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IBERDROLA RENEWABLES, INC.'S APPEAL AND COMPLAINT OF ERCOT DECISION TO APPROVE PRR 830 RELATING TO REACTIVE POWER CAPABILITY REQUIREMENT	§ § § § § §	PUBLIC UTILITY COMMISSION OF TEXAS

IBERDROLA RENEWABLES, INC.'S APPEAL AND COMPLAINT OF ERCOT DECISION TO APPROVE PRR 830; MOTION FOR SUSPENSION; AND MOTION TO EXCEED PAGE LIMIT

TABLE OF CONTENTS

HOU03:1225111.8

Exhibit A	Affidavit of Brett Hunsucker, IBERDROLA RENEWABLES, Inc.
Exhibit B	Interconnection Study for New Generation in Kenedy County (Peñascal) (12/4/07)
Exhibit C	Interconnection Study - Steady State Study Report (Barton Chapel) (7/27/05)
Exhibit D	ERCOT Letter Regarding Barton Chapel (6/5/09)
Exhibit E	Incident Report filed by ERCOT at Texas Regional Entity (10/14/09)
Exhibit F	Excerpts of ERCOT Protocols § 6.5.7.1 and § 6.7.6 as of March 2004, October 2008, and November 2009
Exhibit G	FERC Order No. 661-A (12/12/2005)
Exhibit H	Draft Reliability and Operations Subcommittee (ROS) Minutes (9/10/09) (Approved on 10/15/09 without revision)*
Exhibit I	Draft Reliability and Operations Subcommittee (ROS) Minutes (10/15/09) (Considered for approval on 12/10/09 but not yet available on ERCOT website)
Exhibit J	Draft Protocol Revisions Subcommittee (PRS) Minutes (9/17/09) (Approved on 10/22/09 as amended by Mark Bruce and Mike Grimes)*
Exhibit K	Draft Protocol Revisions Subcommittee (PRS) Minutes (10/22/09) (Approved on 11/19/09 as amended to note Randy Jones's abstention from vote to approve 9/17/09 PRS minutes)*
Exhibit L	Approved Technical Advisory Committee (TAC) Minutes (11/5/09)
Exhibit M	Excerpts from ERCOT Board Meeting Transcript (11/17/09)
Exhibit N	ERCOT Record for PRR 830 Approval Process

*At the time of this filing, the approved version was not yet accessible.

DOCKET NO. _______

IBERDROLA RENEWABLES, INC.'S APPEAL AND COMPLAINT OF ERCOT DECISION TO APPROVE PRR 830 RELATING TO REACTIVE POWER CAPABILITY REQUIREMENT	§ § § § § §	**PUBLIC UTILITY COMMISSION** **OF TEXAS**

IBERDROLA RENEWABLES, INC.'S APPEAL AND COMPLAINT OF ERCOT DECISION TO APPROVE PRR 830; MOTION FOR SUSPENSION; AND MOTION TO EXCEED PAGE LIMIT

Pursuant to P.U.C. PROC. R. 22.251, IBERDROLA RENEWABLES, Inc. files this Appeal and Complaint of ERCOT Decision to Approve PRR 830; Motion for Suspension; and Motion to Exceed Page Limit ("Appeal and Complaint") against the Electric Reliability Council of Texas ("ERCOT") on behalf of its subsidiaries Barton Chapel Wind, LLC, Peñascal Wind Power, LLC, and Peñascal Wind Power II, LLC (collectively, "Iberdrola" or the "Company"). This Appeal and Complaint relates to ERCOT's approval and adoption of Protocol Revision Request ("PRR") 830 (Reactive Power Capability Requirements). For the reasons below, Iberdrola seeks immediate suspension of PRR 830, rejection of PRR 830, and rejection of the interpretation implicit in PRR 830 of ERCOT's reactive power control requirements.

- PRR 830 discriminates against wind generators and is not narrowly tailored to minimize its impact on the competitive market, thus violating PURA[1] § 39.001(c), § 39.001(d), and § 35.004(e).
- PRR 830 imposes reactive power control requirements on wind generators greater than those required to address the wind generators' own effects on system reliability, thus exceeding ERCOT's authority under PURA § 39.904(l).
- PRR 830 is arbitrary and capricious because it was passed in the absence of any reliability, economic, or technical study or other evidence that a reliability problem exists or that PRR 830 is an appropriate solution.

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[1] Public Utility Regulatory Act, TEX. UTIL. CODE §§ 11.004-64.158 (West 2007 & Supp. 2009) ("PURA").

HOU03:1225111.8

I. INTRODUCTION

This Appeal and Complaint asks the Public Utility Commission of Texas ("Commission") to immediately suspend and ultimately reject PRR 830 and to expressly reject ERCOT's interpretation of its prior reactive power protocol language, which led to the adoption of PRR 830. For more than five years, ERCOT has stood by while dozens of companies have invested billions of dollars in Texas to develop thousands of megawatts of wind generation using reactive power control capabilities that were clearly stated and openly reported to ERCOT on ERCOT-required forms. This includes Iberdrola's Barton Chapel and Peñascal facilities.[2]

Now, suddenly, without a study and without any reliable evidence of an actual reliability problem, PRR 830 seeks to require a new, heightened level of reactive power control capability that will require dozens of wind generators to spend hundreds of millions of dollars on retroactive changes and will degrade the economics and potential market savings of future wind generation projects in this state. Advocates of PRR 830 acknowledge that there is no reliability crisis[3] and that studies of the reactive power requirements occasioned by the development of CREZ wind resources are just now underway and not yet complete.[4] Nevertheless, in the absence of a demonstrated problem and before studying the issue, ERCOT seeks to impose a very costly requirement on one group of market participants. That is not the way the Texas market operates. It is not the deliberate and fair way ERCOT usually operates.

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[2] Iberdrola's Barton Chapel facility, located in Jack County, Texas, is a 120 MW wind farm with 60 turbines. Phase 1 of the Peñascal facility, located in Kenedy County, Texas, is a 201.6 MW wind farm consisting of 84 turbines. Phase 2 of the facility is currently under construction and is scheduled to go into operation next year. Phase 2 will also be 201.6 MW in size, consisting of 84 turbines, making the Peñascal facility 403.2 MW in size when Phase 2 is completed.

[3] ERCOT Board Meeting Tr. at 133:25-134:1 (Nov. 17, 2009) ("[I]t's not a reliability crisis right now . . . .") (Exhibit M at 21-22 of 108).

[4] *Id.* at 121:22-25 (Exhibit M at 11 of 108) ("We're about to embark on a significant study of the reactive requirements associated with the many billions of dollars associated with the CREZ investment.").

The issue before the Commission is whether wind generators have been and should be required to provide "triangular" or "rectangular" reactive power control capabilities, referring to how the capabilities look when represented graphically.[5] Iberdrola believes that, prior to PRR 830, the ERCOT Protocols required wind generators to have reactive power capabilities that increased proportionately as generation output increased—the triangle. Advocates of PRR 830 now argue that the ERCOT Protocols have always required, and should require going forward, that generators have a constant level of reactive power capability regardless of their actual generating output level—the rectangle.

Frankly, Iberdrola is at a loss to understand how anyone could credibly argue, as advocates of PRR 830 do, that the Protocols have always required the rectangle and that PRR 830 merely clarifies that interpretation.[6] The record evidence demonstrates beyond any reasonable dispute that between March 2004 and the passage of PRR 830, ERCOT Protocol § 6.7.6(5) required a minimum reactive power capability equal to "the required installed reactive capability *multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output*."[7] The italicized language unambiguously describes the proportional, triangular requirement. In layman's terms, the ratio described above is the percentage of rated capacity at which a unit is operating. A unit operating at 75% of its rated capacity is only required to provide 75% of its maximum reactive power capability.

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[5] A graphical depiction of the "triangle," as contained in Section 7.4 of ERCOT's "Resource Asset Registration Guide," can be found in Exhibit N at 227 of 491.

[6] *See* ERCOT Board Meeting Tr. at 119:17-20 (Exhibit M at 9 of 108) ("They were clearly understood. And, in fact, they're recognized and have been by most of the members of ERCOT for many, many years.").

[7] Exhibit F includes (a) the version of Protocols 6.7.6(5) originally passed in March 2004, (b) the October 2008 version in effect when ERCOT issued its November 13, 2008 Interpretation, and (c) the November 2009 version in effect until ERCOT passage of PRR 830. All three versions contain the referenced language.

In the face of the unambiguous prior requirement, the absence of any study or evidence indicating that there is a current reliability problem, or that PRR 830 is best designed to address any such problem, Iberdrola asks the Commission to:

- suspend PRR 830 immediately pending a decision in this Appeal and Complaint;
- reverse the ERCOT Board's decision to approve PRR 830; and
- in reversing PRR 830, affirm that the ERCOT Protocols have previously required and should continue to require, absent a demonstrated need to do otherwise, the triangular, proportional reactive power requirement.

II. STATEMENT OF THE CASE

Iberdrola requests that the Commission suspend implementation and reverse approval of PRR 830, which revised ERCOT Protocols 2.1 (Definitions), 2.2 (Acronyms), 6.5.7 (Voltage Support Service), 6.5.7.1 (Generation Resources Required to Provide VSS Installed Reactive Capability), and 6.7.6 (Deployment of Voltage Support Service).[8] At first glance, PRR 830 might appear to affect all generation resources. In practice, however, its effects are narrowly aimed at "WGRs that commenced operation on or after February 17, 2004, and have signed a Standard Generation Interconnection Agreement (SGIA) on or before December 1, 2009[.]"[9] It specifically exempts "generating units connected before May 17, 2005, whose owners can demonstrate . . . that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the Reactive Power requirements established in [PRR 830]."[10]

ERCOT Staff submitted PRR 830 on September 8, 2009, pursuant to Section 21 of the Protocols.[11] PRR 830 was approved by the Protocol Revisions Subcommittee on October 22,

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[8] *See* 830PRR-41 Board Action Report 111709 at 8-12 (Exhibit N at 423-427 of 491).
[9] *See* 830PRR-01 Reactive Power Capability Requirement at 5, § 6.5.7.1(2) (Exhibit N at 9 of 491).
[10] *Id.* § 6.5.7.1(4).
[11] *See* 830PRR-01 Reactive Power Capability Requirement 090809 (Exhibit N at 5-11 of 491).

2009,[12] by the Technical Advisory Commission on November 5, 2009,[13] and by the ERCOT Board on November 17, 2009.[14] The issue of ERCOT's reactive power capability requirements for wind generation resources, the subject of this Appeal and Complaint, was submitted to the Commission earlier this year in Docket No. 36482, *Appeal of Competitive Wind Generators Regarding the Electric Reliability Council of Texas' Interpretation of the Reactive Power Protocols*, but was ultimately rejected on purely procedural grounds.[15] That appeal opposed ERCOT's November 13, 2008, legal interpretation ("Interpretation") of ERCOT Protocols § 6.5.7.1(2) and § 6.7.6(5) (the "Interpretation"),[16] which is reflected in PRR 830.[17]

As required by P.U.C. PROC. R. 22.251, no entity may file a complaint with the Commission regarding ERCOT conduct without first using (i) Section 20 of the ERCOT Protocols (Alternative Dispute Resolution Procedures, or ADR), (ii) Section 21 of the Protocols (Process for Protocol Revision), or (iii) other Applicable ERCOT Procedures, which includes Sections 20 and 21 of the Protocols and "other applicable sections of the ERCOT protocols that are available to challenge or modify ERCOT conduct, including participation in the protocol revision process."[18] As described in Section IV of this Appeal and Complaint, Iberdrola has satisfied all necessary prerequisites, and this Appeal and Complaint is properly before the Commission. The Commission has jurisdiction to hear this case pursuant to PURA §§ 14.001, 39.001, 39.151, P.U.C. SUBST. R. 25.362, and P.U.C. PROC. R. 22.251.

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[12] *See* 830PRR-16 PRS Recommendation Report 102209 (Exhibit N at 87-94 of 491).
[13] *See* 830PRR-27 TAC Recommendation Report 110509 (Exhibit N at 162-171 of 491).
[14] *See* 830PRR-41 Board Action Report 111709 (Exhibit N at 416-427 of 491).
[15] *See Appeal of Competitive Wind Generators Regarding the Electric Reliability Council of Texas' Interpretation of the Reactive Power Protocols*, Docket No. 36482, Order (Dec. 8, 2009).
[16] "Protocol Interpretation Request on Reactive Power Capability Requirements," M-D111308-01 Legal (Nov. 13, 2008) (Exhibit N at 241 of 491).
[17] *See* 830PRR-33 Horizon Statement of Position (Exhibit N at 241-43 of 491).d
[18] P.U.C. PROC. R. 22.251(c).

III. AUTHORIZED REPRESENTATIVES

The telephone numbers and addresses of Iberdrola's authorized legal representatives are as follows:

Toan Nguyen
Senior Counsel
Iberdrola Renewables, Inc.
1125 Northwest Couch, Suite 700
Portland, Oregon 97209
(503) 241-3204
(503) 796-6904 (fax)
toan.nguyen@iberdrolausa.com

James H. Barkley
Baker Botts L.L.P.
910 Louisiana Street
Houston, Texas 77002
(713) 229-1234
(713) 229-1522 (fax)
jim.barkley@bakerbotts.com

The telephone number and address of Iberdrola's authorized business representative is as follows:

Kevin Lynch
Director of Policy and Regulation
Iberdrola Renewables, Inc.
1125 Northwest Couch, Suite 700
Portland, Oregon 97209
(503) 796-7108
(503) 796-6907 (fax)
kevin.lynch@iberdrolausa.com

Iberdrola requests that all information and documents in this proceeding be served on each of the persons above at their respective addresses or fax numbers.

IV. JURISDICTION

The Commission has jurisdiction over this Appeal and Complaint pursuant to PURA §§ 14.001, 39.001, 39.151, P.U.C. SUBST. R. 25.362, and P.U.C. PROC. R. 22.251. The

Commission's Procedural Rules provide that any entity affected by ERCOT's promulgation and enforcement of procedures may file a complaint with the Commission so long as the affected entity has used Section 21 of the ERCOT Protocols relating to Alternative Dispute Resolution ("ADR"), Section 20 of the ERCOT Protocols relating to Process for Protocol Revision, or other Applicable ERCOT Procedures.[19] "Applicable ERCOT Procedures" refers to Sections 20 and 21 of the ERCOT Protocols and "other applicable sections of the ERCOT protocols that are available to challenge or modify ERCOT conduct, including participation in the ERCOT protocol revision process."[20] By participating in the protocol revision process, Iberdrola has satisfied the requirements in P.U.C. PROC. R. 22.251(c).[21] This Appeal and Complaint is timely filed and is properly before the Commission.

Given the Commission's ruling in Docket No. 36482, and in response to statements by the Commissioners, Iberdrola requests, to the extent necessary, a good cause waiver from ERCOT's ADR requirements. Iberdrola further requests that the Commission waive its authority under P.U.C. PROC. R. 22.251(c)(3) to require informal dispute resolution, which is unlikely to be fruitful in this case.[22] While Iberdrola is currently involved in discussions with the Commission's Oversight & Enforcement Division and the Texas Regional Entity ("TRE") regarding a mitigation plan, those negotiations are focused on developing a plan to bring Iberdrola quickly into compliance should PRR 830 go forward.[23] Since November 13, 2008, when ERCOT issued its Interpretation of the ERCOT Protocols relating to reactive power, Iberdrola and other wind developers have used various sections of the ERCOT Protocols to seek an amendment to or

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[19] P.U.C. PROC. R. 22.251(b)-(c).
[20] P.U.C. PROC. R. 22.251(c).
[21] *See* PRR830-08 Iberdrola Renewables Comments 100709 (Exhibit N at 39-47 of 491).
[22] *See* P.U.C. PROC. R. 22.251(c)(3).
[23] *See* Incident Report filed by ERCOT at Texas Regional Entity (Oct. 14, 2009) (Exhibit E).

revision of the Protocols at various committee levels within ERCOT, including the Protocol Revisions Subcommittee, Reliability and Operations Subcommittee, Technical Advisory Committee, and ERCOT Board.[24] As the Commission is aware, the issue was also brought before the Commission on appeal in Docket No. 36482.[25] The dispute over reactive power has been exhausted at ERCOT and remains insoluble. Iberdrola, therefore, requests the opportunity to present this issue to the Commission.

V. RESPONDENTS

The only entity against whom Iberdrola seeks relief is ERCOT. The telephone number and address of ERCOT's General Counsel is listed below:

Michael G. Grable
Vice President, General Counsel, and Corporate Secretary
Electric Reliability Council of Texas
7620 Metro Center Drive
Austin, Texas 78744
(512) 225-7076
(512) 225-7079 (fax)
mgrable@ercot.com

VI. ISSUES TO BE ADDRESSED

1. Whether PRR 830 violates PURA § 39.001(c) because it discriminates against wind generators.

2. Whether PRR 830 violates PURA § 39.001(d) because it is neither practical nor limited so as to impose the least impact on competition.

3. Whether PRR 830 violates PURA § 35.004(e) because it requires wind generators to provide reactive power on terms that are unreasonably discriminatory and anticompetitive.

4. Whether PRR 830 violates PURA § 39.904(l) because it requires wind generators to address more than their own effects on system reliability.

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[24] *See* ERCOT Record for PRR 830 Approval Process (Exhibit N).

[25] *See Appeal of Competitive Wind Generators Regarding the Electric Reliability Council of Texas' Interpretation of the Reactive Power Protocols*, Docket No. 36482, Appeal of the ERCOT Legal's Interpretation of the Reactive Power Protocols (Dec. 12, 2009).

5. Whether PRR 830's retroactive application of its reactive power requirements to existing Wind-powered Generation Resources ("WGRs") is unsound as a matter of regulatory policy.

6. Whether ERCOT's approval of PRR 830 was arbitrary and capricious.

7. Whether PRR 830 is a significant change of ERCOT's reactive power capability requirements.

8. Whether ERCOT's approval of PRR 830 was supported by substantial evidence of a need for changes to ERCOT's reactive power capability requirements.

9. Whether PRR 830 will harm wind generators.

10. Whether the ERCOT Protocols have previously required and should continue to require, absent a demonstrated need to do otherwise, the triangular, proportional reactive power requirement.

VII. STATEMENT OF FACTS

Iberdrola seeks Commission clarification on reactive power requirements for wind generation resources in ERCOT. The ERCOT Protocols at issue in this proceeding include Protocol § 6.5.7.1 (Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS) and Protocol § 6.7.6 (Deployment of Voltage Support Service), both of which ERCOT adopted in 2004, and which were substantially revised as a result of PRR 830.

The new requirements imposed by PRR 830 apply to all wind generation resources that (i) commenced operation on or after February 17, 2004, and (ii) have signed a Standard Generation Interconnection Agreement ("SGIA") on or before December 1, 2009.[26] PRR 830 requires Iberdrola and other wind generators to provide the same amount of reactive power—the rectangle—at all energy output levels whether or not the wind blows and regardless of wind speeds.[27] PRR 830, which ERCOT Staff authored, also deleted key substantive elements of the then-existing reactive power capability standard language and included new compliance

[26] ERCOT Protocol § 6.5.7.1(2) (as amended by PRR 830).
[27] *Id.* § 6.5.7.1(1) (as amended by PRR 830).

deadlines.[28] No study (reliability, economic, or technical) was performed by ERCOT in connection with the adoption of PRR 830.[29]

The reactive power protocols that existed prior to approval of PRR 830 established that reactive power was to be provided in the triangle configuration. Protocol § 6.5.7.1(1) identified a generation resource's Unit Reactive Limit ("URL") and only identified the reactive power requirement at the URL without specifying the level of reactive power that must be maintained at any other operating level.[30] Protocol § 6.7.6(5) required that reactive power at the URL must be available "at the generating unit's continuous rated active power output," while requiring that at lower power levels "reactive power up to the unit's operating capability be available."[31] Section 6.7.6(5)'s different reactive power standard for different active power output levels was confirmed by its statement that "[i]n no event shall the Reactive Power available be less than the required installed reactive capability *multiplied by the ratio* of the lower active power output to the generating unit's continuous rated active power output."[32] The graphical depiction of this ratio calculation is triangular in shape.

The requirement in Protocol § 6.7.6(5)—which clearly describes the requirement of a *triangular* reactive power control capability—was incorporated into the interconnection studies conducted by the responsible transmission service providers ("TSPs") for Iberdrola's wind

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[28] *See* 830PRR-41 Board Action Report 111709 (Exhibit N at 416-427 of 491).

[29] *See* ERCOT Board Meeting Tr. at 120:12-16 (Exhibit M at 10 of 108) ("TAC and the other stakeholder groups heard and . . . the votes suggest rejected arguments that studies should be performed to determine whether compliance with the requirements are needed for reliability.").

[30] *See* ERCOT Protocol § 6.5.7.1(1) as of March 2004 through the passage of PRR 830 (Exhibit F at 4 of 20 (March 2004, as initially appearing in the Protocols), 10 of 20 (October 2008, as in effect immediately prior to ERCOT's Nov. 13, 2008 Interpretation), and 16-17 of 20 (November 2009, as in effect at the time of the ERCOT Board's Nov. 17, 2009 approval of PRR 830)).

[31] ERCOT Protocol § 6.7.6(5) as in effect between March 2004 through the passage of PRR 830 (Exhibit F at 7 of 20 (March 2004, as initially appearing in the Protocols), 13 of 20 (October 2008, as in effect immediately prior to ERCOT's Nov. 13, 2008 Interpretation), and 20 of 20 (November 2009, as in effect at the time of the ERCOT Board's Nov. 17, 2009 approval of PRR 830)).

[32] *Id.*

facilities. The full interconnection study performed by AEP for Iberdrola's Peñascal facility is attached as Exhibit B (the "Peñascal Interconnection Study")[33]. The Steady State Study Report prepared by TXU Electric Delivery for Iberdrola's Barton Chapel facility (owned at that time by Gamesa Energía Southwest Company) is attached as Exhibit C (the "Barton Chapel Interconnection Study").[34] The Peñascal Interconnection Study states that "it is assumed for the purposes of this study that the [Peñascal] wind farm is in full compliance with the stated ERCOT Voltage and Reactive Requirements when they go into service."[35] Those ERCOT Voltage and Reactive Requirements were attached as Appendix 5 to the Peñascal Interconnection Study and include the same language found in Protocol § 6.7.6(5), requiring *triangular*—not rectangular—reactive power control capability.[36] Similarly, the Barton Chapel Interconnection Study concludes that the "proposed generation did not cause any significant voltage problems, but it should be able to regulate to voltage specified by ERCOT (0.95 lead/0.95 lag) when online."[37] The phrase "0.95 lead/0.95 lag" describe the power factor. The power factor can only remain constant at 0.95 where there is proportional, *triangular* reactive power control capability. Under the rectangular model, the power factor will decrease as generation output decreases.

PRR 830 made substantial revisions to § 6.5.7.1(1), including the deletion of its reference to the URL, and deleted § 6.7.6(5) in its entirety.[38] PRR 830 now requires that the reactive power requirements "shall be available at all MW output levels at or above 10 percent

[33] Interconnection Study for New Generation in Kenedy County, Report for Generation 006INR0022 ("Peñascal Interconnection Study") (Dec. 4, 2007) (Exhibit B).
[34] Interconnection Study – Stead State Study Report, Generation Interconnection Request 06INR0021 ("Barton Chapel Interconnection Study") (July 27, 2005) (Exhibit C).
[35] Peñascal Interconnection Study at 4 (Exhibit B at 7 of 71).
[36] *Id.* at 64 (Exhibit B at 67 of 71).
[37] Barton Chapel Interconnection Study at 3 (Exhibit C at 4 of 6).
[38] *See* 830PRR-41 Board Action Report 111709 (Exhibit N at 416-427 of 491).

