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| NPRR Number | [1026](http://www.ercot.com/mktrules/issues/nprr1026) | NPRR Title | BESTF-7 Self-Limiting Facilities |
| Date of Decision | | November 11, 2020 | |
| Action | | Recommended Approval | |
| Timeline | | Normal | |
| Proposed Effective Date | | Upon system implementation | |
| Priority and Rank Assigned | | Priority – 2020; Rank – 3010 | |
| Nodal Protocol Sections Requiring Revision | | 2.1, Definitions  3.8, Special Considerations for Split Generation Meters, Combined Cycle Generation Resources, Quick Start Generation Resources, Hydro Generation Resources, Limited Duration Resources, and Energy Storage Resources  3.8.7, Self-Limiting Facility and Self-Limiting Resource (new)  3.9.1, Current Operating Plan (COP) Criteria  3.15, Voltage Support  3.15.3, Generation Resource Requirements Related to Voltage Support | |
| Related Documents Requiring Revision/Related Revision Requests | | Planning Guide Revision Request (PGRR) 081, Related to NPRR1026, BESTF-7 Self-Limiting Facilities | |
| Revision Description | | This Nodal Protocol Revision Request (NPRR) establishes rules for and enables the integration of Self-Limiting Facilities into the ERCOT markets and core systems, as described in Key Topic and Concept #13 which achieved consensus support at the Battery Energy Storage Task Force (BESTF) and was approved by the Technical Advisory Committee (TAC) by email vote which concluded on April 3, 2020. This NPRR is written to be consistent with the approved KTC-13.  A Self-Limiting Facility is described as a site with one or more Generation Resources and/or Energy Storage Resources (ESRs) in the same modeled generation station that connect to the same Point of Interconnection(s) (POI(s)), where the sum of the injection capability of the Resources in the same modeled generation station is greater than either the maximum power export (Pmax) rating as established in the interconnection agreement, or the inverter rating. Similarly, the withdrawal capability of an ESR (or ESRs) in a Self-Limiting Facility may exceed the maximum power withdrawal value (Pmin).  In these cases the Qualified Scheduling Entity (QSE) representing the Self-Limiting Facility will bear the responsibility of ensuring that energy injections to the grid do not exceed the Pmax and energy withdrawals from the grid do not exceed the Pmin.  As proposed, the language in this NPRR reflects the initial determination of the BESTF that when a Self-Limiting Facility exceeds its established injection or withdrawal limit, the consequence should be that ERCOT reports the exceedance to regulatory authorities and that the Resource Entity must submit a Generation Resource Interconnection or Change Request (GINR) to interconnect the entire capacity of the site. The NPRR also clarifies that the self-limiting status of the Facility would immediately terminate.  BESTF discussions have considered an alternate approach in the form of a claw-back mechanism as an economic way to discourage exceedances of the established limits. ERCOT believes at this time there is no need to have a claw-back mechanism; however, that concept is something that may be considered at a later date.  The language in this NPRR is intended to apply to both the current combo model era, in which ESRs are treated in ERCOT systems as two Resources — a Generation Resource and a Controllable Load Resource — as well as the future single model era as described in NPRR1014, BESTF-4 Energy Storage Resource Single Model. ERCOT appreciates stakeholders’ collaboration in developing these provisions. | |
| Reason for Revision | | Addresses current operational issues.  Meets Strategic goals (tied to the [ERCOT Strategic Plan](http://www.ercot.com/content/wcm/lists/144926/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 | | The ERCOT registration process, market rules and core systems currently do not support an approach that allows Facilities to participate with self-limitation. In recent months, ERCOT has fielded numerous requests from developers interested in interconnecting and operating with the ability to self-limit. Many developers would like to co-locate PhotoVoltaic generation and Energy Storage Systems (ESS) to enable optimal use of the interconnection facilities and allow them to inject to the ERCOT System at times when the PV output is less than interconnection limit. The ability to charge an ESS using on-site renewable generation improves the business case for battery energy storage. ERCOT anticipates this trend will continue and believes that the market rules proposed here are important for system reliability and for enabling better use of the interconnection facilities and transmission system. | |
| Credit Work Group Review | | ERCOT Credit Staff and the Credit Work Group (Credit WG) have reviewed NPRR1026 and do not believe that it requires changes to credit monitoring activity or the calculation of liability. | |
| PRS Decision | | On 7/16/20, PRS unanimously voted via roll call to table NPRR1026. All Market Segments were present for the vote.  On 10/15/20, PRS unanimously voted via roll call to recommend approval of NPRR1026 as amended by the 9/22/20 ERCOT comments. All Market Segments were present for the vote.  On 11/11/20, PRS unanimously voted via roll call to endorse and forward to TAC the 10/15/20 PRS Report and Impact Analysis for NPRR1026 with a recommended priority of 2020 and rank of 3010. All Market Segments were present for the vote. | |
| Summary of PRS Discussion | | On 7/16/20, there was no discussion.  On 10/15/20, participants reviewed the 9/22/20 ERCOT comments.  On 11/11/20, participants reviewed the Impact Analysis and Business Case, and discussed the appropriate priority and rank for NPRR1026. | |

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| Market Segment | Not applicable |

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| **Comments Received** | |
| **Comment Author** | **Comment Summary** |
| ERCOT 090320 | Proposed edits to expand the definition of Self-Limiting Facility, remove the proposed term Self-Limiting Resource, and remove the previously proposed claw-back mechanism to deter Entities from exceeding the Self-Limiting Facility maximum limits |
| ERCOT 092220 | Proposed additional edits on top of the 9/3/20 ERCOT comments to clarify the definition of Self-Limiting Facility |

