

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

Interconnection for Wind Energy) **Docket No. RM05-4-000**

**REQUEST FOR REHEARING OF THE
NORTH AMERICAN ELECTRIC RELIABILITY COUNCIL**

The North American Electric Reliability Council (“NERC”) submits this request for rehearing of the final rule issued by the Federal Energy Regulatory Commission on June 2, 2005 in the above-referenced proceeding.¹ Order No. 661 made significant progress in standardizing and facilitating the interconnection of large wind generators to the transmission grid. However, certain of the requirements the Commission prescribed in the final rule present an unacceptable risk to the reliability of the bulk electric system and should be changed.

I. SPECIFICATIONS OF ERROR

1. The Commission erred in adopting the specifications of Figure 1 as the low voltage ride through (“LVRT”) capability required of wind generators.
2. The Commission erred in shifting to transmission providers the burden of justifying the need for certain good utility practices.²

In support of these specifications of error, NERC states as follows:

II. BACKGROUND

On January 24, 2005, the Commission issued a Notice of Proposed Rulemaking (“NOPR”) in the above-referenced docket.³ The NOPR was issued in response to a

¹ *Interconnection for Wind Energy*, 111 FERC ¶ 61,353 (2005) (“Order No. 661”).

² The Commission recently concluded that the term good utility practice includes compliance with NERC’s new Reliability Standards.

³ *Interconnection for Wind Energy*, 110 FERC ¶ 61,036 (2005).

petition submitted by the American Wind Energy Association (“AWEA”) and proposed to require Transmission Providers to adopt certain technical requirements for interconnection service provided to wind generation facilities. The NOPR proposed that the technical requirements applicable to wind generation plants differ in certain respects from those applicable to traditional synchronous generating plants.

On March 2, 2005, NERC submitted comments in response to the NOPR. In particular, NERC commented upon the NOPR’s proposals regarding the LVRT standard that would be applicable to wind generating plants, the NOPR’s proposals regarding Supervisory Control and Data Acquisition (“SCADA”) capability, and power factor design criteria. Order No. 661 did not fully accept NERC’s comments regarding these issues. Over NERC’s objections, the Commission adopted Figure 1, Minimum Required Wind Plant Response to Emergency Low Voltages, as the LVRT standard. In addition, Order No. 661 shifts to Transmission Providers the burden of justifying common practices in the industry regarding LVRT capability, SCADA capability, and power factors.

III. ARGUMENT

A. The Commission erred in adopting the specifications of Figure 1 as the low voltage ride-through capability required of wind generators.

Section A.i. of Appendix G adopted by Order No. 661 defines the LVRT capabilities required of wind generators in its Figure 1, Minimum Required Wind Plant Response to Emergency Low Voltages. NERC believes that adoption of Figure 1 will reduce the reliability of the electric grid. Figure 1 is not appropriate for wind generator plants connected to the electric system at transmission voltage levels. NERC requests the Commission to reconsider its actions in Order No. 661, and instead require wind plants to

meet NERC and regional reliability council reliability standards. NERC strongly believes that anything short of full compliance with its standards could adversely affect grid reliability. NERC therefore respectfully requests that the Commission reverse those aspects of Order No. 661 that would weaken compliance with the NERC reliability standards. Should the Commission choose not to take NERC's approach, the Commission should adopt the LVRT capabilities described in this request for rehearing that would require a wind generator to withstand a normally cleared single line to ground or three phase fault on a transmission line connected to the wind plant switchyard or substation.

1. The Effect of a Transmission Line Fault Near the Point of Interconnection

NERC Reliability Standard TPL-002-0, System Performance Following Loss of a Single BES (Bulk Electric System) Element, requires the planning authority and the transmission planner to ensure that the bulk electric system will remain stable with thermal and voltage limits within applicable ratings, and with no loss of demand or curtailed firm transfers, for a normally cleared fault on a single element (an interval of several cycles). If a fault occurs on a transmission line near a wind plant, the voltage measured at that point could drop instantaneously to zero for the short interval required to clear the fault. This low voltage condition would persist until the fault was cleared by the system of protective relays and circuit breakers, separating the faulted line from the electric grid. This clearing time is typically four to eight cycles, or 0.067 to 0.133 seconds.

2. Applicable NERC Reliability Standards

NERC Reliability Standard TPL-002-0, System Performance Following Loss of a Single BES [Bulk Electric System] Element, classifies this type of normally cleared fault as a Category B, or single contingency event. TPL-002-0 anticipates that the grid would react to this type of fault with the loss of only one element (the faulted transmission line), and that post contingency, the system should be stable and both thermal and voltage limits should be within their applicable ratings. There would be no loss of demand or curtailed firm power transfers, and there would be no cascading outages.

3. Risk to Reliability

Figure 1 of the Appendix G, Interconnection Requirements for a Wind Generating Plant, adopted in Order No. 661 would allow the wind generator plant to disconnect from the electric grid at the instant the voltage at the point of interconnection dropped below 0.15 p.u., which would be prior to the normal clearing time of the fault by the transmission line protective devices. The loss of a single grid element (the faulted transmission line) will now be compounded by the loss to the grid of the real power generation represented by the wind plant, as well as any reactive power support provided by the plant. This effect of creating a double contingency event (loss of the transmission line and the wind power plant) is a violation of Reliability Standard TPL-002-0.

Furthermore, because the point of interconnection, as defined by the Commission, is based on contractual ownership arrangements, it may be distant from the wind plant. In situations involving a distant point of interconnection, the wind plant may trip for voltages higher than 0.15 p.u. at the high side of the wind generator step-up transformer. To avoid such situations, the LVRT capability should be measured at the

high voltage terminal of the wind plant step-up transformer, regardless of where the contractual point of interconnection is located.