(10%) of the WGR's nameplate capacity."[39] In addition to changing the Protocols themselves, on July 24, 2009, ERCOT revised its Resource Asset Registration Guide ("RARF Guide") to remove a triangular depiction of the "Reactive Capability Curve" that had appeared in early drafts of the RARF Guide as well as the first official version released on April 8, 2008.[40]

The events that precipitated approval of PRR 830 began in 2008 when ERCOT issued, as a result of a market participant inquiry, an official interpretation of the reactive power capability requirements relating to wind generation resources.[41] ERCOT's November 13, 2008 Interpretation articulated the rectangle requirement for the first time.[42] On December 13, 2008, a coalition of wind developers appealed ERCOT's Interpretation to the Commission, arguing that ERCOT Protocols required, and the wind developers have been operating since 2004 with the understanding that, increasing amounts of reactive power are required only *proportional* to a unit's generation level, or the "triangle."[43] On June 1, 2009, ERCOT issued a Market Notice withdrawing its interpretation for failure to consult with PUCT Staff prior to issuance of the interpretation.[44] Nevertheless, ERCOT almost immediately began issuing non-compliance letters to owners of wind generation assets not meeting the rectangle requirement.[45] The appeal initiated

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[39] *Id.* at 9, § 6.5.7.1(1) (Exhibit N at 424 of 491).
[40] *See, e.g.*, "Resource Asset Registration Guide" v.0.08 (Dec. 13, 2007) at Figure 11-1; v.4.00 (Apr. 8, 2008) at § 8.4.
[41] "Protocol Interpretation Request on Reactive Power Capability Requirements," M-D111308-01 Legal (Nov. 13, 2008) ("Interpretation") (Exhibit N at 241-43 of 491).
[42] *Id.*
[43] *Appeal of Competitive Wind Generators Regarding the Electric Reliability Council of Texas' Interpretation of the Reactive Power Protocols*, Docket No. 36482, Appeal of the ERCOT Legal's Interpretation of the Reactive Power Protocols (Dec. 12, 2009). The "Competitive Wind Generators" included E.ON Climate & Renewables North America Inc., Horizon Wind Energy, LLC, Invenergy Wind North America, LLC, Edison Mission Energy, and AES Wind Generation, Inc.
[44] *Id.*, Electric Reliability Council of Texas, Inc.'s (ERCOT) Motion to Dismiss Competitive Wind Generators' Appeal at 1 (June 2, 2009).
[45] *See* Letter from Kent Saathoff, Vice President, System Planning and Operations at ERCOT, to Brett Hunsucker, Authorized Representative for Barton Chapel Wind, LLC (June 5, 2009) (Exhibit D).

by wind developers was ultimately denied on December 8, 2009, for failure to follow ERCOT ADR procedures pursuant to P.U.C. PROC. R. 22.251(c).[46]

Before the Commission issued a final written order in Docket No. 36482, and while several ERCOT ADR proceedings related to the November 13, 2008. Interpretation were ongoing, ERCOT filed PRR 830.[47] On September 30, 2009, NextEra Energy Resources responded by filing PRR 835.[48] PRR 835 offered a compromise by proposing revisions to the reactive power protocols that provided a means for ensuring system reliability without unnecessarily burdening existing and future WGRs with the cost of installing supplemental reactive capability in locations where it would have little or no value.[49] ERCOT rejected PRR 835 on October 22, 2009.[50] PRR 830, authored by ERCOT Staff, was approved on November 17, 2009 by the ERCOT Board.[51] Despite efforts made by wind developers to use Applicable ERCOT Procedures, including Sections 20 and 21 of the ERCOT Protocols, and despite participation by wind developers in the ERCOT protocol revision process, the issue of reactive power is not resolved and is now before the Commission for the second time.

The cost of compliance with PRR 830, for Iberdrola as well as for other wind generators, is substantial. Iberdrola anticipates that it will cost between \$5 to \$10 million to retrofit its Barton Chapel and Peñascal facilities. Iberdrola's cost does not include the additional cost to consumers when affected low-cost wind facilities must go offline to perform the retrofits, leaving consumers to rely on more expensive generation sources.

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[46] *Appeal of Competitive Wind Generators*, Docket No. 36482, Order (Dec. 8, 2009).
[47] *See* 830PRR-01 Reactive Power Capability Requirement 090809 (Exhibit N at 5 of 491).
[48] *See* 830PRR-30 NextEra Energy Resources Appeal Supporting Documents 1 (Exhibit N at 197-205 of 491).
[49] *See id.* at 1.
[50] *See id.* PRS Roll Call Vote 102209.
[51] *See* 830PRR-41 Board Action Report 111709 (Exhibit N at 416 of 491).

VIII. ARGUMENT

A. The Commission should suspend implementation of and reverse approval of PRR 830 because ERCOT exceeded its statutory authority in approving PRR 830.

The Commission's, and by extension ERCOT's, statutory authority to impose reactive power capability requirements on renewable energy generators is limited by three important provisions of PURA: § 39.001, § 35.004(e), and § 39.904(l). PURA § 39.001 and § 35.004(e) address broad policy concerns, while PURA § 39.904(l) specifically addresses the reactive power capabilities of renewable generators. PRR 830 violates all three.

1. PRR 830 violates PURA § 39.001 and § 35.004(e) because it discriminates against wind generators and is neither practical nor limited so as to impose the least impact on competition.

The Texas competitive market is a model for the rest of the country. In restructuring the electric industry at the turn of the century, the Legislature took great care to enunciate and protect the competitive principles on which our market depends. PURA § 39.001(c) prohibits discrimination against any market participant or group of market participants.

> (c) Regulatory authorities, excluding the governing body of a municipally owned electric utility that has opted for customer choice or the body vested with power to manage and operate a municipally owned electric utility that has not opted for customer choice, may not make rules or issue orders regulating competitive electric services, prices, or competitors or restricting or conditioning competition except as authorized in this title and *may not discriminate against any participant or type of participant* during the transition to a competitive market and *in the competitive market*.[52]

Similarly, PURA § 39.001(d) requires that regulatory authorities—including ERCOT—"shall adopt rules and issue orders that are both practical and limited so as to impose the least impact on

[52] PURA § 39.001(c) (emphasis added).

HOU03:1225111.8

competition."[53] PURA § 35.004(e) contains a broad prohibition against discrimination in the context of transmission service and ancillary services.

> (e) The Commission shall ensure that ancillary services necessary to facilitate the transmission of electric energy are available at reasonable prices with terms and conditions that are not unreasonably preferential, prejudicial, discriminatory, predatory, or anticompetitive. In this subsection, "ancillary services" means services necessary to facilitate the transmission of electric energy including load following, standby power, backup power, *reactive power*, and any other services as the commission may determine by rule . . . .[54]

PRR 830 contravenes all of these legislative mandates.

PRR 830 discriminates against wind generators in two important ways. First, PRR 830 ignores the unique operating characteristics of wind generation facilities. Opponents of wind generation will no doubt argue that wind generators seek special treatment in the form of an *exemption* from requirements applicable to others. On the contrary, wind generators seek the *same* recognition of their particular operating characteristics that is afforded to other generators. ERCOT's rules and operational practices already recognize the unique operating characteristics of nuclear, hydroelectric, and cogeneration facilities. Pursuant to ERCOT Protocol § 4.4.15 (QSE Resource Plans), "ERCOT shall request Qualifying Facilities (QFs), hydro units and/or nuclear to operate below their [Low Operating Limits] only after other Resource Dispatch options have been exhausted."[55] Under ERCOT Protocol § 6.7.1.2(6) and (15), hydroelectric and nuclear units receive special treatment in the procedures for deploying balancing energy when congestion occurs.[56] "ERCOT shall not automatically redeploy nuclear and hydroelectric units using the ERCOT Systems that analyze and resolve transmission Congestion. ERCOT shall only redeploy

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[53] *Id.* § 39.001(d).
[54] *Id.* § 35.004(e) (emphasis added).
[55] ERCOT Protocol § 4.4.15.
[56] ERCOT Protocol §§ 6.7.1.2(6), (15).

nuclear and hydroelectric units manually through the use of a verbal Dispatch Instruction if there is no reasonably practicable Resource solution to Congestion available."[57]

The Federal Energy Regulatory Commission ("FERC") has reached this same conclusion.

> 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.*[58]

By failing to afford wind generators the same consideration of their unique operating conditions afforded other forms of generation, PRR 830 discriminates against a particular type of participant in the competitive market in direct contravention to PURA § 39.001 and § 35.004(e).

Second, PRR 830 is neither practical nor limited so as to minimize its effects on competition. There is no study to indicate that imposing new requirements on only wind generation is the most practical or least disruptive means of addressing the alleged (and also undocumented) reactive power problem.[59] ERCOT has made no attempt to determine whether similar reactive power requirements should be imposed on currently grandfathered generators who built their facilities prior to 2004.[60] ERCOT has acknowledged that as much as *10 to 20 gigawatts* of conventional generation is on the system today and not being required to meet the reactive power requirements that are now being imposed retroactively on wind generators.[61] This despite

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[57] ERCOT Protocols 6.7.1.2(15).
[58] *Interconnection for Wind Energy*, Order No. 661, FERC Stats. & Regs. ¶31,186 (2005) at ¶ 45, order on reh'g, Order No 661-A, FERC Stats. & Regs. ¶ 31,198 (2005) at ¶ 45 (Exhibit G at 29 of 58, ¶ 45) (Exhibit G) (emphasis added).
[59] *Id.*
[60] ERCOT Board Meeting Tr. at 120:12-16 (Exhibit M at 10 of 108) ("TAC and the other stakeholder groups heard and . . . the votes suggest rejected arguments that studies should be performed to determine whether compliance with the requirements are needed for reliability.").
[61] *Id.* at 139:1-3 (Exhibit M at 26 of 108).

the fact that reactive power capability is less practical and more expensive for wind generators than for conventional generators.[62] ERCOT has to date offered no evidence that PRR 830 is the most practical or limited way of addressing any perceived issues on the ERCOT system. What evidence *does* exist in the record demonstrates the exact opposite. PRR 830 is both discriminatory and anticompetitive in violation of PURA § 39.001(c), § 39.001(d), and § 35.004(e).

2. PRR 830 violates PURA § 39.904(l) because it requires wind generators to address more than their own effects on system reliability.

In addition to laying out broad-style policy guidelines by which ERCOT must operate (see Section VIII.A.1, above), the Legislature has directly addressed—and limited—ERCOT's authority to impose reactive power control requirements on wind generators.

> The commission may adopt rules requiring renewable power facilities to have reactive power control capabilities or any other feasible technology designed to reduce *the facilities' effects* on system reliability.[63]

PURA § 39.904(l) does not allow ERCOT to require wind generators to have reactive power control capability to address system reliability *generally*. Instead, PURA § 39.904(l) limits ERCOT's authority to requiring only that level of reactive power control capability necessary to address a wind facility's *own* effects on system reliability. As a matter of law, wind generators cannot be required to provide reactive power capability to address reliability problems not of their own making. PRR 830 is unsupported by *any* study or other evidence indicating either (a) that the facilities of the 38 wind generators affected by PRR 830[64] are actually creating effects on system reliability or (b) that the requirements of PRR 830 are designed to address those effects. Indeed, wind generation facilities with the "triangular" reactive power capability *are* designed to address

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[62] *See* Order No. 661-A at 28 (Exhibit G at 29 of 58).
[63] PURA § 39.904(l) (emphasis added).
[64] ERCOT Board Meeting Tr. at 136:12-18 (Exhibit M at 24 of 108).

their own effects.[65] As their generation output increases, thus increasing their effects on system reliability, their ability to provide reactive power also increases. This is represented by the triangular shape of representative graphs. PRR 830, by requiring full reactive power capabilities from wind generators without regard to a wind generator's actual effects on system reliability, violates the limitation imposed by PURA § 39.904(l).

B. The Commission should suspend implementation of and reverse approval of PRR 830 because ERCOT's approval of PRR 830 was arbitrary and capricious and unsupported by substantial evidence.

Even if ERCOT had not stepped outside the statutory boundaries protecting competition, and even if ERCOT had not exceeded the statutory limits on its ability to impose reactive power control capabilities on renewable generators, the *manner* in which PRR 830 was adopted justifies its rejection by the Commission. Generally, Texas courts will reverse Commission decisions that are arbitrary and capricious, not supported by substantial evidence, and in excess of the Commission's statutory authority.[66] Under the substantial evidence rule, Texas courts will uphold Commission decisions only if a reasonable basis exists in the record for the decision.[67] Furthermore, an agency acts in an arbitrary and capricious manner when it "considers only relevant factors, yet reaches an unreasonable result."[68]

These standards apply not only to the Commission, but to ERCOT as well. P.U.C. PROC. R. 22.251(l), for example, provides that the Commission will reverse a factual determination supporting ERCOT's conduct if it is "not supported by substantial evidence or is

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[65] *Id.* at 153:25-154:9 (Exhibit M at 39 of 108).
[66] *See AEP Texas Central Co. v. Pub. Util. Comm'n of Tex.*, 286 S.W.3d 450, 468 (Tex. App.—Corpus Christi 2008) (*citing State v. Pub. Util. Comm'n of Tex.*, 246 S.W.3d 324, 332 (Tex. App.—Austin 2008) ("'[I]f the decision is not reasonably supported by substantial evidence, in violation of a constitutional or statutory provision, in excess of the [Commission's] statutory authority, made through unlawful procedure, affected by other error of law, arbitrary or capricious, or characterized by an abuse of discretion,' we will reverse the Commission's Final Order.")
[67] *Id.* at 473.
[68] *Id.* (*citing City of El Paso v. Pub. Util. Comm'n of Tex.*, 883 S.W.2d 179, 184 (Tex. 1994)).

arbitrary and capricious." Here, ERCOT has made a significant change in its Protocol requirements that will have a far-reaching effect on market participants. It has done so without supporting studies or evidence. In doing so, ERCOT has acted arbitrarily and capriciously and without substantial evidence to support its action, and has therefore failed to follow required standards of reasoned decision-making.

1. PRR 830 is a significant change of ERCOT's reactive power capability requirements.

Although the introductory comments to PRR 830 say it is a "clarification" of the reactive power Protocols, even a cursory review shows that PRR 830 goes far beyond clarification. Significant and facially obvious changes have been made to the language of Protocol § 6.5.7.1 and § 6.7.6.[69] The changes go well beyond mere textual clarification; they represent a broad transformation of the reactive power capability requirements for generation resources interconnected with the ERCOT transmission grid.

The changes to the text of Protocol § 6.5.7.1 and § 6.7.6 cannot reasonably be called a mere clarification. PRR 830 changed the definition of terms,[70] struck entire existing paragraphs,[71] inserted entirely new paragraphs,[72] and created new compliance deadlines.[73] In many respects, one could even argue that PRR 830 is *less clear* on certain issues than the Protocol language it sought to clarify. For example, § 6.5.7.1(7)'s allowance for generators to pay TSPs to install reactive capability equipment previously contained precise language approved by the ERCOT Board in PRR 493 to ensure consumers did not bear unwarranted costs through

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[69] *See* 830PRR-01 Reactive Power Capability Requirement 090809 at 1 (Exhibit N at 5 of 491).
[70] *See, e.g.,* 830PRR-01 Reactive Power Capability Requirement 090809 at 4 (changing the definition of "Wind-powered Generation Resource" in Protocol § 2.1) (Exhibit N at 8 of 491).
[71] *See, e.g., id.* at 7, § 6.7.6(5) (Exhibit N at 11 of 491).
[72] *See, e.g., id.* at 5, § 6.5.7.1(2) (Exhibit N at 9 of 491).
[73] *Id.*

transmission rates.[74] PRR 830, by contrast, has replaced that specificity with vague language allowing generators and TSPs to "enter into an agreement."[75] However, PRR 830's dramatic break from prior ERCOT conduct is nowhere more noticeable than in its requirement that WGRs provide reactive power in the rectangle configuration as opposed to the triangle configuration.

Until ERCOT adopted PRR 830 on November 17, 2009, Protocol § 6.5.7.1(1) indicated that "Unit Reactive Limit" refers to the amount of reactive power produced when a resource is operating at its full rated capability, and § 6.7.6(5) indicated that the reactive power capability varies with the resource's actual power production.[76] PRR 830, however, deleted the reference to "URL" in Protocol § 6.5.7.1(1), and also deleted all of Protocol § 6.7.6(5).[77] Indeed, Protocol § 6.7.6(5) contained the language that unambiguously described and authorized the triangular reactive power capability curve. That section required that reactive power at the URL be available "at the generating unit's continuous rated active power output."[78] For lower levels of power output, however, it required that "Reactive Power *up to the unit's operating capability* must be available."[79] The fact that the existing Protocol specified a different reactive power standard for lower operating levels forecloses the possibility of rectangular interpretation which necessarily requires that *the same* standard be applied to all levels of operation.

This different reactive power standard for lower levels of operation was, until recently, graphically depicted as a triangular configuration in ERCOT's RARF Guide. Until at least July 24, 2009, Section 7.4 of the RARF Guide contained an illustration of the "Reactive

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[74] *See* PRR 493 Board Action 072604 at 4, § 6.5.7.1(7); PRS Recommendation 072604 at 2.
[75] *See* 830PRR-01 Reactive Power Capability Requirement 090809 at 6, § 6.5.7.1(7) (Exhibit N at 10 of 491).
[76] *See* ERCOT Protocol § 6.5.7.1(1) and § 6.7.6(5), *supra* notes 30 and 31.
[77] *See* 830PRR-01 Reactive Power Capability Requirement 090809 at 4-7 (redline of prior language) (Exhibit N at 8-11 of 491).
[78] Exhibit F includes (a) the version of Protocol 6.7.6(5) originally passed in March 2004, (b) the October 2008 version in effect when ERCOT issued its November 13, 2008 Interpretation, and (c) the November 2009 version in effect until ERCOT passage of PRR 830. All three versions contain the referenced language.
[79] *Id.*

Capability Curve," which showed the reactive power capability of a sample unit at varying levels of MW capacity.[80] That illustration included two lines designated "Minimum Reactive Required" that showed the requirement in a triangle configuration.[81] It did not include horizontal top and bottom lines that would have been necessary to depict a rectangular requirement. The fact that ERCOT felt compelled, on July 24, 2009, to revise the RARF Guide to remove its own triangular "Minimum Reactive Required" illustration is further evidence that ERCOT has substantially changed—not clarified—the reactive power requirements.[82]

One need look no further than the presentations made at the ERCOT Board's November 17, 2009 meeting to see that PRR 830 represents a sea change in the industry's understanding of what the Protocols require. There, the TAC advocate asserted that PRR 830 clarified, not changed, the existing requirements.[83] He also stated that the pre-PRR 830 requirements "were clearly understood" and "have been by most of the members of ERCOT for many, many years."[84] That assertion, however, is contradicted by an ERCOT representative's later statement that of the 70 wind generators ERCOT contacted, only 16 actually met the rectangular requirement.[85] That more than three quarters of generators were operating outside the rectangular requirement[86] is evidence that the vast majority of wind developers did not read the Protocols to require the rectangle.

Indeed, the notion that the reactive power Protocols have always required the rectangle lacks support. Here, ERCOT's actions speak louder than its words. For five years,

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[80] *See, e.g.*, Exhibit N at 273-275 of 491.
[81] *Id.* at 274 of 491.
[82] *See* "Resource Asset Registration Guide" v.4.08 (July 24, 2009) at 2 (stating that ERCOT "Updated Section 7.4") and at 33-34 (still referring to the "Reactive Capability curve," though the curve no longer appears).
[83] ERCOT Board Meeting Tr. at 119:9 (Exhibit M at 9 of 108).
[84] *Id.* at 119:17-20 (Exhibit M at 9 of 108).
[85] *Id.* at 136:12-18 (Exhibit M at 24 of 108).
[86] *Id.* at 136:12-18 (noting that "29 met the triangle requirement") (Exhibit M at 24-108).

ERCOT has accepted without objection RARFs, interconnection studies, interconnection agreements, and other formal documents from numerous WGRs indicating that their reactive capability increased with the increase in their power generation. In response to that argument, ERCOT has presented three rather uncompelling justifications for its failure to take any action despite alleged non-compliance with the reactive power protocols.

First, ERCOT claims the RARFs it received never raised red flags because RARFs "weren't established for checking protocol compliance" but rather "to get accurate data on what is out there in real life so [ERCOT] can appropriately model it."[87] ERCOT's attempt to distance itself from compliance issues raised by the RARFs fails because it is clear that the "real life" reactive power capabilities of wind generators were never used for modeling purposes. For example, it is difficult to reconcile ERCOT's admission that the modeling for the CREZ transmission study is based on the rectangle[88] with its claim that the purpose of all the "triangular" RARFs ERCOT was receiving was to "appropriately model" the transmission system.

Second, with regard to the interconnection process through which WGRs have repeatedly communicated their reactive power capability, ERCOT defends its inaction by stating that "[g]enerator interconnection agreements are between the generator and the transmission provider," and "ERCOT is not a party to those agreements."[89] This response, however, only highlights the lack of evidence showing that the TSPs—who were conducting full interconnection studies before signing interconnection agreements—ever raised any compliance issues with ERCOT with respect to the WGRs having triangular reactive power capabilities.

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[87] *Id.* at 136:1-4 (Exhibit M at 23 of 108).
[88] *Id.* at 148:21-22 (Exhibit M at 34 of 108) ("The current CREZ reactive study is assuming the rectangle.").
[89] *Id.* at 140:2-7 (Exhibit M at 27 of 108).

Third, in response to a question from the ERCOT Board as to why there was a "four year period before this became an issue," ERCOT responded that "frankly, it didn't come to our attention."[90] This statement undermines the argument that the Protocols have always required the rectangle, for it requires one to assume that for years ERCOT was in possession of information showing widespread non-compliance with a requirement that it now argues is essential to system reliability, but that such non-compliance never came to its attention. ERCOT asserted that non-compliance issues usually come to its attention in response to some "incident."[91] In this case, however, there is no credible evidence of an "incident" caused by and requiring changes to WGR reactive power capabilities.

Rather than claim that virtually an entire segment of the generation market was knowingly non-compliant with the Protocols for five years, or that ERCOT was never made aware of a compliance problem despite the unambiguous data it received to the contrary, the more reasonable approach is simply to recognize PRR 830 for what it is: a significant re-defining of the way that both WGRs and ERCOT interpreted the Protocols.

2. The change required by PRR 830 will have a dramatic impact on Iberdrola and other wind generators.

The cost of compliance with PRR 830 is substantial. Maintaining a rectangle requirement is a significant additional and unanticipated cost for Iberdrola and other wind developers. To supply the reactive power requirement imposed by PRR 830, Iberdrola must undertake retrofits at both its Barton Chapel and Peñascal facilities. Although Iberdrola continues to refine its estimates, initial engineering studies suggest that the cost of compliance will be $5 million to $10 million for the two facilities. Because so many wind generators built and operated

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[90] *Id.* at 137:23-24 (Exhibit M at 25 of 108).
[91] *Id.* at 137:14-20 (Exhibit M at 25 of 108).

their facilities with the understanding that ERCOT required triangular reactive power capabilities, the total cost to comply with PRR 830 could be hundreds of millions of dollars. That cost does not include the additional cost to consumers when affected low-cost wind facilities must go offline to perform the necessary retrofits and consumers must rely on more expensive forms of generation. While there is not one study to justify implementation of PRR 830, the new requirements imposed by PRR 830 will certainly have a dramatic effect on Iberdrola and other wind generators.

3. Despite its far-reaching, anticompetitive effects, PRR 830 is unsupported by any evidence of a need for this change.

The TAC advocate at the ERCOT Board meeting approving PRR 830 noted that TAC, in fact, "rejected arguments that studies should be performed to determine whether compliance with the requirements are needed for reliability."[92] The lack of some data, a study, report, or other analysis to support the significant capital infusion required to meet the PRR 830 requirements is troubling and brings into question the value of the new requirements. Although ERCOT is "about to embark on a significant study of the reactive requirements associated with the many billions of dollars associated with the CREZ investment,"[93] the ERCOT Board hastily approved PRR 830 without the benefit of that study or any other study to marry the new reactive power requirements with actual system reliability needs. Iberdrola is further unaware of any recent incident on the ERCOT grid that would justify requiring wind developers to provide the additional reactive power capability ERCOT now claims is necessary for reliable operation of the grid. Without some evidence that the PRR 830 requirements are needed for system reliability, the

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[92] *Id.* at 120:12-16 (Exhibit M at 10 of 108).
[93] *Id.* at 121:22-25 (Exhibit M at 11 of 108).

reactive power requirements imposed by PRR 830 do not and cannot justify the enormous costs associated with compliance.

IX. MOTION FOR SUSPENSION

P.U.C. PROC. R. 22.251(i) provides that the Commission may, upon demonstration of good cause, issue an order "on such terms as may be reasonable to preserve the rights and protect the interests of the parties during the processing of the complaint[.]"[94] Good cause exists to grant Iberdrola's request for suspension of implementation and enforcement of PRR 830.

Iberdrola cannot currently provide rectangular reactive power as required by PRR 830. Under the new Protocol, Iberdrola will have until December 31, 2010, to bring existing equipment into compliance with the new Protocol.[95] Without a suspension, Iberdrola must begin very quickly to dedicate technical and financial resources to meet the December 31st deadline even while the Company's Appeal and Complaint is pending. Compliance with PRR 830 will require the Company to retrofit its existing facilities to incorporate new equipment and operating systems consistent with the new Protocol. The Company's current estimates suggest that the task will be extensive and the cost to comply with PRR 830 will be significant. Such costs will not be recoverable if the Commission grants Iberdrola's request and PRR 830 is reversed.

ERCOT has for many years permitted the interconnection of generation units, including wind generation assets, that did not have the reactive power capabilities to comply with the new requirements of PRR 830. Although ERCOT represents that the new reactive power capability requirements are needed for system reliability, no study exists to support ERCOT's position that reliability is actually at issue or that PRR 830 is an appropriate solution. Suspension

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[94] P.U.C. PROC. R. 22.251(i).
[95] ERCOT Protocol § 6.5.7.1(2) (as amended by PRR 830).

of PRR 830 will not cause undue harm to any participant, because ERCOT has not shown that PRR 830 is needed to ensure system reliability.