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| **Market Rules Notes** |

Please note the baseline Protocol language in the following sections has been updated to reflect the incorporation of the following NPRRs into the Protocols:

* NPRR989, BESTF-1 Energy Storage Resource Technical Requirements (incorporated 7/1/20)
  + Section 3.15
  + Section 3.15.3
* NPRR1000, Elimination of Dynamically Scheduled Resources (incorporated 9/1/20)
  + Section 3.9.1
* NPRR1015, Clarification of DAM implementation of NPRR863 Phase 2 (incorporated 9/1/20)
  + Section 3.9.1
* NPRR1016, Clarify Requirements for Distribution Generation Resources (DGRs) and Distribution Energy Storage Resources (DESRs) (incorporated 9/1/20)
  + Section 3.8
  + Section 3.15
* NPRR1019, Pricing and Settlement Changes for Switchable Generation Resources (SWGRs) Instructed to Switch to ERCOT (incorporated 6/10/20)
  + Section 3.9.1
* NPRR1038, BESTF-8 Limited Exemption from Reactive Power Requirements for Certain Energy Storage Resources (incorporated 11/1/20)
  + Section 3.15

Please note the following NPRR(s) also propose revisions to the following sections:

* NPRR1001, Clarification of Definitions of Operating Condition Notice, Advisory, Watch, Emergency Notice, and Related Clarifications
  + Section 3.15.3
* NPRR1005, Clarify Definition of Point of Interconnection (POI) and Add Definition Point of Interconnection Bus (POIB)
  + Section 3.15
* NPRR1007, RTC – NP 3: Management Activities for the ERCOT System
  + Section 3.9.1
* NPRR1014
  + Section 3.9.1
* NPRR1029, BESTF-6 DC-Coupled Resources
  + Section 3.9.1
  + Section 3.15

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| Proposed Protocol Language Revision |

## 2.1 DEFINITIONS

**MW Injection**

The instantaneous MW energy injected into the ERCOT System as measured at the Point of Interconnection (POI).

**MW Withdrawal**

The instantaneous MW energy withdrawn from the ERCOT System as measured at the Point of Interconnection (POI).

**Self-Limiting Facility**

A modeled generation station that includes one or more Generation Resources and/or Energy Storage Resources (ESRs) with an established limit on the total MW Injection that is less than the total nameplate capacity of all Resource(s) within the Facility. A Facility with one or more ESRs may also have an established limit on the MW Withdrawal that is less than the total nameplate MW Withdrawal rating of all ESR(s) within the facility.

3.8 Special Considerations

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| ***[NPRR986 and NPRR1016: Replace applicable portions of Section 3.8 above with the following upon system implementation:]***  **3.8 Special Considerations** |

***3.8.7 Self-Limiting Facility***

(1) A Resource Entity or Interconnecting Entity for a Self-Limiting Facility may establish a MW Injection or MW Withdrawal limit by submitting an attestation in a form designated by ERCOT through the Resource Registration process. The Resource Entity or Interconnecting Entity shall simultaneously provide a copy of the attestation to the interconnecting Transmission and/or Distribution Service Provider (TDSP). All Resources within a Self-Limiting Facility shall be represented by a single Resource Entity and a single Qualified Scheduling Entity (QSE).

(2) A Self-Limiting Facility shall not inject or withdraw power in excess of its established MW Injection limit or its established MW Withdrawal limit.

(3) On a monthly basis, ERCOT will report to the Reliability Monitor and IMM any instance where a Self-Limiting Facility’s actual MW Injections exceeded the MW Injection limit or where actual MW Withdrawals exceeded the MW Withdrawal limit established in the Resource Registration data for the Self-Limiting Facility, as described in Section 3.9.1, Current Operating Plan Criteria.

(4) If requested by ERCOT, the relevant QSE shall provide meter data to confirm whether the established limits for a Self-Limiting Facility were violated.

(5) If ERCOT determines that a Self-Limiting Facility connected at transmission voltage has exceeded either its MW Injection limit or its MW Withdrawal limit established in the Resource Registration data by more than the greater of 5 MW or 3% of the limit, the Self-Limiting Facility shall submit a new generation interconnection request based on the installed MW capacity of the individual Resource(s) and shall deregister as a Self-Limiting Facility at the completion of the generation interconnection process. The Self-Limiting Facility shall be subject to the established MW Injection limit and any established MW Withdrawal limit until the generation interconnection process has been completed.

(6) A Distribution Service Provider (DSP) may limit injections and withdrawals from any Generation Resource or ESR based on Resource Registration data and the interconnection agreement between the DSP and the Interconnecting Entity or Resource Entity. In that case, the Interconnecting Entity or Resource Entity shall submit the attestation required by paragraph (1) above, and shall be considered a Self-Limiting Facility.

(7) If ERCOT determines that a Self-Limiting Facility connected at distribution voltage has exceeded either its MW Injection limit or its MW Withdrawal limit established in the Resource Registration data, the Self-Limiting Facility shall submit a new generation interconnection request based on the installed MW capacity of the individual Resource(s) and shall be deregistered as a Self-Limiting Facility at the completion of the generation interconnection process. The Self-Limiting Facility shall be subject to any MW Injection or MW Withdrawal limit until the generation interconnection process has been completed.

(8) The interconnecting TDSP, at its sole discretion, may use relaying to ensure a Self-Limiting Facility does not inject or withdraw energy in excess of its MW Injection or MW Withdrawal limits in order to protect the TDSP’s limiting element(s).

***3.9.1 Current Operating Plan (COP) Criteria***

(1) Each QSE that represents a Resource must submit a COP to ERCOT that reflects expected operating conditions for each Resource for each hour in the next seven Operating Days.

