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| NPRR Number | [849](http://www.ercot.com/mktrules/issues/nprr849) | NPRR Title | **Clarification of the Range of Voltage Set Points at a Generation Resource’s POI** |
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| Date | June 21, 2019 |
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| Submitter’s Information |
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| Cell Number |  |
| Market Segment | Investor Owned Utility (IOU); Independent Generator  |

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| Comments |

Oncor Electric Delivery Company, LLC and Invenergy LLC (“Joint Commenters”) appreciate the opportunity to file comments in Nodal Protocol Revision Request (NPRR) 849.

NPRR849 was filed in September of 2017 and has yet to reach consensus. These comments represent a compromise in attempt to get Transmission Service Providers (TSPs) and Generation Resources to agreement. These comments include elements from: previous agreement in discussions at the Operations Working Group (OWG); ERCOT’s “NPRR 849 Problem Statements and Solutions” presented to the OWG Meeting on March 21, 2019; “Joint Comments” filed to NPRR849 on April 25, 2019; and other discussions between stakeholders.

The revisions made by these comments are as follows:

* Clarification of the sequence in which reactive resources will be used in relation to the TSP instruction to change the Voltage Set Point of a Generation Resource under both normal conditions and during unplanned system contingencies or system instability. This addition describes when the Voltage Set Point change instructions will be provided by a TSP to a Generation Resource in Real-Time operations.
* Changes the obligation of supplying an identified machine power factor over a specified voltage range at the generator’s Point of Interconnection (POI), for both leading and lagging conditions on the network. These ranges were agreed upon by OWG in 2018 and articulated in “Option 3” of ERCOT’s “NPRR 849 Problem Statements and Solutions” presented to the OWG Meeting on March 21, 2019.
* Separates the reactive power requirements for a generator in following Real-Time Operations from resource study and testing requirements. This is to ensure that no Generation Resource has to re-perform a costly or physically impossible new reactive power study to an older Resource, merely due to the passage of this NPRR.
* Addresses the obligation of the Generation Resource to provide reactive power within its inherent capability when instructed to operate outside of the specified range.
* Addresses the obligation of Generation Resource operators to change the POI Voltage Set Point, as directed by the respective TDSP or the ERCOT Operator regardless if the current voltage is within the tolerances identified in paragraph (4) of Operating Guide Section 2.7.3.5, Resource Entity Responsibilities and Generation Resource Requirements.
* Paragraph (g) does not intend to exempt, or otherwise address Repowered Facilities or any other situation after Generation Resource commissioning that may require a reactive power study. Reactive studies or testing may be required after the Resource Commissioning Date, but those are not currently defined in Section 3.15. Our intent is for those to be addressed in a future NPRR, in order to implement the necessary elements of NPRR849 more expeditiously.

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| Revised Cover Page Language |

None proposed at this time.

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| Revised Proposed Protocol Language |

**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).

(3) TSPs should operate to maintain adequate reactive reserve on Generation Resources to be available for dynamic response during unplanned system contingencies or system instability. To maintain reactive reserves on Generations Resources, TSPs should utilize available static reactive resources to support area voltages prior to requesting a Voltage Set Point change from a Generation Resource. During unplanned system contingencies or system instability, it may be necessary for the TSPs to simultaneously adjust a Generation Resource’s Voltage Set Points while inserting static devices in order to restore or maintain system voltages.

(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. Resource testing and study requirements are detailed in paragraphs (f) and (g) below:

(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 between 0.95 per unit and 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 between 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 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) As part of the technical Resource testing requirements prior to the Resource Commissioning Date, all Generation Resources must conduct an engineering study, or demonstrate through performance testing, compliance with the Reactive Power capability requirements of this section. Any study or testing results must be accepted by ERCOT prior to the Resource Commissioning Date;

(g) A Generation Resource commissioned prior to July 1, 2019 will not be required to submit a new reactive study or conduct pre-commissioning performance testing as described in paragraph (f) above.

(5) 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 (5)(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.

(6) 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.

(7) 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.

(8) For purposes of meeting the Reactive Power requirements in paragraphs (4) through (7) 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.

(9) 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.

(10) 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).

(11) 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.

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

(13) 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:

(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.

(14) 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:

(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.

(15) 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.