In this Appeal and Complaint, Iberdrola has established that there is no reliability issue to justify the reactive power capability requirements imposed by PRR 830 and no cost justification to impose such requirements on primarily wind generation resources. Considering the hundreds of millions of dollars it will cost developers to bring wind generation units into compliance with PRR 830 and the lack of justification for PRR 830, there is certainly a likelihood that Iberdrola will succeed on the merits. For the reasons set forth above, Iberdrola requests that the Commission expeditiously consider and grant this motion and suspend implementation and enforcement of PRR 830.

X. MOTION TO EXCEED PAGE LIMIT

Iberdrola requests permission from the Commission to exceed the page limit requirement in P.U.C. PROC. R. 22.72(f). The presiding officer is authorized to grant such requests and shall consider such factors as (i) which party has the burden of proof and (ii) the extent of opposition to a party's position that would need to be addressed in the document.[96] As the party with the burden of proof in this case, Iberdrola requests a waiver from P.U.C. PROC. R. 22.72(f) so that pertinent documents including the ERCOT record approving PRR 830, the conduct complained of in this Appeal and Complaint, may be fully presented to the Commission for review.

XI. CONCLUSION

Iberdrola requests that the Commission expeditiously reverse approval of PRR 830 and find that the reactive power capability requirements imposed by PRR 830 are not needed as a

[96] P.U.C. PROC. R. 22.72(f).

matter of policy and that, to the extent needed, no study exists to support the unusual demands made of wind developers to meet the new requirements. Iberdrola further requests that the Commission order ERCOT to reinstate the old Protocols with the understanding that, as written, the Protocols require a minimum reactive capability that is proportional to a generator's real power output. If the Commission determines that PRR 830 is needed for reliability purposes, the Commission should find, pursuant to P.U.C. SUBST. R. 25.503(f)(2)(C), that the requirements imposed by PRR 830 do not apply retroactively to Iberdrola's wind facilities in Texas. Iberdrola further requests all other relief, legal and equitable, to which it is justly entitled.

Respectfully submitted,

BAKER BOTTS L.L.P.

By: James H B

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Baker Botts L.L.P.
910 Louisiana Street
Houston, Texas 77002
713.229.1234
713.229.1522 (fax)

COUNSEL FOR IBERDROLA RENEWABLES, INC.

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing document was served on ERCOT's General Counsel and the Office of Public Utility Counsel by hand-delivery on this 22nd day of December, 2009. In addition, a copy was furnished electronically to ERCOT's General Counsel, Michael G. Grable, via e-mail.

James H

HOU03:1225111.8

EXHIBIT A

AFFIDAVIT

STATE OF Oregon §

§

COUNTY OF Multnomah §

BEFORE ME, the undersigned notary public, this day personally appeared Brett Hunsucker, duly sworn according to law, who deposes and says:

"My name is Brett Hunsucker. I am of legal age and a resident of the State of Oregon. I am employed as a Wind Asset Manager by IBERDROLA RENEWABLES, Inc. ("Iberdrola"). In that capacity, I have management responsibility for Iberdrola's Texas wind generation assets. The facts stated in the foregoing "Iberdrola Renewables, Inc.'s Appeal and Complaint of ERCOT Decision to Approve PRR 830" are, based on my personal knowledge and professional experience, true and correct.

"The following documents, contained herein as Exhibits, are also, based on my personal knowledge, true and correct copies of the original documents: the "Peñascal Interconnection Study" (Exhibit B), the "Barton Chapel Interconnection Study" (Exhibit C), the June 5, 2009 letter from ERCOT's Kent Saathoff to Brett Hunsucker, Barton Chapel Wind, LLC (Exhibit D), and the Texas Regional Entity's October 14, 2009 "Incident Report" to Barton Chapel Wind, LLC (Exhibit E).

"Wind generators have invested billions of dollars to develop thousands of megawatts of wind generation in Texas. PRR 830 will require many of those wind generators to retrofit their existing equipment. Iberdrola will have to retrofit equipment at both of its existing Texas wind facilities to comply with PRR 830. Based on my personal knowledge of the most recent engineering analyses performed for Iberdrola, Iberdrola's estimated cost of compliance with PRR 830 is between $5 and $10 million."

Further affiant sayeth not.

____

SUBSCRIBED AND SWORN before me on this 21st day of December, 2009.

____
Notary Public in and for the State of Oregon

My commission expires:

10/1/2013

OFFICIAL SEAL
CHELSEA C MC FARLAND
NOTARY PUBLIC - OREGON
COMMISSION NO. 443054
MY COMMISSION EXPIRES OCTOBER 1, 2013

(SEAL)

EXHIBIT B

Interconnection Study for New Generation
In
Kenedy County

Report for Generation 006INR0022

212 East Sixth Street

Tulsa, Oklahoma 74119-1295

(918) 599-2000

American Electric Power Service Corporation

Texas Transmission Planning

December 4, 2007

TABLE OF CONTENTS

Introduction

Heartland Wind LLC (Heartland) has requested to interconnect a 1200 MW wind farm located in Kenedy County, Texas, into the AEP Texas Central Company's (TCC) transmission system (Figure 1). The project will be split into six 200 MW phases starting in October 2008 and completed by December 2013. The Nelson Sharpe to Rio Hondo 345 kV transmission line and the Loyola to Raymondville 138 kV transmission lines are located approximately 16 miles from the proposed wind farm. A new 345 kV TCC Ajo substation will be constructed in the Nelson Sharpe to Rio Hondo 345 kV transmission line, a new Sarita substation and 46 mile looped double circuit capable 345 kV transmission line with bundled 1590 ACSR conductor will be constructed to connect Ajo and Sarita substations.

Competitive Renewable Energy Zones (CREZs) study

TCC has had repeated inquiries, over the past 5 years, into the connection of wind generation to the TCC transmission system along the gulf coast from Corpus Christi down to the Rio Grande Valley. TCC performed study state power flow analysis to determine the impact of wind generation to the TCC transmission system along the gulf coast and prepared long range transmission plans in the event that wind generation projects were to be developed. These bulk transmission improvements identified for this area (Figure 2) have been supplied to the Electric Reliability Council of Texas (ERCOT) for consideration in the Competitive Renewable Energy Zones (CREZs) study.

AEP identified that the existing transmission infrastructure is capable of supporting up to 1200 MW with the construction of a new bulk 345 kV Hub (Ajo) located in the Lon Hill to Rio Hondo 345 kV transmission line. The Rio Hondo series capacitor bank would need to be by passed at the 1000 MW level to prevent overload of the bank for loss of the Ajo to Nelson Sharpe 345 kV transmission line. At 1200 MW the limiting elements are the Ajo to Nelson Sharpe and the Ajo to Rio Hondo 345 kV transmission lines. Loss of either 345 kV transmission line overloads the remaining 345 kV transmission line.

The next improvement to the system would be to construct a new bulk 345 kV substation (Caballo) in the Lon Hill to North Edinburg 345 kV transmission line and a new 345 kV transmission line between the Caballo to the Ajo. These upgrades would support up to 2200 MW of generation out of the area. The limiting elements are the Ajo to Nelson Sharpe 345 kV transmission line and the 138 kV transmission lines out of the Ajo to Loyola and Raymondville for loss of the Caballo to Lon Hill 345 kV.

To increase the transfers above 2200 MW, a new 345 kV source to the Rio Grande Valley is required. A new 345 kV transmission line from Laredo Lobo to Rio Bravo to Sol to North Edinburg and Sol to Frontera in the Rio Grande Valley would be constructed. A series capacitor bank with 50% compensation was added at Sol on the Sol to Rio Bravo 345 kV transmission line. This increases the export capability to 2900 MW to ERCOT but the export capability out of the Ajo reaches its maximum export capability at 2200 MW. A new independent 345 kV transmission line from the Ajo to the Caballo would be constructed so that the full 2900 MW export could be achieved.

At export levels above 2900 MW, the existing 345 kV transmission system is not capable of supporting exports from the Hubs to Corpus Christi or to the Rio Grande Valley. The 345 kV lines from the Ajo and Caballo to the Rio Grande Valley are operating close to there normal rating and all 345 kV transmission lines out of both Hubs reach there emergency rating following a contingency. Loss of any one of the 345 kV transmission lines out of the Caballo or Ajo overloads the remaining 345 kV transmission lines out of the Hubs. The underlying 69 kV and 138 kV system between Corpus Christi and STP is also beginning to see heavy loading under normal conditions and overloads occur for loss of the Whitepoint to STP 345 kV transmission line. Instead of constructing new 345 kV transmission lines out of the area, AEP proposes the construction of two 765 kV transmission lines.

A new 765 kV transmission line from Sol to the Caballo and the Caballo to Hillje substation located in the Centerpoint system would be constructed. At Sol, Caballo, and Hillje 1500/2100 MW 765/345 kV autotransformers would be installed. The 765 kV from Caballo to Sol off loads the 345 kV transmission lines out of the Caballo to North Edinburg and the 345 kV transmission line out of the Ajo to the Rio Hondo. The 765 kV from Caballo to Hillje reduces the loading on the 345 kV transmission lines from the Caballo and the Ajo to Lon Hill, located in Corpus Christi, and the underlying 138 kV and 69 kV transmission system between Corpus Christi and STP. The 765 kV provides AEP the ability to take the 345 kV transmission lines out for maintenance and reconductor if necessary when exports out of the area exceed 4000 MW. At the 4000 MW level, the first 345 kV transmission line to overload is the Ajo to Nelson Sharpe for loss of the 765 kV transmission line from Caballo to Hillje.

Voltage

As outlined in the "ERCOT Voltage and Reactive Requirements And Compliance Monitoring" (Appendix 6), "Generating unit installations to which this Standard applies shall have and maintain an overexcited (lagging) power factor capability, of 0.95 or less and an under-excited (leading) power factor capability of 0.95 or less, both determined at the generating unit's maximum net power to be supplied to the transmission grid and at the transmission system voltage profile established by ERCOT, and both measured at the point of interconnection to the TDSP." Thus it is assumed for the purposes of this study that the Heartland wind farm is in full compliance with the stated ERCOT Voltage and Reactive Requirements when they go into service.

Steady State Analysis

The 2009, 2010, 2011 and 2012 Summer ERCOT cases, produced in 2005, were used to determine the impact of the 1200 MW of new generation to the transmission system. Generation was displaced by turning off the mothballed units connected to the TCC system and by scaling generation in the central and north Texas areas. In addition to this

1200 MW study, another 1920 MW of additional generation, also under study on the TCC system, was incorporated for a total of 3120 MW of new generation. Single and double circuit contingency analysis was performed and the upgrades detailed below were added such that there were no NERC, ERCOT (Appendix 5), and TCC (Appendix 4) planning criteria violations. Appendix 1 shows the critical contingencies in this area and transmission line loadings for all of the cases. The generation facility was connected to a new Ajo 345 kV substation in the Nelson Sharpe to Rio Hondo 345 kV transmission line approximately 5 miles north of the existing Armstrong 138 kV substation. Each phase will require additional system improvements and are detailed below. In this study there will be references to Zorillo substation which is associated with another IPP connecting 1200 MW of wind generation into the proposed 345 kV transmission loop that also will connect the Heartland project. Both parties signed a confidentially agreements with AEPSC to share information on each others projects. A separate study report has been completed detailing the aspects of the IPP connecting to the Zorillo location.

Phase 1 will require the construction of three new 345 kV substations (Ajo, Sarita, and Zorillo) and a 26 mile 345 kV transmission line designed for bundled 1590 ACSR conductor and double circuit capable. This 345 kV transmission line will connect the new Sarita and Zorillo 345 kV substations located at the wind farm facility to the new Ajo 345 kV substation cut into the Nelson Sharpe to Rio Hondo 345 kV transmission line. Due to high voltages during off peak, 2-100 MVar 345 kV shunt reactors will be installed at the new Ajo 345 kV substation. Phase 1 improvements scheduled for completion by October 2008 are shown in figure 3.

Phase 2 will require the construction of the second independent 30 mile 345 kV transmission line from Ajo to Sarita to complete the 345 kV transmission loop into the area. This 345 kV transmission line will also be designed for bundled 1590 ACSR conductor and double circuit capable. No additional improvement will be necessary until Phase 5 of the project. Phases 2 through 4 improvements scheduled for completion by October 2010 are shown in figure 4. Phase 5 will require the installation of one +/- 300 MVar Static Var Compensator (SVC) and two 200 MVar 345 kV shunt capacitor banks at Ajo 345 kV substation and two 100 MVar 345 kV shunt capacitor banks at Zorillo substation. Phase 5 improvements scheduled for completion by December 2011 are shown in figure 5.

Phase 6 is the last phase of the project with the last 200 MW of generation installed totaling 1200 MW. At the 1200 MW generation level, the 345 kV transmission line from Ajo to Rio Hondo is at its emergency rating for loss of the Ajo to Nelson Sharpe 345 kV transmission line and the Ajo to Nelson Sharpe 345 kV transmission line is at its emergency rating for loss of the Ajo to Rio Hondo 345 kV transmission line. At this generation level, the Rio Hondo series capacitor bank must be bypassed so that it does not overload for loss of the Ajo to Nelson Sharpe 345 kV transmission line. For generation at or above 1200 MW, a new Caballo substation will be constructed in the Lon Hill to North Edinburg 345 kV transmission line. This will create a Caballo to North Edinburg and a Caballo to Lon Hill 345 kV transmission lines. Since this 345 kV transmission line is also series compensated, two 100 MVar shunt reactor will be installed at the Caballo 345 kV substation. A new 22 mile double circuit capable bundled 1590 ACSR 345 kV transmission will be constructed from Ajo to Caballo. With this new 345 kV transmission line completed the system will be capable of supporting the full 1200 MW of generation. Phase 6 improvements scheduled for completion by December 2013 are shown in figure 5.

Short Circuit Analysis

The 2006 short circuit case was modified to add the 1200 MW generation at the Sarita 345 kV bus and the impact of the other 1920 MW of generation currently under study was also incorporated into this study. A new Ajo 345 kV bus was inserted in the Nelson Sharpe to Rio Hondo 345 kV transmission line, a 16 mile 345 kV transmission line from Ajo to Zorillo, a 10 mile 345 kV transmission line from Zorillo to Sarita, and a 20 mile 345 kV transmission line from Ajo to Sarita were added to the case. The new Caballo 345 kV substation was inserted in the North Edinburg to Lon Hill 345 kV and a new 345 kV transmission line was added to connect Ajo and Caballo. The study used lumped modeling of the 2.4 MW Mitsubishi M92/M95 wind turbines in groups of 84. An equivalence was made for the generation on the 34.5 kV collector sites and is made up of five 201.6 MVA (Z1= 0 + j.13055 and Z0= 0 + j.13055 on a 100 MVA Base) and one 192 MVA (Z1= 0 + j.13708 and Z0= 0 + j.13078 on a 100 MVA Base) totaling 1200 MW. Each 34.5 kV collector site is connected to the 345 kV with a 345/34.5 kV Wye-Delta main transformer bank (Z1=Z0= j.15 on a 100 MVA Base) connected to the Sarita 345 kV bus.

The X/R ratio and source impedances at the Zorillo 345 kV bus are shown below without the generation.

X/R Three Phase	X/R Single Phase	Positive Sequence in Ohms	Zero Sequence in Ohms
5.62	4.67	2.65 + j19.81	12.09 + j42.34

There was no significant increase in fault current that would require the change out of any equipment on the transmission system. The fault current at the Ajo 345 kV bus is 15.7 kA for a three phase fault and 14.4 kA for a single line to ground fault and the fault current at the Sarita 345 kV bus is 13.3 kA for a three phase fault and 13.5 kA for a single line to ground fault. The three phase and single phase fault currents at the point of interconnection are shown in Appendix 2.

Stability Analysis

The stability study was undertaken to evaluate the dynamic performance of the proposed wind farm in response to transmission disturbances, and to check the adequacy of dynamic reactive compensation in correcting any instability and maintaining acceptable system voltage during the post-disturbance transient period. Three phase to ground faults with primary clearing and phase to ground faults with delayed clearing resulting in the tripping of nearby transmission lines were considered.

The proposed wind farm stages of development over time were studied in six successive phases of 200 MW increments each up to a total of 1200 MW. The proposed wind farm is to be connected to the Nelson Sharpe to Rio Hondo 345 kV transmission line from the coastal area via a 345 kV loop originating from the new Ajo 345 kV substation on the Nelson Sharpe to Rio Hondo 345 kV transmission line. Subsequent phases beyond the first phase would add a new 345 kV line from Ajo to another new 345 kV substation at Caballo on the Lon Hill to North Edinburg 345 kV transmission line. In 2012, a second Ajo to Caballo 345 kV transmission line is required.

The wind farm power factor at the 345 kV point of interconnection was assumed to be at approximately unity. Three 7.2 MVar shunt capacitor banks were added at the 34.5 kV collector buses accordingly. Reactive compensation in the form of 345 kV shunt capacitor banks at Ajo and Zorillo 345 kV substations is necessary to maintain acceptable steady-sate post-contingency voltage levels from 2011 and beyond. A +/- 300 MVAR SVC at Ajo substation is also necessary from 2011. The proposed project phases and reactive requirements are summarized as follows:

YEAR	MW	Ajo Station Connections	Sarita 345 kV Cap Banks	Ajo 345 kV Cap Banks
2009	400	Ajo 345 kV Station only	None	None
2010	800	1 Ajo-Caballo 345 kV line	“	“
2011	1200	“	1X100	2X200 & SVC
2012	“	2 Ajo-Caballo 345 kV lines	2X100	“
2013	“	“	“	“
2014	“	“	“	“

Dynamic modeling of the 2.4 MW Mitsubishi M92 and M95 wind turbines was supplied by PTI in their subject report dated December 15, 2006. The study used lumped modeling of the wind turbines according to the phases of project development in groups of 84. No appreciable difference in steady-state or dynamic performance was observed between MWT92 and MWT95 model types. In accordance with the instructions in the PTI report, shunt capacitive compensation was applied at the equivalent 690V buses equal to 9.24 MVAR per 84 wind turbines.

Capacitor bank switching time delays were 30 cycles at Sarita 345 kV and 60+ cycles at Ajo 345 kV with a 6 cycle switch closing/opening time. These delay times were observed to generally coordinate with the wind turbine undervoltage protection so as to avoid tripping the wind farm during or after the contingency events simulated in this study.

Stability simulations were run with all transmission elements in service. 345 kV 3-phase faults were 3.5 cycles in duration, 345 kV phase to ground faults with delayed clearing were 15 cycles in duration. In each case, the faulted line(s) was removed from service with no automatic reclosing simulated. The following scenarios were simulated:

1) Three phase fault at Ajo and trip Ajo to Nelson Sharpe 345 kV
2) Three phase fault at Ajo and trip Ajo to Rio Hondo 345 kV
3) Three phase fault at Zorillo and trip Ajo to Zorillo 345 kV
4) Three phase fault at Ajo and trip Ajo to Sarita 345 kV
5) Three phase fault at Ajo and trip Ajo to Caballo 345 kV (2)
6) Phase to ground fault and trip Ajo to Caballo 345 kV and then Ajo to Zorillo 345 kV
7) Phase to ground fault and trip Ajo to Nelson Sharpe 345 kV and then Ajo to Sarita 345 kV

Fault MVAs for phase-to-ground faults associated with Cases 6 and 7 were sized to result in a positive sequence voltage in the 50-60 percent range during the fault.

Since the proposed wind farm location and connection point is along the transmission path connecting the Rio Grande Valley area to the remainder of the ERCOT system to the North, heavy import flow conditions were also considered for the 2014 year case.

No transient stability problems were identified in any of the simulations. The main performance issue is steady-state post-contingency voltage drop. The type and quantity of reactive compensation found to be necessary to maintain acceptable post-contingency voltage levels in the vicinity of the proposed wind farm is given in the above table.

The category C contingencies, Cases 6 and 7, cause post-contingency quasi-steady-state voltage regulation challenges due to the lengthy interconnection resulting from the combined loss of two lines, particularly the Sarita and Nelson Sharpe 345 kV transmission lines out of Ajo substation. The difficulties were addressed by adjusting capacitor bank switching time delays at Ajo.

Selected plots of bus voltage and SVC MVAR output versus time from among the more severe contingency scenarios are attached shown below in Figures 6 through 24.

Subsynchronous Resonance (SSR)

The location of the proposed wind farm will be connected to the Nelson Sharpe to Rio Hondo 345 kV transmission line which is series compensated at the Rio Hondo end. There is the potential that the wind farm could be radially fed through the series compensated Ajo to Rio Hondo 345 kV transmission for loss of the Ajo to Nelson Sharpe 345 kV transmission line. The series compensation could have potential SSR interaction with the wind farm generators tied to Ajo substation. AEP is concerned about the interaction of the converter controls and the transmission system. It is also important that Heartland understand any potential impact of interconnecting to a series compensated 345 kV transmission line. Heartland is responsible for the analysis and protection of their equipment as well as any damage that can occur on their side of the interconnect. AEP recognizes interconnecting to the transmission system with series compensated line is not a typical interconnection. The following are some of the issues for consideration by Heartland in their analysis.

1) SSR on Turbines
2) Resonance between 34.5 kV collector cable charging and converter controls
3) Self excitation with all of the 34.5 kV cable, when wind farm is separated from the transmission system

Heartland and their selected turbine manufacturer will need to take this into consideration and determine if the turbines are susceptible to any damaging interaction due to the close proximity of the series compensated Ajo to Rio Hondo 345 kV transmission line. Based on the data provided by Heartland and their turbine manufacturer, AEP has performed analysis and compared the results of the studies performed when the series capacitors were placed into service and with the connection of the new wind turbines. There was no impact to the rest of the system (TCC side of the interconnect) due to the interconnection of the of the wind farm turbines.

Cost Estimates

The cost estimates are split into the 6 different phases as shown in figures 3 - 6

Phase 1

Description	Dollars
Ajo 345 kV Substation	$ 22,000,000
Rio Hondo Substation upgrades	$ 350,000
Nelson Sharpe Substation upgrades	$ 350,000
Sarita 345 kV Substation	$ 11,000,000
Ajo to Zorillo 345 kV transmission line (16 Miles)	$ 24,000,000
Sarita to Zorillo 345 kV transmission line (10 Miles)	$ 15,000,000
Subtotal	**$ 72,700,000**

Phase 2 – Phase 4

Description	Dollars
Ajo to Sarita 345 kV transmission line (30 Miles)	$ 45,000,000
Subtotal	**$ 45,000,000**

Phase 5

Description	Dollars
Ajo 345 Substation +/- 300 MVar SVCs, 2-200 MVar 345 kV Shunt Capacitor Banks	$ 54,000,000

Zorillo Substation 2-100 MVar 345 kV Shunt Capacitor Banks	$ 4,000,000
Subtotal	**$ 58,000,000**

Phase 6

Description	Dollars
Ajo 345 Substation, Caballo 345 kV Transmission line	$ 4,000,000
Ajo to Caballo 345 kV Transmission line (22 Miles)	$ 27,500,000
Caballo 345 kV Substation	$ 22,000,000
Lon Hill Substation upgrades	$ 350,000
North Edinburg Substation upgrades	$ 350,000
Subtotal	**$ 54,200,000**
Total	**$229,900,000**

Conclusions

Based on the steady state, short circuit, and stability analysis, the addition of the 1200 MW of new generation is the maximum the Ajo to Nelson Sharpe and Ajo to Rio Hondo 345 kV transmission lines can support and meet all applicable NERC, ERCOT, and TCC planning criteria. This project will require the construction of a new Ajo 345 kV substation, a 46 mile double circuit capable 345 kV transmission lines loop from Ajo to the wind farm facility, and a new Sarita 345 kV wind farm substation. The dynamic reactive support required is dependant on the turbine selection and once There was no impact to the rest of the system (TCC side of the interconnect) due to the interconnection of the of the wind farm turbines to the Ajo to Rio Hondo series compensated 345 kV transmission line. To support additional generation greater than 1200 MW, the system improvements mentioned above in the CREZ section will be required.