(2) Each QSE that represents a Resource shall update its COP reflecting changes in availability of any Resource as soon as reasonably practicable, but in no event later than 60 minutes after the event that caused the change.

(3) The Resource capacity in a QSE’s COP must be sufficient to supply the Ancillary Service Supply Responsibility of that QSE.

(4) Load Resource COP values may be adjusted to reflect Distribution Losses in accordance with Section 8.1.1.2, General Capacity Testing Requirements.

(5) A COP must include the following for each Resource represented by the QSE:

(a) The name of the Resource;

(b) The expected Resource Status:

(i) Select one of the following for Generation Resources synchronized to the ERCOT System that best describes the Resource’s status. Unless otherwise provided below, these Resource Statuses are to be used for COP and/or Real-Time telemetry purposes, as appropriate.

(A) ONRUC – On-Line and the hour is a RUC-Committed Hour;

(B) ONREG – On-Line Resource with Energy Offer Curve providing Regulation Service;

(C) ON – On-Line Resource with Energy Offer Curve;

(D) ONDSR – On-Line Dynamically Scheduled Resource (DSR);

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| ***[NPRR1000: Delete item (D) above upon system implementation and renumber accordingly.]*** |

(E) ONOS – On-Line Resource with Output Schedule;

(F) ONOSREG – On-Line Resource with Output Schedule providing Regulation Service;

(G) ONDSRREG – On-Line DSR providing Regulation Service;

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| ***[NPRR1000: Delete item (G) above upon system implementation and renumber accordingly.]*** |

(H) FRRSUP – Available for Dispatch of Fast Responding Regulation Service (FRRS). This Resource Status is only to be used for Real-Time telemetry purposes;

(I) ONTEST – On-Line blocked from Security-Constrained Economic Dispatch (SCED) for operations testing (while ONTEST, a Generation Resource may be shown on Outage in the Outage Scheduler);

(J) ONEMR – On-Line EMR (available for commitment or dispatch only for ERCOT-declared Emergency Conditions; the QSE may appropriately set LSL and High Sustained Limit (HSL) to reflect operating limits);

(K) ONRR – On-Line as a synchronous condenser providing Responsive Reserve (RRS) but unavailable for Dispatch by SCED and available for commitment by RUC;

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| ***[NPRR863: Insert paragraph (L) below upon system implementation and renumber accordingly:]***  (L) ONECRS – On-Line as a synchronous condenser providing ERCOT Contingency Response Service (ECRS) but unavailable for Dispatch by SCED and available for commitment by RUC; |

(L) ONOPTOUT – On-Line and the hour is a RUC Buy-Back Hour;

(M) SHUTDOWN – The Resource is On-Line and in a shutdown sequence, and has no Ancillary Service Obligations other than Off-Line Non-Spinning Reserve (Non-Spin) which the Resource will provide following the shutdown. This Resource Status is only to be used for Real-Time telemetry purposes;

(N) STARTUP – The Resource is On-Line and in a start-up sequence and has no Ancillary Service Obligations. This Resource Status is only to be used for Real-Time telemetry purposes;

(O) OFFQS – Off-Line but available for SCED deployment. Only qualified Quick Start Generation Resources (QSGRs) may utilize this status; and

(P) ONFFRRRS – Available for Dispatch of RRS providing Fast Frequency Response (FFR) from Generation Resources. This Resource Status is only to be used for Real-Time telemetry purposes;

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| ***[NPRR1015: Replace paragraph (P) above with the following upon system implementation of NPRR863:]***  (P) ONFFRRRS – Available for Dispatch of RRS when providing Fast Frequency Response (FFR) from Generation Resources. This Resource Status is only to be used for Real-Time telemetry purposes. A Resource with this Resource Status may also be providing Ancillary Services other than FFR; |

(ii) Select one of the following for Off-Line Generation Resources not synchronized to the ERCOT System that best describes the Resource’s status. These Resource Statuses are to be used for COP and/or Real-Time telemetry purposes, as appropriate.

(A) OUT – Off-Line and unavailable;

(B) OFFNS – Off-Line but reserved for Non-Spin;

(C) OFF – Off-Line but available for commitment in the Day-Ahead Market (DAM) and RUC;

(D) EMR – Available for commitment as a Resource contracted by ERCOT under Section 3.14.1, Reliability Must Run, or under paragraph (2) of Section 6.5.1.1, ERCOT Control Area Authority, or available for commitment only for ERCOT-declared Emergency Condition events; the QSE may appropriately set LSL and HSL to reflect operating limits; and

(E) EMRSWGR – Switchable Generation Resource (SWGR) operating in a non-ERCOT Control Area, or in the case of a Combined Cycle Train with one or more SWGRs, a configuration in which one or more of the physical units in that configuration are operating in a non-ERCOT Control Area; and

(iii) Select one of the following for Load Resources. Unless otherwise provided below, these Resource Statuses are to be used for COP and/or Real-Time telemetry purposes.

