

OGRR Comments

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| OGRR Number | 208 | OGRR Title | Voltage Ride-Through (VRT) Requirement |
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| Date | November 7, 2008 |
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| Submitter's Information | |
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| Market Segment | Municipal |

| Comments |
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On November 5, 2008, ERCOT Staff, E.ON, Invenergy, and Horizon, presented a set of draft comments to the TAC which incorporated revisions, limited to the retrospective provisions of OGRR208, which are scheduled for appeal at the November 17, 2008 ERCOT Board of Directors meeting. On November 6, 2008, TAC considered the draft comments and voted to file comments with the Board that TAC recommend that the Board adopt this language as a resolution of the appeal of OGRR208 with the TAC amendment that there be a date certain for the proposed study. The motion passed with four opposing votes from the Municipal (2) and Investor Owned Utility (IOU) (2) Market Segments and nine abstentions from the IOU, Independent Generator (2), Consumer, Independent Retail Electric Provider (4) and Independent Power Marketer Market Segments.

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Revised Proposed Guide Language

3.1.4.1 PGC Data Reporting

The PGC's reporting QSE shall provide the following information to ERCOT Control Area Authority at the times specified:

| TIME | INFORMATION |
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| Every 10 seconds | <ul style="list-style-type: none">➤ Generation net MW output➤ Generation net MVAR➤ Status of switching devices in switchyard➤ Generating unit breaker status➤ Generating unit High Operating Limit➤ Generating unit Low Operating Limit |
| Daily | <ul style="list-style-type: none">➤ Planned unit status,➤ Planned unit capability (both hourly and daily),➤ Fuel limitations. <p>The reporting Entity will promptly report this condition to ERCOT Control Area Authority</p> |
| Annually | <ul style="list-style-type: none">➤ Seasonal capability where applicable,➤ Planned maintenance schedules. <p>This information shall be updated when it changes.</p> |
| Upon request | <ul style="list-style-type: none">➤ Fuel capability as described in Section 6.2.7, Unit Alternative Fuel Capability Operating Guide Form, in conjunction with an Operating Condition Notice, Alert, Advisory, or Emergency Notice, |

Each generator at a generation facility shall have its turbine's automatic speed governor in service when the generator is in normal operation. Testing and regulation performance of the speed governor shall be in accordance with Section 2.2.5, Turbine Speed Governors, of these Operating Guides. The generator operator is required to notify the ERCOT Control Area Authority, through its QSE, if the operation of speed governors is impaired.

Each generation facility providing an Ancillary Service shall provide output consistent with the requirements of that Ancillary Service and ERCOT instructions.

In the event of an ERCOT declared Emergency, ERCOT may require the QSE to notify the generation facility through the reporting Entity and require it to increase or decrease generation or change voltage and reactive requirements in accordance with the Protocols. The generation facility shall use its best efforts in meeting these required output levels in order that the ERCOT System can maintain safe and reliable operation.

It is the responsibility of all generators to carry an operational share of reactive support to insure adequate and safe Voltage Profiles are maintained in all areas of ERCOT. To accomplish this, the following requirements shall apply to each generation facility.

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- Each generation facility shall have Automatic Voltage Regulators and power system stabilizers in service as defined in Section 3.1.4.5, Automatic Voltage Regulators and Power System Stabilizers, below.
- The generation facility shall be designed and operated consistent with its obligations to supply Voltage Support Service as required in the ERCOT Protocols and ERCOT Control Area Authority Procedures.
- ERCOT has the right and obligation to Dispatch the reactive output (Vars) of each generation facility within its design capability to maintain adequate transmission voltage in ERCOT.
- ERCOT and the TSP shall be notified of any equipment changes that affect the reactive capability of an operating generating unit no less than 60 days prior to implementation. Changes that decrease the reactive capability of the generating unit below the required level and changes that decrease the Voltage Ride-Through (VRT) capability of the plant must be approved by ERCOT prior to implementation. “Voltage Ride-Through” is defined as the ability of a generation plant to remain connected to the transmission system for specified high voltage and low voltage conditions.
- High reactive loading or reactive oscillations on generation units should be communicated to the QSE, the transmission operator, and ERCOT as soon as practicable.
- The tripping off line of a generating unit due to voltage or reactive problems should be reported to ERCOT, the transmission operator, and the QSE as soon as practicable.

