

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

18 CFR Part 35

(Docket No. RM05-4-001; Order No. 661-A)

Interconnection for Wind Energy

(Issued December 12, 2005)

AGENCY: Federal Energy Regulatory Commission

ACTION: Order on Rehearing and Clarification

SUMMARY: The Federal Energy Regulatory Commission is granting in part and denying in part the requests for rehearing and clarification of its Final Rule on Interconnection for Wind Energy, Order No. 661. Order No. 661 requires public utilities that own, control, or operate facilities for transmitting electric energy in interstate commerce to append to their standard large generator interconnection procedures and large generator interconnection agreements in their open access transmission tariffs standard procedures and technical requirements for the interconnection of large wind generation.

EFFECTIVE DATE: Changes made to Order No. 661 in this order on rehearing and clarification will become effective on [insert date 30 days after publication in the Federal Register].

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UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Joseph T. Kelliher, Chairman;
Nora Mead Brownell, and Suedeen G. Kelly.

Interconnection for Wind Energy

Docket No. RM05-4-001

ORDER NO. 661-A

ORDER ON REHEARING AND CLARIFICATION

(Issued December 12, 2005)

1. On June 2, 2005, the Commission issued Order No. 661, the Final Rule on Interconnection for Wind Energy (Final Rule).¹ Several entities have filed timely requests for rehearing and clarification of the Final Rule.² In this order, the Commission grants in part and denies in part the requests for rehearing and clarification.

I. Background

2. In Order No. 2003,³ the Commission adopted standard procedures and a standard

¹ Interconnection for Wind Energy, Order No. 661, 70 FR 34993 (June 16, 2005), FERC Stats. & Regs. ¶ 31,186 (2005) (Final Rule); see also Order Granting Extension of Effective Date and Extending Compliance Date, 70 FR 47093 (Aug. 12, 2005), 112 FERC ¶ 61,173 (2005).

² Those entities requesting rehearing and/or clarification, and the acronyms used to refer to them in this order, are listed in Appendix A to this order.

³ Standardization of Generator Interconnection Agreements and Procedures, Order No. 2003, 68 FR 49845 (Aug. 19, 2003), FERC Stats. & Regs., Regulations Preambles ¶ 31,146 (2003) (Order No. 2003), order on reh'g, 69 Fed. Reg. 15,932 (Mar. 24, 2004), FERC Stats & Regs., Regulations Preambles ¶ 31,160 (2004) (Order No. 2003-A),

(continued)

agreement for the interconnection of large generation facilities. The Commission required public utilities that own, control, or operate facilities for transmitting electric energy in interstate commerce to file revised Open Access Transmission Tariffs (OATTs) containing these standard provisions, and use them to provide interconnection service to generating facilities having a capacity of more than 20 megawatts.

3. In Order No. 2003-A, on rehearing, the Commission noted that the standard interconnection procedures and agreement were based on the needs of traditional generation facilities and that a different approach might be more appropriate for generators relying on other technologies, such as wind plants.⁴ Accordingly, the Commission granted certain clarifications, and also added a blank Appendix G to the standard Large Generation Interconnection Agreement (LGIA) for future adoption of requirements specific to other technologies.⁵

4. The Commission issued a Notice of Proposed Rulemaking (NOPR) that proposed technical standards applicable to the interconnection of large wind generating plants⁶ to

order on reh'g, 70 Fed. Reg. 265 (January 4, 2005), FERC Stats & Regs., Regulations Preambles ¶ 31,171 (2004) (Order No. 2003-B), order on reh'g, 70 FR 37661 (June 30, 2005), FERC Stats. & Regs. ¶ 31,190 (2005) (Order No. 2003-C); see also Notice Clarifying Compliance Procedures, 106 FERC ¶ 61,009 (2004).

⁴ Order No. 2003-A at P 407, n.85.

⁵ Id.

⁶ Large wind generating plants are those with an output rated at more than 20 MW at the point of interconnection. The interconnection requirements for small generators rated at 20 MW or less are set forth in Standardization of Small Generator

be included in Appendix G of the LGIA.⁷ We proposed the standards in light of our findings in Order No. 2003-A noted above and in response to a petition submitted by the American Wind Energy Association (AWEA).⁸ Specifically, the Commission proposed to establish uniform standards in Appendix G that would require large wind plants seeking to interconnect to the grid to: (1) demonstrate low voltage ride-through capability; in other words, show that the plant can remain on line during voltage disturbances up to specified time periods and associated voltage levels; (2) have supervisory control and data acquisition (SCADA) capability to transmit data and receive instructions from the Transmission Provider; and (3) maintain a power factor within the range of 0.95 leading to 0.95 lagging, measured at the high voltage side of the substation transformers. The Commission proposed to permit the Transmission Provider to waive the low voltage ride-through requirement on a comparable and not unduly discriminatory basis. We proposed to permit the Transmission Provider to waive or defer compliance with the power factor requirement where it is not necessary. The Commission did not

Interconnection Agreements and Procedures, Order No. 2006, 70 FR 34190 (June 13, 2005), FERC Stats. & Regs. ¶ 31,180 (2005), reh'g pending.

⁷ See Interconnection for Wind Energy and Other Alternative Technologies, Notice of Proposed Rulemaking, 70 FR 4791 (Jan. 31, 2005), 110 FERC ¶ 61,036 (2005) (NOPR).

⁸ See Petition for Rulemaking or, in the Alternative, Request for Clarification of Order No. 2003-A, and Request for Technical Conference of the American Wind Energy Association (May 20, 2004), filed in Docket Nos. RM02-1-005 and PL04-15-000 (AWEA Petition).

propose to adopt a proposal by AWEA to allow a wind generator to “enter the interconnection queue and conduct its own Feasibility Study, having obtained the information necessary to do so upon paying the initial deposit and submitting its interconnection application” (referred to as “self-study” provisions).⁹ The Commission did, however, ask for comments on how to balance the need of wind generators to obtain certain data from the Transmission Provider before completing their Interconnection Requests with the need to protect critical energy infrastructure information and commercially sensitive data against unwarranted disclosure.

5. In the Final Rule, the Commission adopted final standard procedures and technical requirements for the interconnection of large wind plants in Appendix G, and required all public utilities that own, control, or operate facilities for transmitting electric energy in interstate commerce to append Appendix G to the Large Generator Interconnection Procedures (LGIPs) and LGIAs in their OATTs. As described in more detail below, the Commission adopted provisions establishing standards for low voltage ride-through and power factor design criteria, and requiring that wind plants meet those standards if the Transmission Provider shows, in the System Impact Study, that they are needed to ensure the safety or reliability of the transmission system. Additionally, the Appendix G adopted by the Commission included a SCADA requirement applicable to all wind

⁹ See AWEA Petition at 13.

plants. Finally, as described in more detail below, the Commission adopted in Appendix G to the LGIP limited special interconnection procedures applicable to wind plants.

II. Requests for Rehearing and Clarification and Commission Conclusions

A. Low Voltage Ride-Through Provisions

6. In the Final Rule, the Commission adopted a low voltage ride-through standard, but provided that a wind plant is required to meet the standard only if the Transmission Provider shows, in the System Impact Study, that low voltage ride-through capability is needed to ensure safety or reliability. The standard (adopted in Figure 1 of Appendix G to the LGIA), if applicable, requires the wind plant to stay online for specified time periods and at associated voltage levels where there is a disturbance on the transmission system. The Final Rule requires that the required voltage levels be measured at the Point of Interconnection.

7. Several entities requested rehearing of various aspects of the low voltage ride-through requirement and standard included in the Final Rule, including: (1) provisions that require low voltage ride-through only when the System Impact Study shows that such capability is necessary for safety or reliability; (2) the specific low voltage ride-through standard adopted in the Final Rule; (3) the point of measurement for the standard; and (4) arguments that Transmission Providers should be permitted to adopt other provisions of the German low voltage ride-through standard (which the Commission referenced in the Final Rule).