(A) ONRGL – Available for Dispatch of Regulation Service by Load Frequency Control (LFC) and, for any remaining Dispatchable capacity, by SCED with a Real-Time Market (RTM) Energy Bid;

(B) FRRSUP – Available for Dispatch of FRRS by LFC and not Dispatchable by SCED. This Resource Status is only to be used for Real-Time telemetry purposes;

(C) FRRSDN - Available for Dispatch of FRRS by LFC and not Dispatchable by SCED. This Resource Status is only to be used for Real-Time telemetry purposes;

(D) ONCLR – Available for Dispatch as a Controllable Load Resource by SCED with an RTM Energy Bid;

(E) ONRL – Available for Dispatch of RRS, excluding Controllable Load Resources;

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| ***[NPRR863: Insert paragraph (F) below upon system implementation and renumber accordingly:]***  (F) ONECL – Available for Dispatch of ECRS, excluding Controllable Load Resources; |

(F) OUTL – Not available;

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| ***[NPRR863 and NPRR1015: Insert applicable portions of paragraph (H) below upon system implementation of NPRR863:]***  (H) ONFFRRRSL – Available for Dispatch of RRS when providing FFR, excluding Controllable Load Resources. This Resource Status is only to be used for Real-Time telemetry purposes; |

(c) The HSL;

(i) For Load Resources other than Controllable Load Resources, the HSL should equal the expected power consumption;

(d) The LSL;

(i) For Load Resources other than Controllable Load Resources, the LSL should equal the expected Low Power Consumption (LPC);

(e) The High Emergency Limit (HEL);

(f) The Low Emergency Limit (LEL); and

(g) Ancillary Service Resource Responsibility capacity in MW for:

(i) Regulation Up (Reg-Up);

(ii) Regulation Down (Reg-Down);

(iii) RRS; and

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| ***[NPRR863: Insert paragraph (iv) below upon system implementation and renumber accordingly:]***  (iv) ECRS; and |

(iv) Non-Spin.

(6) For Combined Cycle Generation Resources, the above items are required for each operating configuration. In each hour only one Combined Cycle Generation Resource in a Combined Cycle Train may be assigned one of the On-Line Resource Status codes described above.

(a) During a RUC study period, if a QSE’s COP reports multiple Combined Cycle Generation Resources in a Combined Cycle Train to be On-Line for any hour, then until the QSE corrects its COP, the On-Line Combined Cycle Generation Resource with the largest HSL is considered to be On-Line and all other Combined Cycle Generation Resources in the Combined Cycle Train are considered to be Off-Line. Furthermore, until the QSE corrects its COP, the Off-Line Combined Cycle Generation Resources as designated through the application of this process are ineligible for RUC commitment or de-commitment Dispatch Instructions.

(b) For any hour in which QSE-submitted COP entries are used to determine the initial state of a Combined Cycle Generation Resource for a DAM or Day-Ahead Reliability Unit Commitment (DRUC) study and the COP shows multiple Combined Cycle Generation Resources in a Combined Cycle Train to be in an On-line Resource Status, then until the QSE corrects its COP, the On-Line Combined Cycle Generation Resource that has been On-Line for the longest time from the last recorded start by ERCOT systems, regardless of the reason for the start, combined with the COP Resource Status for the remaining hours of the current Operating Day, is considered to be On-Line at the start of the DRUC study period and all other COP-designated Combined Cycle Generation Resources in the Combined Cycle Train are considered to be Off-Line.

(c) ERCOT systems shall allow only one Combined Cycle Generation Resource in a Combined Cycle Train to offer Off-Line Non-Spin in the DAM or Supplemental Ancillary Services Market (SASM).

(i) If there are multiple Non-Spin offers from different Combined Cycle Generation Resources in a Combined Cycle Train, then prior to execution of the DAM, ERCOT shall select the Non-Spin offer from the Combined Cycle Generation Resource with the highest HSL for consideration in the DAM and ignore the other offers.

(ii) Combined Cycle Generation Resources offering Off-Line Non-Spin must be able to transition from the shutdown state to the offered Combined Cycle Generation Resource On-Line state and be capable of ramping to the full amount of the Non-Spin offered.

(d) The DAM and RUC shall honor the registered hot, intermediate or cold Startup Costs for each Combined Cycle Generation Resource registered in a Combined Cycle Train when determining the transition costs for a Combined Cycle Generation Resource. In the DAM and RUC, the Startup Cost for a Combined Cycle Generation Resource shall be determined by the positive transition cost from the On-Line Combined Cycle Generation Resource within the Combine Cycle Train or from a shutdown condition, whichever ERCOT determines to be appropriate.

(7) ERCOT may accept COPs only from QSEs.

(8) For the first 168 hours of the COP, ERCOT will update the HSL values for Wind-powered Generation Resources (WGRs) with the most recently updated Short-Term Wind Power Forecast (STWPF), and the HSL values for PhotoVoltaic Generation Resources (PVGRs) with the most recently updated Short-Term PhotoVoltaic Power Forecast (STPPF). ERCOT will notify the QSE via an Extensible Markup Language (XML) message each time COP HSL values are updated with the forecast values. A QSE representing a WGR may override the STWPF HSL value but must submit an HSL value that is less than or equal to the amount for that Resource from the most recent STWPF provided by ERCOT; a QSE representing a PVGR may override the STPPF HSL value but must submit an HSL value that is less than or equal to the amount for that Resource from the most recent STPPF provided by ERCOT.

(9) A QSE representing a Generation Resource that is not actively providing Ancillary Services or is providing Off-Line Non-Spin that the Resource will provide following the shutdown, may only use a Resource Status of SHUTDOWN to indicate to ERCOT through telemetry that the Resource is operating in a shutdown sequence or a Resource Status of ONTEST to indicate in the COP and through telemetry that the Generation Resource is performing a test of its operations either manually dispatched by the QSE or by ERCOT as part of the test. A QSE representing a Generation Resource that is not actively providing Ancillary Services may only use a Resource Status of STARTUP to indicate to ERCOT through telemetry that the Resource is operating in a start-up sequence requiring manual control and is not available for Dispatch.

(10) If a QSE has not submitted a valid COP for any Generation Resource for any hour in the DAM or RUC Study Period, then the Generation Resource is considered to have a Resource Status as OUT thus not available for DAM awards or RUC commitments for those hours.

