operational issues. Meets Strategic goals (tied to the [ERCOT Strategic Plan](https://www.ercot.com/files/docs/2018/12/13/ERCOT_Strategic_Plan_2019-2023.pdf) or directed by the ERCOT Board). Market efficiencies or enhancements Administrative Regulatory requirements Other: (explain)*(please select all that apply)* |
| Business Case | Currently, black start training utilizes a list of units that may be black start capable, but that are not contracted Black Start Resources, and a separate list of units that are capable of isochronous control. These lists are both manually maintained and are based on knowledge and experience of ERCOT Qualified Scheduling Entities (QSEs) and Transmission Operators (TOs) over several years of black start training. Both of these capabilities have been used in some simulations of the black start training to incorporate into the training the additional challenges of the contracted Black Start Resources or cranking path to the next start unit being unavailable. In these training simulations, alternative options must be innovated to still create alternative, stable black start cranking paths or accomplish short time frame Critical Load restorations. This training technique helps to challenge operators to utilize system fundamentals as well as black start strategies and principles to accomplish objectives with critical thinking. There are currently no explicit requirements for identification of breakers or switches with a Synchroscope or Synchronism Check Relay. This NPRR also requires that breakers and switches identify if this equipment has these capabilities. Situational awareness of these capabilities helps to identify synchronization points and ensure that voltage, frequency, and phase angle permissives are within range to allow the closing of the breakers and switches.To help provide clarity and consistency of the required designations, ERCOT has proposed definitions for a Black Start Capable Resource, Isochronous Control Capable Resource, Synchroscope, and Synchronism Check Relay as well. By requiring this information to be maintained in the Network Operations Model and Resources Registration data, ERCOT can then integrate it with the Energy Management System (EMS) and associated simulator to ensure this designation is maintained by the Resource Entities and TSPs as capabilities change and as new physical Resources are interconnected to the ERCOT System. This will then ensure this information is maintained for use in black start training and, if needed, for situational awareness during a Blackout.  |

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| Proposed Protocol Language Revision |

**2.1 DEFINITIONS**

**Black Start Capable Resource**

A physical Resource that can start without support of the ERCOT Transmission Grid and that a Resource Entity believes can meet the Black Start capability tests in Section 8.1.1.2.1.5, System Black Start Capability Qualification and Testing, excluding paragraph (1)(g) 72 hours Back-up Fuel requirement.

**Isochronous Control Capable Resource**

A Resource that is capable of controlling frequency in isochronous control mode instead of droop control mode during a Blackout or Partial Blackout.

**Synchronism Check Relay**

A relay that electrically determines if the difference in voltage magnitude, frequency and phase angle falls within allowable limits for a breaker or switch to close. The Synchronism Check Relay will either allow or prevent closing depending on its settings.

**Synchroscope**

A piece of equipment that is used to monitor voltage waveforms from the two sides of an open circuit breaker or disconnect switch to ensure that the voltage magnitude, frequency, and phase angle are close enough to close the breaker or switch.

3.10.7.1.3 Transmission Breakers and Switches

(1) ERCOT’s Network Operations Model must include all transmission breakers and switches, the operation of which may cause a change in the flow on transmission lines or Electrical Buses. Breakers and switches may only be connected to defined Electrical Buses.

(2) Each TSP and Resource Entity shall provide ERCOT with the following information, subject to the naming conventions in Section 3.10.7.1, Modeling of Transmission Elements and Parameters:

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| ***[NPRR857: Replace paragraph (2) above with the following upon system implementation and satisfying the following conditions: (1) Southern Cross provides ERCOT with funds to cover the entire estimated cost of the project; and (2) Southern Cross has signed an interconnection agreement with a TSP and the TSP gives ERCOT written notice that Southern Cross has provided it with: (a) Notice to proceed with the construction of the interconnection; and (b) The financial security required to fund the interconnection facilities:]***(2) Each TSP, DCTO, and Resource Entity shall provide ERCOT with the following information, subject to the naming conventions in Section 3.10.7.1, Modeling of Transmission Elements and Parameters:  |

(a) Equipment owner(s);

(b) Equipment operator(s);

(c) The Transmission Element name;

(d) The substation name;

(e) Connectivity;

(f) Normal status;

(g) Synchronism Check Relay phase angle limits that are applied to operator-initiated, non-automated control actions of TSP-owned transmission breakers; and

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| ***[NPRR857: Replace item (g) above with the following upon system implementation and satisfying the following conditions: (1) Southern Cross provides ERCOT with funds to cover the entire estimated cost of the project; and (2) Southern Cross has signed an interconnection agreement with a TSP and the TSP gives ERCOT written notice that Southern Cross has provided it with: (a) Notice to proceed with the construction of the interconnection; and (b) The financial security required to fund the interconnection facilities:]***(g) Synchronism Check Relay phase angle limits that are applied to operator-initiated, non-automated control actions of TSP-owned or DCTO-owned transmission breakers; and |

(h) Other data necessary to model Transmission Element(s).

