

**UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION**

Interconnection for Wind Energy

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Docket No. RM05-4-000

**JOINT REPORT OF THE NORTH AMERICAN ELECTRIC RELIABILITY
COUNCIL AND THE AMERICAN WIND ENERGY ASSOCIATION**

Pursuant to the Commission’s Order Granting Extension of Effective Date and Extending Compliance Date issued in this docket on August 5, 2005, the North American Electric Reliability Council (“NERC”) and the American Wind Energy Association (“AWEA”) submit this joint report describing the final results of their discussions and recommending revisions to the low voltage ride-through (“LVRT”) provisions of the Final Rule.

I. Background

On June 2, 2005, the Commission issued Order No. 661,¹ which sets forth a Final Rule for the interconnection of new wind facilities greater than 20 MW. Among the standards adopted by the Commission in its Final Rule is a requirement that the new facility be able to remain on-line during specified low-voltage events on the grid. On July 5, 2005, NERC filed a Request for Rehearing of Order No. 661, asserting, among other things, that the adopted LVRT standard would permit violation of NERC standard TPL-002-0, System Performance Following Loss of a Single BES (Bulk Electric System) Element. On August 4, 2005, NERC and AWEA filed a request for extension of the effective date of the Commission’s Final Rule. AWEA and NERC requested a 60-day

¹ *Interconnection for Wind Energy*, Order No. 661, 70 Fed. Reg. 34993 (June 16, 2005), FERC Stats. & Regs. ¶ 31,186 (2005) (“Final Rule” or “Order No. 661”), *reh’g pending*.

extension to October 14, 2005, in order to allow them to engage in discussions to resolve NERC's concern regarding the LVRT standard. On August 5, 2005, the Commission granted this request. That Order called upon NERC and AWEA to submit a final report on their discussions by September 14, 2005. Pursuant to a request from NERC and AWEA, the Commission thereafter extended this date to September 19, 2005.

Following the Commission's August 5 Order allowing time for NERC and AWEA to engage in settlement discussions, the two organizations have exchanged information continuously and held two separate day-long meetings on the subject of the adopted LVRT rule. Because these settlement discussions are confidential pursuant to Section 602 of the Commission's Rules, this report will not describe their substance. Suffice it to say that both NERC and AWEA are pleased to report that these discussions have resulted in a joint recommendation for revisions to the Final Rule that each organization fully endorses.

II. Joint Recommendation

NERC and AWEA have reached an agreement regarding revisions to the LVRT provisions of Order No. 661. A substitute of the LVRT section of the Final Rule implementing this agreement is set forth as Attachment A. NERC and AWEA jointly recommend that the Commission adopt the terms of this agreement in a rehearing order, without modification. This proposed settlement has the support of the NERC Planning Committee and AWEA members.

NERC agrees that the concerns regarding the LVRT standard in the Final Rule expressed in its Request for Rehearing will be resolved if the Commission adopts this recommendation. More specifically, NERC agrees that:

- The LVRT performance requirement in this filing is not different from the performance required for other generation technologies;
- FERC should only consider an exception to the LVRT standard in Appendix G of the Large Generator Interconnection Agreement (“LGIA”) if it is interconnection-wide (*i.e.*, the Western Interconnection and/or the Eastern Interconnection). Nothing in this position should restrict an individual transmission provider from requesting a deviation from the LGIA LVRT standard in an interconnection agreement it files with the FERC, as is currently allowed by Commission rules; and
- A wind generating plant that meets the requirements of the jointly recommended Appendix G LVRT standard complies with NERC standard TPL-002-0.

NERC and AWEA agree that adoption of this joint recommendation by the Commission will result in a Final Rule for the interconnection for wind facilities that is just and reasonable and not unduly discriminatory or preferential.

III. Key Differences Between the Recommendation and the LVRT provisions of the Final Rule

The joint recommendation differs from the Appendix G LVRT provisions in Order No. 661 in several respects. Briefly, the major differences are as follows:

- Order No. 661 does not require wind facilities to ride-through voltage drops below 15%. The joint recommendation proposes that, following a transition period, interconnecting wind facilities subject to the Rule remain on-line for the duration of a normally-cleared fault on the transmission network (up to a maximum of 9 cycles), as well as the recovery from such a normally cleared fault even where the voltage drops to zero during the clearing of the fault. The normal clearing time requirement (approximately 4 – 9 cycles for three phase faults) is non-discriminatory, as it would be applied consistently with how the NERC standard is applied to synchronous generators. If the fault remains after the normal clearing time, the joint recommendation would permit a wind generator plant to disconnect from the transmission system. While 9 cycles, 0.15 seconds, is significantly shorter than the time proposed in the Final Rule, 0.625 seconds, it is an amount of time comparable to that which would be expected for synchronous generators.
- Order No. 661 measures the voltage for purposes of compliance with the LVRT standard at the point of interconnection. The joint recommendation proposes to measure the voltage at the high side of the wind generating plant

step-up transformer. This is appropriate because a contractually defined interconnection point for a wind farm could result in a trip at higher voltages than proposed in the joint recommendation.