(11) If a COP is not available for any Resource for any hour from the current hour to the start of the DAM period or RUC study, then the Resource Status for those hours are considered equal to the last known Resource Status from a previous hour’s COP or from telemetry as appropriate for that Resource.

(12) A QSE representing a Resource may only use the Resource Status code of EMR for a Resource whose operation would have impacts that cannot be monetized and reflected through the Resource’s Energy Offer Curve or recovered through the RUC make-whole process or if the Resource has been contracted by ERCOT under Section 3.14.1 or under paragraph (2) of Section 6.5.1.1. If ERCOT chooses to commit an Off-Line unit with EMR Resource Status that has been contracted by ERCOT under Section 3.14.1 or under paragraph (2) of Section 6.5.1.1, the QSE shall change its Resource Status to ONRUC. Otherwise, the QSE shall change its Resource Status to ONEMR.

(13) A QSE representing a Resource may use the Resource Status code of ONEMR for a Resource that is:

(a) On-Line, but for equipment problems it must be held at its current output level until repair and/or replacement of equipment can be accomplished; or

(b) A hydro unit.

(14) A QSE operating a Resource with a Resource Status code of ONEMR may set the HSL and LSL of the unit to be equal to ensure that SCED does not send Base Points that would move the unit.

(15) A QSE representing a Resource may use the Resource Status code of EMRSWGR only for an SWGR.

(16) A QSE representing a Self-Limiting Facility must ensure that the sum of the COP HSL/LSL and the sum of the telemetered HSL/LSL submitted for each Resource within the Self-Limiting Facility do not exceed either the limit on MW Injection or the limit on the MW Withdrawal established for the Self-Limiting Facility.

3.15 Voltage Support

(1) ERCOT, in coordination with the Transmission Service Providers (TSPs), shall establish and update, as necessary, the ERCOT System Voltage Profile and shall post it on the Market Information System (MIS) Secure Area. ERCOT, the interconnecting TSP, or that TSP’s agent, may modify the Voltage Set Point described in the Voltage Profile based on current system conditions.

(2) All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than 20 MVA or those units connected at the same Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than 20 MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

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| ***[NPRR989 and NPRR1016: Replace applicable portions of paragraph (2) above with the following upon system implementation:]***  (2) All Generation Resources (including self-serve generating units) and Energy Storage Resources (ESRs) that are connected to Transmission Facilities and that have a gross unit rating greater than 20 MVA or those units connected at the same Point of Interconnection (POI) that have gross unit ratings aggregating to greater than 20 MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS). |

(3) Except as reasonably necessary to ensure reliability or operational efficiency, TSPs should utilize available static reactive devices prior to requesting a Voltage Set Point change from a Generation Resource.

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| ***[NPRR989: Replace paragraph (3) above with the following upon system implementation:]***  (3) Except as reasonably necessary to ensure reliability or operational efficiency, TSPs should utilize available static reactive devices prior to requesting a Voltage Set Point change from a Generation Resource or ESR. |

(4) Each Generation Resource required to provide VSS shall comply with the following Reactive Power requirements in Real-Time operations when issued a Voltage Set Point by a TSP or ERCOT:

(a) An over-excited (lagging or producing) power factor capability of 0.95 or less determined at the generating unit's maximum net power to be supplied to the ERCOT Transmission Grid and for any Voltage Set Point from 0.95 per unit to 1.04 per unit, as measured at the POI;

(b) An under-excited (leading or absorbing) power factor capability of 0.95 or less, determined at the generating unit's maximum net power to be supplied to the ERCOT Transmission Grid and for any Voltage Set Point from 1.0 per unit to 1.05 per unit, as measured at the POI;

(c) For any Voltage Set Point outside of the voltage ranges described in paragraphs (a) and (b) above, the Generation Resource shall supply or absorb the maximum amount of Reactive Power available within its inherent capability and the capability of any VAr-capable devices as necessary to achieve the Voltage Set Point;

(d) When a Generation Resource required to provide VSS is issued a new Voltage Set Point, that Generation Resource shall make adjustments in response to the new Voltage Set Point, regardless of whether the current voltage is within the tolerances identified in paragraph (4) of Nodal Operating Guide Section 2.7.3.5, Resource Entity Responsibilities and Generation Resource Requirements;

(e) Reactive Power capability shall be available at all MW output levels and may be met through a combination of the Generation Resource’s Unit Reactive Limit (URL), which is the generating unit’s dynamic leading and lagging operating capability, and/or dynamic VAr-capable devices. This Reactive Power profile is depicted graphically as a rectangle. For Intermittent Renewable Resources (IRRs), the Reactive Power requirements shall be available at all MW output levels at or above 10% of the IRR’s nameplate capacity. When an IRR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT, the interconnecting TSP, or that TSP’s agent may require an IRR to disconnect from the ERCOT System for purposes of maintaining reliability;

(f) For any Generation Resource or Energy Storage Resource (ESR) that is part of a Self-Limiting Facility, the capabilities described in paragraphs (a) and (b) above shall be determined based on the Self-Limiting Facility’s established MW Injection limit and, if applicable, established MW Withdrawal limit.