Figure 1 Kenedy County Area Transmission System

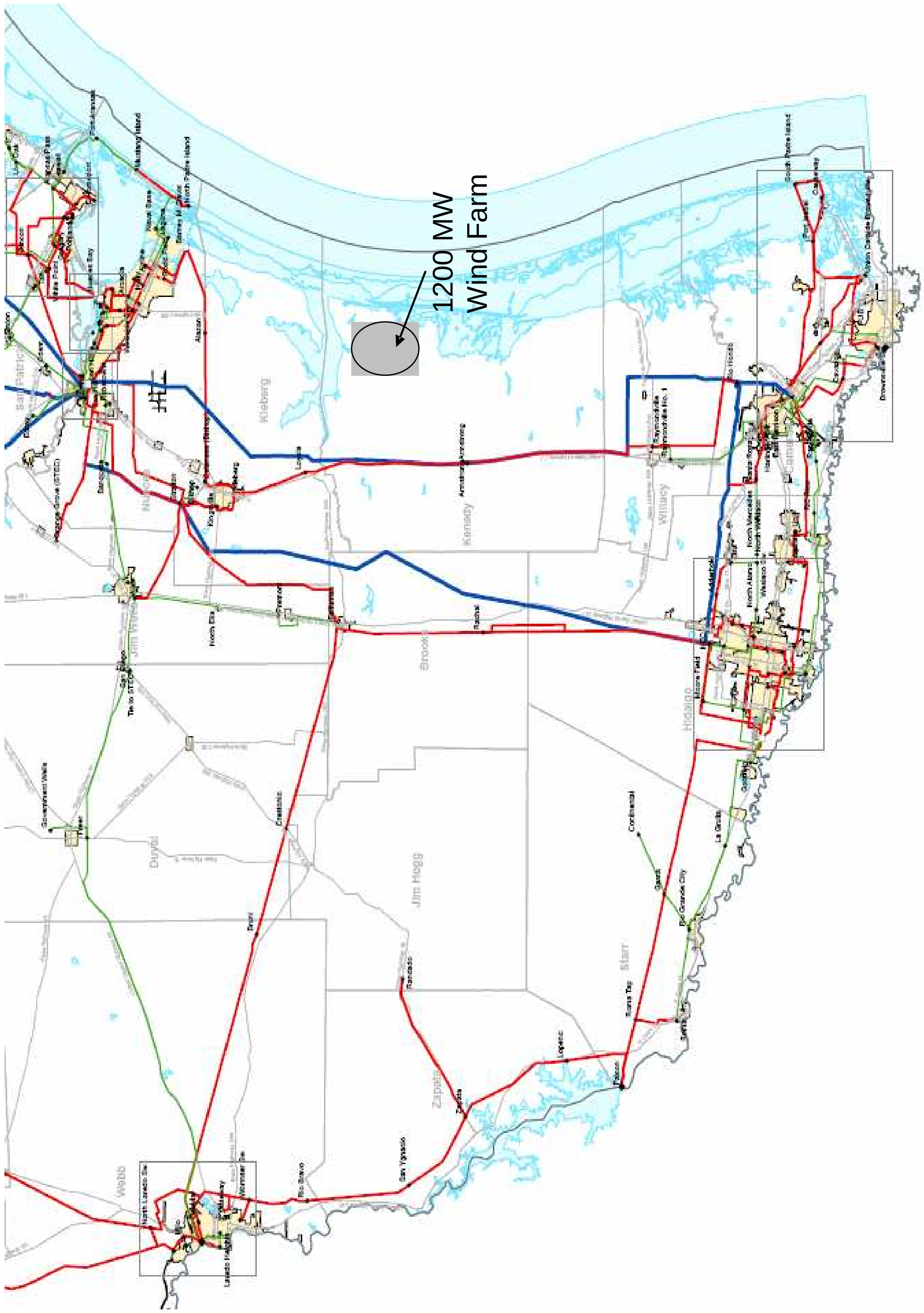

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Figure 2 CREZ Zone 24 Proposed Transmission Improvements

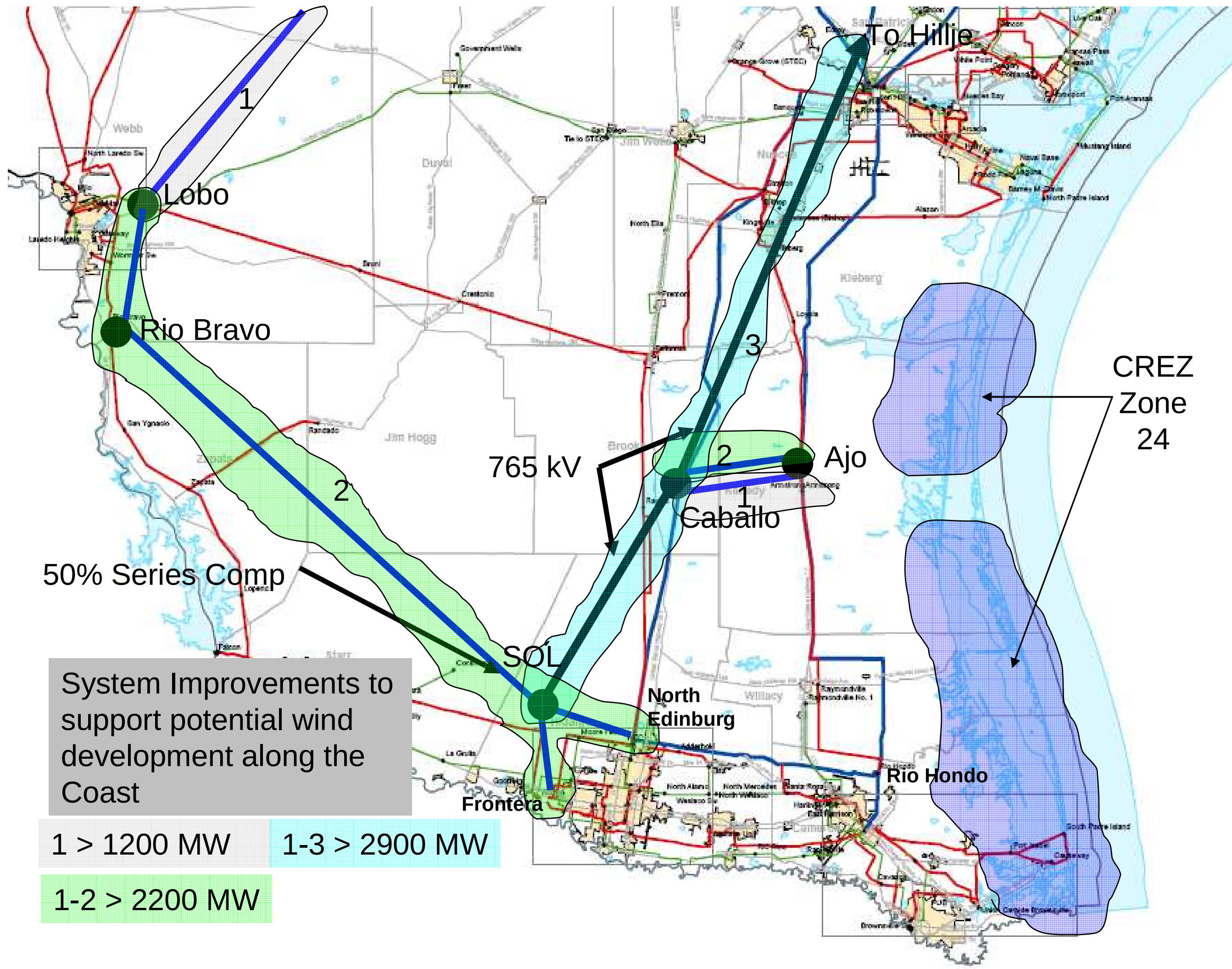

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Figure 3 Ajo and Sarita 345 kV Substations Phase 1 Improvements

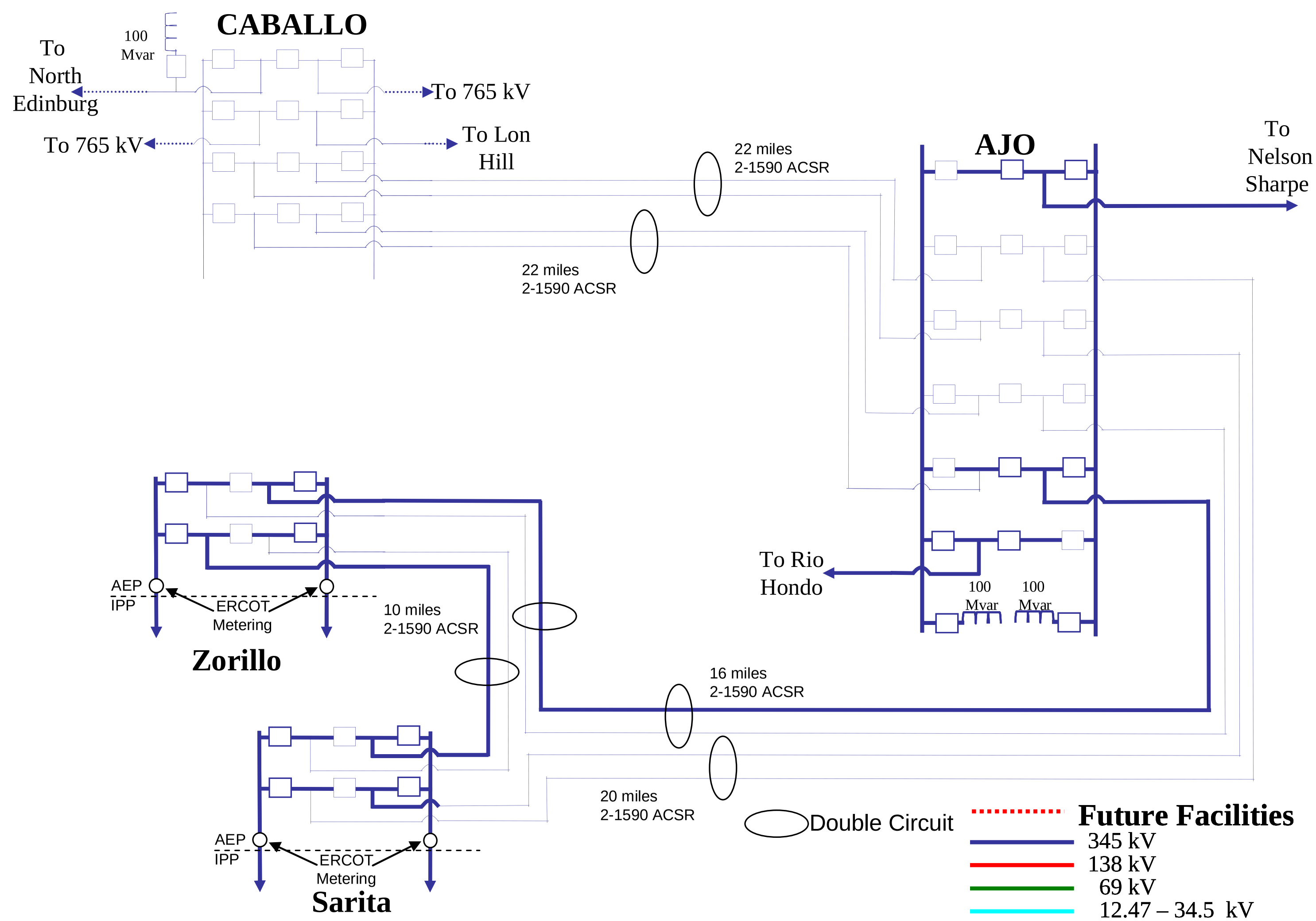

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Figure 4 Ajo and Sarita 345 kV Substations Phases 2-4 Improvements

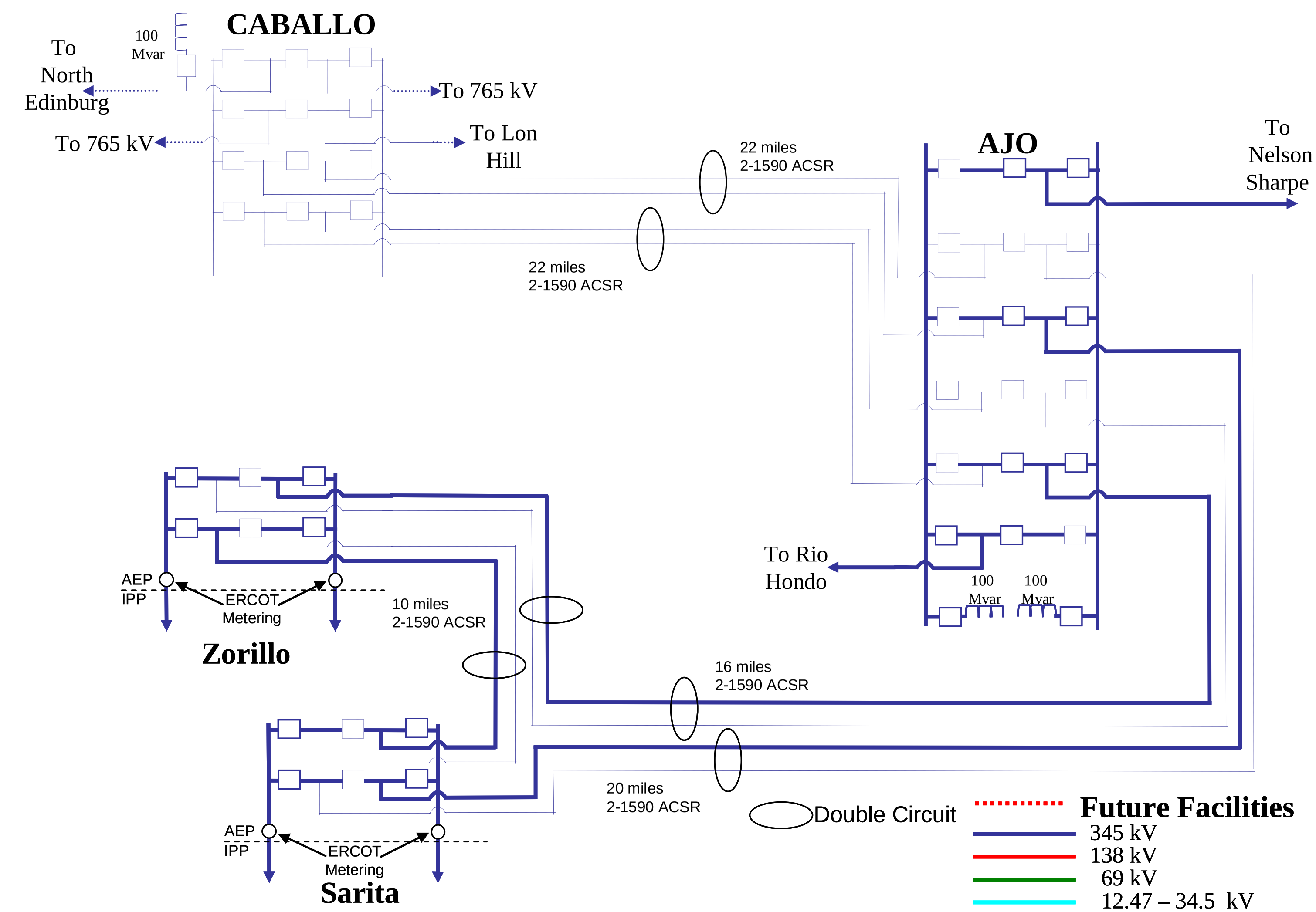

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Figure 5 Ajo and Sarita 345 kV Substations Phase 5 and 6 Improvements

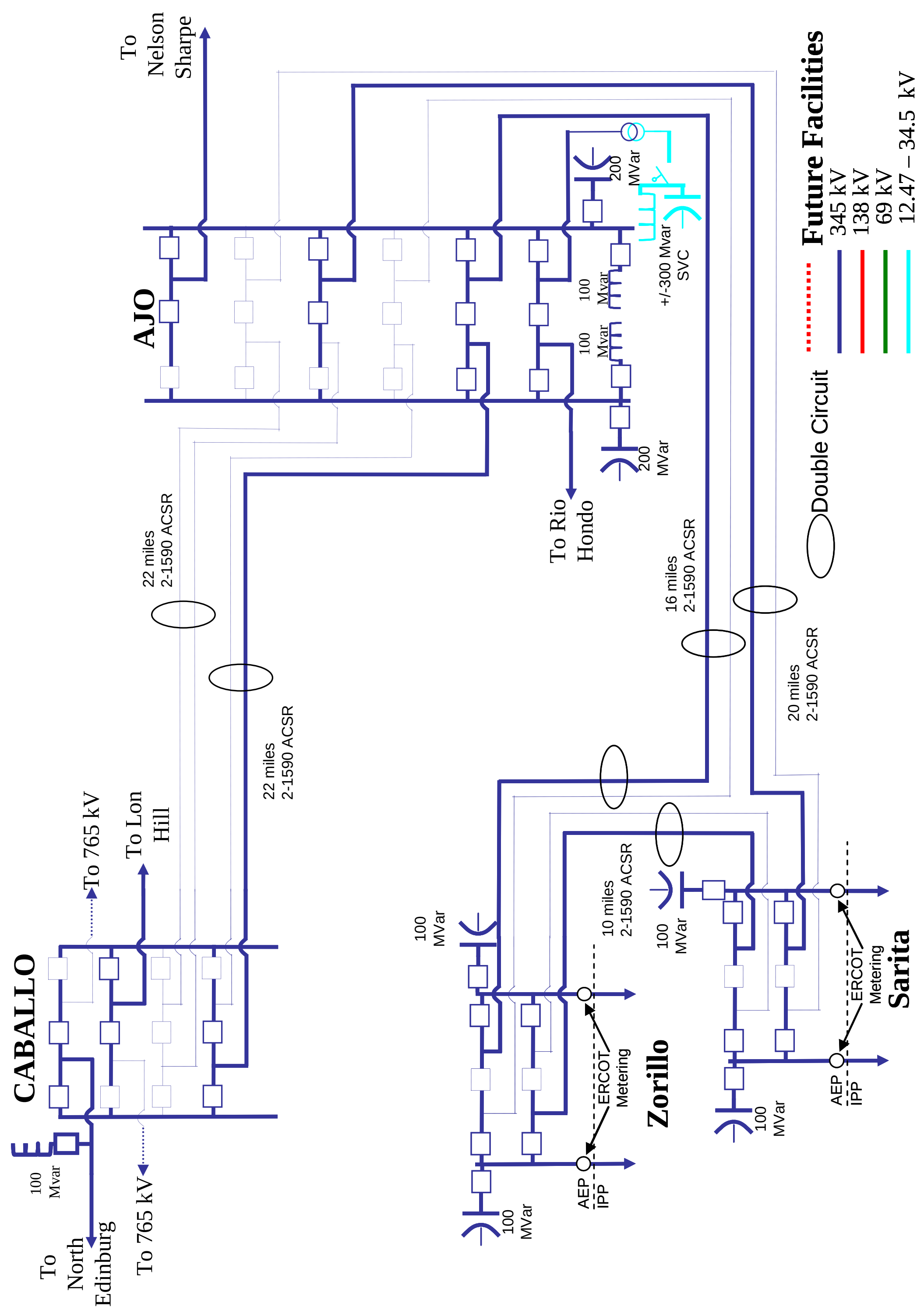

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Figure 6 Case 1 – Three phase fault at Ajo 345 kV with normal clearing removing Ajo-Nelson Sharpe line 2010 345 kV Bus Voltages

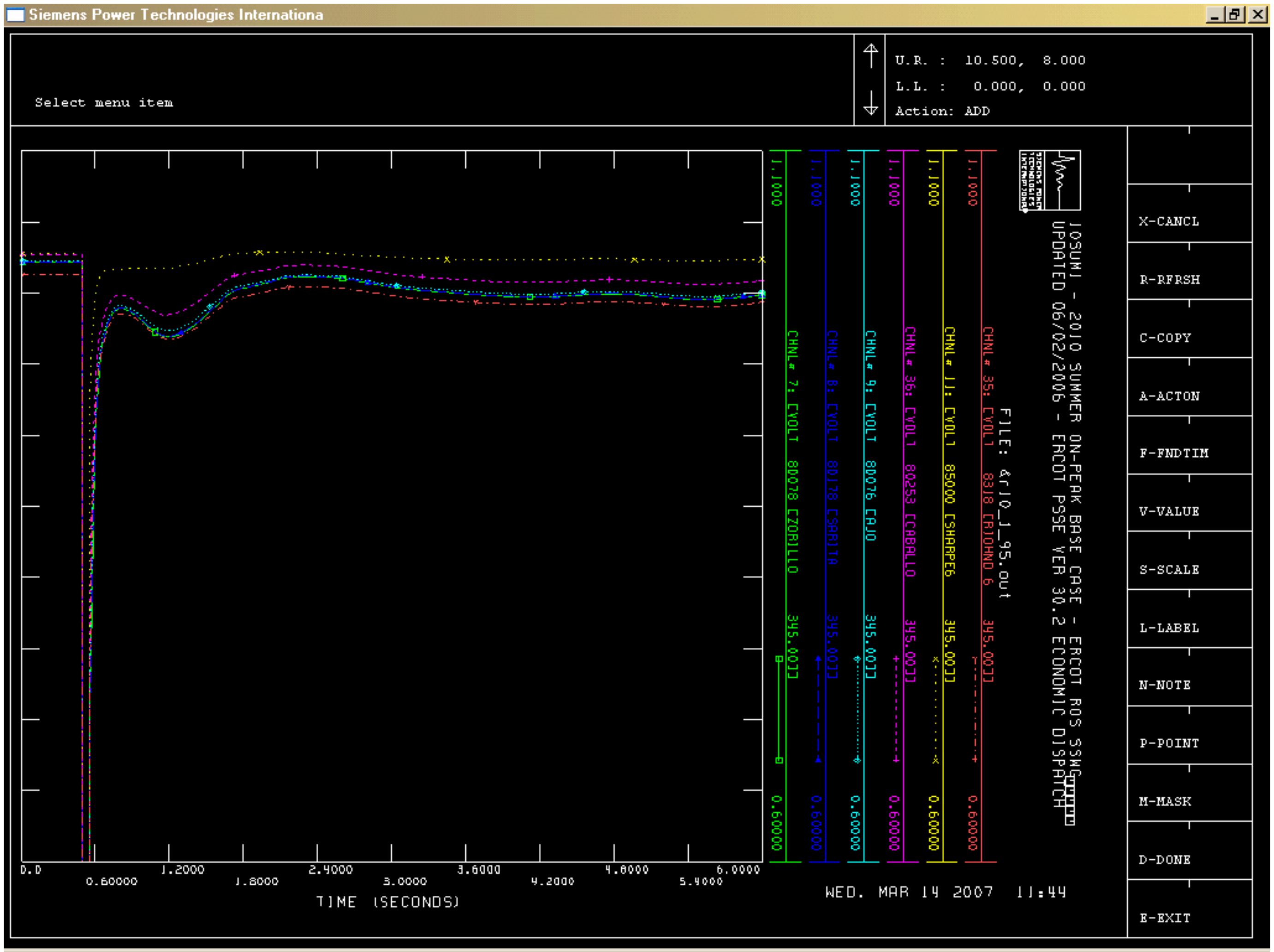
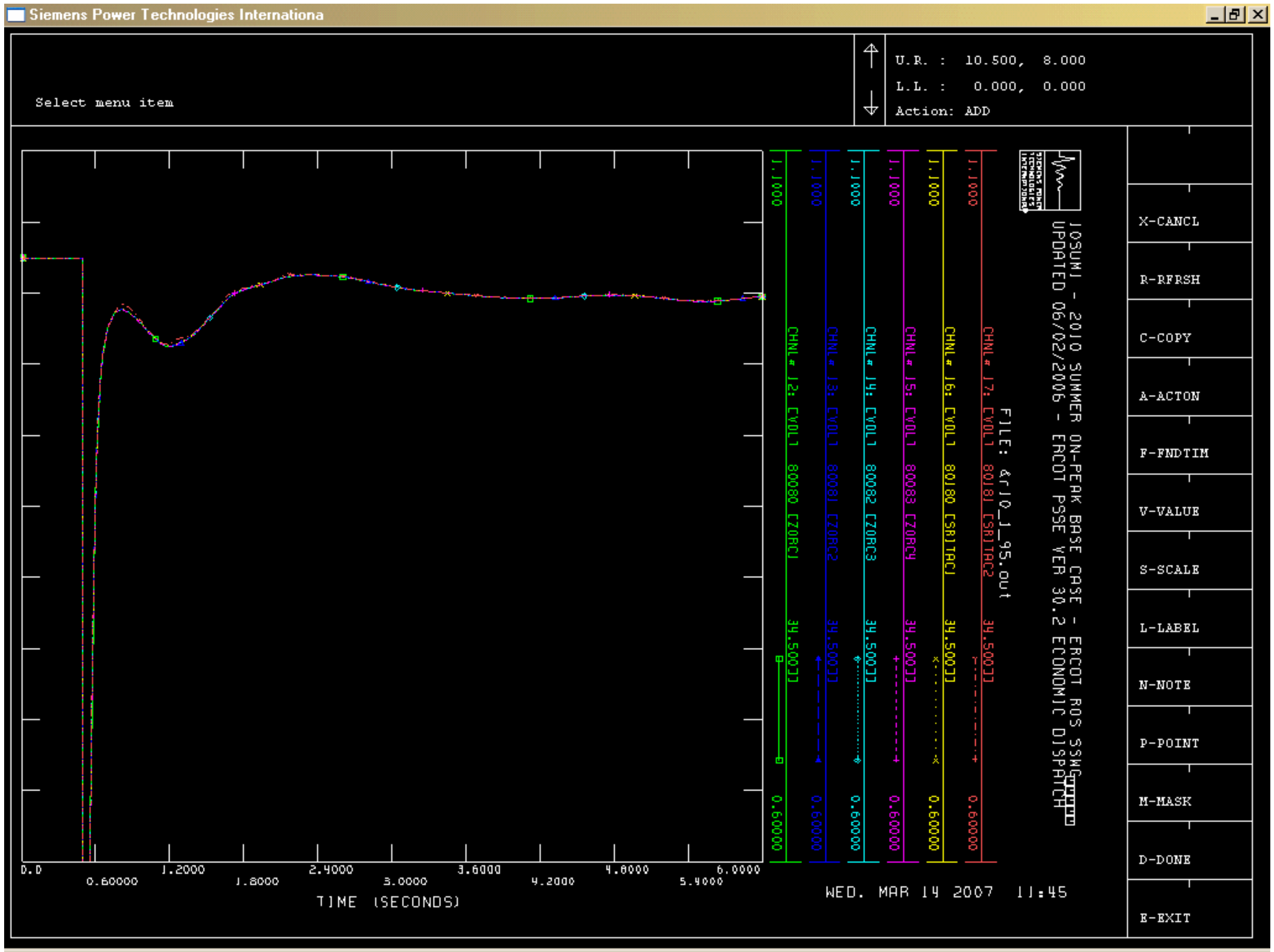