REFERENCE: *PROTOCOL SECTION 6.10.2, GENERAL CAPACITY TESTING REQUIREMENTS (IN PART)*

QSEs shall provide ERCOT a list identifying each Generation Resource unit that is expected to operate more than one hundred sixty eight (168) hours in a Season as a provider of energy and/or Ancillary Services. ERCOT shall evaluate, during each Season of expected operation, the Net Dependable Capability of each unit expected to operate more than one hundred sixty eight (168) hours during that Season, except for any Generation Resources used solely for energy services and whose capacity is less than ten (10) MW. Prior to the beginning of each Season, QSEs shall identify the Generation Resources to be tested during the Season and the specific week of the test if known. This schedule may be modified by the QSE (including retests) during the Season. QSEs not identifying a specific week for a Generation Resource unit test must test the unit within the first one hundred sixty eight (168) hours of run time during the Season or operate with a Net Dependable Capability equal to the highest integrated hourly MWh output demonstrated during the first one hundred sixty eight (168) hours of run time. QSEs do not have to bring units On-line or shut down solely for the purpose of the seasonal verification. Any unit for which the QSE desires qualification to provide Ancillary Services shall have its Net Dependable Capability verified prior to providing services using the Generation Resource unit even if it fits the less than one hundred sixty eight (168) hour or small capacity exception. The capability of hydro units operating in the synchronous condenser fast response mode to provide hydro Responsive Reserve shall be evaluated by Season. Load acting as a Resource to provide Ancillary Services shall have its telemetry attributes verified by ERCOT annually. In addition, once every two (2) years, any LaaR providing Responsive Reserve Service shall test the under frequency relay or the output from the solid-state switch, whichever applies, for correct operation. However, if the Load's performance has been verified through

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response to an actual event, the data from the event can be used to meet the annual telemetry verification requirement for that year and/or the biennial relay testing requirement...

3.1.4.6 Protective Relaying and Voltage Ride-Through (VRT) Requirement

The Facility's generation machine characteristics and plant design shall incorporate the under-frequency firm Load shedding philosophy and criteria defined in Operating Guide 2.9, Requirements for Under-Frequency Relaying. Inherent in this philosophy is the idea that all generators remain on line until all three steps of firm Load shedding have been executed. In addition, Generation Resources must set generator voltage relays to remain connected to the transmission system during the following operating conditions:

- Generator terminal voltages are within five percent (5%) of the rated design voltage and volts per hertz are less than one hundred five percent (105%) of generator rated design voltage and frequency;
- Generator terminal voltage deviations exceed five percent (5%) but are within ten percent (10%) of the rated design voltage and persist for less than 10.0 seconds;
- Generator volts per hertz conditions are less than one hundred sixteen percent (116%) of generator rated design voltage and frequency and last for less than 1.5 seconds;
- A transmission system fault (three-phase, single-phase or phase-to-phase), but not a generator bus fault, is cleared by the protection scheme coordinated between the Generation Entity and the TDSP on any line connected to the generator's transmission interconnect bus, provided such lines are not connected to induction generators described in Protocol subsection 6.5.7.1, Generation Resources Required to Provide Voltage Support Service Installed Reactive Capability, paragraph (7). However, in the case of a generator bus fault or a primary transmission system relay failure, the generator protective relaying may clear the generator independent of the operation of any transmission protective relaying.

The generation Facility shall have protective relaying necessary to protect its equipment from abnormal conditions as well as to be consistent with protective relaying criteria as described in Section 7.2, System Protective Relaying.

Within thirty (30) days of ERCOT's request, Generation Resources shall provide ERCOT with the operating characteristics of any generating unit's equipment protective relay system or controls that may respond to temporary excursions in voltage with actions that could lead to tripping of the generating unit.