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| ***[NPRR989: Replace paragraph (4) above with the following upon system implementation:]***  (4) Each Generation Resource and ESR required to provide VSS shall comply with the following Reactive Power requirements in Real-Time operations when issued a Voltage Set Point by a TSP or ERCOT:  (a) An over-excited (lagging or producing) power factor capability of 0.95 or less determined at the unit's maximum net power to be supplied to the ERCOT Transmission Grid and for any Voltage Set Point from 0.95 per unit to 1.04 per unit, as measured at the POI;  (b) An under-excited (leading or absorbing) power factor capability of 0.95 or less, determined at the unit's maximum net power to be supplied to the ERCOT Transmission Grid and for any Voltage Set Point from 1.0 per unit to 1.05 per unit, as measured at the POI;  (c) For any Voltage Set Point outside of the voltage ranges described in paragraphs (a) and (b) above, the Generation Resource or ESR shall supply or absorb the maximum amount of Reactive Power available within its inherent capability and the capability of any VAr-capable devices as necessary to achieve the Voltage Set Point;  (d) When a Generation Resource or an ESR required to provide VSS is issued a new Voltage Set Point, that Generation Resource or ESR shall make adjustments in response to the new Voltage Set Point, regardless of whether the current voltage is within the tolerances identified in paragraph (4) of Nodal Operating Guide Section 2.7.3.5, Resource Entity Responsibilities and Generation Resource and Energy Storage Resource Requirements;  (e) For Generation Resources, the Reactive Power capability shall be available at all MW output levels and may be met through a combination of the Generation Resource’s Corrected Unit Reactive Limit (CURL), which is the generating unit’s dynamic leading and lagging operating capability, and/or dynamic VAr-capable devices. This Reactive Power profile is depicted graphically as a rectangle. For Intermittent Renewable Resources (IRRs), the Reactive Power requirements shall be available at all MW output levels at or above 10% of the IRR’s nameplate capacity. When an IRR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT, the interconnecting TSP, or that TSP’s agent may require an IRR to disconnect from the ERCOT System for purposes of maintaining reliability. For ESRs, the Reactive Power capability shall be available at all MW levels, when charging or discharging, and may be met through a combination of the ESR’s CURL, and/or dynamic VAr-capable devices. For any ESR that achieved Initial Synchronization before December 16, 2019, the requirement to have Reactive Power capability when charging does not apply if the Resource Entity for the ESR has submitted a notarized attestation to ERCOT stating that, since the date of Initial Synchronization, the ESR has been unable to comply with this requirement without physical or software changes/modifications, and ERCOT has provided written confirmation of the exemption to the Resource Entity. The exemption shall apply only to the extent of the ESR’s inability to comply with the requirement when the ESR is charging.  (f) For any Generation Resource or Energy Storage Resource (ESR) that is part of a Self-Limiting Facility, the capabilities described in paragraphs (a) and (b) above shall be determined based on the Self-Limiting Facility’s established MW Injection limit and, if applicable, established MW Withdrawal limit. |

(5) As part of the technical Resource testing requirements prior to the Resource Commissioning Date, all Generation Resources must conduct an engineering study, and demonstrate through performance testing, the ability to comply with the Reactive Power capability requirements in paragraph (4), (7), (8), or (9) of this Section, as applicable. Any study and testing results must be accepted by ERCOT prior to the Resource Commissioning Date.

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| ***[NPRR989: Replace paragraph (5) above with the following upon system implementation:]***  (5) As part of the technical Resource testing requirements prior to the Resource Commissioning Date, all Generation Resources and ESRs must conduct an engineering study, and demonstrate through performance testing, the ability to comply with the Reactive Power capability requirements in paragraph (4), (7), (8), or (9) of this Section, as applicable. Any study and testing results must be accepted by ERCOT prior to the Resource Commissioning Date. |

(6) Except for a Generation Resource subject to Planning Guide Section 5.1.1, Applicability, a Generation Resource that has already been commissioned is not required to submit a new reactive study or conduct commissioning-related reactive testing, as described in paragraph (5) above.

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| ***[NPRR989: Replace paragraph (6) above with the following upon system implementation:]***  (6) Except for a Generation Resource or an ESR subject to Planning Guide Section 5.1.1, Applicability, a Generation Resource or an ESR that has already been commissioned is not required to submit a new reactive study or conduct commissioning-related reactive testing, as described in paragraph (5) above. |

(7) Wind-powered Generation Resources (WGRs) that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before December 1, 2009 (“Existing Non-Exempt WGRs”), must be capable of producing a defined quantity of Reactive Power to maintain a set point in the Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (4) above, except in the circumstances described in paragraph (a) below.

(a) Existing Non-Exempt WGRs whose current design does not allow them to meet the Reactive Power requirements established in paragraph (4) above must conduct an engineering study using the Summer/Fall 2010 on-peak/off-peak Voltage Profiles, or conduct performance testing to determine their actual Reactive Power capability. Any study or testing results must be accepted by ERCOT. The Reactive Power requirements applicable to these Existing Non-Exempt WGRs will be the greater of: the leading and lagging Reactive Power capabilities established by the Existing Non-Exempt WGR’s engineering study or testing results; or Reactive Power proportional to the real power output of the Existing Non-Exempt WGR (this Reactive Power profile is depicted graphically as a triangle) sufficient to provide an over-excited (lagging) power factor capability of 0.95 or less and an under-excited (leading) power factor capability of 0.95 or less, both determined at the WGR’s set point in the Voltage Profile established by ERCOT, and both measured at the POI.

(i) Existing Non-Exempt WGRs shall submit the engineering study results or testing results to ERCOT no later than five Business Days after its completion.

(ii) Existing Non-Exempt WGRs shall update any and all Resource Registration data regarding their Reactive Power capability documented by the engineering study results or testing results.