8. However, as described in more detail below, NERC and AWEA jointly requested

that the Commission delay the effective date of the Final Rule to give them time to resolve concerns expressed by NERC regarding the low voltage ride-through provisions. The Commission granted this extension, and on September 19, 2005, NERC and AWEA submitted a joint report with recommended revisions.

1. **Case-by-Case Application/Burden of Proof for Applying the Low Voltage Ride-Through Standard**

9. Prior to the NERC/AWEA joint report, several entities objected on rehearing to the Final Rule's adoption of a low voltage ride-through requirement on a case-by-case basis, placing the burden of proof on the Transmission Provider to show that low voltage ride-through capability is needed. ATC, EEI, NERC, NRECA/APPAA, and SCE, among others, urged the Commission to return to the approach in the NOPR, which would have required low voltage ride-through for all wind plants unless waived by the Transmission Provider on a not unduly discriminatory basis. ATC noted that interconnection studies only consider a snapshot of the transmission system, and do not take into account changes in the future that may cause a need for low voltage ride-through capability to ensure reliability. ATC, as well as EEI and SCE, argued that under the case-by-case approach adopted in the Final Rule, Transmission Providers will need to perform additional analyses to determine if a reliability need will exist over the life of the wind plant. SCE, for example, noted that while a particular System Impact Study may not conclusively demonstrate that low voltage ride-through is needed at that time, if other generation projects are built, the first wind plant may come to need low voltage ride-

through. According to various entities, the additional analyses needed to take these scenarios into account will increase the time, cost and complexity of wind plant interconnections and could be a barrier to their development.¹⁰

10. Furthermore, ATC asserted that the case-by-case approach imposes the responsibility for resolving reliability concerns that arise in the future on the Transmission Provider because wind generating plants cannot be retrofitted with low voltage ride-through capability. Similarly, NRECA/APPAA argued that this approach unduly discriminates in favor of wind plants in that low voltage ride-through capability may not be “necessary” (and therefore required) for a specific plant because other generators or Transmission Providers can “make up the difference.”¹¹ ATC also contended that the case-by-case approach may require the Transmission Provider to incur capital costs that should have been incurred by the wind plant.

11. EEI and NU argued that the case-by-case approach adopted by the Commission in the Final Rule “lowers the bar for reliability.”¹² NERC similarly asserted that requiring Transmission Providers to justify common elements of good utility practice on a case-by-

¹⁰ New York ISO asserts that the case-by-case approach could lead to acute problems in New York, where it has received interconnection applications from wind plants totaling over 5000 MW of generation. According to New York ISO, conducting case-by-case reviews for each of these projects could greatly complicate the study process and result in substantial delays.

¹¹ Request for Rehearing of NRECA/APPAA at 6.

¹² Request for Rehearing of EEI at 8.

case basis is unwise and may deter Transmission Providers from implementing and following good utility practice.¹³ Southern Company states that the Transmission Provider, as the entity responsible for maintaining reliability, should not bear the burden of proof to establish what is required to maintain system reliability. Southern Company states that it supports the Commission's statement that Transmission Providers should not be permitted to require wind plants to install costly equipment that is not needed for reliability, but argues that the burden of proof should be shifted, and the System Impact Study should establish that such equipment is not required. Also, NRECA/APPAs argued that the case-by-case approach imposes unreasonable reliability risks, and effectively voids the requirement that wind plants have low voltage ride-through capability "in a broad range of circumstances."¹⁴

12. Those requesting rehearing raised several other arguments regarding the case-by-case approach and burden of proof for applying the low voltage ride-through standard. NERC believed that the case-by-case approach could unintentionally create a "patchwork" of varying requirements. EEI and NU also suggested that requiring a showing of need may introduce prolonged uncertainties into the interconnection process if parties disagree as to the study assumptions. SCE asserted that rather than limiting opportunities for undue discrimination, the requirement of a showing of need could result

¹³ New York ISO states that it adopts NERC's position on this issue.

¹⁴ Request for Rehearing of NRECA/APPAs at 6.

in discriminatory treatment in areas with large amounts of wind generation because projects lower in the queue may be responsible for additional costs since the need for low voltage ride-through could not be demonstrated for earlier projects. EEI contended that Order No. 2003 already contains provisions allowing the parties to an interconnection to exercise their discretion in complying with system reliability obligations, and that there is no evidence of problems with these procedures that justifies such a significant departure from them in the Final Rule. Further, EEI argued that the Final Rule was a significant departure from the NOPR and that the Commission should not adopt it without providing an opportunity for comments on it. Finally, NRECA/APPA argued that the Commission has not explained how this approach is consistent with NERC and WECC standards.

2. Specific Low Voltage Ride-Through Standard

13. Certain requests for rehearing and clarification also addressed the specific low voltage ride-through standard adopted by the Commission in the Final Rule. In its request for rehearing, NERC asserted that the standard in Figure 1 of the Final Rule is not appropriate. More specifically, NERC contended that Figure 1, by allowing a wind plant to disconnect from the transmission system when the voltage drops below 15 percent of the nominal voltage, could result in violation of NERC Reliability Standard TPL-002-0. This standard requires transmission planners to ensure that the system will remain stable and within applicable thermal and voltage ratings, with no loss of demand or curtailment of firm transfers, where there is a normally cleared fault on a single element, which is typically four to eight cycles or 0.067 to 0.133 seconds (67 to 133 milliseconds).

According to NERC, a fault occurring on a transmission line near a wind plant could cause the voltage at that point to drop to zero for this clearing time. NERC stated that because Figure 1 would allow the wind plant to disconnect when the voltage drops below 15 percent of the nominal voltage, the loss of the single grid element (the transmission line) would be compounded by the loss of the real power (and any reactive power) produced by the wind plant. This “double contingency event” (loss of both the transmission line and wind plant) violates Reliability Standard TPL-002-0, NERC asserted.

14. To remedy this problem, NERC requested that the Commission simply require wind plants to meet NERC and regional reliability council requirements.¹⁵ Alternatively, NERC argued that the rule should be modified to require wind plants to remain connected through a normally cleared single line to ground or three phase fault. Specifically, NERC asserted that Figure 1 should be altered to require a wind plant to remain online for 0.167 seconds (167 milliseconds), or ten cycles, if voltage at the high side of the wind plant step-up transformer is reduced to zero. After 0.167 seconds (167 milliseconds), but before 0.625 seconds (625 milliseconds), NERC argued that Figure 1 should require the wind plant to stay connected as long as the voltage is at or above 15 percent of the

¹⁵ ISO-NE argued that the Commission should have required wind plants to be subject to the same system performance standards that are applied to other generating technologies.

nominal voltage. NERC contended that these modifications would reduce the risk to the reliability of the electric system to an acceptable level.¹⁶

15. Similarly, NU asserted that wind plants should be required to “remain on-line for all faults cleared by normal operation of all protective equipment unless clearing the fault . . . isolates the plant from the rest of the grid.”¹⁷ According to NU, this change would require generators to have low voltage ride-through capability down to zero percent of the nominal voltage at the Point of Interconnection. CenterPoint also contend that wind plants should be required to maintain low voltage ride-through capability down to zero percent of the rated line voltage 150 milliseconds (.150 seconds) (the time generally needed for the transmission system protective equipment to clear the fault). NU and CenterPoint argued that this change would reduce the likelihood that a low voltage event would escalate to a cascading outage or voltage collapse. NU also asserted that this requirement is similar to those applicable to other generators, and could be achieved by wind turbines that are currently available. NU stated that the standard adopted in the Final Rule would threaten reliability by allowing a wind plant to reduce output, or trip offline, simply due to a typical system fault.

¹⁶ ISO-NE also suggested that, if the Commission adopted a low voltage ride-through standard, it be modified to require the wind plant to be connected at zero voltage for “a time period associated with the typical clearing time of a normal design contingency fault.” Request for Rehearing of ISO-NE at 4.

¹⁷ Request for Rehearing of NU at 5.