(3) ERCOT shall develop methods to accurately model changes in transmission line loading resulting from Load rollover schemes transferring more than ten MW. This may include modeling distribution circuit breakers, dead line sensing, or other methods that signal when the Load should be transferred from one transmission line to another transmission line. ERCOT may employ heuristic rule sets for all manual Load transfers and for automated transfers where feasible. ERCOT application software is required to model the effects of automatic or manual schemes in the field transfer Load under line outage conditions. Each TSP and as applicable, Resource Entity, shall define the Load rollover schemes under Section 3.10.7.2, Modeling of Resources and Transmission Loads, and furnish this information to ERCOT. Transmission field (right-of-way) switches must be connected to a named Electrical Bus and be included in the Network Operations Model.

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| ***[NPRR857: Replace paragraph (3) above with the following upon system implementation and satisfying the following conditions: (1) Southern Cross provides ERCOT with funds to cover the entire estimated cost of the project; and (2) Southern Cross has signed an interconnection agreement with a TSP and the TSP gives ERCOT written notice that Southern Cross has provided it with: (a) Notice to proceed with the construction of the interconnection; and (b) The financial security required to fund the interconnection facilities:]***(3) ERCOT shall develop methods to accurately model changes in transmission line loading resulting from Load rollover schemes transferring more than ten MW. This may include modeling distribution circuit breakers, dead line sensing, or other methods that signal when the Load should be transferred from one transmission line to another transmission line. ERCOT may employ heuristic rule sets for all manual Load transfers and for automated transfers where feasible. ERCOT application software is required to model the effects of automatic or manual schemes in the field transfer Load under line outage conditions. Each TSP and as applicable, each DCTO and Resource Entity, shall define the Load rollover schemes under Section 3.10.7.2, Modeling of Resources and Transmission Loads, and furnish this information to ERCOT. Transmission field (right-of-way) switches must be connected to a named Electrical Bus and be included in the Network Operations Model.  |

3.14.2 Black Start

(1) Each Generation Resource providing BSS must meet the requirements specified in North American Electric Reliability Corporation (NERC) Reliability Standards and the Operating Guides.

(2) Each Generation Resource providing BSS must meet the technical requirements specified in Section 8.1.1, QSE Ancillary Service Performance Standards, and Section 8.1.1.1, Ancillary Service Qualification and Testing.

(3) Bids for BSS are due on or before February 15th of each three-year period. Bids must be evaluated based on evaluation criteria attached as an appendix to the request for bids and contracted by December 31st for the following three-year period. ERCOT shall ensure BSSs are arranged, provided, and deployed as necessary to reenergize the ERCOT System following a Blackout or Partial Blackout.

(a) Resources shall disclose any weather-related limitations that could affect the Resource’s ability to provide BSS using the form provided in Section 22, Attachment M, Generation Resource Disclosure Regarding Bids for Black Start Service, as part of a bid to provide BSS.

(b) BSS bids shall include the hourly stand-by price and the BSS Back-up Fuel costs where applicable.

(c) When a Resource is selected to provide BSS, the Black Start Resource shall be required to complete all applicable testing requirements as specified in Section 8.1.1.2.1.5, System Black Start Capability Qualification and Testing.

(d) ERCOT shall provide a list of all prospective Black Start Resources that responded to the RFP for BSS to the impacted TSPs no later than seven days after the date on which bids for BSS are due. Any feedback from affected TSPs shall be limited to the identification of transmission constraints that may adversely impact the ability of the Black Start Resource to energize the Next Start Resource and shall be due to ERCOT by March 1st of that year. ERCOT shall share the feedback with the QSE representing the prospective Black Start Resource as soon as practicable. The QSE representing the Black Start Resource shall have the option to provide a response to any feedback provided by an affected TSP.

(4) ERCOT may schedule unannounced Black Start testing, to verify that BSS is operable as specified in Section 8.1.1.2.1.5.

(5) QSEs representing Generation Resources contracting for BSSs shall participate in training and restoration drills coordinated by ERCOT.

(6) ERCOT shall periodically determine and review the location and number of Black Start Resources required, as well as any special transmission or voice communication needs required. ERCOT and providers of this service shall meet the requirements as specified in the Operating Guides and in NERC Reliability Standards.