- Order No. 661 states that transmission providers can only impose the LVRT requirement where case specific reliability studies demonstrate that the requirement is needed. The joint recommendation proposes an LVRT standard that need not be supported by such case-specific studies, though the requirement would be based on the location-specific normal clearing time for a three phase fault (which is a time period of approximately 4 – 9 cycles).
- The Order No. 661 LVRT standard would take effect on January 1, 2006. The joint recommendation provides a transition period with an interim LVRT rule. Similar to the Order No. 661 standard, this interim standard would require wind facilities to ride-through low voltage events as low as 0.15 p.u. for location-specific normal clearing times (up to a maximum of 9 cycles). After the transition period, the rule would become more stringent, requiring the wind facility to ride-through low voltage events down to zero for location-specific normal clearing times (up to a maximum of 9 cycles). The transition standard applies to (1) wind generating facilities that have interconnection agreements signed and filed with the Commission, filed with the Commission in unexecuted form, or filed with the Commission as non-conforming agreements between January 1, 2006, and December 31, 2006, with a scheduled in-service date no later than December 31, 2007; or (2) wind generating turbines subject to a wind turbine procurement contract executed prior to December 31, 2005, for delivery through 2007. The intent of the transition period is to permit wind turbine manufacturers time to develop technology to meet the new standard, and to create a balance between insuring that stranded investment does not occur, while limiting the amount of generation that can interconnect under the transition period LVRT standard.
- Figure 1 in the Order No. 661 LVRT standard provides a voltage trace that defines the LVRT requirement. The joint recommendation eliminates Figure 1 and specifies that the “normal clearing” time for a fault shall not exceed 9 cycles and thereby requires the wind facility to ride-through a voltage drop to zero for up to that length of time. Thereafter, the joint recommendation substitutes a performance standard (i.e., that the facility remain on-line during recovery from the normally-cleared network fault) for the numeric voltage trace.
- The joint recommendation would limit the LVRT variations that were permitted under the Final Rule.² Specifically, FERC would only consider an

² The Commission in Order No. 661 at P 109 proposed to permit variations to the LVRT standard under three circumstances:

exception to the LVRT standard in Appendix G to the Large Generator Interconnection Agreement (“LGIA”) if it is interconnection wide (the Western Interconnection and/or the Eastern Interconnection). As (i) the LVRT standard is intended to satisfy NERC standard TPL-002-0, and (ii) permitting variations from the LVRT standard could result in wind generators incurring significant additional costs and potential stranded investment, limiting the variations from the *pro forma* Appendix G LVRT standard is justified. Nothing, however, would restrict an individual transmission provider from requesting a deviation from the Appendix G LVRT standard in any interconnection agreement it files with FERC, as is currently allowed by the Commission’s rules.

IV. Conclusion

AWEA and NERC appreciate the opportunity afforded the two organizations by the Commission to resolve the issue of LVRT for wind generating plants subject to Order No. 661. The joint recommendation accomplishes a number of objectives of both AWEA and NERC. The joint recommendation resolves NERC’s reliability concerns in a satisfactory manner. The joint recommendation sets a uniform national LVRT standard. The joint recommendation provides critical temporal stability by creating a transition period that will provide wind manufacturers with sufficient time to develop the technology required to meet the post-transition period LVRT standard, and is fair to industry participants who will in many cases be able to interconnect under the interim

First, public utilities could seek variations from the Final Rule Appendix G based on regional reliability council requirements. Second, we proposed that public utilities may argue that proposed variations are “consistent with or superior to” the Final Rule Appendix G. Third, we proposed to permit independent public utility Transmission Providers, such as Regional Transmission Organizations (RTOs) and Independent System Operators (ISOs), greater flexibility in adopting Appendix G (the “independent entity variation”).