16. NRECA/APPa also objected to the low voltage ride-through standard adopted in the Final Rule. Specifically, they contended that the Final Rule should not have established the low voltage ride-through curve as an absolute standard, and instead should have permitted Transmission Providers to adopt an alternative curve (subject to review by the Commission if there is a dispute) when the System Impact Study shows that it is necessary. ISO-NE, going further, requested that if the Commission adopted a low voltage ride-through standard, it should be only a guideline for wind turbine manufacturers. NRECA/APPa asserted that the Final Rule did not conclude that the low voltage ride-through standard will protect reliability or address the technical concerns raised by comments, and, by stating that the Commission might consider an alternative low voltage ride-through standard, recognizes that it may not be adequate to preserve reliability in all circumstances. Alternatively, NRECA/APPa asked that the Commission clarify that Transmission Providers may support variations from the low voltage ride-through curve in the Final Rule, based on local and subregional reliability conditions, under the three variation standards adopted in the Final Rule.

17. EEI asserted that the technical challenges presented by wind generation are being considered by the industry worldwide, and that many international standards differ from the Commission's Final Rule. Both EEI and SCE objected to the specific low voltage ride-through standard through comparison to the German interconnection guidelines. Particularly, EEI noted that the German grid code requires wind plants to remain connected to the grid following a fault that results in the voltage at the Point of

Interconnection dropping to 15 percent of the nominal voltage for as long as 0.15 seconds. According to EEI, revisions to the German grid code are nearing completion that will require wind plants to remain connected to the transmission system following a fault that drops the voltage at the Point of Interconnection to zero percent of the nominal voltage for as long as 0.15 seconds. Further, EEI reported that the Hydro-Québec requirements for wind farm interconnection are stricter than the Commission's Final Rule; they require wind plants to ride through a fault resulting in a voltage drop to zero percent of nominal voltage for as long as 0.15 seconds. Finally, EEI noted that Ireland requires wind plants to stay online after a fault that drops the voltage to 15 percent of nominal voltage for as long as 0.15 seconds. SCE additionally asserted that the requirement that low voltage ride-through be shown to be necessary in the System Impact Study conflicts with the German wind interconnection guidelines because those guidelines assume that all generation will meet the low voltage ride-through standard. SCE stated that the Final Rule should adopt low voltage ride-through capability as a governing standard, with exceptions approved by the governing technical body (NERC or the Western Electricity Coordinating Council (WECC), a regional reliability council), as in the German standard.

18. In the Final Rule, the Commission stated that "the low voltage ride-through requirement, and the time periods and associated voltage levels set forth in Appendix G, Figure 1, apply to three-phase faults." ATC sought clarification as to whether the low voltage ride-through requirement applied only to three-phase faults. Assuming that is the

case, ATC asked whether there was a requirement for single-phase and double-phase faults.

3. Point of Measurement for the Low Voltage Ride-Through Standard

19. NERC argued on rehearing that because the Point of Interconnection may be some distance from a wind plant, the plant might actually disconnect at voltages higher than 15 percent of the nominal voltage at the high side of the wind plant step-up transformer. According to NERC, this could create a further risk of a double contingency event.¹⁸ To avoid this risk, NERC contended that low voltage ride-through capability should be measured at the high voltage terminal of the wind plant step-up transformer. Southern Company stated that a revision to section A.i.2 of the LGIA Appendix G was necessary to reflect the Commission's decision in the Final Rule to adopt the Point of Interconnection as the measurement point.

4. Adoption of Other Provisions from the German Standards

20. SCE noted that while the Final Rule adopted a low voltage ride-through standard based on the German wind interconnection guidelines, the Commission did not adopt the related requirements in the German guidelines. It noted several provisions of the German guidelines that it stated go hand-in-hand with the low voltage ride-through standard.¹⁹

¹⁸ See supra, P 13.

¹⁹ See Request for Rehearing and Clarification of SCE at 9-10.

SCE asked the Commission to clarify that Transmission Providers may implement these other guidelines in the German standard.

5. NERC/AWEA Recommended Revisions to Low Voltage Ride-Through Provisions

21. As noted above, NERC filed a request for rehearing of the Final Rule contending, in part, that the specific low voltage ride-through standard adopted by the Commission would permit violations of a NERC system performance standard.²⁰ On August 4, 2005, NERC and AWEA filed a request to extend the effective date of the Final Rule to allow for discussions to resolve the reliability concerns expressed by NERC. They committed to submitting to the Commission a joint final report on their discussions. On August 5, 2005, the Commission issued an order granting this request.²¹

22. On September 19, 2005, NERC and AWEA submitted their joint final report, which recommended revisions to the low voltage ride-through provisions of the Final Rule. They state that the recommended revisions are supported by the NERC Planning Committee and AWEA members. NERC states that the concerns expressed in its request for rehearing will be resolved if the Commission adopts the recommended revisions.

23. Specifically, NERC and AWEA recommend a different low voltage ride-through

²⁰ See supra, P 13.

²¹ Interconnection for Wind Energy, 70 FR 47093 (Aug. 12, 2005), 112 FERC ¶ 61,173 (2005).

section to be inserted in Appendix G. The recommended provisions include a transition period standard, which would apply to wind plants that either: (a) 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 (b) involve wind turbines subject to a procurement contract executed before December 31, 2005 for delivery through 2007. During this transition period, wind plants would be required to ride through low voltage events down to 0.15 per unit for normal clearing times up to a maximum of nine cycles.

24. Following this transition period, the NERC/AWEA proposal would require wind plants to ride through low voltage events down to a zero voltage level for “location-specific” clearing times up to a maximum of nine cycles. If the fault on the transmission system remained after this clearing time, the joint recommendation would permit the wind plant to disconnect from the system.

25. Under the joint recommendation of NERC and AWEA, during both the transition period and after, low voltage ride-through capability would be required for all new wind plant interconnections, instead of only when the System Impact Study shows that such capability is needed for safety or reliability, as in the Final Rule. Additionally, in both cases the point of measurement for the requirement would be at the high side of the wind plant step-up transformer, instead of at the Point of Interconnection, as in the Final Rule. NERC and AWEA also recommend eliminating Figure 1 during both the transition

period and after the transition period because the low voltage ride-through standard described in their Joint Report replaces the voltage trace represented by Figure 1.

26. Finally, NERC and AWEA recommend limiting the variations to the low voltage ride-through provisions that were permitted by the Final Rule. The Final Rule permits Transmission Providers to justify variations between their pro forma tariff and the Final Rule Appendix G based on the regional reliability, the “consistent with or superior to,” or the independent entity variation standards in Order No. 2003.²² NERC and AWEA recommend that variations to their proposed low voltage ride-through provisions be permitted on an interconnection-wide basis only, reasoning that such a limitation is appropriate because the provisions are intended to satisfy a NERC reliability standard, and because wind generators could incur significant additional costs if they had to meet many different standards. NERC and AWEA note that limiting variations would not restrict the ability to request a deviation in a specific non-conforming agreement filed with the Commission (as opposed to a variation built into a pro forma tariff).

27. The Commission issued notice of the NERC/AWEA joint report on September 21, 2005, and provided interested parties with the opportunity to submit comments on or before October 3, 2005. FPL Energy, National Grid, New York ISO and PJM all filed comments supporting the technical recommendations in the joint report.

28. National Grid also asks that the Commission make two clarifications. First, it asks

²² Final Rule at P 107, 109.

the Commission to clarify that while the point of measurement for compliance with the low voltage ride-through standard would be at the high side of the step-up transformer, the point of measurement for reactive power would remain at the Point of Interconnection. Second, National Grid requests that the nine cycle maximum clearing time in the low voltage ride-through provision applies only to three-phase faults. It says that single line-to-ground faults are typically much longer than nine cycles, so a general, non-specified standard is more appropriate for such faults.

29. New York ISO, while strongly supporting the technical aspects of the NERC/AWEA joint recommendations, urges the Commission to reject the proposal that variations to the low voltage ride-through provision be permitted only on an interconnection-wide basis or through individually-filed interconnection agreements. It argues that this could hamper efforts to preserve reliability in individual regions, and asserts that satisfying NERC planning standards is not sufficient to preserve reliability because New York State, as well as other regions, sometimes need more stringent reliability requirements than those of NERC. New York ISO says that the Commission has viewed NERC's criteria as being minimum reliability requirements, which individual regions may exceed if necessary. Therefore, New York ISO argues that at a minimum, the Commission should permit independent entities to seek variations from the low voltage ride-through standards recommended by NERC and AWEA.