Figure 7 Case 1 – Three phase fault at Ajo 345 kV with normal clearing removing Ajo-Nelson Sharpe line 2010 34.5 kV Bus Voltages



17

Figure 8 Case 3 – Three phase fault at Zorillo 345 kV with normal clearing removing Ajo-Zorillo line 2010 345 kV Bus Voltages

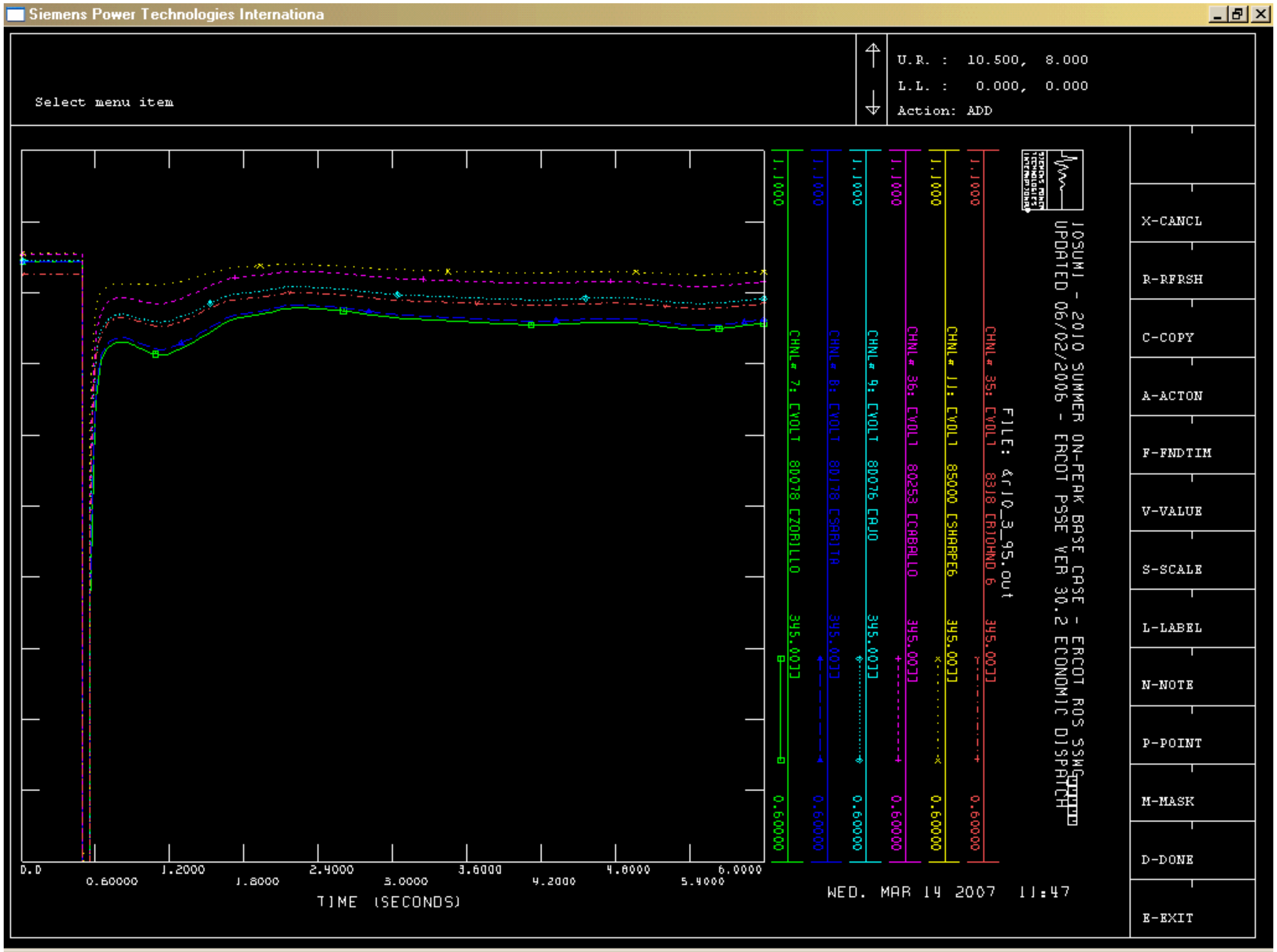


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Figure 9 Case 3 – Three phase fault at Zorillo 345 kV with normal clearing removing Ajo-Zorillo line 2010 34.5 kV Bus Voltages

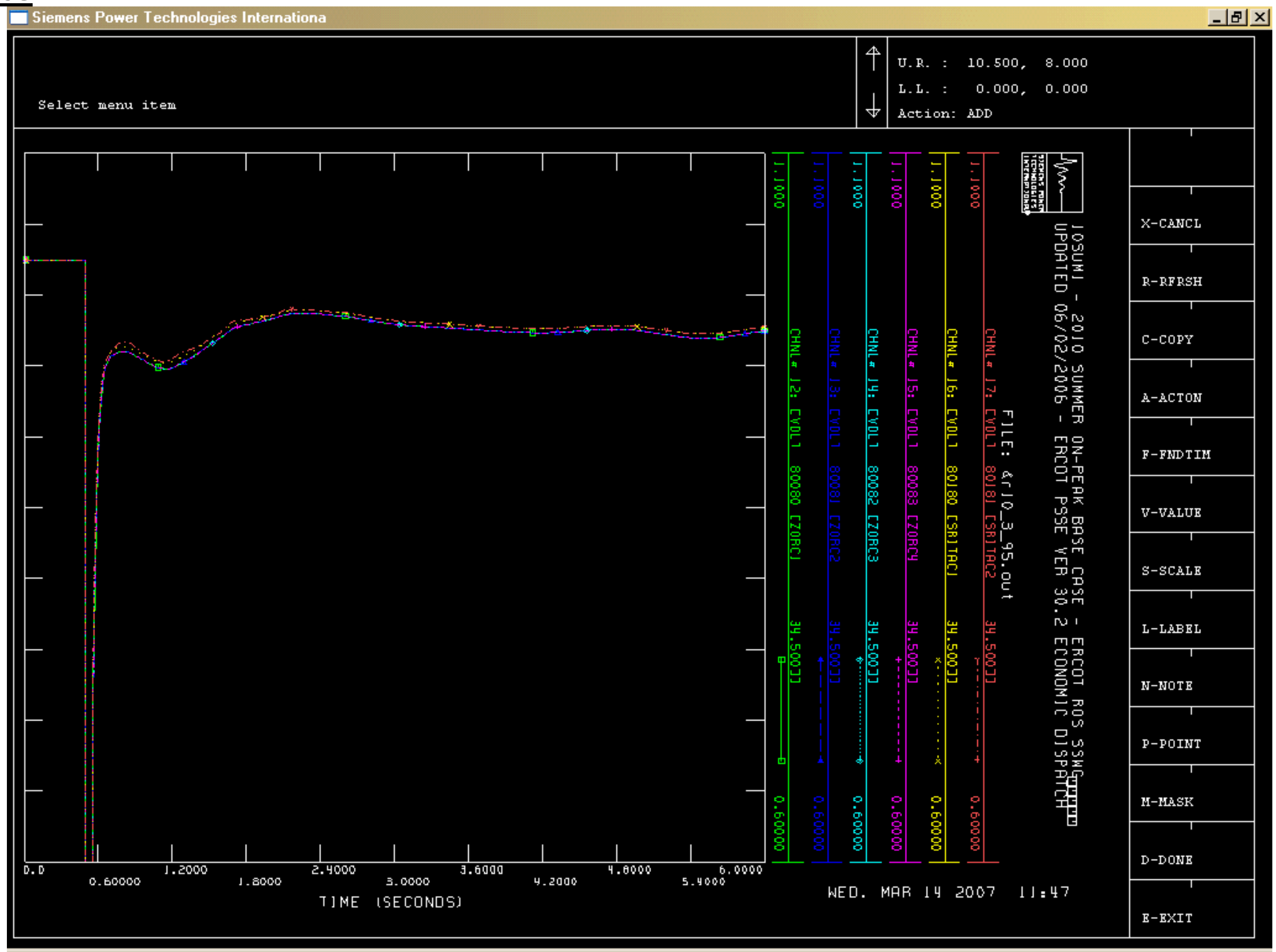

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Figure 10 Case 3 – Three phase fault at Zorillo 345 kV with normal clearing removing Ajo-Zorillo line 2011 SVC MVAR Output

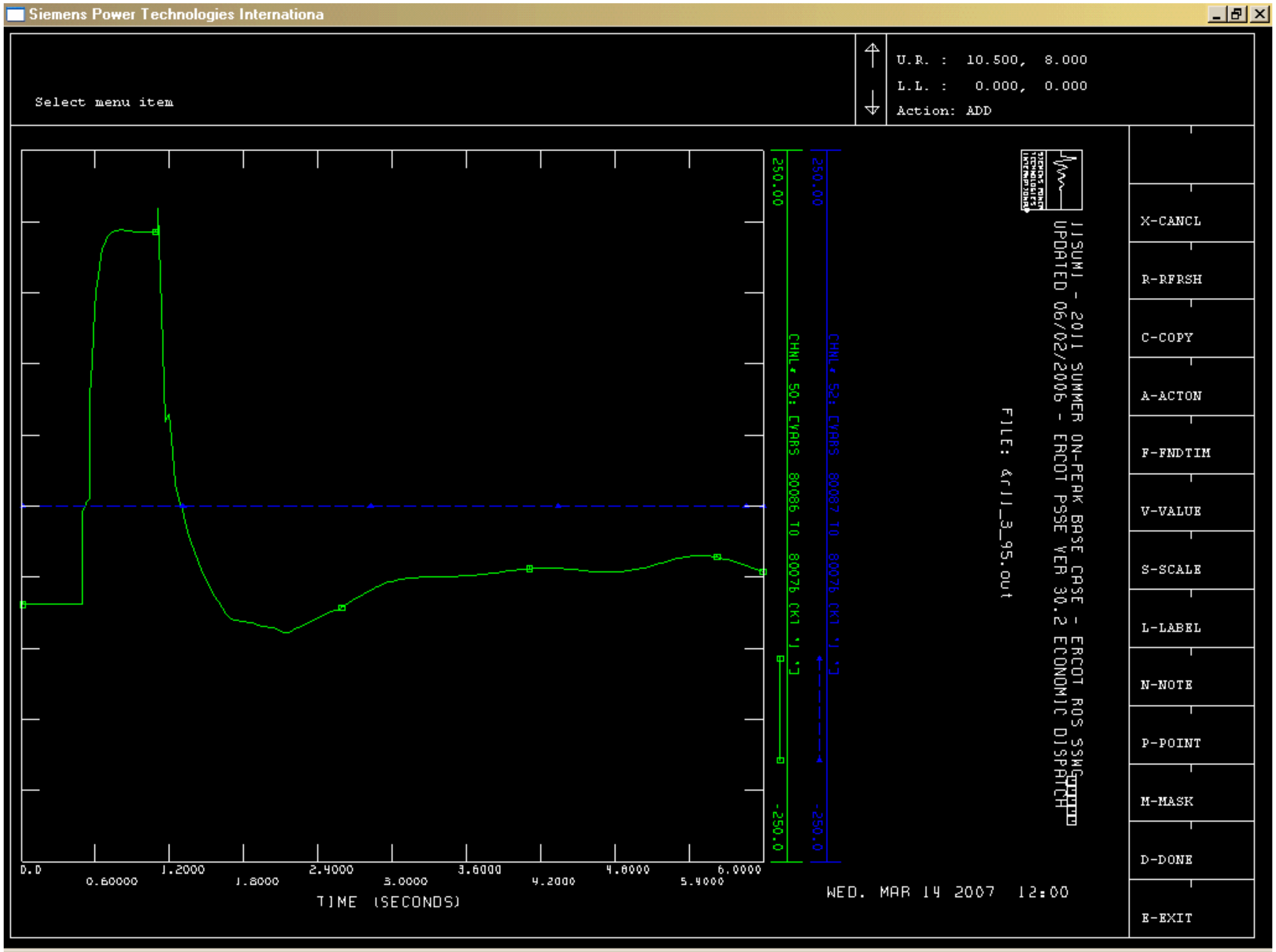

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Figure 11 Case 3 – Three phase fault at Zorillo 345 kV with normal clearing removing Ajo-Zorillo line 2011 345 kV Bus Voltages

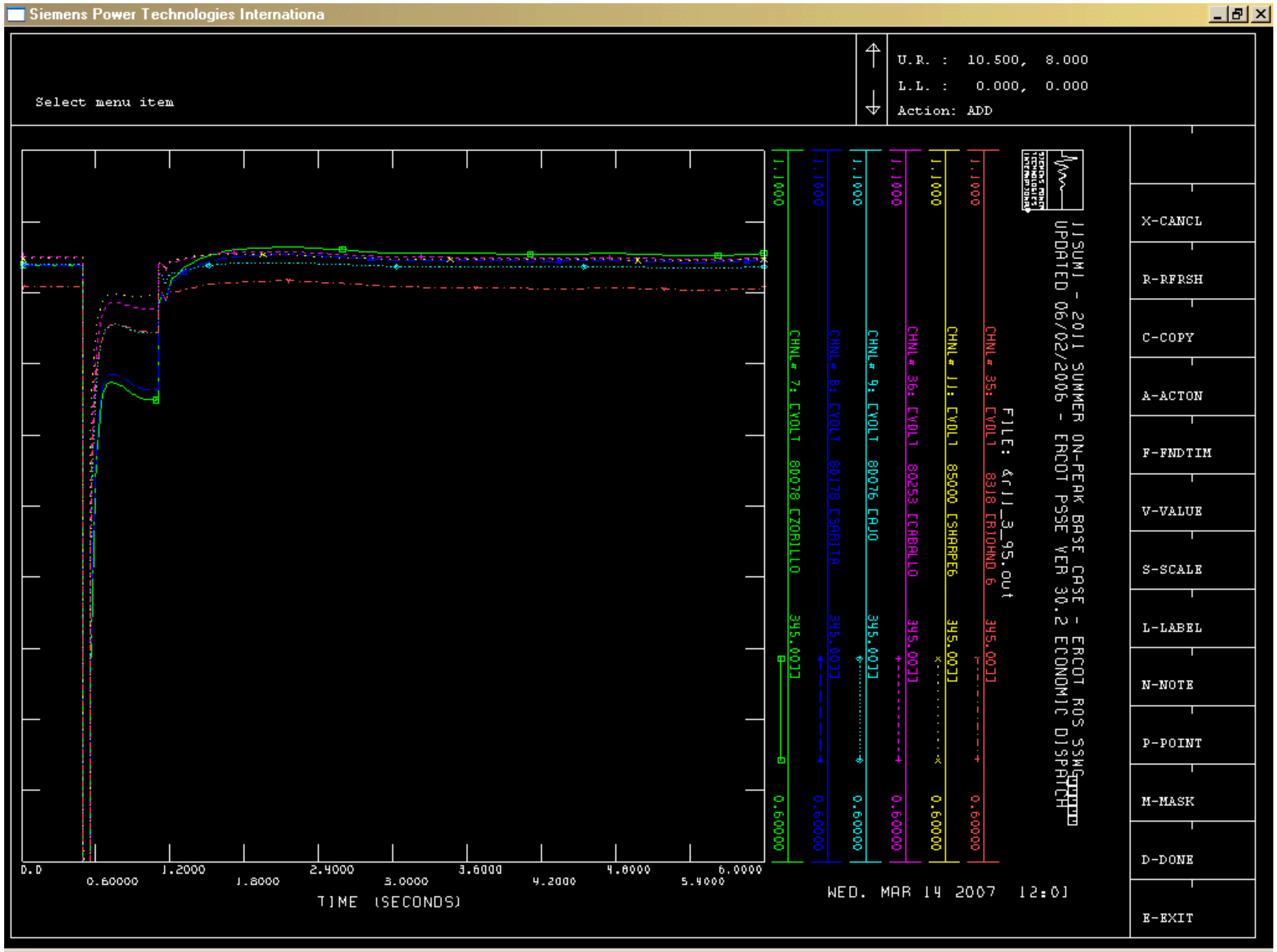

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Figure 12 Case 3 – Three phase fault at Zorillo 345 kV with normal clearing removing Ajo-Zorillo line 2011 34.5 kV Bus Voltages

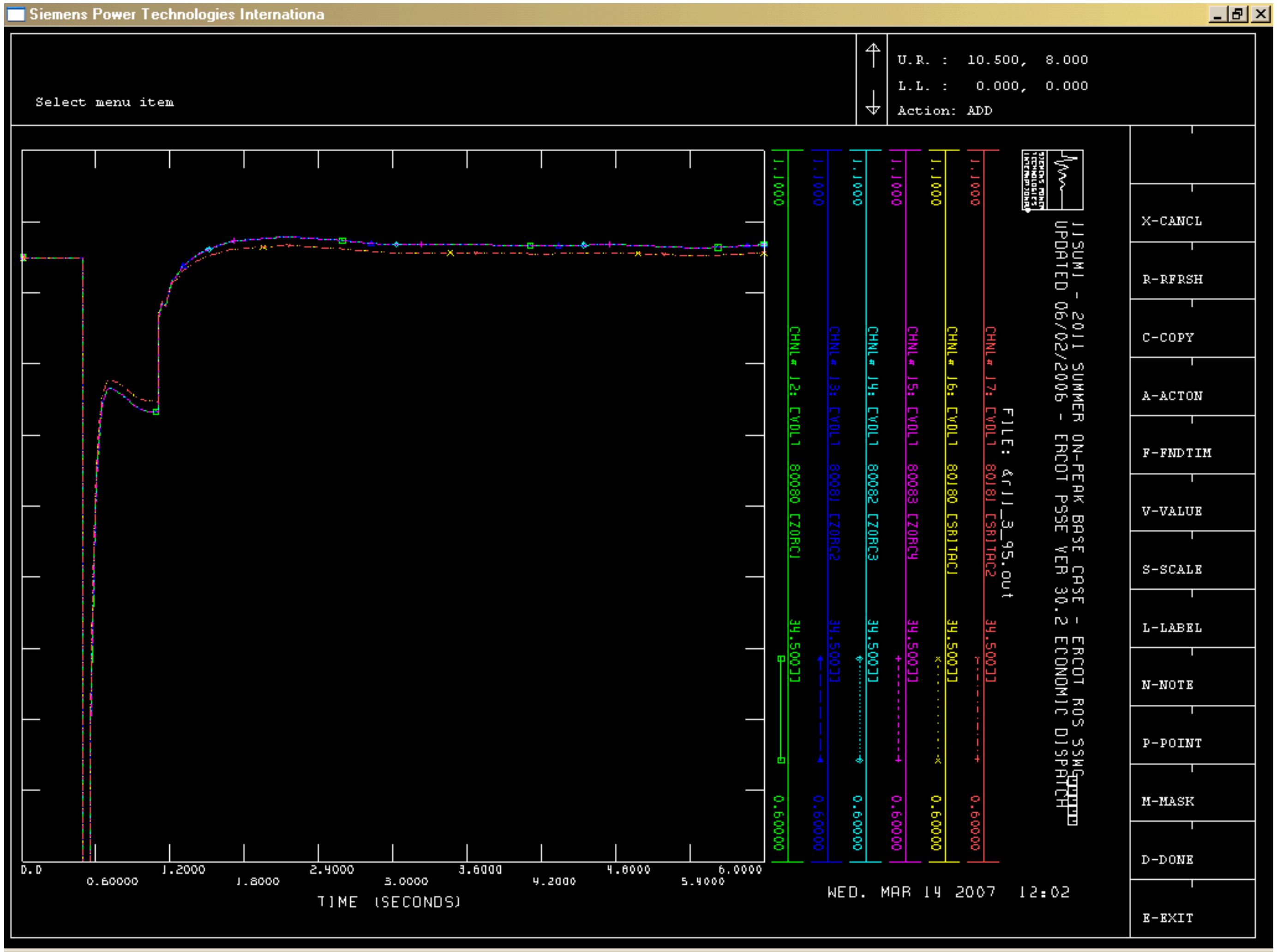

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Figure 13 Case 6 – Phase to ground fault at Ajo 345 kV with delayed clearing removing Ajo-Caballo and Ajo-Zorillo lines 2012 SVC MVAR Output

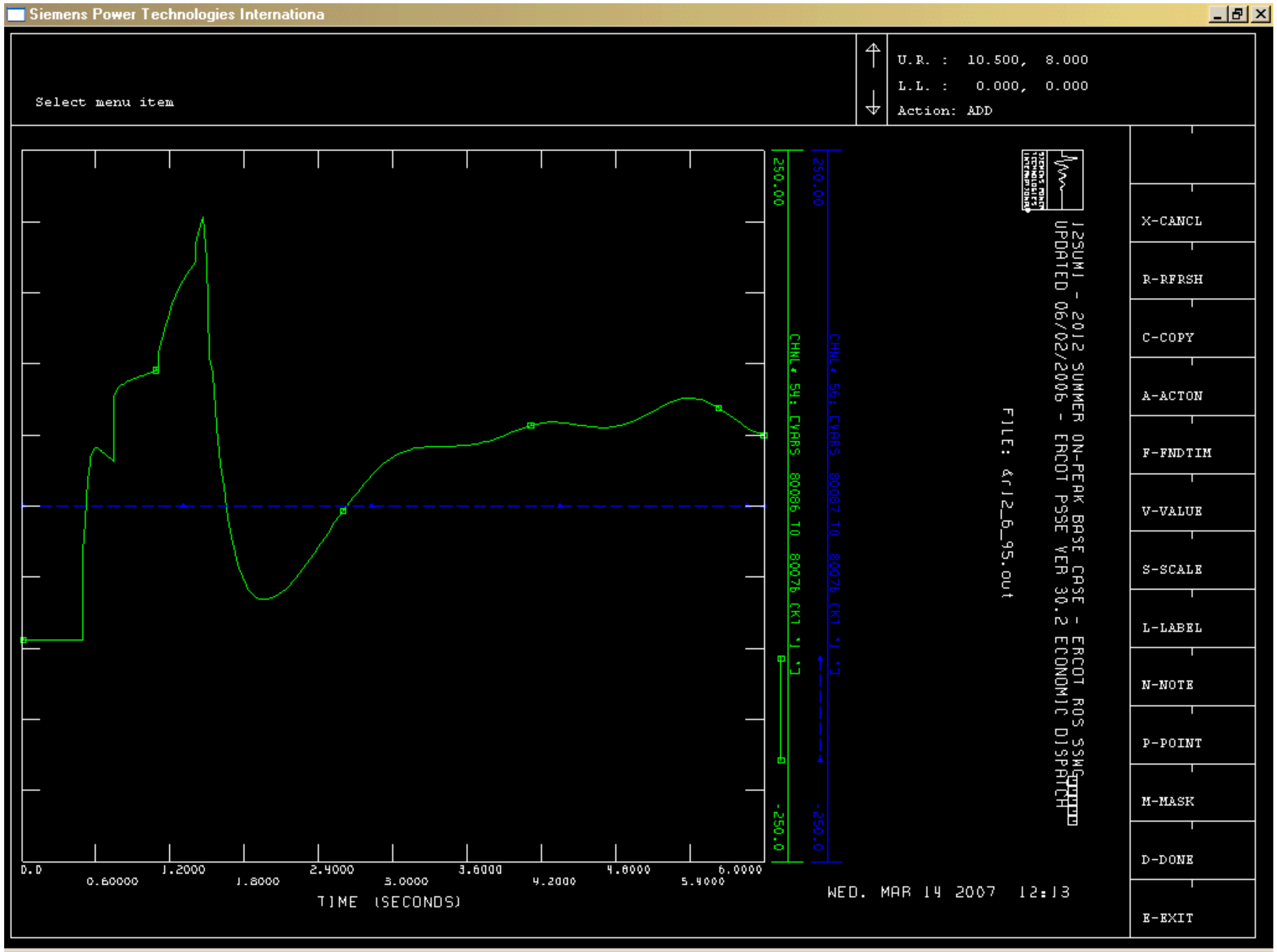

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Figure 14 Case 6 – Phase to ground fault at Ajo 345 kV with delayed clearing removing Ajo-Caballo and Ajo-Zorillo lines 2012 345 kV Bus Voltages

