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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 | July 3, 2019 |
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| Submitter’s Information |
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| Market Segment | Not applicable |

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| Comments |

ERCOT appreciates the efforts of Invenergy and Oncor (“Joint Commenters”) and others to develop consensus on this Nodal Protocol Revision Request (NPRR). While ERCOT prefers the clarifications proposed in its April 24, 2019 comments, ERCOT is willing to support the Joint Commenters’ approach with the additional clarifications proposed herein. ERCOT submits these comments on top of the 6/21/19 Joint Comments.

In paragraph (3) of Section 3.15, Voltage Support, Joint Commenters have proposed to include the concept that TSP static devices should be used to manage voltage before adjusting the Voltage Set Point of Generation Resources. It is unclear to ERCOT why this concept is needed in this NPRR because it is already captured in paragraph (3) of Nodal Operating Guide Section 2.7.3.3, TO/TSP Responsibilities, which states “Each TO shall operate static Reactive Power resources within its operating area as required by its criteria while maintaining dynamic reactive reserves provided by Generation Resources.” The phrase “as required by its criteria” allows the Transmission Operator (TO) flexibility to determine when it is more reliable, practical, or efficient to make a Voltage Set Point adjustment rather than, or in conjunction with, the use of one or more TSP-owned static reactive resources. .

However, if stakeholders conclude that proposed paragraph (3) should be retained, ERCOT would propose additional revisions to clarify and simplify that language. Most importantly, ERCOT’s revisions would clarify that TSPs may instruct a Voltage Set Point adjustment without exhausting TSP-owned static device capability in any case where reliability or operating efficiency reasonably justifies that action, and not just in the event of an unplanned contingency or stability issue. While TSPs will typically utilize static reactive resources to maintain dynamic reactive reserves, in some situations it is more appropriate or efficient to maintain dynamic reactive reserves or support area voltage with a Voltage Set Point change first, and the language should reasonably allow that flexibility. This flexibility is consistent with NERC Reliability Standard VAR-001-5 R3, which allows NERC Transmission Operators to direct voltage “as necessary.” Also, restricting TSPs to instruct a Voltage Set Point adjustment during a stability issue is counterintuitive as the Voltage Set Point should be adjusted to prevent the stability issue from occurring in the first place. ERCOT’s edits resolve this concern.

ERCOT notes that it is beginning a project in August 2019 to procure and implement a Reactive Power coordination tool that will help optimize reactive controls in the ERCOT Region to enhance reliability and efficiency of the utilization of Reactive Power controls across the entire ERCOT System. ERCOT expects to submit an NPRR related to the Reactive Power coordination tool soon. The Joint Commenters’ language would create confusion about whether a TSP may utilize the output of such a tool when managing voltage in its area, if that output recommends a Voltage Set Point change due to operating efficiencies, and not just stability issues or unplanned system contingencies. For this reason, ERCOT proposes that paragraph (3) be further modified to allow TSPs to use generator dynamic devices to the extent that may be needed for operational efficiency.

ERCOT’s revisions to paragraph (3) also eliminate the use of “should,” rather than “shall,” which is consistent with existing language in the Operating Guide and avoids any question about whether the language is mandatory.

With respect to paragraph (4), ERCOT proposes to add language recognizing that ERCOT may issue a Voltage Set Point instruction as well. ERCOT also proposes to strike Joint Commenters’ sentence indicating that, “Resource testing and study requirements are detailed in paragraphs (f) and (g).” Joint Commenters presumably added this language because their previous sentence indicates that paragraph (4) is intended to apply only to Real-Time operations, and yet the Resource testing and study requirements described in paragraph (4)(f) apply only to Resources that are being commissioned. ERCOT suggests that the better way to address this problem is to simply break out paragraph (f) into a new paragraph (5), and renumber subsequent paragraphs accordingly, rather than retaining (f) in a paragraph that, by its own terms, does not apply.

ERCOT proposes to clarify (4)(a) and (b) to provide that the voltage ranges should be from 0.95 to 1.04 and from 1.0 to 1.05 rather than *between* those values so that the ranges are inclusive of the numbers cited numbers of the voltage ranges. This change is consistent with desktop edits discussed at the 6/26/19 OWG meeting.

ERCOT also proposes to align paragraph (5) (as renumbered) with current practices that both reactive studies *and* performance testing are required. This change is consistent with desktop edits discussed at the 6/26/19 OWG meeting.

Regarding paragraph (4)(g), ERCOT asserts that the proposed exemption is unnecessary because it is self-evident that a Generation Resource that has already been commissioned is not required to comply with study or testing requirements that are expressly limited to Generation Resources that have *not* yet been commissioned. Joint Commenters do not explain why it is necessary to include additional language to address a logically impossible circumstance. Moreover, ERCOT is concerned that adding this language only creates potential confusion about whether existing Generation Resources that are undergoing “repowering” upgrades that trigger the Generator Interconnection and Change Request (GINR) procedures under Planning Section 5.1.1, Applicability, would be subject to these additional requirements. Joint Commenters’ proposed language might be interpreted by some to exempt these repowering Generation Resources from studies and/or testing related to the commissioning process. Based on discussions with Oncor and Invenergy at the 6/26/19 OWG meeting, this impact does not appear to have been intended. Given this primary drawback, and the lack of any clarity provided by the language, ERCOT would propose to strike this language.

Nevertheless, if there is sufficient stakeholder support for such language, then ERCOT would propose modifying (4)(g) (which ERCOT would propose to include under newly renumbered (5)) to read as follows:

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 this paragraph (5). Nothing in this section prohibits ERCOT from conducting reactive testing after a Generation Resource’s Resource Commissioning Date, as otherwise required by NERC Reliability Standards, ERCOT Protocols, and Operating Guides.

The introductory clause, “Except for a Generation Resource subject to Planning Guide Section 5.1.1, Applicability” ensures clarity that the exclusion does not apply to Generation Resources that are undergoing a qualifying repowering project. The final sentence, “Nothing in this section prohibits ERCOT from conducting reactive testing after a Generation Resource’s Resource Commissioning Date, as otherwise required by NERC Reliability Standards, ERCOT Protocols, and Operating Guides” provides further clarity that ERCOT may conduct reactive testing for existing Generation Resources as it is otherwise required to do.

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| Revised Cover Page Language |

None

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

(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 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;

(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) above. Any study and testing results must be accepted by ERCOT prior to the Resource Commissioning Date;

(6) 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 (6)(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.

(7) 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.

(8) 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.

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

(10) 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.

(11) 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).

(12) 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.

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

(14) 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.

(15) 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.

(16) 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.