30. Finally, New York ISO asks the Commission to clarify that, assuming the NERC/AWEA recommendations are adopted, the "filing date" for purposes of the

proposed transition period includes the date that conforming interconnection agreements are fully and finally executed. New York ISO notes that executed conforming agreements need not be filed with the Commission. Therefore, it contends that the transition period should apply to agreements executed within its timeframe but not filed with the Commission.

Commission Conclusion on Low Voltage Ride-Through Provisions

31. The Commission grants rehearing with regard to the low voltage ride-through provisions, and adopts the joint recommendation of NERC and AWEA without modification. This provides a standard that will ensure that wind plants are interconnected to the grid in a manner that will not degrade system reliability. Furthermore, this standard satisfies the reliability concerns expressed by NERC, and either satisfies or renders moot many of the rehearing requests described above, including those related to the case-by-case application of the low voltage ride-through standard and point of measurement for the low voltage ride-through standard. Additionally, the joint recommendation also responds to the arguments on rehearing of EEI and SCE regarding comparison to the German interconnection guidelines.

32. We are eliminating Figure 1 from Appendix G because the standard we are adopting in Appendix G replaces that figure. Accordingly, all references to Figure 1 in the preamble to the Final Rule should be read to apply to the standard now described in Appendix G.

33. We also adopt the NERC/AWEA proposal to permit variations to the low voltage ride-through provisions of Appendix G only on an interconnection-wide basis. The low voltage ride-through provisions we adopt in this order on rehearing were crafted specifically, after negotiation among the wind industry and NERC, to ensure that NERC Reliability Standard TPL-002-0 is met in all regions. While other interconnection standards may be more susceptible to variation among Transmission Providers or independent entities, the close connection of this standard to an industry-wide reliability standard persuades us that limiting variations to those made on an interconnection-wide basis will best ensure that reliability is protected. Accordingly, we reject SCE's request that we clarify that Transmission Providers may implement other guidelines from the German interconnection standard. Adoption of other guidelines from the German standard on a Transmission Provider-specific basis could result in varying requirements that may not meet established reliability standards. For the same reasons, we also reject New York ISO's assertion that the Commission should continue to permit variations to the low voltage ride-through provisions under the three variation standards in the Final Rule, and particularly the independent entity variation. We note, however, that under section 1211 of the Energy Policy Act of 2005, the State of New York "may establish rules that result in greater reliability within that State, as long as such action does not result in lesser reliability outside the State than that provided by the reliability

standards.”²³ Therefore, the Commission will consider proposed variations from the State of New York under this statutory provision.

34. In response to the arguments of NRECA/APPA that the Final Rule should have permitted Transmission Providers to adopt alternative low voltage ride-through standards, and ISO-NE’s contention that the standard in the Final Rule should be only a guideline, we find that the definitive standard we adopt here will provide certainty to wind developers and manufacturers and ensure that reliability is maintained and NERC planning standards are met. If another standard is necessary for a specific wind plant interconnection to maintain reliability, a non-conforming agreement may be filed with the Commission.

35. In response to ATC and National Grid, we clarify that the low voltage ride-through provisions we are adopting apply to all types of faults, not just to three-phase faults. The standard refers to three-phase faults with normal clearing as well as single line to ground faults with delayed clearing. In response to National Grid’s specific concern, we clarify that the nine cycle maximum clearing time expressed in the low voltage ride-through provisions applies only to three-phase faults. Single line to ground faults have typically much longer clearing times, as National Grid notes, and the low voltage ride-through provisions adopted here recognize this difference by specifically

²³ Energy Policy Act of 2005, Pub. L. No. 109-58, § 1211, 119 Stat. 594, 945 (2005).

referring to “single line to ground faults with delayed clearing.” This non-specified standard is appropriate for those types of faults.

B. Power Factor (Reactive Power) Provisions

36. In the Final Rule, the Commission adopted in Appendix G to the LGIA a power factor standard applicable to wind plants. The Final Rule provides that wind plants are required to meet this standard only if the Transmission Provider shows, in the System Impact Study, that reactive power capability is necessary to ensure the safety or reliability of the transmission system. The specific power factor standard in Appendix G to the LGIA, if applicable, requires a wind plant to maintain a power factor within the range of 0.95 leading to 0.95 lagging (hereinafter +/- 0.95), to be measured at the Point of Interconnection.

37. Requests for rehearing and/or clarification of these provisions concern whether wind plants should have to maintain a required power factor only where the System Impact Study shows that it is required for reliability or safety, and whether the power factor standard and point of measurement adopted by the Commission in the Final Rule are appropriate.

1. Case-by-Case Application/Burden of Proof for Applying the Power Factor Standard

38. Several entities object to the provisions in the Final Rule that require wind plants to maintain the required power factor only when the Transmission Provider, in the System Impact Study, shows that it is necessary to ensure safety or reliability. NERC

objects to this approach because it may deter Transmission Providers from implementing and following good utility practice and could create a “patchwork” of varying requirements. NU argues that this approach “lowers the bar for reliability,” and will add complexity, cost and delay to the generator interconnection process because Transmission Providers will be required to perform more studies to determine whether reactive power capability is necessary for reliability or safety. Southern Company states that the Transmission Provider, as the entity responsible for maintaining reliability, should not bear the burden of proof to establish what is required to maintain system reliability. It supports the Commission’s statement that Transmission Providers should not be permitted to require wind plants to install costly equipment that is not needed for reliability, but argues that the burden of proof should be shifted to the generator.

39. NRECA/APPA notes that traditional generators are required to meet the power factor standard not because reactive power is needed in every case to preserve reliability, but instead because the transmission system is dynamic and requires flexibility over time to maintain reliability. They state that the need for reactive power in the future under a variety of operating conditions cannot be determined with perfect certainty in the System Impact Study. The case-by-case approach, they contend, grants an undue preference to wind plants, imposes risks to system reliability, and shifts costs to consumers and other generating plants. The risk to system reliability is that the Final Rule may only require a wind plant to provide reactive power after other wind plants have been installed without such capability, and that at that point the resources from that single plant may not be

enough to protect the transmission system. NRECA/APPA also asserts that the case-by-case approach increases uncertainty, contrary to the Commission's conclusion in the Final Rule, because each wind plant will face different requirements based on the outcome of the System Impact Study. Additionally, it contends that this approach creates more opportunities for discrimination because it would permit wind plants to be treated differently.

40. ATC contends that the Commission has offered no guidance as to what power factor range would be acceptable if a reliability need is not identified (and thus reactive power is not required), and whether wind plants in this instance must operate within any particular reactive power operating band. Similarly, NU expresses concern that wind plants could operate at any power factor in the absence of a showing of need in the System Impact Study, and thus avoid a physical requirement for delivering power onto the transmission system. According to ATC, the rule could be interpreted to permit wind plants to operate at any power factor they choose. It claims that reactive power is needed for each generator, and that each generator should be obligated to operate within a range of power factors, regardless of whether the transmission system as a whole needs additional reactive power capability. ATC recommends that at a minimum, the Commission require all wind plants to meet a power factor range of 0.95 leading to 1.0 (unity), and allow the Transmission Provider to require a range of 1.0 (unity) to 0.95 lagging if the System Impact Study shows that there is a reliability need.