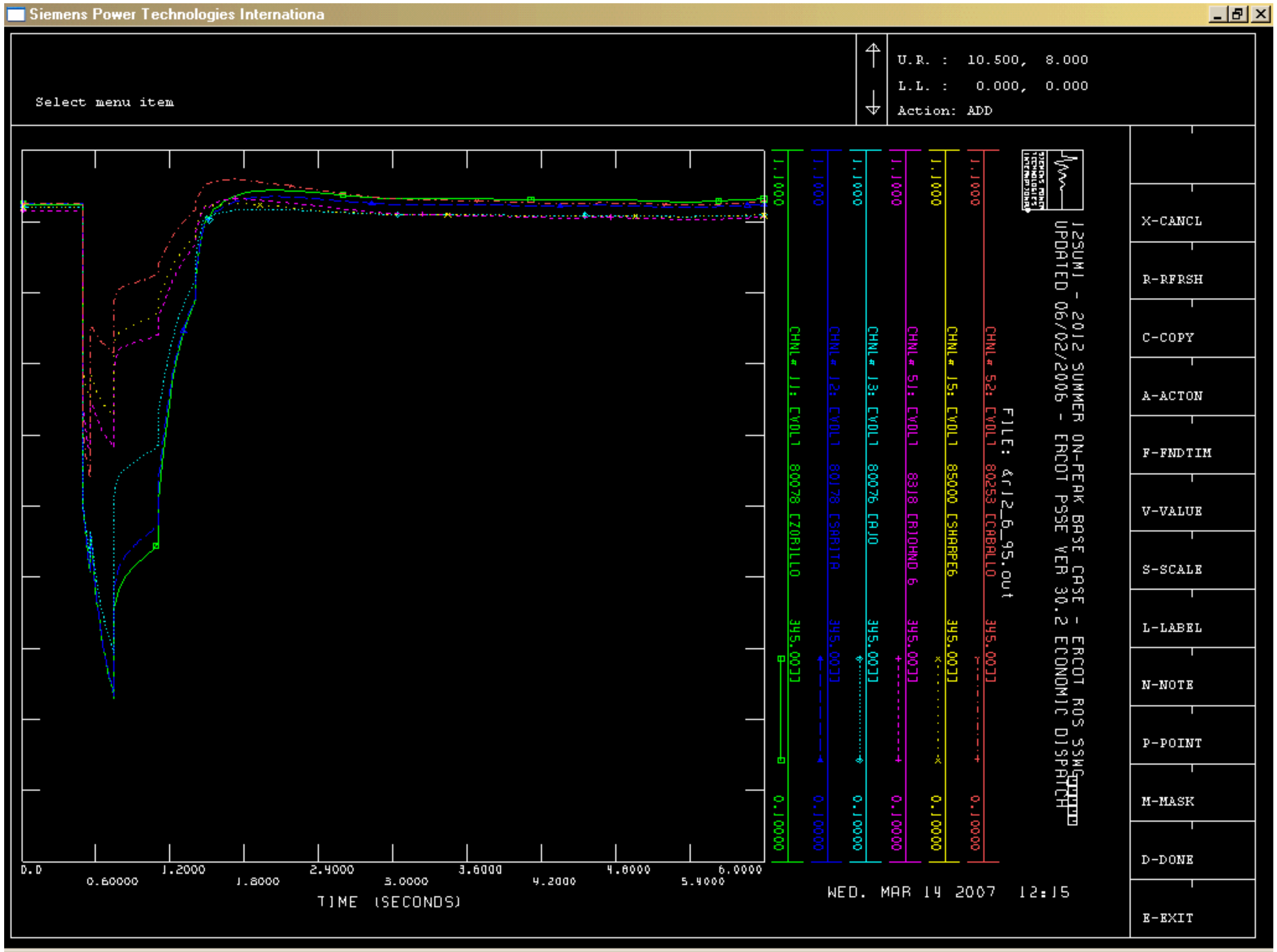

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Figure 15 Case 6 – Phase to ground fault at Ajo 345 kV with delayed clearing removing Ajo-Caballo and Ajo-Zorillo lines 2012 34.5 kV Bus Voltages

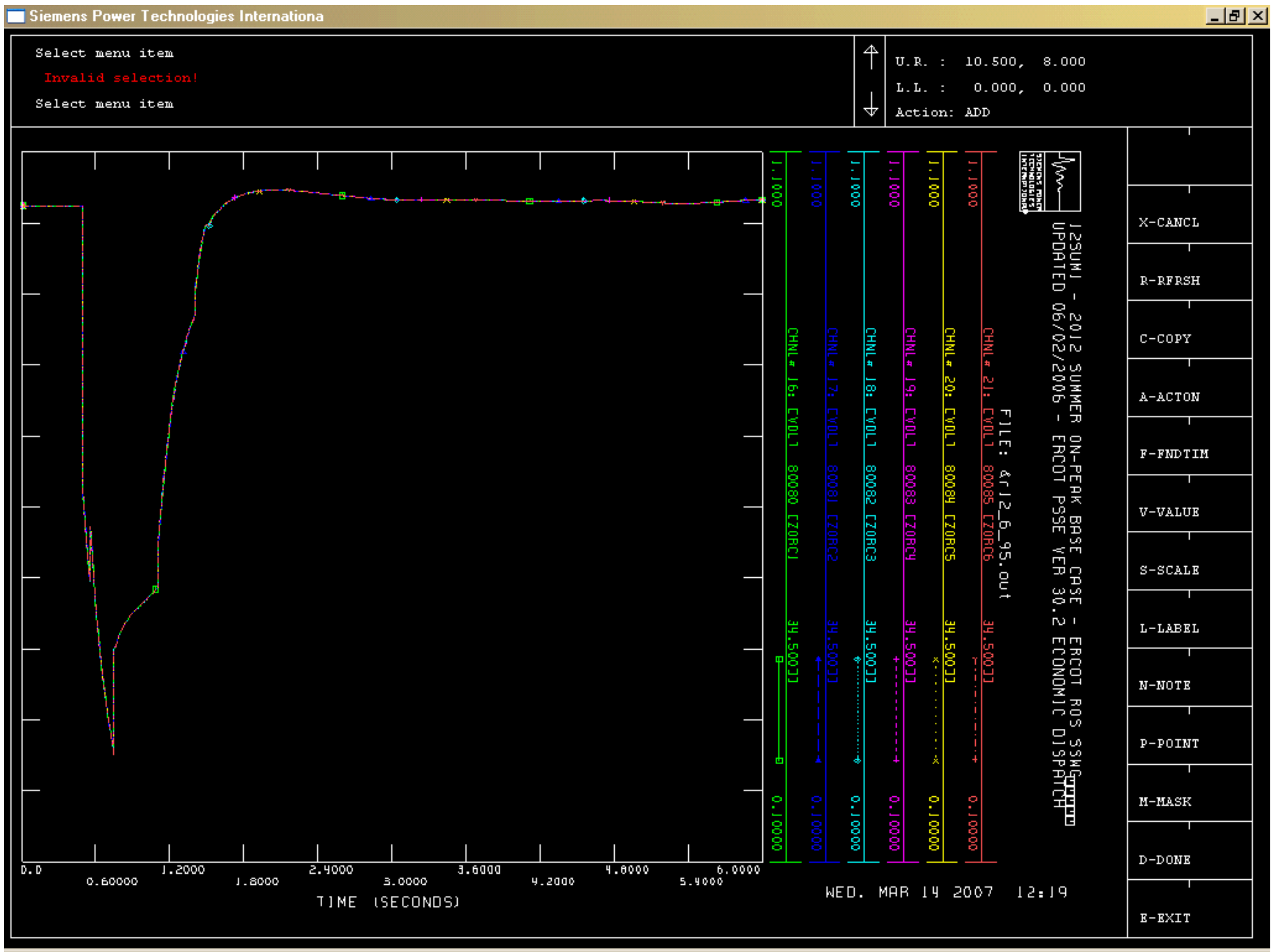

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Figure 16 Case 7 – Phase to ground fault at Ajo 345 kV with delayed clearing removing Ajo-Nelson Sharpe and Ajo-Sarita lines 2012 SVC MVAR Output

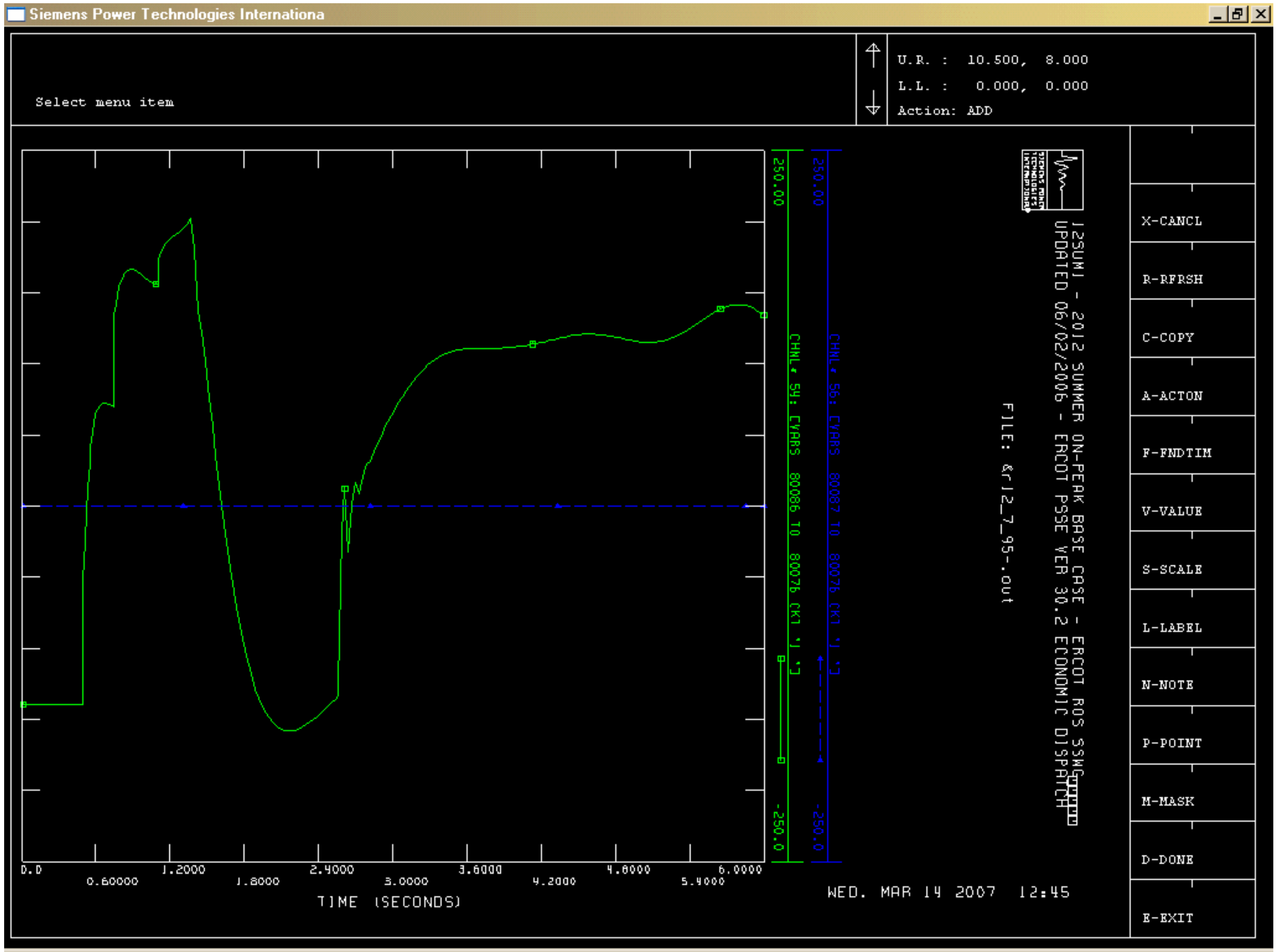

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Figure 17 Case 7 – Phase to ground fault at Ajo 345 kV with delayed clearing removing Ajo-Nelson Sharpe and Ajo-Sarita lines 2012 345 kV Bus Voltages

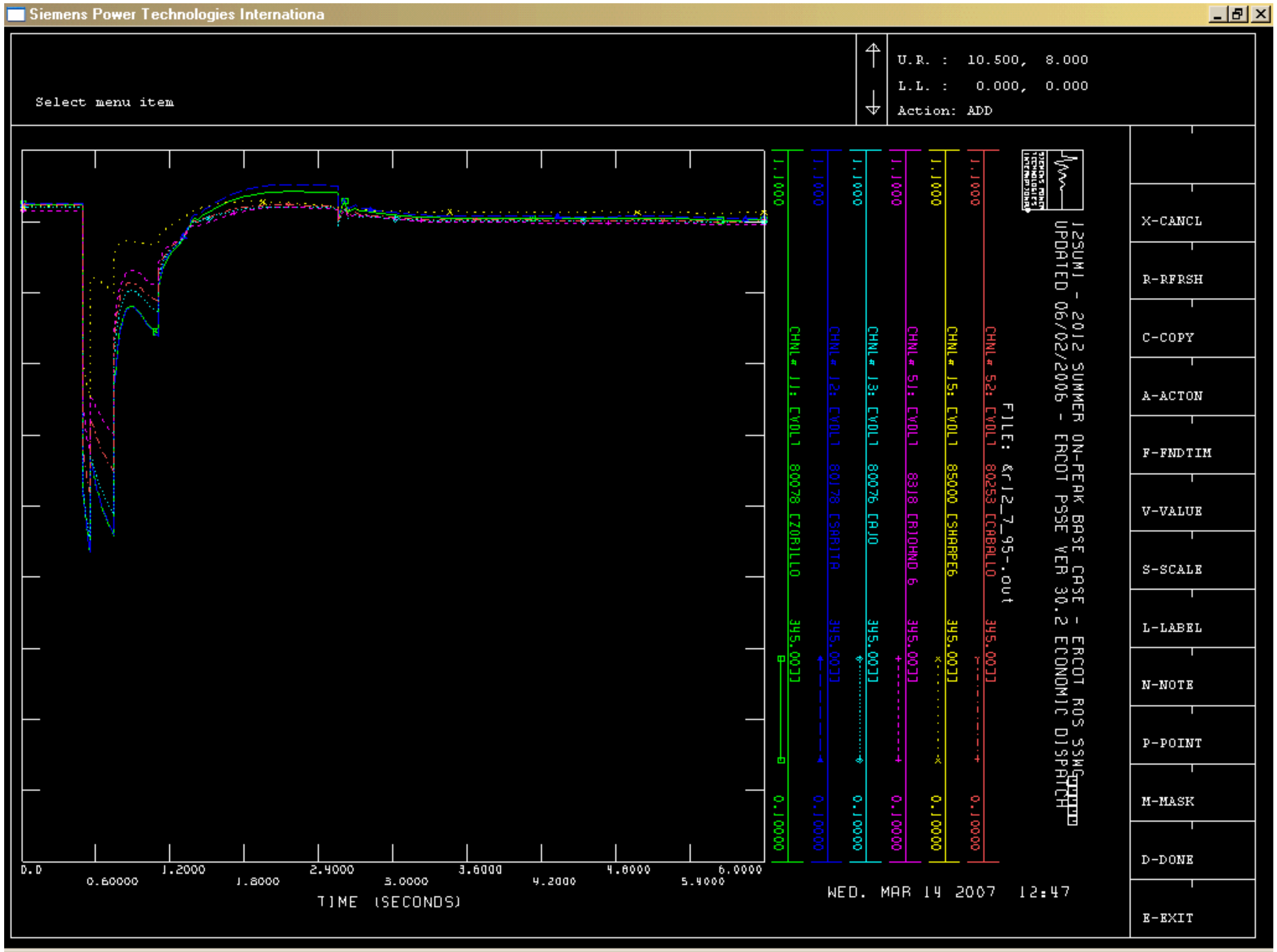

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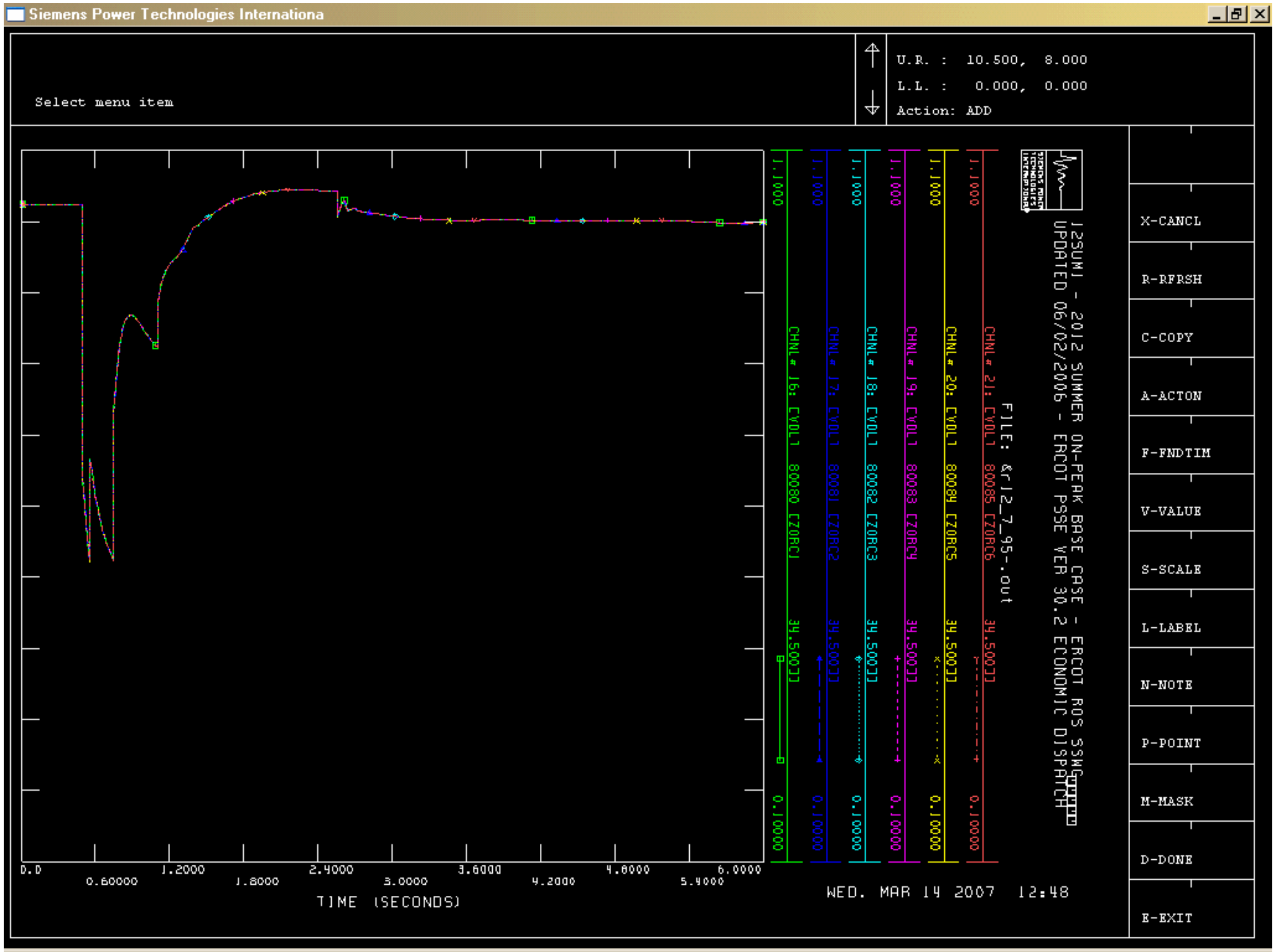
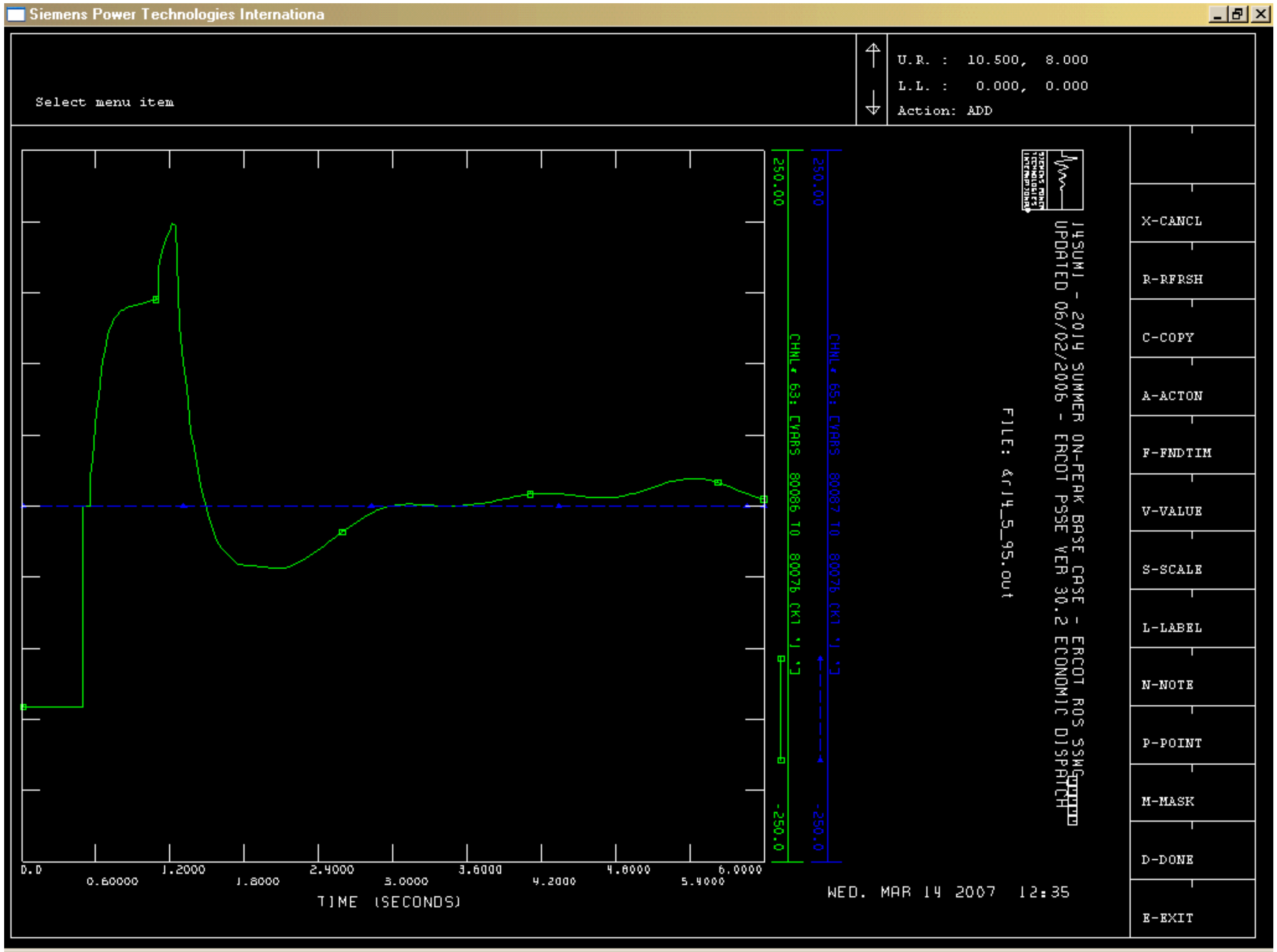
Figure 18 Case 7 – Phase to ground fault at Ajo 345 kV with delayed clearing removing Ajo-Nelson Sharpe and Ajo-Sarita lines 2012 34.5 kV Bus Voltages



28

Figure 19 Case 5 – Three phase fault at Ajo 345 kV with normal clearing removing both Ajo-Caballo lines 2014 SVC MVAR Output



29

Figure 20 Case 5 – Three phase fault at Ajo 345 kV with normal clearing removing both Ajo-Caballo lines 2014 345 kV Bus Voltages