(iii) If the Existing Non-Exempt WGR’s engineering study results or testing results indicate that the WGR is not able to provide Reactive Power capability that meets the triangle profile described in paragraph (a) above, then the Existing Non-Exempt WGR will take steps necessary to meet that Reactive Power requirement depicted graphically as a triangle by a date mutually agreed upon by the Existing Non-Exempt WGR and ERCOT. The Existing Non-Exempt WGR may meet the Reactive Power requirement through a combination of the WGR’s URL and/or automatically switchable static VAr-capable devices and/or dynamic VAr-capable devices. No later than five Business Days after completion of the steps to meet that Reactive Power requirement, the Existing Non-Exempt WGR will update any and all Resource Registration data regarding its Reactive Power and provide written notice to ERCOT that it has completed the steps necessary to meet its Reactive Power requirement.

(iv) For purposes of measuring future compliance with Reactive Power requirements for Existing Non-Exempt WGRs, results from performance testing or the Summer/Fall 2010 on-peak/off-peak Voltage Profiles utilized in the Existing Non-Exempt WGR’s engineering study shall be the basis for measuring compliance, even if the Voltage Profiles provided to the Existing Non-Exempt WGR are revised for other purposes.

(b) Existing Non-Exempt WGRs whose current design allows them to meet the Reactive Power requirements established in paragraph (4) above (depicted graphically as a rectangle) shall continue to comply with that requirement. ERCOT, with cause, may request that these Existing Non-Exempt WGRs provide further evidence, including an engineering study, or performance testing, to confirm accuracy of Resource Registration data supporting their Reactive Power capability.

(8) Qualified Renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the Reactive Power requirements established in paragraph (4) above, will be required to maintain a Reactive Power requirement as defined by the Generation Resource’s URL that was submitted to ERCOT and established per the criteria in the ERCOT Operating Guides.

(9) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT’s satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the Reactive Power requirements established in paragraph (4) above, will be required to maintain a Reactive Power requirement as defined by the Generation Resource’s URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(10) For purposes of meeting the Reactive Power requirements in paragraphs (4) through (9) above, multiple generation units including IRRs shall, at a Generation Entity’s option, be treated as a single Generation Resource if the units are connected to the same transmission bus.

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| ***[NPRR989: Replace paragraph (10) above with the following upon system implementation:]***  (10) For purposes of meeting the Reactive Power requirements in paragraphs (4) through (9) above, multiple units including IRRs shall, at a Resource Entity’s option, be treated as a single Resource if the units are connected to the same transmission bus. |

(11) Generation Entities may submit to ERCOT specific proposals to meet the Reactive Power requirements established in paragraph (4) above by employing a combination of the URL and added VAr capability, provided that the added VAr capability shall be automatically switchable static and/or dynamic VAr devices. A Generation Resource and TSP may enter into an agreement in which the proposed static VAr devices can be switchable using Supervisory Control and Data Acquisition (SCADA). ERCOT may, at its sole discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall provide the submitter an explanation of its decision.

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| ***[NPRR989: Replace paragraph (11) above with the following upon system implementation:]***  (11) Resource Entities may submit to ERCOT specific proposals to meet the Reactive Power requirements established in paragraph (4) above by employing a combination of the CURL and added VAr capability, provided that the added VAr capability shall be automatically switchable static and/or dynamic VAr devices. A Resource Entity and TSP may enter into an agreement in which the proposed static VAr devices can be switchable using Supervisory Control and Data Acquisition (SCADA). ERCOT may, at its sole discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall provide the submitter an explanation of its decision. |

(12) A Generation Resource and TSP may enter into an agreement in which the Generation Resource compensates the TSP to provide VSS to meet the Reactive Power requirements of paragraph (4) above in part or in whole. The TSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (4).

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| ***[NPRR989: Replace paragraph (12) above with the following upon system implementation:]***  (12) A Resource Entity and TSP may enter into an agreement in which the Generation Resource or ESR compensates the TSP to provide VSS to meet the Reactive Power requirements of paragraph (4) above in part or in whole. The TSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (4). |

(13) Unless specifically approved by ERCOT, no unit equipment replacement or modification at a Generation Resource shall reduce the capability of the unit below the Reactive Power requirements that applied prior to the replacement or modification.

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| ***[NPRR989: Replace paragraph (13) above with the following upon system implementation:]***  (13) Unless specifically approved by ERCOT, no unit equipment replacement or modification at a Generation Resource or ESR shall reduce the capability of the unit below the Reactive Power requirements that applied prior to the replacement or modification. |

(14) Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT unless equipment damage is imminent.

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| ***[NPRR989: Replace paragraph (14) above with the following upon system implementation:]***  (14) Generation Resources or ESRs shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT unless equipment damage is imminent. |

(15) All WGRs must provide a Real-Time SCADA point that communicates to ERCOT the number of wind turbines that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid. WGRs must also provide two other Real-Time SCADA points that communicate to ERCOT the following:

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| ***[NPRR989: Replace paragraph (15) above with the following upon system implementation:]***  (15) All WGRs must provide a Real-Time SCADA point that communicates to ERCOT the number of wind turbines that are available for real power and Reactive Power injection into the ERCOT Transmission Grid. WGRs must also provide two other Real-Time SCADA points that communicate to ERCOT the following: |

(a) The number of wind turbines that are not able to communicate and whose status is unknown; and

(b) The number of wind turbines out of service and not available for operation.

(16) All PhotoVoltaic Generation Resources (PVGRs) must provide a Real-Time SCADA point that communicates to ERCOT the capacity of PhotoVoltaic (PV) equipment that is available for real power and/or Reactive Power injection into the ERCOT Transmission Grid. PVGRs must also provide two other Real-Time SCADA points that communicate to ERCOT the following:

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| ***[NPRR989: Replace paragraph (16) above with the following upon system implementation:]***  (16) All PhotoVoltaic Generation Resources (PVGRs) must provide a Real-Time SCADA point that communicates to ERCOT the capacity of PhotoVoltaic (PV) equipment that is available for real power and Reactive Power injection into the ERCOT Transmission Grid. PVGRs must also provide two other Real-Time SCADA points that communicate to ERCOT the following: |

(a) The capacity of PV equipment that is not able to communicate and whose status is unknown; and

(b) The capacity of PV equipment that is out of service and not available for operation.