Commission Conclusion

41. The Commission will not modify the Final Rule to require wind plants to meet the power factor standard without a showing by the Transmission Provider, through the System Impact Study, that it is needed for safety or reliability. The case-by-case approach to a reliability needs assessment adopted in the Final Rule will not threaten reliability, as several of those seeking rehearing argue. As we noted in the Final Rule, if reactive power is necessary to maintain the safety or reliability of the transmission system, the System Impact Study performed by the Transmission Provider will establish that need.²⁴ We stated in the Final Rule, and reiterate here, that the System Impact Study is the appropriate study for determining whether reactive power capability is needed.²⁵ Furthermore, we reasoned in the Final Rule that requiring wind plants to maintain the power factor standard only if the System Impact Study shows it to be necessary will not only ensure that increased reliance on wind power will not degrade system safety or reliability, but also will limit opportunities for undue discrimination by ensuring that Transmission Providers do not require costly equipment that is not necessary for reliability.²⁶

²⁴ Final Rule at P 51.

²⁵ Id.

²⁶ Id.

42. NERC states that the decision in Order No. 661 to use a case-by-case approach may deter Transmission Providers from following Good Utility Practice, and may have the unintended consequence of spawning a patchwork of varying requirements. We agree with NERC that Transmission Providers must follow Good Utility Practice when interconnecting all generating plants, including wind plants, and that not following Good Utility Practice when performing System Impact Studies could lead to problems. However, the Commission points out that every Transmission Provider is required under Order No. 2003 to follow Good Utility Practice. Transmission Providers are required to complete a detailed System Impact Study, and are required to ensure that NERC reliability standards are met in all instances. This includes performing studies to determine what is necessary to ensure that the interconnection of a wind generating facility does not degrade grid reliability. The Commission recognizes that the industry (and particularly NERC) is continuing to address technical issues involved in the interconnection of wind plants. If NERC through its stakeholders and Board approval process develops a new standard, the Commission will entertain such a standard. Finally, we disagree with NRECA/APPA's suggestion that the Final Rule threatens the reliability of the transmission system because it may require only wind plants later in the queue to provide reactive power, which may not be sufficient to protect the grid. The System Impact Study will take into account the system's need for reactive power, both as it exists today and under reasonable anticipated assumptions. NRECA/APPA has not explained how assessing the need for reactive power through the System Impact Study process will

result in too little reactive power being available in the future. Whenever a new generator is added to its system, the Transmission Provider must complete a new System Impact Study to ensure that reliability requirements are met; this may require a new wind generator later in the queue to meet the reactive power requirement.

43. We also reject arguments that the case-by-case approach is inappropriate because of the dynamic nature of the transmission system. The fact that the transmission system is constantly changing is not new or unique to the study of wind plant interconnections. The studies that are part of the interconnection process should take into account likely circumstances that could occur on the Transmission Provider's system, whether the studies are conducted in connection with a proposed wind plant or another type of generating facility.

44. Furthermore, we are not persuaded that the approach adopted in the Final Rule will result in additional studies, increased costs and delays, and cost shifts. First, as noted previously, the System Impact Study, as well as the other interconnection studies, should take into account a variety of assumptions concerning anticipated transmission system conditions. If additional or expanded studies are needed to determine whether the power factor standard is necessary, the Commission does not believe that the additional burden will outweigh the cost considerations underlying the case-by-case approach. Finally, although the case-by-case approach may result in some delay, we remind the parties to a wind plant interconnection, like other interconnections, that they are still required to meet the milestones set forth in the LGIP. Any increased costs from completing expanded or

additional studies within the timeframe required by this rule will be borne by the wind plant Interconnection Customer, as provided in Order No. 2003, which will leave other generators and the Transmission Provider unharmed.

45. The Commission also rejects arguments that the case-by-case approach provides more opportunities for discrimination. As we noted in the Final Rule Appendix G was adopted to take into account the technical differences between wind plants and traditional generating plants. One of these differences is that for wind plants, reactive power capability is a significant added cost, while it is not a significant additional cost for traditional generators. Given these technical differences, treating wind plants differently with regard to reactive power requirements is not unduly discriminatory or preferential. Additionally, we note that the outcome of the System Impact Study, which determines whether reactive power will be required, can be challenged, which will serve to minimize the opportunities for discrimination by the Transmission Provider. Also, the wind plant Interconnection Customer will have recourse to the Commission if it believes the Transmission Provider has acted in a discriminatory manner.

46. The Commission declines to adopt ATC's request that all wind plants, at a minimum, operate within a power factor range of 0.95 leading to 1.0 (unity). This requirement would essentially require reactive power in every case, which we have already rejected. If reactive power capability is needed, including a power factor range of 0.95 leading to 1.0 (unity), the System Impact Study will demonstrate this need.

2. Specific Power Factor Standard

47. NRECA/APPA argues that the Commission should clarify that wind generators must meet the same reactive power requirements as other generators, provided the requirements are imposed in a nondiscriminatory manner. It notes that some Transmission Providers impose a power factor range wider than +/- 0.95 on all new generation, and argues that in such cases, the same range should be applied to wind plants. It argues that not imposing the same range threatens reliability and shifts the costs of preserving reliability to customers or competing generators.

48. EEI and NU assert that wind plants should regulate voltage to a set point established by the Transmission Provider, as do synchronous generators. EEI contends that the language it offered in its initial comments would provide this necessary clarity, while also maintaining the flexibility provided in Order No. 2003 so that individual, site-specific conditions may be addressed.²⁷ NU states that wind turbines have this capability, either inherently (doubly fed induction generators) or through external equipment.

49. NRECA/APPA also expresses concern that the phrase “taking into account any limitations due to voltage level, real power output, etc.” in the power factor requirements

²⁷ EEI’s March 2, 2005 comments in this proceeding suggest that we require the wind plant to maintain a power factor within the range specified by the Transmission Provider “from time to time,” but would not require that it operate outside of the 0.95 leading to 0.95 lagging range. See Comments of EEI (March 2, 2005) at 5-6.

section of Appendix G could create operational problems for Transmission Providers with wind plants on their systems. Specifically, it is concerned that this language could exempt wind plants from their reactive power requirements during startup and low output periods, which could degrade reliability during a system contingency.

Commission Conclusion

50. With regard to NRECA/APPA's request for clarification that wind generators must meet a wider power factor range because some Transmission Providers impose a power factor range wider than ± 0.95 on all new generation, we note that if we were to allow the Transmission Provider to impose a wider power factor range as a matter of routine, that would defeat the purpose of adopting a reactive power standard for wind generators. However, we note that if the System Impact Study shows the need for a power factor range wider than ± 0.95 for safety or reliability, the Transmission Provider must file a non-conforming agreement, as Order No. 2003 permits. The Commission will consider these non-conforming agreements on a case by case basis. If a Transmission Provider has a different power factor range in its LGIA and wishes to apply that same range in Appendix G, it may seek a variation from the Commission under the variation standards approved in the Final Rule.²⁸ We remind Transmission Providers, however, that the Commission has adopted a specific power factor standard for wind plants because of their technical differences. Any proposed variations will be viewed in light of

²⁸ Final Rule at P 109.

these technical differences.

51. In response to the assertion of EEI and NU that wind plants should regulate voltage to a set point established by the Transmission Provider, we note that in the Final Rule we concluded that article 9.6.2 of the LGIA (which applies to all plants, including wind plants) already requires that the “Interconnection Customer . . . operate the Large Generating Facility to maintain the specified output voltage or power factor at the Point of Interconnection.”²⁹

52. Finally, the Commission addressed in the Final Rule the concerns raised by NRECA/APPA regarding the phrase “taking into account any limitations due to voltage level, real power output, etc.” We stated that this language was necessary due to the technical limitations of wind generating technology.³⁰ We noted that all wind generating equipment vendors cannot meet the required power factor range at all levels of output. We reiterate that these technical differences make the disputed language necessary. Furthermore, without this language, a Transmission Provider could discriminate against a wind plant by requiring that it operate at the stated power factor at voltages where it is technically infeasible to do so.

3. Point of Measurement of Power Factor

53. National Grid asks that if the Commission adopts the recommended revisions to

²⁹ Id. at P 55.

³⁰ Id. at P 56.

the low voltage ride-through provisions filed jointly by AWEA and NERC, it clarify that while the point of measurement for compliance with the low voltage ride-through standard would be at the high-side of the step-up transformer, the point of measurement for reactive power is at the Point of Interconnection.