Variations other than to the LVRT standard would be permitted in accordance with Order No. 661.

standard through 2007. To that end, AWEA and NERC join in recommending the revisions to the adopted Final Rule set forth above.

Dated: September 19, 2005

Respectfully submitted,

By: _____

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ATTACHMENT A

(Replace section A.i of Appendix G with the following section A.i)

APPENDIX G

INTERCONNECTION REQUIREMENTS FOR A WIND GENERATING PLANT

A. Technical Standards Applicable to a Wind Generating Plant

i. Low Voltage Ride-Through (LVRT) Capability

A wind generating plant shall be able to remain online during voltage disturbances up to the time periods and associated voltage levels set forth in the standard below. The LVRT standard provides for a transition period standard and a post-transition period standard.

Transition Period LVRT Standard

The transition period standard applies to wind generating plants subject to FERC Order 661 that have either: (i) interconnection agreements signed and filed with the Commission, filed with the Commission in unexecuted form, or filed with the Commission as non-conforming agreements between January 1, 2006 and December 31, 2006, with a scheduled in-service date no later than December 31, 2007, or (ii) wind generating turbines subject to a wind turbine procurement contract executed prior to December 31, 2005, for delivery through 2007.

1. Wind generating plants are required to remain in-service during three-phase faults with normal clearing (which is a time period of approximately 4 – 9 cycles) and single line to ground faults with delayed clearing, and subsequent post-fault voltage recovery to prefault voltage unless clearing the fault effectively disconnects the generator from the system. The clearing time requirement for a three-phase fault will be specific to the wind generating plant substation location, as determined by and documented by the transmission provider. The maximum

clearing time the wind generating plant shall be required to withstand for a three-phase fault shall be 9 cycles at a voltage as low as 0.15 p.u., as measured at the high side of the wind generating plant step-up transformer (i.e. the transformer that steps the voltage up to the transmission interconnection voltage or “GSU”), after which, if the fault remains following the location-specific normal clearing time for three-phase faults, the wind generating plant may disconnect from the transmission system.

2. This requirement does not apply to faults that would occur between the wind generator terminals and the high side of the GSU or to faults that would result in a voltage lower than 0.15 per unit on the high side of the GSU serving the facility.
3. Wind generating plants may be tripped after the fault period if this action is intended as part of a special protection system.
4. Wind generating plants may meet the LVRT requirements of this standard by the performance of the generators or by installing additional equipment (e.g., Static VAR Compensator , etc.) within the wind generating plant or by a combination of generator performance and additional equipment.
5. Existing individual generator units that are, or have been, interconnected to the network at the same location at the effective date of the Appendix G LVRT Standard are exempt from meeting the Appendix G LVRT Standard for the remaining life of the existing generation equipment. Existing individual generator units that are replaced are required to meet the Appendix G LVRT Standard.

Post-transition Period LVRT Standard

All wind generating plants subject to FERC Order No. 661 and not covered by the transition period described above must meet the following requirements:

1. Wind generating plants are required to remain in-service during three-phase faults with normal clearing (which is a time period of approximately 4 – 9 cycles) and single line to ground faults with delayed clearing, and subsequent post-fault voltage recovery to prefault voltage unless clearing the fault effectively disconnects the generator from the system. The clearing time requirement for a three-phase fault will be specific to the wind generating plant substation location, as determined by and documented by the transmission provider. The maximum clearing time the wind generating plant shall be required to withstand for a three-phase fault shall be 9 cycles after which, if the fault remains following the location-specific normal clearing time for three-phase faults, the wind generating plant may disconnect from the transmission system. A wind generating plant shall remain interconnected during such a fault on the transmission system for a voltage level as low as zero volts, as measured at the high voltage side of the wind GSU.

2. This requirement does not apply to faults that would occur between the wind generator terminals and the high side of the GSU.
3. Wind generating plants may be tripped after the fault period if this action is intended as part of a special protection system.
4. Wind generating plants may meet the LVRT requirements of this standard by the performance of the generators or by installing additional equipment (e.g., Static VAr Compensator) within the wind generating plant or by a combination of generator performance and additional equipment.
5. Existing individual generator units that are, or have been, interconnected to the network at the same location at the effective date of the Appendix G LVRT Standard are exempt from meeting the Appendix G LVRT Standard for the remaining life of the existing generation equipment. Existing individual generator units that are replaced are required to meet the Appendix G LVRT Standard.

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each party designated on the official service list in this proceeding.

Dated at Sacramento, California, this 19th day of September, 2005.

Ron O'Connor