(17) For the purpose of complying with the Reactive Power requirements under this Section 3.15, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by automatically switchable static VAr-capable devices.

***3.15.3 Generation Resource Requirements Related to Voltage Support***

(1) Generation Resources required to provide VSS shall have and maintain Reactive Power capability at least equal to the Reactive Power capability requirements specified in these Protocols and the ERCOT Operating Guides.

(2) Generation Resources providing VSS shall be compliant with the ERCOT Operating Guides for response to transient voltage disturbance.

(3) Generation Resources providing VSS must meet technical requirements specified in Section 8.1.1.1, Ancillary Service Qualification and Testing, and the performance standards specified in Section 8.1.1, QSE Ancillary Service Performance Standards.

(4) Each Generation Resource providing VSS shall operate with the unit’s Automatic Voltage Regulator (AVR) in the automatic voltage control mode unless specifically directed to operate in manual mode by ERCOT, or when the unit is telemetering its Resource Status as STARTUP, SHUTDOWN, or ONTEST, or the QSE determines a need to operate in manual mode in the event of an Emergency Condition at the generating plant.

(5) Each Generation Resource providing VSS shall maintain the Voltage Set Point established by ERCOT, the interconnecting TSP, or the TSP’s agent, subject to the Generation Resource’s operating characteristic limits, voltage limits, and within tolerances identified in paragraph (4) of Operating Guide Section 2.7.3.5, Resource Entity Responsibilities and Generation Resource Requirements.

(6) The reactive capability required must be maintained at all times that the Generation Resource is On-Line.

(7) Each QSE shall send to ERCOT, via telemetry, the AVR and Power System Stabilizer (PSS) status for each of its Generation Resources providing VSS. For AVRs, an “On” status will indicate the AVR is on and set to regulate the Resource’s terminal voltage in the voltage control mode, and an “Off” status will indicate the AVR is off or in a manual mode. For PSS, an “On” status will indicate the service is enabled and ready for service, and an “Off” status will indicate it is off or out of service. Each QSE shall monitor the status of its Generation Resources’ regulators and stabilizers, and shall report status changes to ERCOT.

(8) Each Resource Entity shall provide information related to the tuning parameters, local or inter-area, of any PSS installed at a Generation Resource.

(9) If any individual Resource within a Self-Limiting Facility is incapable of meeting its Reactive Power requirement at the POI, the QSE must bring On-Line additional Resource(s) within the Self-Limiting Facility to provide VSS as specified in paragraph (4) of Section 3.15, Voltage Support, while respecting the limit on MW Injection.

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| ***[NPRR989: Replace Section 3.15.3 above with the following upon system implementation:]***  ***3.15.3 Generation Resource and Energy Storage Resource Requirements Related to Voltage Support***  (1) Generation Resources and ESRs required to provide VSS shall have and maintain Reactive Power capability at least equal to the Reactive Power capability requirements specified in these Protocols and the ERCOT Operating Guides.  (2) Generation Resources and ESRs providing VSS shall be compliant with the ERCOT Operating Guides for response to transient voltage disturbance.  (3) Generation Resources and ESRs providing VSS must meet technical requirements specified in Section 8.1.1.1, Ancillary Service Qualification and Testing, and the performance standards specified in Section 8.1.1, QSE Ancillary Service Performance Standards.  (4) Each Generation Resource and ESR providing VSS shall operate with the unit’s Automatic Voltage Regulator (AVR) in the automatic voltage control mode unless specifically directed to operate in manual mode by ERCOT, or when the unit is telemetering its Resource Status as STARTUP, SHUTDOWN, or ONTEST, or the QSE determines a need to operate in manual mode in the event of an Emergency Condition at the generating plant.  (5) Each Generation Resource and ESR providing VSS shall maintain the Voltage Set Point established by ERCOT, the interconnecting TSP, or the TSP’s agent, subject to the Generation Resource’s or ESR’s operating characteristic limits, voltage limits, and within tolerances identified in paragraph (4) of Nodal Operating Guide Section 2.7.3.5, Resource Entity Responsibilities and Generation Resource Requirements.  (6) The reactive capability required must be maintained at all times that the Generation Resource or ESR is On-Line.  (7) Each QSE shall send to ERCOT, via telemetry, the AVR and Power System Stabilizer (PSS) status for each of its Generation Resources providing VSS. Each QSE shall send to ERCOT via telemetry the AVR status for each of its ESRs providing VSS. For AVRs, an “On” status will indicate the AVR is on and set to regulate the Resource’s terminal voltage in the voltage control mode, and an “Off” status will indicate the AVR is off or in a manual mode. For PSS, an “On” status will indicate the service is enabled and ready for service, and an “Off” status will indicate it is off or out of service. Each QSE shall monitor the status of its Generation Resources’ and ESRs’ regulators and stabilizers, and shall report status changes to ERCOT.  (8) Each Resource Entity shall provide information related to the tuning parameters, local or inter-area, of any PSS installed at a Generation Resource.  (9) If any individual Resource within a Self-Limiting Facility is incapable of meeting its Reactive Power requirement at the POI, the QSE must bring On-Line additional Resource(s) within the Self-Limiting Facility to provide VSS as specified in paragraph (4) of Section 3.15, Voltage Support, while respecting the limit on MW Injection. |