Commission Conclusion

54. We clarify that the point of measurement for the reactive power standard is at the Point of Interconnection.

C. Self-Study of Interconnection Feasibility

55. In the Final Rule, the Commission adopted special interconnection procedures that allow the wind plant Interconnection Customer, when completing the Interconnection Request form required by section 3.3 of the LGIP, to provide the Transmission Provider with a simplified set of preliminary data depicting the wind plant as a single equivalent generator.³¹ Once the wind generator has provided this data and satisfied all other applicable Interconnection Request conditions, the special procedures permit the wind plant to enter the queue and receive the base case data as provided for in the LGIP.

Finally, the special procedures adopted in the Final Rule require the wind plant Interconnection Customer to submit, within six months of submitting the Interconnection Request, completed detailed electrical design specifications and other data (including

³¹ “Single equivalent generator” information is design data that represents the aggregate electrical characteristics of the individual wind generators as a single generator.

collector system layout data) needed by the Transmission Provider to complete the System Impact Study.

56. Southern Company argues on rehearing that these provisions give wind developers a special preference that unfairly disfavors other generating technologies.

57. EEI, NU and Southern Company contend that the “self-study” provisions of the Final Rule will add further complexity and uncertainty to the queue process and make queue management and assignment of cost responsibilities more difficult for Transmission Providers with large wind-powered generation projects in their queue. Southern Company adds that the self-study provisions could increase costs to market participants because the Transmission Provider will have to run multiple studies. EEI argues that until the industry can fully address the issues raised by these provisions in a technical forum, the Commission should remove the provisions from Appendix G. EEI and NU assert that the provisions do not protect against a wind plant Interconnection Customer making significant revisions to its project proposal. If the Commission does not remove the provisions entirely, EEI and NU suggest that the Commission allow the Transmission Provider to determine whether the detailed electrical design specifications later submitted by the wind plant Interconnection Customer are a material modification to the initial proposal, which would result in the initial Interconnection Application being withdrawn.

58. Midwest ISO agrees with the Commission that a wind plant should be able to enter

the queue and receive base case data based on preliminary design specifications.

However, it seeks rehearing of the provision that permits a wind plant to wait up to six months before submitting final design specifications. It argues that this procedure promotes inefficiency because the Transmission Provider may be able to evaluate the proposed interconnection, but cannot do so because it lacks necessary data. Midwest ISO requests that the Commission revise the Appendix G self-study provisions to permit the Transmission Provider to notify the wind plant Interconnection Customer of its intent to start the System Impact Study. Once this notice is given, the wind plant developer would have five business days to “submit either actual design specifications or generic specifications based on typical equipment used in the industry.”³² Further, Midwest ISO proposes that if the wind plant Interconnection Customer submits generic specifications, it should have to accept cost uncertainty, because additional facilities may be required when the actual design specifications are taken into account. Midwest ISO asserts that this would limit delays in the study process and would allow the Transmission Provider to identify potential problems or eliminate tenuous or technically deficient projects earlier and to better use its resources to study proposed interconnections.

Commission Conclusion

59. The Commission will deny these requests for rehearing. We will make one minor revision to label these special interconnection procedures for wind plants as “Appendix

³² Request for Rehearing of Midwest ISO at 4.

7” to the LGIP, as discussed in more detail below.

60. In response to arguments that the self-study procedures for wind plants give these plants a preference, we reiterate that these procedures were developed to recognize the technical differences of wind plants. Unlike conventional generators, wind plant design specifications and configurations can change significantly based on their placement on the transmission system.³³ For example, the placement of wind turbines, voltage support devices, transformers, and other equipment (including the layout of the medium voltage collector system) depend on the location of the wind plant, the location of other generators on the transmission system, and other information included in the base case data.³⁴ To accommodate these differences, the Final Rule permits wind plants to enter the interconnection queue with a set of preliminary electrical design specifications depicting the wind plant as a single generator, instead of providing detailed design specifications as required by Order No. 2003. Treating wind plants differently in this regard is not unduly discriminatory or preferential, but as noted elsewhere, simply recognizes that wind plants have different technical characteristics than the more traditional forms of generation that the LGIP and LGIA were designed to accommodate. We continue to believe that without this reasonable accommodation, Transmission Providers could frustrate the interconnection of wind plants by requiring them to submit

³³ Final Rule at P 97.

³⁴ Id.

detailed design data, which they cannot do until later in the interconnection process.

61. We are not persuaded that the reasonable self-study provision we adopted will make the interconnection queue process significantly more difficult or complex. Wind plant Interconnection Customers who provide the preliminary single generator equivalent data are required to provide final detailed electrical design specifications no later than six months after submitting the initial Interconnection Request. This six-month time period takes into account the procedures needed before the start of the System Impact Study, including the Feasibility Study and negotiation of study agreements. Therefore, the Transmission Provider will receive from the wind plant the detailed design information needed to conduct the System Impact Study. For this reason, we also deny Midwest ISO's request to modify the six-month deadline. If we adopted Midwest ISO's proposed modifications, the Transmission Provider could request that the wind plant provide detailed design specifications at any time it believes it is ready to begin the System Impact Study, even a day after the initial Interconnection Request is submitted. As a result, this modification would defeat the purpose of permitting wind plants to submit preliminary design specifications, and could allow Transmission Providers to frustrate the interconnection of wind plants.

62. With respect to the alternative suggestion by EEI and NU that the Transmission Provider be permitted to determine that a detailed design specification later submitted by the wind plant Interconnection Customer is a material modification of the Interconnection Request, we note that section 4.4 of the LGIP already addresses modifications and will

apply to wind plants as well as other generating technologies. When applying this section to wind plant Interconnection Requests that first submit preliminary design specifications, Transmission Providers are not to consider the detailed design data provided later by the wind plant Interconnection Customer to be a material modification unless it significantly departs from the preliminary specifications provided. In other words, the detailed design provided later should be substantially the same as the initial single-generator equivalent design in terms of its costs and effect on the transmission system.

63. Finally, to avoid confusion, the Commission will rename the Appendix G to the LGIP it adopted in the Final Rule as “Appendix 7, Interconnection Procedures for a Wind Generating Plant.” Accordingly, when complying with the Final Rule and this order on rehearing, public utilities must adopt the special interconnection procedures applicable to wind plants as Appendix 7 to their LGIPs. The low voltage ride-through, power factor design criteria and SCADA provisions should continue to be labeled “Appendix G” to the LGIA.

D. Adoption of Appendix G on an Interim Basis Only

64. EEI and NU each generally argue that the Commission should apply Appendix G only on an interim basis, and should defer to NERC and Institute of Electrical and Electronics Engineers (IEEE) processes to develop formal technical standards. Southern Company argues that the Commission should defer to NERC, regional reliability councils, and other technical organizations to develop technical requirements for wind

plants, and should suspend application of the Final Rule and formally request that these entities develop technical standards. Southern Company argues that this would avoid the problems that result from having the Commission review each variation to Appendix G as the technical standards are developed and revised. It also asserts that the Commission should not be the arbiter of technical disputes, such as the outcome of the System Impact Study or specific SCADA requirements, as the Final Rule provides.

65. As noted above, NERC similarly argues that the Commission should only require wind plants to meet NERC and regional reliability council requirements, noting that Figure 1 is likely to remain static over time, which could hamper the development of wind generator technology. EEI notes that NERC has established a Wind Generator Task Force that is examining existing standards and will make proposals later this year. It states that the industry worldwide is addressing technical challenges presented by wind generation. Significant modifications are being developed for the German grid code, and Hydro-Québec is considering several reliability issues regarding wind generator interconnection. NERC further notes that Hydro-Québec requires the same dynamic performance of wind plants that it requires of other generating facilities, and that major wind turbine manufacturers have shown that they can meet this requirement. EEI proposes that the industry conduct a technical forum to resolve issues related to wind plant interconnection, concluding with formal recommendations to the Commission that could be used in a new NOPR, or to develop formal proposals for NERC or IEEE standards.