The loss of multiple elements of the electric system escalates a Category B single contingency event to the consequences of a Category C or a Category D multiple contingency event. These Category C and Category D events are described in NERC Reliability Standard TPL-003-0, System Performance Following Loss of Two or More BES Elements, or TPL-004-0, System Performance Following Extreme BES Events, respectively. The multiple elements involved in this situation are the faulted transmission line and the wind generation connected to the wind plant switchyard or substation. The impacts to the system of a Category C or Category D contingency are more severe than those permitted for Category B events. Implementation of Figure 1 in Appendix G for wind generating plants will have the effect of reducing the reliability of the electric grid. What would normally be a Category B event will now have the consequences similar to a Category C or a Category D event, with the potential of adverse impacts to the electric grid. High penetration levels of wind generator resources also may increase the severity of the adverse impacts to the grid.

NERC believes that significant amounts of wind generation can reliably be added to the bulk electric system as long as all parties involved in the planning and operation of these wind plants (generator owners, generator operators, transmission owners, transmission planners and transmission operators) adhere to established reliability standards.

4. Proposed Alternative to Figure 1

NERC stated in its March 2, 2005 comments in this docket that the standards for the reliable planning and operation of bulk electric system facilities should be contained in the standards set by NERC and the regional reliability councils, not the Commission's regulations. NERC's comments encouraged the Commission to require wind plants to meet the requirements of NERC and regional council reliability standards. NERC still believes that NERC and the regional reliability councils are the appropriate organizations to establish reliability requirements for the electric grid. The Commission should, therefore, grant rehearing of Order No. 661 and make clear that wind generating plants must meet all applicable standards established by NERC and the regional reliability councils.

If, however, the Commission chooses to establish specific reliability standards in its regulations,⁴ NERC believes that Figure 1, Minimum Required Wind Plant Response to Emergency Low Voltage, must be modified to require that a wind generator connected to the grid be able to survive a normally cleared single line to ground or three phase fault on a transmission line connected to the plant switchyard or substation. This can be accomplished by modification of Figure 1 to require the wind plant to stay interconnected with the grid if the voltage at the high side of the wind generator step-up transformer is reduced to zero at time 0.0 for a period of up to 0.167 seconds (ten cycles). After 0.167 seconds, but before 0.625 seconds, the wind plant must remain interconnected as long as the voltage is at or above 0.15 p.u., as currently proposed by Figure 1. These

⁴ NERC recognizes that the Order No. 661 indicates that the Commission will consider a future standard developed by NERC, but that, in the meantime, a Commission-established standard is necessary. Nonetheless, the Commission must grant rehearing of Order No. 661 as described herein in order to ensure that the standard adopted by the Commission does not harm system reliability.

modifications will provide for the wind plant to remain interconnected during a normally cleared fault and will reduce the risk to the reliability of the electric system to an acceptable level.

NERC understands that the intent of Figure 1 is to have a reasonable requirement for system reliability and also meet the physical capabilities of existing wind generation technology. But wind technology is advancing rapidly. If Figure 1 is included in the Commission's order, it is likely to be static over time and may limit technological development. For example, Hydro-Quebec's grid code⁵ for wind plant interconnections requires that the dynamic behavior of wind plants provides the same level of performance as traditional generating facilities to insure system reliability. Hydro-Quebec believes that wind turbine generators can meet its LVRT requirement, which is similar to what NERC proposes (that a wind plant remain interconnected for a normally cleared transmission fault). In fact, a major wind turbine manufacturer will supply wind turbines to Hydro-Quebec for eight projects totaling over 1000 MW during the 2006 through 2012 period.

B. The Commission erred in shifting to transmission providers the burden of justifying the need for certain good utility practices.

The NOPR would have required that large wind plants seeking to interconnect to the grid (1) to demonstrate LVRT capability;⁶ (2) to possess SCADA capability to transmit data and receive instructions from the Transmission Provider; and (3) to maintain a power factor within the range of 0.95 leading to 0.95 lagging, measured at the

⁵ See "Hydro-Quebec Grid Code for Wind Farm Interconnection," S. Bernard, D. Beaulieu, G. Trudel, IEEE 0-7803-9156-X/05. Paper presented at IEEE Power Engineering Society 2005 General Meeting, San Francisco, California, June 12-16, 2005.

⁶ To demonstrate LVRT capability, the wind generator must show that the plant can remain on line during voltage disturbances up to specified time periods and associated voltage levels.

high voltage side of the substation transformers.⁷ In Order No. 661, the Commission, without adequate explanation or justification, shifted the burden to transmission providers to justify the need for these commonly accepted features of good utility practice in each particular system impact study. The Commission also said that wind generators could challenge a transmission provider's finding that such requirements were necessary.

Shifting the burden to transmission providers of justifying on a case-by-case basis what most regard as common elements of good utility practice is unwise. The approach contained in the final rule could deter transmission providers from following and implementing good utility practice. Inviting wind generators to challenge a transmission provider's decision that such requirements are necessary only compounds the problem. Finally, the Commission's decision in the final rule to use a case-by-case approach may have the unintended consequence of spawning a patchwork of varying requirements. NERC urges the Commission to grant rehearing and return to the approach set out in the NOPR.

IV. CONCLUSION

Based on the foregoing, NERC respectfully requests that, on rehearing, the Commission remove Figure 1 from Appendix G and instead require wind generators to meet standards established by NERC and the regional reliability councils. If the Commission continues to believe it must specify low voltage ride-through requirements in its regulations, NERC urges the Commission to revise those requirements as described above to reduce the risk to the reliability of the electric system. NERC also requests that the Commission return to requiring wind generators to conform to certain good utility

⁷ A transmission provider may waive this requirement if it is unnecessary in particular circumstances.