Generating Resources required to provide VSS shall have and maintain the following capability:

- (1) Over-excitation limiters shall be provided and coordinated with the thermal capability of the generator field winding and protective relays in order to permit short-term reactive capability that allows at least eighty percent (80%) of the unit design standard (ANSI C50.13-1989), as follows:

| Time (seconds) | 10 | 30 | 60 | 120 |
|----------------|----|----|----|-----|
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Field Voltage % 208 146 125 112

After allowing temporary field current overload, the limiter shall operate through the automatic AC voltage regulator to reduce field current to the continuous rating. Return to normal AC voltage regulation after current reduction shall be automatic. The over-excitation limiter shall be coordinated with the over-excitation protection so that over-excitation protection only operates for failure of the voltage regulator/limiter.

- (2) Under-excitation limiters shall be provided and coordinated with loss-of-field protection to eliminate unnecessary generating unit disconnection as a result of operator error or equipment misoperation.

3.1.4.6.1 Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-powered Generation Resources

- Wind-powered Generation Resources (WGRs) **specified below** are required to set generator voltage relays to remain in-service during all transmission faults (no more than nine (9) cycles) in accordance with Figure 1, Voltage Ride-Through Boundaries For ~~Generating Units~~, Wind-powered Generation Resources, below. Faults on individual phases with delayed clearing (zone 2) may result in phase voltages outside this boundary but if the phase voltages remain inside this boundary then generator voltage relays are required to be set to remain connected and recover within the voltage recovery boundary of Figure 1.
- -WGR voltage relays shall be set to remain interconnected during three-phase faults on the transmission system for a voltage level as low as zero volts with a duration no more than nine (9) cycles as measured at the point of interconnection as shown in Figure 1. The clearing time requirement for a three-phase fault will be specific to the generating plant point of interconnection, as determined by and documented by the transmission provider in conjunction with the interconnection agreement. This requirement does not apply to faults that would occur between the generator terminals and the transmission voltage side of the generation step-up transformer or when clearing the fault effectively disconnects the generator from the system.
- WGRs may be tripped after the fault period if this action is intended as part of a special protection system.
- WGRs may meet the VRT requirements of Figure 1 by the performance of the generators or by installing additional equipment (e.g., Static VAR Compensator) within the generating plant or by a combination of generator performance and additional equipment.
- WGRs that have had over 50 seconds cumulative operation over the life of the WGR below 10% of nominal voltage at the point of interconnection shall be allowed, with ERCOT's approval, to set generator voltage relays to provide sufficient protection to the WGR to comply with warranty requirements and to retain the expected life of the resource.

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- Existing individual WGRs that are replaced are required to meet the requirements of Figure 1.
- ~~Existing individual WGRs that are part of a Generation Interconnect Agreement signed prior to January 1, 2003 are exempt from the requirements of Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-powered Generation Resources.~~
- ~~WGRs that are part of a Generation Interconnect Agreement signed after January 1, 2003 and before November 1, 2008 shall meet the requirements of Section 3.1.4.6.1 by January 1, 2015.~~
- WGRs that are part of a Generation Interconnect Agreement signed after November 1, 2008 shall meet the requirements of Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-powered Generation Resources. All such WGRs shall provide a status of compliance to ERCOT System Planning by July 1, 2009.
- WGRs that are part of a Generation Interconnect Agreement signed prior to November 1, 2008 shall provide information requested by ERCOT, including existing WGR VRT capabilities, for a study to evaluate the need for additional protective relaying and VRT requirements applicable to some or all such WGRs. If the results of the study demonstrate the need, this Operating Guide shall be revised to establish those requirements, including a schedule for compliance. ERCOT shall publish study results and provide recommendations to ROS by the scheduled ROS meeting of June 2010
- ~~All WGRs shall provide a status of compliance with the requirements of Section 3.1.4.6.1 to ERCOT System Planning by July 1, 2009.~~
- ~~All non-exempt WGRs shall provide an implementation plan for compliance with the requirements of Section 3.1.4.6.1 to ERCOT System Planning by July 1, 2009.~~
- Notwithstanding any allowed exemptions of the foregoing provisions, existing individual WGRs that meet the requirements of Figure 1 on November 1, 2008 shall continue to meet the requirements of Figure 1.
- If, due to a system disturbance, a WGR come off-line within the boundaries of the VRT requirement of Figure 1, then the WGR owner and the TSP shall be required to investigate and report to ERCOT on the cause of the WGR trip identifying a reasonable mitigation plan and timeline.