Commission Conclusion

66. The Commission denies these requests for rehearing, and others noted earlier, that ask us to adopt Appendix G only on an interim basis. Standards are needed today because no nationwide standard is currently in place and it is uncertain when such a standard will be finalized. Without a firm standard in place, the current ad hoc practices for wind interconnection requirements may frustrate the interconnection of wind plants. As we noted in the Final Rule, Appendix G is necessary to recognize the technical differences between wind plants and traditional plants to ensure that the entry of wind generation into markets is not unnecessarily inhibited.

67. We recognize, however, that the industry continues to study and address issues raised by the interconnection and operation of wind plants. For that reason, the Commission stated in the Final Rule that if another entity develops an alternate standard, a Transmission Provider may seek to justify adopting it as a variation from Appendix G.³⁵ We also stated that we would consider a future industry petition to revise Appendix G to conform to a NERC-developed standard.³⁶ We reiterate both of those statements

³⁵ Id. at P 34. We note that in this order on rehearing, variations to the low voltage ride-through standard will only be permitted on an interconnection-wide basis. As we note above, however, non-conforming agreements may be submitted to the Commission. See P 33-34, supra.

³⁶ Id.

here, and also note that under the Energy Policy Act of 2005, the Commission will be addressing mandatory reliability standards.³⁷

E. Transition Period

68. In the Final Rule, the Commission adopted a transition period that applies to the low voltage ride-through, power factor design criteria and SCADA requirements. These technical requirements in the Final Rule Appendix G, if applicable, apply only to LGIAs signed, filed with the Commission in unexecuted form, or filed as non-conforming agreements, on or after January 1, 2006, or the date six months after publication of the Final Rule in the Federal Register, whichever is later.³⁸ The Commission adopted this transition period to allow wind equipment currently in the process of being manufactured to be completed without delay or added expense, and to ensure that the Final Rule did not interrupt the supply of wind turbines.

69. NRECA/APPA argues that the transition period is arbitrary, capricious, and unduly discriminatory. NRECA/APPA asserts that the Commission adopted the

³⁷ See Energy Policy Act of 2005, Pub. L. No. 109-58, § 1211, 119 Stat. 594, 941 (2005).

³⁸ The Final Rule was published in the Federal Register on June 16, 2005. Thus, the low voltage ride-through, power factor design criteria and reactive power provisions in the Final Rule, as revised herein, will apply to LGIAs signed, filed with the Commission in unexecuted form, or filed as non-conforming agreements, on or after January 1, 2006.

transition period with no technical justification and no explanation of how the transition period will maintain the reliability of the transmission system. They contend that the transition period requires transmission customers and competing generators to bear the reliability effects of wind plants interconnected during the transition period. While NRECA/APPAs state that there are “valid commercial considerations” that should be taken into account for the existing inventory of wind equipment, they contend that such determinations should be made on a case-by-case basis.

Commission Conclusion

70. The Commission declines to remove the transition period as NRECA/APPAs request. We adopted this reasonable transition mechanism to allow wind turbines in the process of being manufactured to be completed without delay or additional expense.³⁹ The transition period ensures that the supply of wind turbines is not unfairly or unreasonably interrupted.⁴⁰ Furthermore, contrary to NRECA/APPAs’s contention, the Commission considered the possible reliability effects of the transition period, and concluded that the remaining provisions of Order No. 2003 will adequately protect reliability.⁴¹ The remaining provisions of Order No. 2003 will also ensure that other generators or the Transmission Provider will not bear the reliability effects of a wind

³⁹ Final Rule at P 115.

⁴⁰ Id.

⁴¹ Id.

plant because that rule, and the LGIA and LGIP contained in it, ensure that generating facilities are not interconnected in a manner that degrades reliability.

III. Document Availability

71. In addition to publishing the full text of this document in the Federal Register, the Commission provides all interested persons an opportunity to view and/or print the contents of this document via the Internet through FERC's Home Page (<http://www.ferc.gov>) and in FERC's Public Reference Room during normal business hours (8:30 a.m. to 5:00 p.m. Eastern time) at 888 First Street, N.E., Room 2A, Washington, D.C. 20426.

72. From the Commission's Home Page on the Internet, this information is available in the Commission's document management system, eLibrary. The full text of this document is available on eLibrary in PDF and Microsoft Word format for viewing, printing, and/or downloading. To access this document in eLibrary, type the docket number excluding the last three digits of this document in the docket number field.

73. User assistance is available for eLibrary and the Commission's website during normal business hours. For assistance, please contact FERC Online Support at 1-866-208-3676 (toll free) or 202-502-6652 (e-mail at FERCOnlineSupport@FERC.gov), or the Public Reference Room at 202-502-8371, TTY 202-502-8659 (e-mail at public.referenceroom@ferc.gov).

IV. Effective Date

74. As noted above, on August 5, 2005, the Commission issued an order extending the

effective date of the Final Rule to October 14, 2005.⁴² Those provisions of the Final Rule not revised in this order on rehearing and clarification are effective as of that date. Changes made to the Final Rule in this order on rehearing and compliance will become effective on **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

V. Compliance with the Final Rule and Order on Rehearing and Clarification

75. In the Commission's August 5, 2005 order extending the effective date of the Final Rule, the Commission also extended to November 14, 2005, the date by which all public utilities that own, control, or operate transmission facilities in interstate commerce are to adopt, in their OATTS, the Final Rule Appendix 7 (as described above)⁴³ as an amendment to the LGIP, and Final Rule Appendix G as an amendment to the LGIA. By further notice issued October 28, 2005, the Commission extended this date further, to December 30, 2005. Public utilities who have already filed a Final Rule Appendix G as amendments to the LGIPs and LGIAs in their OATTs must file, by December 30, 2005, the revisions to the Final Rule Appendix G to the LGIA made in this order on rehearing.

⁴² Order Granting Extension of Effective Date and Extending Compliance Date, 70 FR 47093 (Aug. 12, 2005), 112 FERC ¶ 61,173 (2005).

⁴³ See supra, P 60.

List of Subjects in 18 C.F.R. Part 35

Electric power rates; Electric utilities.

By the Commission. Chairman Kelliher dissenting in part with a separate statement attached.

(S E A L)

Magalie R. Salas,
Secretary.

In consideration of the foregoing, the Commission revises part 35, Chapter I, Title 18 of the Code of Federal Regulations as follows.

PART 35 B FILING OF RATE SCHEDULES

1. The authority citation for part 35 continues to read as follows:

Authority: 16 U.S.C. §§ 791a-825r, §§ 2601-2645; 31 U.S.C. § 9701; 42 U.S.C. §§ 7101-7352.

2. In § 35.28, the first sentences of currently existing paragraphs (f)(1) and (f)(1)(iii) are revised, a new paragraph (f)(1)(iii) is added, and currently existing paragraph (f)(1)(iii) is renumbered to account for new paragraph (f)(1)(iii), all to read as follows:

§ 35.28 Non-discriminatory open access transmission tariff.

* * * * *

(f) Standard generator interconnection procedures and agreements.

(1) Every public utility that is required to have on file a non-discriminatory open access transmission tariff under this section must amend such tariff by adding the standard interconnection procedures and agreement contained in Order No. 2003, FERC Stats. & Regs. & 31,146 (Final Rule on Generator Interconnection), as amended by the Commission in Order No. 661, FERC Stats. & Regs. ¶ 31,186 (Final Rule on Interconnection for Wind Energy), and the standard small generator interconnection

procedures and agreement contained in Order No. 2006, FERC Stats. & Regs. ¶ 31,180 (Final Rule on Small Generator Interconnection), or such other interconnection procedures and agreements as may be approved by the Commission consistent with Order No. 2003, FERC Stats. & Regs. & 31,146 (Final Rule on Generator Interconnection) and Order No. 2006, FERC Stats. & Regs. ¶ 31,180 (Final Rule on Small Generator Interconnection).

(i) The amendment to implement the Final Rule on Generator Interconnection required by the preceding subsection must be filed no later than January 20, 2004.

(ii) The amendment to implement the Final Rule on Small Generator Interconnection required by the preceding subsection must be filed no later than August 12, 2005.