(7) A Resource Entity representing a Black Start Resource may request that an alternate Generation Resource which is connected to the same black start primary and secondary cranking path as the original Black Start Resource be substituted in place of the original Black Start Resource during the three year term of an executed Standard Form Black Start Agreement (Section 22, Attachment D, Standard Form Black Start Agreement) if the alternate Generation Resource meets testing and verification under established qualification criteria to ensure BSS.

(a) ERCOT, in its sole discretion, may reject a Resource Entity’s request for an alternate Generation Resource and will provide the Resource Entity an explanation of such rejection.

(b) If ERCOT accepts the alternative Generation Resource as the substituted Black Start Resource, such acceptance shall not affect the original terms, conditions and obligations of the Resource Entity under the Standard Form Black Start Agreement. The Resource Entity shall submit to ERCOT an Amendment to Standard Form Black Start Agreement (Section 22, Attachment I, Amendment to Standard Form Black Start Agreement) after qualification criteria has been met.

(8) For the purpose of the Black Start Hourly Standby Fee as described in Section 6.6.8.1, Black Start Hourly Standby Fee Payment, the Black Start Service Availability Reduction Factor shall be determined by using the availability for the original Black Start Resource and any substituted Black Start Resource(s), as appropriate for the rolling 4380-hour period of the evaluation.

(9) Each Generation Resource selected to provide BSS shall be prepared and able to provide BSS at any time as may be required by ERCOT, subject only to the limitations described in ERCOT Protocols or the Black Start Agreement.

(10) Each Generation Resource selected to provide BSS shall be able to utilize BSS Back-up Fuel for BSS and shall maintain a contracted amount of BSS Back-up Fuel to run the Black Start Resource for a minimum of 72 hours at its maximum output. The Generation Resource shall maintain the contracted amount of BSS Back-up Fuel at all times during the duration of the BSS contract term unless performing a BSS Back-up Fuel Switching Test or the Generation Resource is operating pursuant to a Black Start deployment event. This requirement does not apply to Resources that do not rely on purchased fuel.

(11) A Black Start Resource may utilize the contracted amount of BSS Back-up Fuel outside of BSS if ERCOT determines it is necessary during an Energy Emergency Alert (EEA) event.

(12) A Black Start Resource is not obligated to contract its full on site fuel storage capability for BSS Back-up Fuel. On site backup fuel in excess of the contracted BSS Back-up Fuel amount may be used by the Generation Resource at the discretion of the Generation Resource and ERCOT shall not prevent the Black Start Resource from utilizing the excess fuel, nor shall the Black Start Resource be required to request permission from ERCOT to utilize fuel in excess of the contracted BSS Back-up Fuel amount.

(13) ERCOT may, at its discretion, waive the BSS Back-up Fuel requirement stated in this Section, in whole or in part, if ERCOT deems necessary in order to procure a sufficient number or preferred combination of Generation Resources to provide BSS.

(14) A Resource Entity that submits a bid or is contracted to provide BSS or serve as an alternate to provide BSS with a Switchable Generation Resource (SWGR):

(a) Shall not nominate the SWGR to satisfy supply adequacy or capacity planning requirements in any Control Area other than the ERCOT Region during the term of the BSS contract;

(b) Shall submit a report to ERCOT in compliance with paragraph (2) of Section 16.5.4, Maintaining and Updating Resource Entity Information, indicating that the SWGR does not have any contractual requirement in a non-ERCOT Control Area during the term of the BSS contract; and

(c) Shall take any further action requested by ERCOT to ensure that ERCOT will be classified as the “Primary Party” for the SWGR under any agreement between ERCOT and another Control Area Operator during the term of the BSS contract.

(15) If a Resource Entity with a SWGR is contracted to provide BSS or designated as an alternate to provide BSS, the Resource Entity shall have its Black Start plan procedures approved by ERCOT. In the event of a Partial Blackout or Blackout of the ERCOT System, the Resource Entity with a SWGR shall immediately:

(a) Effectuate its Black Start plan procedures to be available to provide BSS; and

(b) Provide BSS as directed by ERCOT or the local Transmission Operator (TO).

(16) Each Resource Entity shall identify in its Resources Registration data if its Resource is a Black Start Capable Resource and an Isochronous Control Capable Resource.

(17) Each Resource Entity and each TSP shall identify in the Network Operations Model if a modeled breaker or switch it operates or directs the operation of has a Synchroscope and a Synchronism Check Relay associated with the breaker or switch.