ERCOT and the TSP shall be notified of any equipment changes that affect the reactive capability of an operating WGR no less than sixty (60) days prior to implementation. of the changes, and any such changes that decrease the reactive capability of the WGR below the required level and changes that decrease the Voltage Ride-Through (VRT) capability of the plant must be approved by ERCOT prior to implementation.

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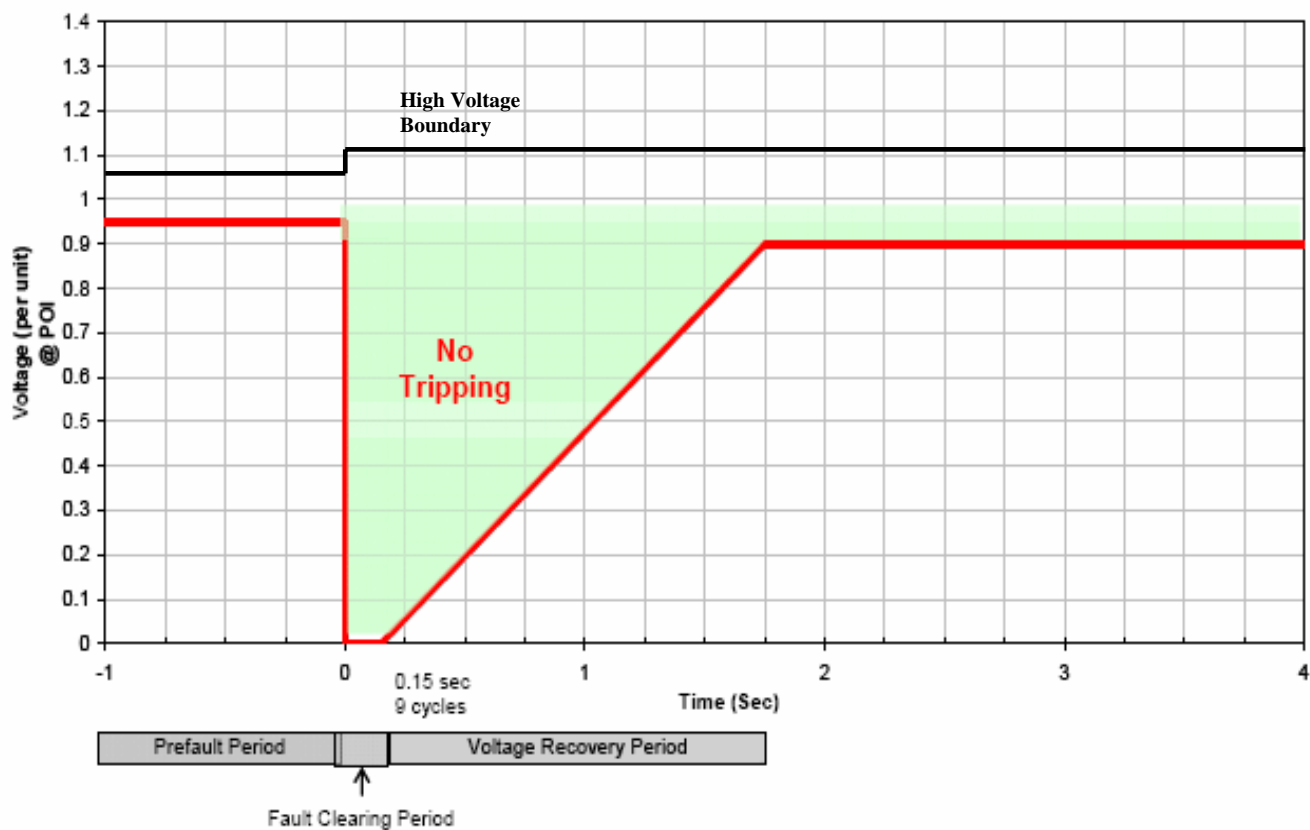


Figure 1: Voltage Ride-Through Boundaries For Wind-powered Generation Resources