(iii) The amendment to implement the Final Rule on Interconnection for Wind Energy required by the preceding subsection must be filed no later than December 30, 2005.

(iv) Any public utility that seeks a deviation from the standard interconnection procedures and agreement contained in Order No. 2003, FERC Stats. & Regs. & 31,146 (Final Rule on Generator Interconnection), as amended by the Commission in Order No. 661, FERC Stats. & Regs. ¶ 31,186 (Final Rule on Interconnection for Wind Energy), or the standard small generator interconnection procedures and agreement contained in

Order No. 2006, FERC Stats. & Regs. ¶ 31,180 (Final Rule on Small Generator Interconnection), must demonstrate that the deviation is consistent with the principles of either Order No. 2003, FERC Stats. & Regs. & 31,146 (Final Rule on Generator Interconnection) or Order No. 2006, FERC Stats. & Regs. ¶ 31,180 (Final Rule on Small Generator Interconnection).

[NOTE: THE APPENDICES WILL NOT BE PUBLISHED IN THE CODE OF FEDERAL REGULATIONS]

Appendix A

**List of Entities Requesting Rehearing and/or Clarification or Submitting Comments
and Acronyms**

ATC – American Transmission Company LLC

CenterPoint – CenterPoint Energy Houston Electric, LLC

EI – Edison Electric Institute

FPL Energy – FPL Energy, LLC

ISO-NE – ISO New England, Inc.

Midwest ISO – Midwest Independent Transmission System Operator, Inc.

National Grid – National Grid USA

NERC – North American Electric Reliability Council

New York ISO – New York Independent System Operator, Inc.

NRECA/APPAA – National Rural Electric Cooperative Association and American Public
Power Association

NU – Northeast Utilities

PJM – PJM Interconnection, L.L.C.

SCE - Southern California Edison Company

Southern Company – Southern Company Services, Inc

Appendix B

[NOTE: THESE PROVISIONS TO BE ADOPTED AS APPENDIX G TO THE LGIA]

APPENDIX G**INTERCONNECTION REQUIREMENTS FOR A WIND GENERATING PLANT**

Appendix G sets forth requirements and provisions specific to a wind generating plant. All other requirements of this LGIA continue to apply to wind generating plant interconnections.

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.

ii. Power Factor Design Criteria (Reactive Power)

A wind generating plant shall maintain a power factor within the range of 0.95 leading to 0.95 lagging, measured at the Point of Interconnection as defined in this LGIA, if the Transmission Provider's System Impact Study shows that such a requirement is

necessary to ensure safety or reliability. The power factor range standard can be met by using, for example, power electronics designed to supply this level of reactive capability 606 (taking into account any limitations due to voltage level, real power output, etc.) or fixed and switched capacitors if agreed to by the Transmission Provider, or a combination of the two. The Interconnection Customer shall not disable power factor equipment while the wind plant is in operation. Wind plants shall also be able to provide sufficient dynamic voltage support in lieu of the power system stabilizer and automatic voltage regulation at the generator excitation system if the System Impact Study shows this to be required for system safety or reliability.

iii. Supervisory Control and Data Acquisition (SCADA) Capability

The wind plant shall provide SCADA capability to transmit data and receive instructions from the Transmission Provider to protect system reliability. The Transmission Provider and the wind plant Interconnection Customer shall determine what SCADA information is essential for the proposed wind plant, taking into account the size of the plant and its characteristics, location, and importance in maintaining generation resource adequacy and transmission system reliability in its area.

Appendix C

[NOTE: THESE PROVISIONS TO BE ADOPTED AS APPENDIX G TO THE LGIP]

APPENDIX 7**INTERCONNECTION PROCEDURES FOR A WIND GENERATING PLANT**

Appendix G sets forth procedures specific to a wind generating plant. All other requirements of this LGIP continue to apply to wind generating plant interconnections.

A. Special Procedures Applicable to Wind Generators

The wind plant Interconnection Customer, in completing the Interconnection Request required by section 3.3 of this LGIP, may provide to the Transmission Provider a set of preliminary electrical design specifications depicting the wind plant as a single equivalent generator. Upon satisfying these and other applicable Interconnection Request conditions, the wind plant may enter the queue and receive the base case data as provided for in this LGIP.

No later than six months after submitting an Interconnection Request completed in this manner, the wind plant Interconnection Customer must submit completed detailed electrical design specifications and other data (including collector system layout data) needed to allow the Transmission Provider to complete the System Impact Study.

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Interconnection for Wind Energy

Docket No. RM05-4-001

(Issued December 12, 2005)

Joseph T. KELLIHER, Chairman, *dissenting in part*:

I vote for this order because it constitutes an improvement over the final rule. I agree with the Commission's decision to grant rehearing with respect to the low voltage ride-through (LVRT) provisions and to adopt the joint recommendation of NERC and AWEA. As the order points out, by adopting a definitive, uniform, LVRT standard, the Commission "provide[s] certainty" to the industry and "ensure[s] that reliability is maintained and NERC planning standards are met."¹

Unfortunately, the Commission's decision on LVRT contrasts with its decision to exempt wind generators from compliance with the same power factor standard as all other generators. The Commission requires all non-wind generators to maintain a power factor within the range of 0.95 leading to 0.95 lagging, which NERC has determined to be "within a range required by Good Utility Practice."² Order No. 661, however, singles out wind generators for special treatment by exempting them from meeting the standard power factor requirement unless the Transmission Provider demonstrates in the System Impact Study that reactive power capability is necessary to ensure the safety or reliability of the transmission system. In my view, exempting only wind generators from the power factor standard does not provide certainty to the industry, results in an undue preference for wind generators and does not adequately ensure that reliability of the transmission system is maintained.

Section 205 of the Federal Power Act broadly precludes public utilities, in any transmission or sale subject to the Commission's jurisdiction, from "mak[ing] or grant[ing] any undue preference or advantage to any person or subject[ing] any person to any undue prejudice or disadvantage. . . ."³ In my view, Order No. 661 gives preferential treatment to

¹ Order at P34.

² Order No. 2003 at P541.

³ 16 U.S.C. § 824d(b).

wind generators, since it exempts wind generators from meeting the same power factor requirement as all other non-wind generators. The issue is whether the preferential treatment afforded to wind generators is undue.

I do not believe that either the record or the explanation offered in this order provides a basis for giving preferential treatment to wind generators when it comes to meeting the power factor requirement. The order's attempt to justify discriminating in favor of wind generators as an accommodation for "technical differences"⁴ is not convincing. The only "technical" difference identified is the assertion that compliance with reactive power capability is more expensive for wind generators than for other generator resources.⁵ While one can understand why wind generators would like to be relieved of the added cost of complying with the same power factor standard as all other non-wind generators, I fail to see how the desire to avoid incurring the costs of complying with the Commission's standardized power factor requirement constitutes a technological difference warranting discriminatory treatment.

Equally troubling, I disagree with the Commission's decision to brush aside the concerns raised by NERC and other protesters that the Commission has "lowered the bar" for reliability by shifting the burden to the Transmission Provider to justify the need for wind generators to comply with the same power factor requirement as non-wind generators. I find little comfort in the Commission's view that any reliability concerns can be addressed in the System Impact Study if the Transmission Provider proves that a wind generator's compliance with the reactive power factor standard is necessary. In my view, shifting the burden to Transmission Providers to make such a showing simply cannot be reconciled with the approach taken by the Commission in Order No. 2003 which presumes the need for all generators to comply with power factor requirement under "Good Utility Practice."⁶

As a result, I would have granted rehearing and returned to the approach proposed by the Commission in the NOPR of requiring all generators to meet the same power factor

⁴ Order at P45.

⁵ *Id.* ("One of these [technical] differences is that for wind plants, reactive power capability is a significant added cost, while it is not a significant additional cost for traditional generators.").

⁶ Order No. 2003 at PP541-42.

standard absent a waiver by the Transmission Provider. Accordingly, I dissent in part from the order.

Joseph T. Kelliher