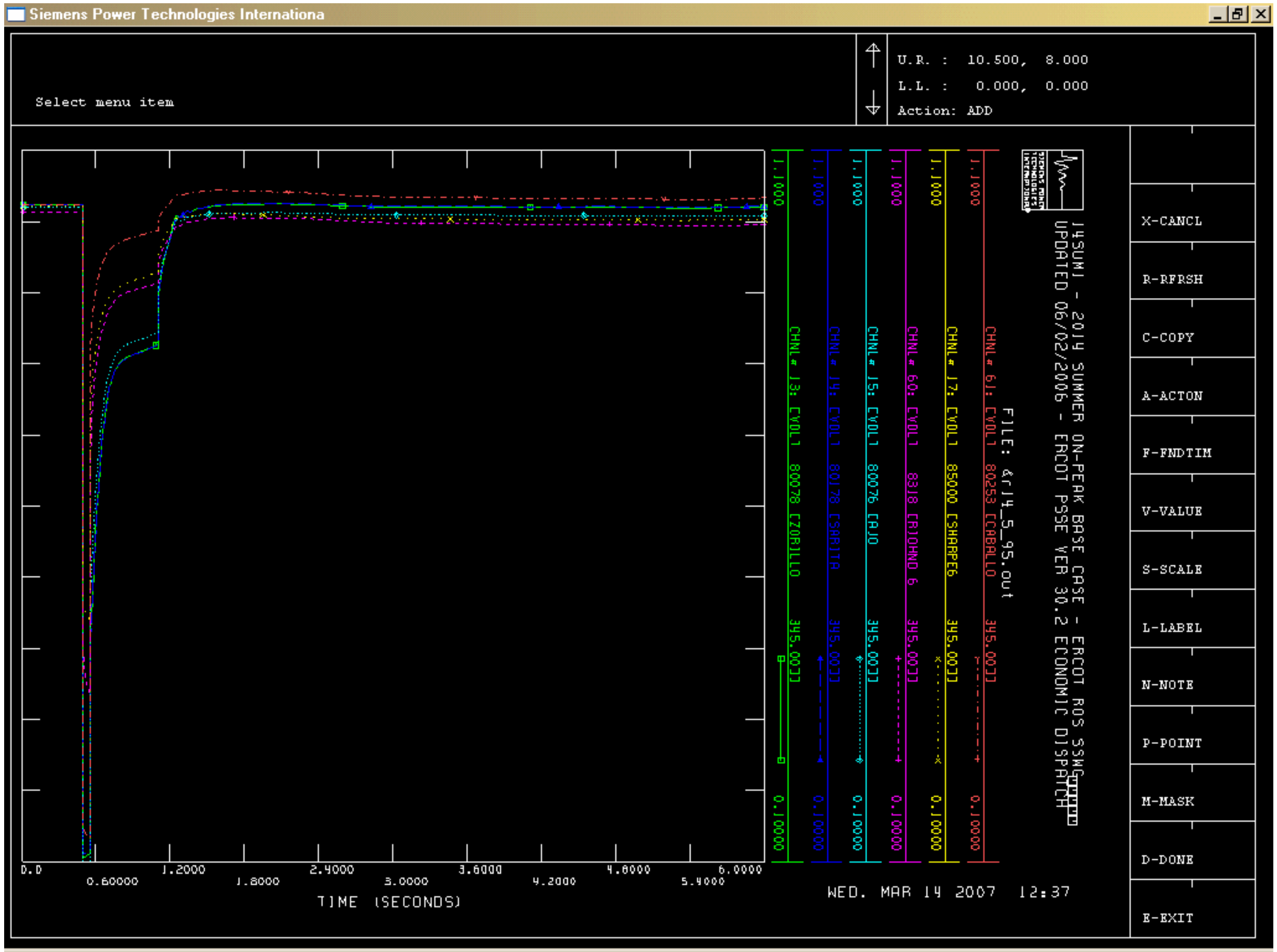


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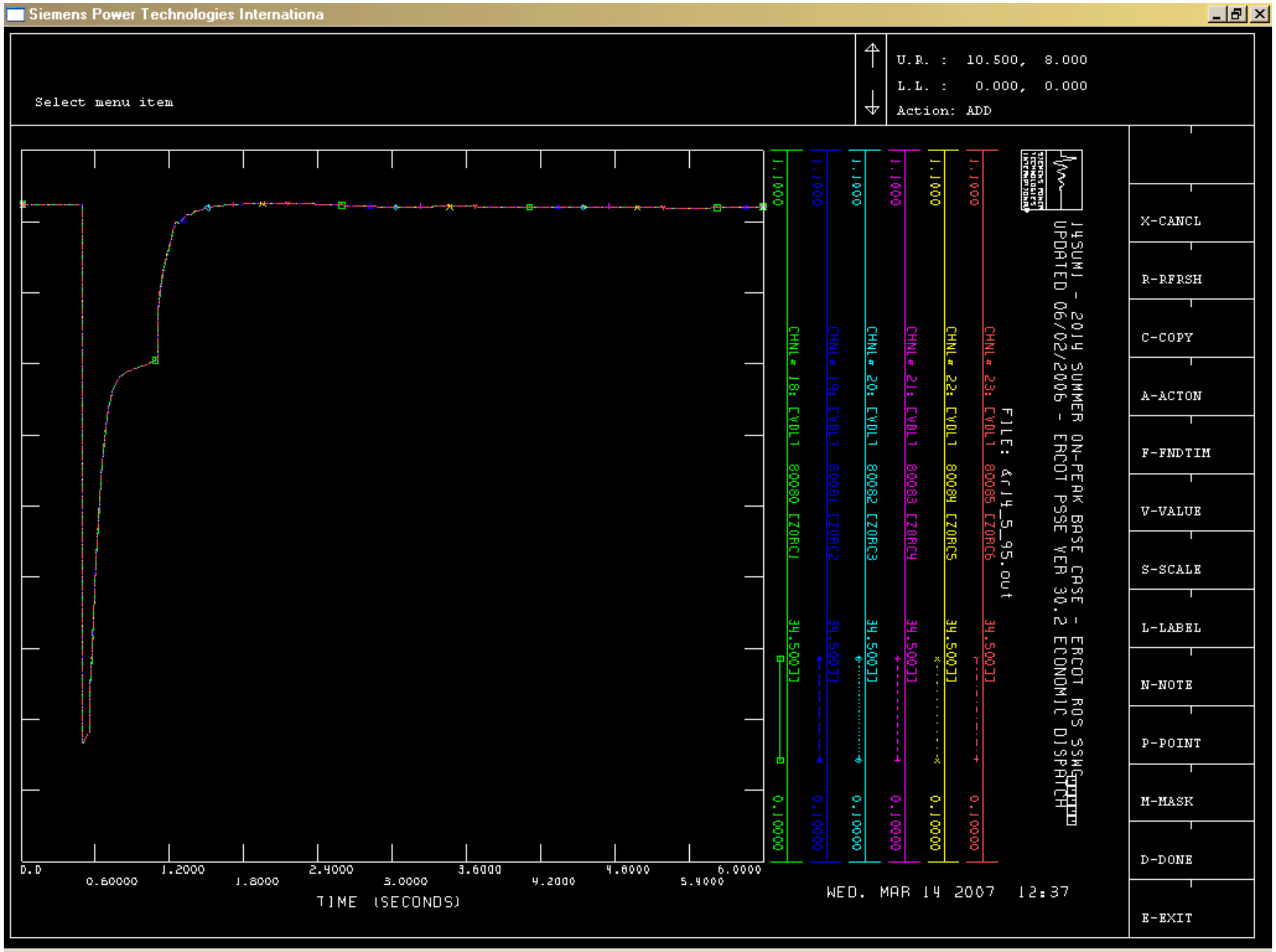
Figure 21 Case 5 – Three phase fault at Ajo 345 kV with normal clearing removing both Ajo-Caballo lines 2014 34.5 kV Bus Voltages



31

Figure 22 Case 7 – Phase to ground fault at Ajo 345 kV with delayed clearing removing Ajo-Nelson Sharpe and Ajo-Sarita lines 2014 SVC MVAR Output

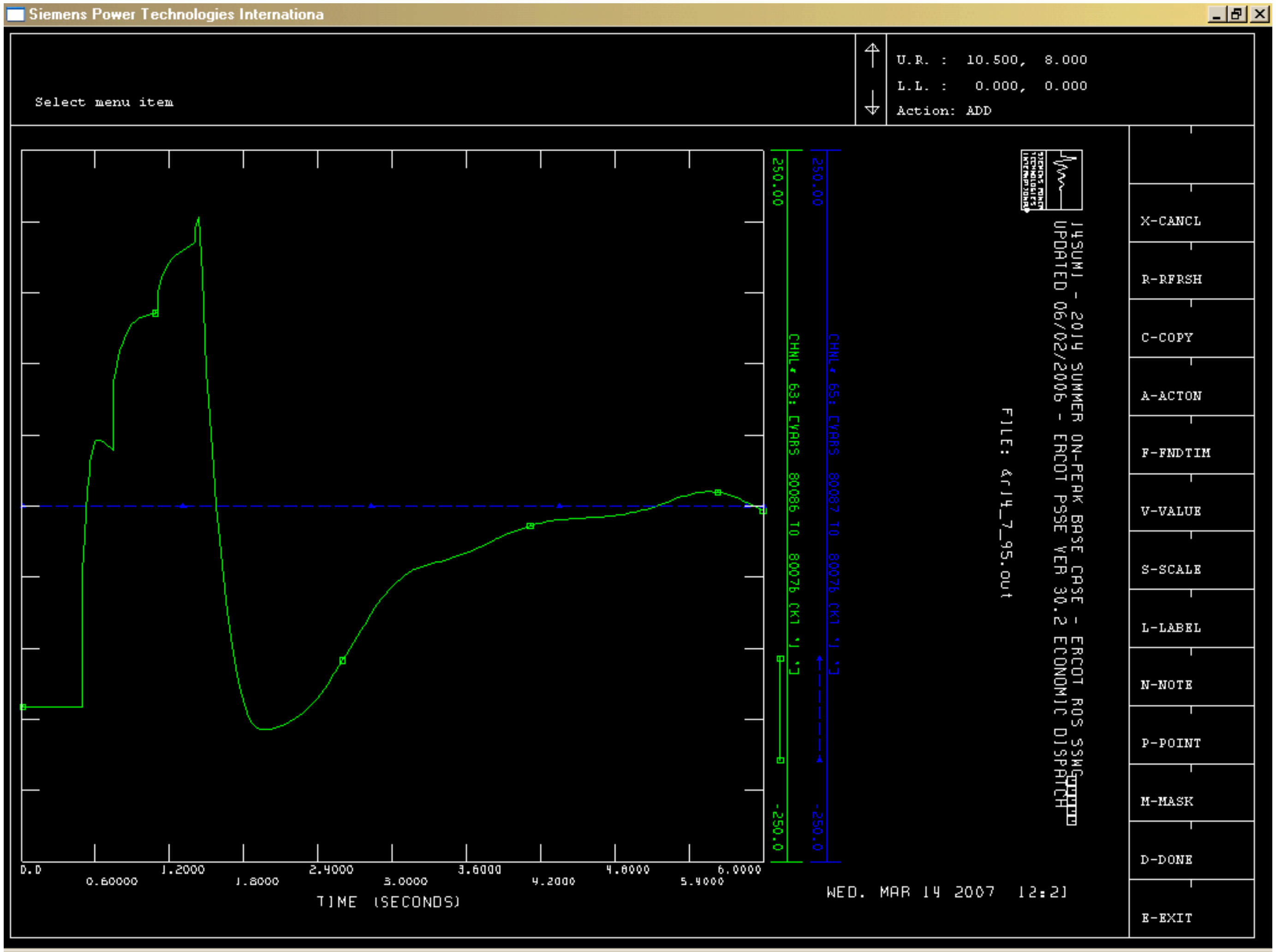


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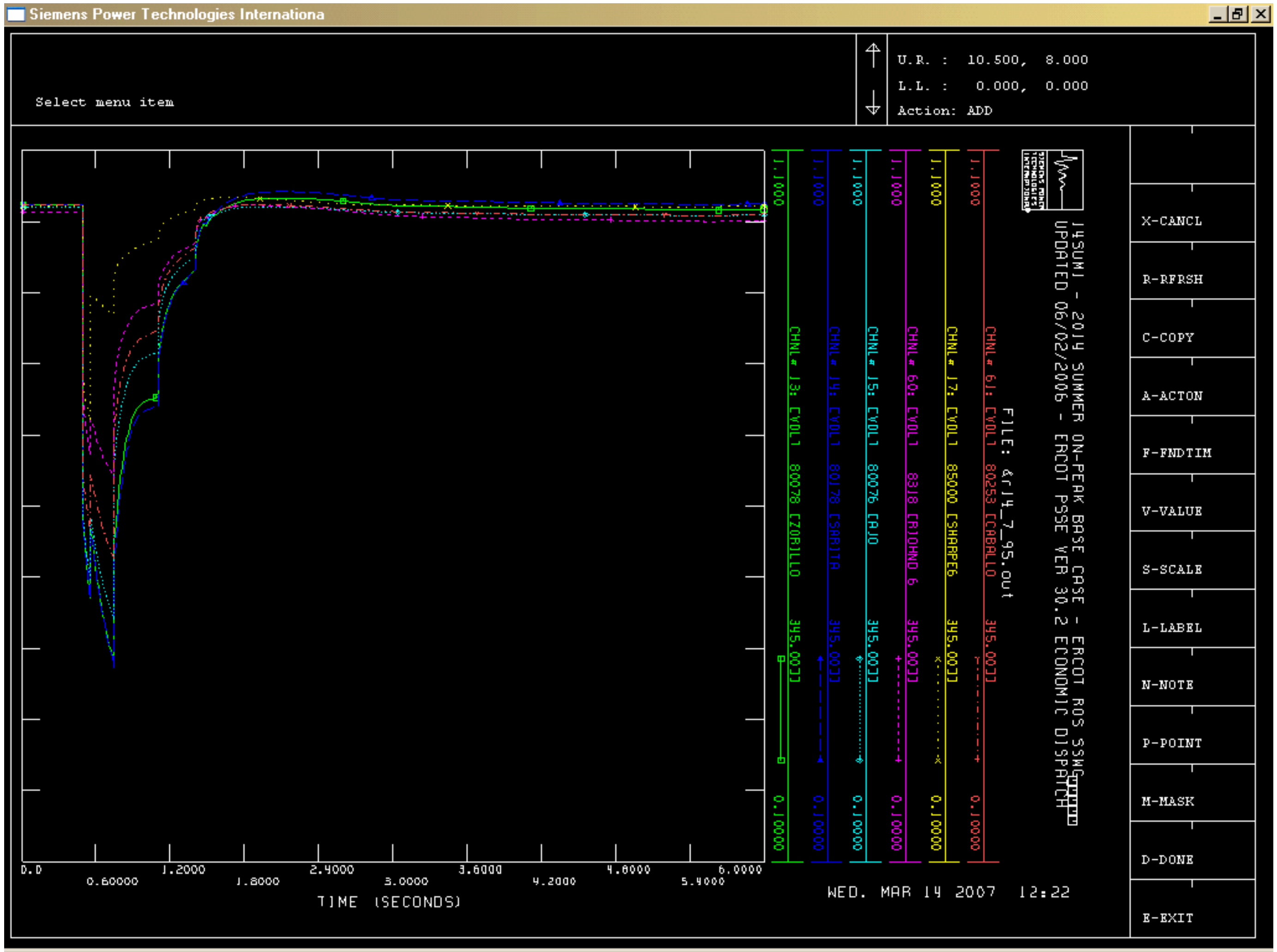
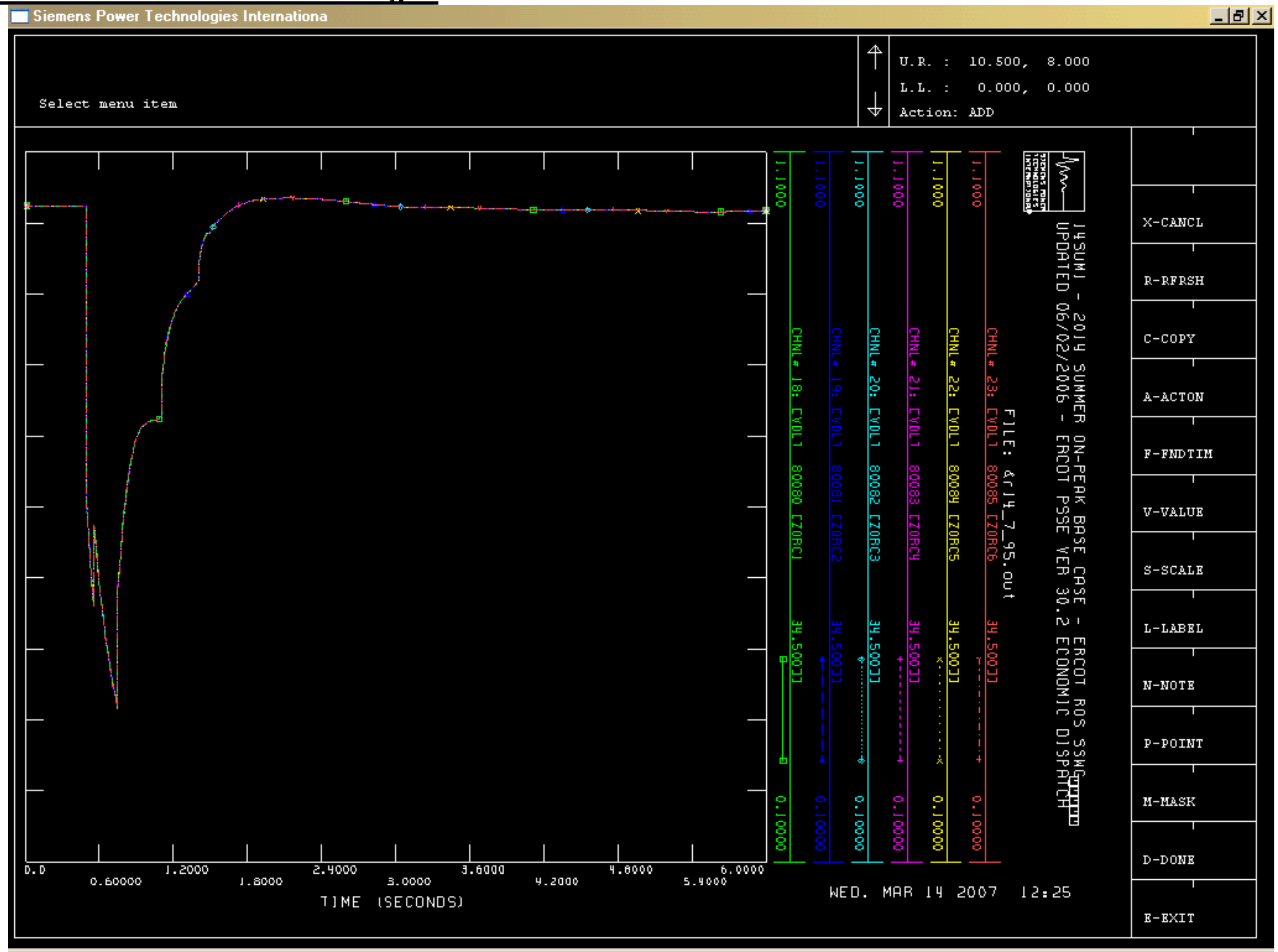
Figure 23 Case 7 – Phase to ground fault at Ajo 345 kV with delayed clearing removing Ajo-Nelson Sharpe and Ajo-Sarita lines 2014 345 kV Bus Voltages



33

Figure 24 Case 7 – Phase to ground fault at Ajo 345 kV with delayed clearing removing Ajo-Nelson Sharpe and Ajo-Sarita lines 2014 34.5 kV Bus Voltages



34

Appendix 1 Steady State Results for area surrounding wind farm

Table 3 Major Contingencies

Contingency	Transmission Element	Voltage (kV)
1	Ajo (80076) to Nelson Sharpe (85000) 345 kV	345
2	Ajo (80076) to Rio Hondo (8318) 345 kV	345
3	Caballo (80253) to Lon Hill (8455) 345 kV	345
4	Caballo (80253) to North Edinburg (8383) 345 kV	345
5	Caballo (80253) to Ajo (80076) 345 kV	345

Table 4 Transmission Line Loadings without improvements

Contingency	Monitored Element	Line MVA Rating	2009 Line Percent Loading	2010 Line Percent Loading	*2011 Line Percent Loading	*2012 Line Percent Loading
none	Ajo (80076) to Nelson Sharpe (85000) 345 kV	1176	38.7	41.3	52.1	69.7
	Ajo (80076) to Rio Hondo (8318) 345 kV	1176	31.5	58.5	35.5	37.2
	Caballo (80253) to Lon Hill (8455) 345 kV	1176	-	-	22.8	38.4
	Caballo (80253) to North Edinburg (8383) 345 kV	1176	-	-	16.6	21.6
	Caballo (80253) to Ajo (80076) 345 kV	2678	-	-	17	25
1	Ajo (80076) to Nelson Sharpe (85000) 345 kV	1176	-	-	-	-
	Ajo (80076) to Rio Hondo (8318) 345 kV	1176	42.2	100.3	45.8	58.4
	Caballo (80253) to Lon Hill (8455) 345 kV	1176	-	-	60	100.2
	Caballo (80253) to North Edinburg (8383) 345 kV	1176	-	-	14.2	29.8
	Caballo (80253) to Ajo (80076) 345 kV	2678	-	-	31.7	53.9
2	Ajo (80076) to Nelson Sharpe (85000) 345 kV	1176	35.1	100	57.8	81.4

	Ajo (80076) to Rio Hondo (8318) 345 kV	1176	-	-	-	-
	Caballo (80253) to Lon Hill (8455) 345 kV	1176	-	-	18.5	37.3
	Caballo (80253) to North Edinburg (8383) 345 kV	1176	-	-	45.3	62.6
	Caballo (80253) to Ajo (80076) 345 kV	2678	-	-	27.7	42.9
3	Ajo (80076) to Nelson Sharpe (85000) 345 kV	1176	-	-	68.8	107
	Ajo (80076) to Rio Hondo (8318) 345 kV	1176	-	-	32.9	39.9
	Caballo (80253) to Lon Hill (8455) 345 kV	1176	-	-	-	-
	Caballo (80253) to North Edinburg (8383) 345 kV	1176	-	-	23.8	35.7
	Caballo (80253) to Ajo (80076) 345 kV	2678	-	-	10.2	15.3
4	Ajo (80076) to Nelson Sharpe (85000) 345 kV	1176	-	-	51	74.6
	Ajo (80076) to Rio Hondo (8318) 345 kV	1176	-	-	47.3	61.4
	Caballo (80253) to Lon Hill (8455) 345 kV	1176	-	-	27	45.8
	Caballo (80253) to North Edinburg (8383) 345 kV	1176	-	-	-	-
	Caballo (80253) to Ajo (80076) 345 kV	2678	-	-	11.6	19.6
5	Ajo (80076) to Nelson Sharpe (85000) 345 kV	1176	-	-	68.2	105.4
	Ajo (80076) to Rio Hondo (8318) 345 kV	1176	-	-	53.8	77.2
	Caballo (80253) to Lon Hill (8455) 345 kV	1176	-	-	<10	11.8
	Caballo (80253) to North Edinburg (8383) 345 kV	1176	-	-	<10	13.5
	Caballo (80253) to Ajo (80076) 345 kV	2678	-	-	-	-
* Added the Ajo to Caballo 345 kV 345 kV transmission line so case will solve						

Table 5 Transmission Line Loadings with improvements

Contingency	Monitored Element	Line MVA Rating	2009 Line Percent Loading	2010 Line Percent Loading	2011 Line Percent Loading	2012 Line Percent Loading
none	Ajo (80076) to Nelson Sharpe (85000) 345 kV	1176	38.7	35.7	52.1	58.3
	Ajo (80076) to Rio Hondo (8318) 345 kV	1176	31.5	47.8	35.5	42.7
	Caballo (80253) to Lon Hill (8455) 345 kV	1176	-	17.1	22.8	24
	Caballo (80253) to North Edinburg (8383) 345 kV	1176	-	<10	16.6	42.9
	Caballo (80253) to Ajo (80076) 345 kV	2678	-	7.3	17	28.2
1	Ajo (80076) to Nelson Sharpe (85000) 345 kV	1176	-	-	-	-
	Ajo (80076) to Rio Hondo (8318) 345 kV	1176	42.2	61.3	45.8	53
	Caballo (80253) to Lon Hill (8455) 345 kV	1176	-	44	60	59.3
	Caballo (80253) to North Edinburg (8383) 345 kV	1176	-	<10	14.2	45.6
	Caballo (80253) to Ajo (80076) 345 kV	2678	-	17	31.7	48.9
2	Ajo (80076) to Nelson Sharpe (85000) 345 kV	1176	35.1	46.4	57.8	64.7
	Ajo (80076) to Rio Hondo (8318) 345 kV	1176	-	-	-	-
	Caballo (80253) to Lon Hill (8455) 345 kV	1176	-	12.2	18.5	22
	Caballo (80253) to North Edinburg (8383) 345 kV	1176	-	42	45.3	75.1
	Caballo (80253) to Ajo (80076) 345 kV	2678	-	23.3	27.7	41.3
3	Ajo (80076) to Nelson Sharpe (85000) 345 kV	1176	-	48.6	68.8	72.7
	Ajo (80076) to Rio Hondo (8318) 345 kV	1176	-	45.5	32.9	42
	Caballo (80253) to Lon Hill (8455) 345 kV	1176	-	-	-	-
	Caballo (80253) to North Edinburg (8383) 345 kV	1176	-	<10	23.8	51.7

	Caballo (80253) to Ajo (80076) 345 kV	2678	-	<10	10.2	21.7
4	Ajo (80076) to Nelson Sharpe (85000) 345 kV	1176	-	35.9	51	61.1
	Ajo (80076) to Rio Hondo (8318) 345 kV	1176	-	47.6	47.3	67.2
	Caballo (80253) to Lon Hill (8455) 345 kV	1176	-	17.3	27	35.7
	Caballo (80253) to North Edinburg (8383) 345 kV	1176	-	-	-	-
	Caballo (80253) to Ajo (80076) 345 kV	2678	-	<10	11.6	15
5	Ajo (80076) to Nelson Sharpe (85000) 345 kV	1176	-	41.3	68.2	86.9
	Ajo (80076) to Rio Hondo (8318) 345 kV	1176	-	58.5	53.8	73
	Caballo (80253) to Lon Hill (8455) 345 kV	1176	-	11.8	<10	<10
	Caballo (80253) to North Edinburg (8383) 345 kV	1176	-	11.8	<10	<10
	Caballo (80253) to Ajo (80076) 345 kV	2678	-	-	-	-

Appendix 2 Short Circuit at 1200 MW

SUBSTATION	BUS NUMBER	VOLTAGE (KV)	THREE PHASE FAULT (AMPS)	SINGLE PHASE FAULT (AMPS)	THREE PHASE FAULT (AMPS)	SINGLE PHASE FAULT (AMPS)
Zorillo	80078	345	9,657	7,294	13,652	13,848
Sarita	80178	345	9,460	7,082	13,382	13,547
Ajo	80076	345	12,244	9,953	15,726	14,430
Rio Hondo	8318	345	10,865	11,110	12,097	12,199
North Edinburg	8383	345	14,813	15,668	16,341	16,480
Nelson Sharpe	85000	345	12,092	10,231	18,205	16,228
Lon Hill	8455	345	18,117	16,334	18,205	16,228
Caballo	80253	345	12,651	9,846	13,691	11,004

Appendix 3 AEP Transmission Planning Guideline

American Electric Power

Transmission Planning Reliability Criteria

AEP's transmission lines and substations, which operate at voltages of 69 kV and above, are used to transfer power from generating stations to load centers or to interconnect with other electric utilities for the purpose of providing reliable electric supply to load serving entities and making power transfers. AEP uses Good Utility Practice to ensure its transmission system is in compliance with the Electric Reliability Council of Texas (ERCOT) Reliability Criteria and NERC Planning Standards as applicable, as well as the specific criteria listed below.

1. Nominal Voltage Levels

   Nominal 345 kV, 161 kV and 138 kV voltage levels will normally be used for most new power transmission lines. Some interconnection lines may be at 115 kV, 230 kV, or 500 kV to match neighboring utilities' voltage, and some 69 kV lines may be constructed in appropriate situations.

2. Voltage regulation

   (a) Generators are generally scheduled to hold higher than nominal generator voltage during peak load periods to stabilize transmission system voltages.

   (b) Capacitor banks, reactors, and LTC auto-transformers are used in transmission substations to hold voltage levels within acceptable ranges during normal and emergency conditions.

   (c) System conditions must be controlled so as to prevent excessive LTC tap changes.

   (d) Dynamic reactive resources, synchronous condensers, stored energy devices, and series compensation are used as appropriate.

3. Voltage Limits

(a) Transmission voltages should not exceed 105% nor fall below 95% of the nominal voltages shown above during normal operation of the system.

(b) Transmission voltages during emergencies should not exceed equipment overexcitation ratings.

(c) Transmission voltages during emergencies should not result in customer voltages exceeding or falling below prescribed limits at distribution substations on the transmission system.

(d) Transmission voltage should not exceed 105% nor fall below 90% of nominal voltage shown above during emergencies. The low limit can be lower if voltage regulating equipment maintains voltage to the customers within prescribed limits at distribution substations involved without causing voltage problems at nearby loads.

(e) Voltage flicker on the transmission system (such as those caused by motor starting, capacitor or reactor switching, furnace loads, drag lines and other intermittent or varying real and reactive loads) will be dictated by the sensitivity of the load or loads being served. The attached chart is a modified version of the ANSI/IEEE (Std. 141-1993) Voltage Flicker Chart listed in the IEEE Red Book.

4. Thermal Capabilities of Transmission Facilities

(a) Transmission Lines

(1) Existing transmission lines were designed to meet operating standards that were in effect at the time the line was built. The National Electric Safety Code (NESC) specified the maximum conductor temperature that maintained acceptable ground clearance while allowing for acceptable loss of conductor tensile strength.

AEP's Transmission Planning group uses thermal ratings that are consistent with the NESC design standards being practiced at the time the line was built.

(2) The thermal capabilities are assigned on a line-by-line basis with design constraints applied based on design limits.

(3) The circuit thermal capabilities should be reduced to the rating of the substation terminal equipment if the ratings of that equipment are lower than the conductor ratings. In general, substation terminal equipment should be sized to match or exceed conductor ratings.

(4) The emergency rating for transmission lines are for two (2) hours.

(b) Autotransformers

(1) The normal rating for autotransformers shall be its top nameplate rating, including the effects of forced cooling equipment if it is available.

(2) The emergency rating for autotransformers shall be 110% of its top nameplate rating for the first two (2) hours of emergency operation and 100% thereafter. Such ratings may be increased on a case-by-case basis following detailed evaluation of the transformer's manufacturer test results.

(c) Disconnect Switches

The normal and emergency rating shall be 100% of nameplate rating.

(d) Wave Traps

The emergency rating shall be 110% of nameplate rating.

(e) Current Transformers

The normal rating shall be 1.5 times the primary current rating of the CT. The two (2) hour emergency rating shall be 10% greater than the normal rating.

(f) Circuit Breakers

The normal and emergency rating shall be 100% of nameplate rating.

5. Reactive Power Capability

Reactive power resources will be provided in amounts that are sufficient for system voltage control under normal and contingency conditions, including the dynamic period following system disturbances. Each AEP operating company is responsible for providing or arranging for the provision of reactive power reasonably adequate to supply both its own reactive power load and any reactive power losses associated with service to its transmission service load, whether such losses are incurred on its own system or the facilities of others. Transmission Planning with Regional Transmission Operations will coordinate reactive power resource planning.

The power factor for each operating company and its major sub-areas will be maintained as follows:

(a) The overall system power factor range should be maintained at 99-100% lagging. This will be calculated from the net MW and MVAr flows on the high side of the generator step-up transformer, and at the interconnections. A net power factor of 97%-100% lagging should be maintained on the generator side of the step-up transformer.

(b) Leading power factor on generators will normally be used only for off-peak, low load situations for limited amounts of time, to reduce the likelihood of generator instability.

6. Transmission Capacity and Load at Risk

(a) Transmission capacity of individual power transmission lines is planned so generation can be economically scheduled for all load levels with all lines in service with consideration of the cost of transmission losses and future loading of the lines.

(b) With one line out of service, no generation curtailment should be necessary.

(c) The minimum transmission capacity to a major transmission substation will be maintained at the substation rating with the largest incoming line out of service.

7. Stability

Stability testing covers the entire range of power system dynamics from "first swing" transient stability to longer term oscillatory and steady-state stability. This testing is an essential complement to the steady-state analysis embodied in load flow testing.

Power plant transient stability is an important consideration since loss of synchronism (or instability) of a generating unit or an entire generating plant can lead to equipment damage and severe power system transient swings, which compounds the disturbance by causing the tripping of the unstable generators and possibly other equipment. When simulating system contingencies affecting power plant stability, various types of fault and network conditions are analyzed using the transient stability performance testing criteria outlined in the attached table. The generator’s responsibility for facility upgrades as identified in the table is dependent on the regulatory provisions in the jurisdiction in which the generator is interconnected.

Steady-state and oscillatory stability performance problems may be initiated by a wide variety of contingencies or operating conditions on the transmission network. Network disturbances are similarly applied when testing for steady-state and oscillatory instability.

AEP generally carries out simulations corresponding to the A through E set of criteria in the attached table for facility planning studies. For operational planning studies, the F and G criteria, in addition to the A-E set, are applied, especially when a long-term facility outage is anticipated. Testing of more severe disturbances than those in the table may be performed to evaluate the strength of the transmission system and to assess potential for cascading outages. Examples of such testing include common-failure mode disturbances such as double circuit tower faults or bus faults that result in the outage of multiple facilities at a location.

The disconnection of generation due to a disturbance is distinct from instability. Instability refers to loss of synchronism or pole slipping when the generation remains physically connected. Disconnection results in generator overspeed followed by turbine shutdown in response to protective relay action. Systems are planned such that disconnection does not occur for single contingencies. Disconnection may occur during disturbance scenarios involving the outage of more than one transmission element, or common-failure mode disturbances such as bus outages, as a consequence of isolating faulted facilities or other system design considerations. Disconnection under these circumstances is considered to be acceptable whereas instability is not.

8. Reliability

(a) More probable contingency testing shall investigate the following situations:

(1) Loss of any single critical transmission line,

(2) Loss of any single transformer,

(3) Loss of any bus section,

(4) Loss of any double circuit line of one mile or greater length,

(5) Loss of any tie breaker,

(6) Loss of any generating unit,

(7) Loss of a critical transmission line or auto-transformer when any generating unit is unavailable, and

(b) For the occurrence of any of the above more probable contingencies, testing must conclude that:

(1) All facility loadings are within their emergency ratings and all voltages are within their emergency limits, and

(2) Facility loadings can be returned to their normal limits within two hours.

(c) Less probable contingency testing shall investigate the following situations:

(1) Loss of any combination of related facilities, a critical transmission line when a 345 kV auto-transformer is out of service, or a generating unit when another generating unit is out of service.

(2) Sudden outage of any multi-circuit transmission line at a time when any other single circuit is out of service,

(3) Sudden outage of any single or double-circuit transmission tower line at a time when two generating units are out of service, for maintenance or economics,

(4) Sudden outage of any generating unit at a time when any two other generating units are out of service for maintenance or economics,

(5) Sudden outage of all generating units at any plant,

(6) Sudden outage of all transmission lines on the same right-of-way,

(7) Sudden outage of any transmission station including all generating capacity associated with such a station,

(8) Sudden dropping of a large load or a major load center, and

(9) Any other credible contingent scenario that might lead to cascading outages.

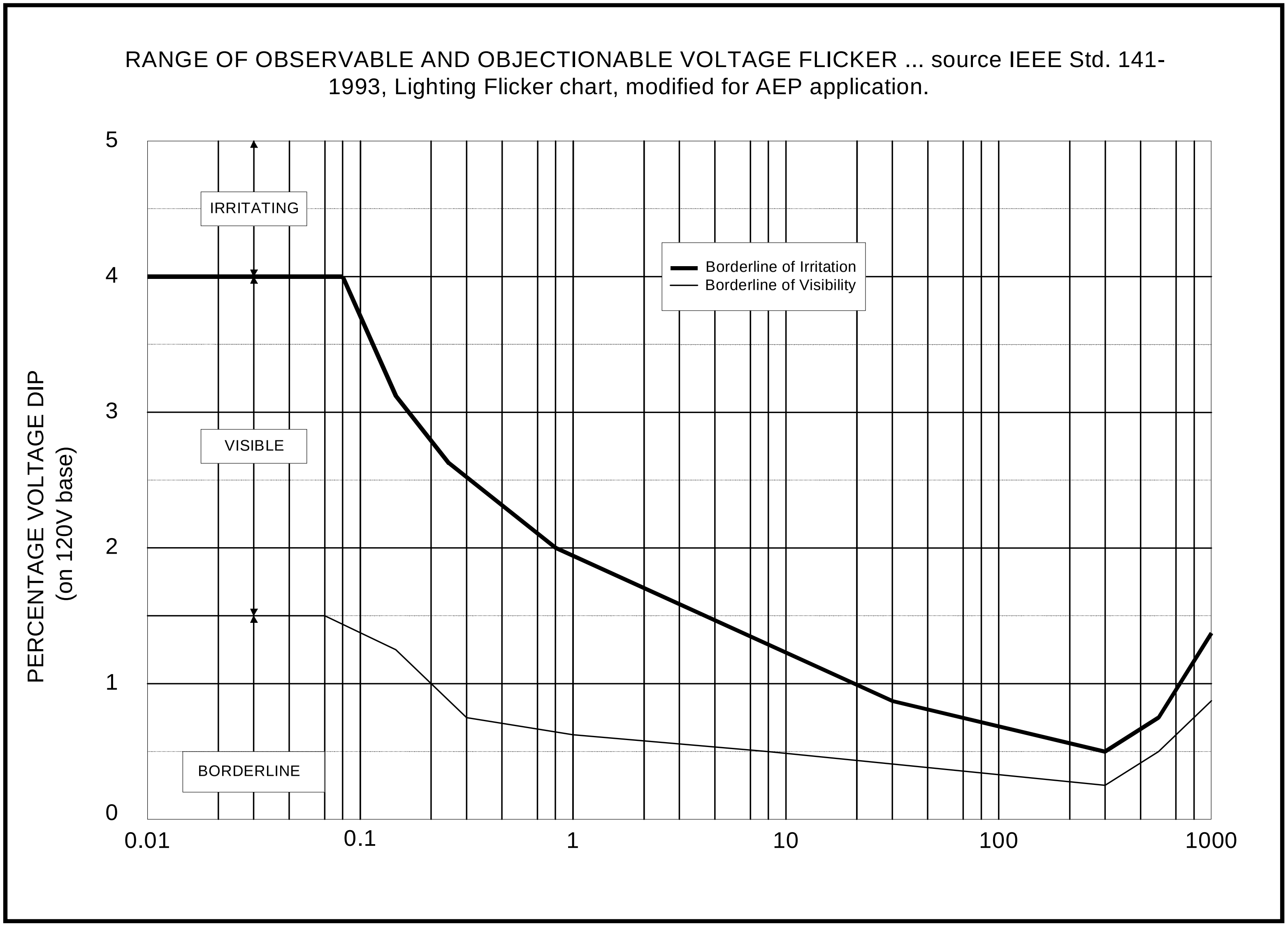
(d) For the occurrence of any of the above less probable contingencies, testing must conclude that neither uncontrolled islanding, nor uncontrolled loss of large amounts of load will result.

9. Transfer Capability

The following guidelines are applied in determining adequate transfer capability:

(a) Each load center within the AEP transmission network must be able to import an amount of power at least equal to the net of the center's load and generation, while maintaining all facilities within their emergency ratings, and maintaining voltages within emergency limits during any of the more probable contingencies listed in section 8.

(b) Each operating company will maintain an import capability sufficient to support a loss of load expectation index of no greater than 0.1 indicating that load will exceed generation no more than one day in 10 years.


RANGE OF OBSERVABLE AND OBJECTIONABLE VOLTAGE FLICKER ... source IEEE Std. 141-1993, Lighting Flicker chart, modified for AEP application.
PERCENTAGE VOLTAGE DIP
(on 120V base)
5
4
3
2
1
0
0.01
0.1
1
10
100
1000
IRRITATING
VISIBLE
BORDERLINE
Borderline of Irritation
Borderline of Visibility

AEP TRANSIENT STABILITY DISTURBANCE TESTING CRITERIA

PREFAULT CONDITION	765 KV PLANTS	345 KV PLANTS	138 KV PLANTS
All Transmission Facilities in Service	1A Permanent single line-to-ground (SLG) fault with 1φ breaker failure. Fault cleared by backup breakers.	2A Permanent SLG fault with 1φ breaker failure. Fault cleared by backup breakers.	3A Permanent SLG fault with 3φ breaker failure. Fault cleared by backup breakers.
	1B Permanent SLG fault cleared by primary breakers. 3φ fault developed following HSR. Fault cleared by primary breakers.	2B Permanent 3φ fault with unsuccessful HSR, if applicable. Fault cleared by backup breakers.	3B Permanent 3φ fault with unsuccessful HSR, if applicable. Fault cleared by backup breakers.
	1C 3φ line opening without fault.	2C 3φ line opening without fault.	3C 3φ line opening without fault.
One Transmission Facility Out of Service	1D Permanent SLG fault with unsuccessful HSR, if applicable. Fault cleared by primary breakers.	2D Permanent 3φ fault with unsuccessful HSR, if applicable. Fault cleared by primary breakers.	3D Permanent 3φ fault with unsuccessful HSR, if applicable. Fault cleared by primary breakers.
	1E 3φ line opening without fault.	2E 3φ line opening without fault.	3E 3φ line opening without fault.
Two Transmission Facilities Out of Service	1F Temporary SLG fault with successful HSR, if applicable.	2F Temporary 3φ fault with successful HSR, if applicable.	3F Temporary 3φ fault with successful HSR, if applicable.
	1G 3φ line opening without fault.	2G 3φ line opening without fault.	3G 3φ line opening without fault.

Generation Connection Studies
Process and Criteria for Evaluating the Impacts on the AEP Transmission System

The underlying premise of American Electric Power's (AEP's) process and criteria to evaluate the integration of a new or expanded generating plant facility is based on the premise that the generation facility owner should be responsible to mitigate any negative impacts on service reliability to existing transmission customers through the reinforcement of the network.

In the evaluation of generating plant connections to the AEP transmission system, the planning criteria must be adhered to not only for the initial year when the plant is scheduled to be placed in service but for a period of at least 5 to 10 years thereafter. In addition, the evaluation must also recognize that the EHV transmission system was designed to transmit electric power from remotely located large base-loaded power plants to local area loads. The 138 kV and the lower voltage local transmission systems were designed to distribute this power from the point of connection with the EHV transmission system to the point of consumption (i.e., directly connected customer facilities, distribution system, etc.). While the EHV transmission system in some areas may have capacity to accommodate moderate levels of new generation without significant system impacts, the local transmission, with normally lesser capacities, may not have margin available to easily integrate the new generation. New generating capacity is typically an order of magnitude or more greater than the connected loads (e.g., 300-1000 MW generating facility vs. 10-30 MW of connected load at a single node). In addition, circuit breakers may become inadequate from a fault interrupting perspective as a result of additional fault current caused by the new generating facilities.

The 138 kV and lower voltage transmission systems are designed to provide margins for changing conditions. The study process for determining and implementing future facility modifications or additions takes into consideration expected load growth over a 5 to 10 year period. These analyses are conducted for normal peak load and contingency conditions to ensure continuous and reliable power delivery to the local transmission system customers.

As part of the process to evaluate new capacity addition requests for connection to the transmission system, the cost responsibility of the generating plant integration must be assessed by applying AEP's planning criteria over a reasonable planning horizon. The application of AEP's criteria in examining generating plant connection is consistent with the existing AEP practices and criteria that are used in defining potential constraints and implementing future system modifications or additions. The intent of the process in applying AEP's criteria in the evaluation of new generating capacity connection to the system is to maintain a level of service reliability, with the new generating capacity in service, comparable to the level that existed prior to the new generating capacity connection.

In all cases following a single contingency outage, all transmission facilities must be within their respective thermal capabilities and voltages must be no less than minimum acceptable levels. Stability performance of the proposed generator must be sufficient to 'ride through' a single contingency outage without loss of synchronism. AEP will generally allow the generator to agree to reduce output following the first transmission contingency in order to maintain reliability following a potential next contingency outage and thereby minimize the extent of transmission upgrades or modifications.

The criteria detailed below for system enhancements associated with the connection of new generating capacity is designed to maintain the prevailing level of service reliability and quality to existing customers.

Transmission Line Loading:

If as a result of the added generation, the loading on an EHV line would exceed its normal capability during normal or single contingency conditions, the generating plant owner shall be responsible for all system modifications required to restore the line loading to within the normal capability. Likewise, if as a result of additional generation, the loading on an EHV facility would exceed its emergency rating during double contingencies, the generating plant owner would be expected to reduce plant output in actual operation following the loss of a critical transmission facility or be responsible for the necessary system modifications to reduce the EHV facility loading to within emergency capability.

If as a result of the added generation, a 138 kV transmission line loading exceeds its emergency rating during either normal or contingency conditions, the generating plant owner shall be responsible for all system modifications to restore the line loadings to within rating. In some cases, limiting terminal equipment must be replaced in order to increase the capability of the line. In other cases, more extensive system modifications may be required.

If as a result of the added generation, transmission line loadings exceed the normal rating of the conductor during normal or contingency conditions and the line has not been recently assessed for safe conductor clearance, the generating plant owner shall pay AEP to conduct a survey to check for appropriate sag clearance. If the sag checks indicate any sag violations that limit the line to less than the conductor emergency capability, the generating plant owner shall pay for the removal of those limitations.

Transformer Loading:

If as a result of the added generation, the loading on an EHV/EHV, e.g., 765/345 kV, 500/345 kV transformer would exceed its normal capability during either normal or single contingency conditions, the generating plant owner shall be responsible for all system modifications required to restore the transformer loading to within the normal capability or to the transformer loading level which would occur without the generation, whichever is greater.

If as a result of the added generation, the loadings on any EHV/138 kV or any lower voltage transformer exceeds its emergency rating during either normal or contingency conditions, the generating plant owner shall be responsible for system modifications needed to reduce the transformer loadings to below the transformer emergency rating.

Short Circuit Duty:

If the short circuit duty of any existing circuit breaker would exceed its rating due to the installation of the new generating capacity addition, the generating plant owner shall be responsible for the cost to replace the affected equipment. These facilities are necessary to safely and reliably connect the new generating capacity to the AEP transmission system.

Additional system improvements may also be required to transmit the output of the new generating capacity across the transmission system. The request for transmission service and any additional transmission system improvements would be addressed und

Category	Contingencies		System Limits or Impacts				
	Initiating Event(s) and Contingency Component(s)	Components Out of Service	Thermal Limits	Voltage Limits	System Stable	Loss of Demand or Curtailed Firm Transfers	Cascading [c] Outages
A – No Contingencies	All Facilities in Service	None	Normal	Normal	Yes	No	No
B – Event resulting in the loss of a single component.	Single Line Ground (SLG) or 3-Phase (3Ø) Fault, with Normal Clearing: 1. Generator 2. Transmission Circuit 3. Transformer Loss of a Component without a Fault.	Single Single Single Single	Applicable Rating [a] (A/R) A/R A/R A/R	Applicable Rating [a] (A/R) A/R A/R A/R	Yes Yes Yes Yes	No [b] No [b] No [b] No [b]	No No No No
	Single Pole Block, Normal Clearing: 4. Single Pole (dc) Line	Single	A/R	A/R	Yes	No [b]	No
C – Event(s) resulting in the loss of two or more (multiple) components.	SLG Fault, with Normal Clearing: 1. Bus Section 2. Breaker (failure or internal fault)	Multiple Multiple	A/R A/R	A/R A/R	Yes Yes	Planned [d] Planned [d]	No No
	SLG or 3Ø Fault, with Normal Clearing, Manual System Adjustments, followed by another SLG or 3Ø Fault, with Normal Clearing: 3. Category B (B1, B2, B3, or B4) contingency, manual system adjustments, followed by another Category B (B1, B2, B3, or B4) contingency	Multiple	A/R	A/R	Yes	Planned [d]	No
	Bipolar Block, with Normal Clearing: 4. Bipolar (dc) Line Fault (non 3Ø), with Normal Clearing: 5. Double Circuit Towerline	Multiple Multiple	A/R A/R	A/R A/R	Yes Yes	Planned [d] Planned [d]	No No
	SLG Fault, with Delayed Clearing: 6. Generator 8. Transformer 7. Transmission Circuit 9. Bus Section	Multiple Multiple	A/R A/R	A/R A/R	Yes Yes	Planned [d] Planned [d]	No No

D [e] – Extreme event resulting in two or more (multiple) components removed or cascading out of service	3Ø Fault, with Delayed Clearing (stuck breaker or protection system failure): 1. Generator 3. Transformer 2. Transmission Circuit 4. Bus Section 3Ø Fault, with Normal Clearing: 5. Breaker (failure or internal fault) Other: 6. Loss of towerline with three or more circuits 7. All transmission lines on a common right-of way 8. Loss of a substation (one voltage level plus transformers) 9. Loss of a switching station (one voltage level plus transformers) 10. Loss of a all generating units at a station 11. Loss of a large load or major load center 12. Failure of a fully redundant special protection system (or remedial action scheme) to operate when required 13. Operation, partial operation, or misoperation of a fully redundant special protection system (or remedial action scheme) for an event or condition for which it was not intended to operate 14. Impact of severe power swings or oscillations from disturbances in another Regional Council.	Evaluate for risks and consequences. May involve substantial loss of customer demand and generation in a widespread area or areas. Portions or all of the interconnected systems may or may not achieve a new, stable operating point. Evaluation of these events may require joint studies with neighboring systems. Document measures or procedures to mitigate the extent and effects of such events. Mitigation or elimination of the risks and consequences of these events shall be at the discretion of the entities responsible for the reliability of the interconnected transmission systems.

Footnotes to Table I.

a) Applicable rating (A/R) refers to the applicable normal and emergency facility thermal rating or system voltage limit as determined and consistently applied by the system or facility owner.
b) Planned or controlled interruption of generators or electric supply to radial customers or some local network customers, connected to or supplied by the faulted component or by the affected area, may occur in certain areas without impacting the overall security of the interconnected transmission systems. To prepare for the next contingency, system adjustments are permitted, including curtailments of contracted firm (non-recallable reserved) electric power transfers.
c) Cascading is the uncontrolled successive loss of system elements triggered by an incident at any location. Cascading results in widespread service interruption which cannot be restrained from sequentially spreading beyond an area predetermined by appropriate studies.
d) Depending on system design and expected system impacts, the controlled interruption of electric supply to customers (load shedding), the planned removal from service of certain generators, or the curtailment of contracted firm (non-recallable reserved) electric power transfers may be necessary to maintain the overall security of the interconnected transmission systems.
e) A number of extreme contingencies that are listed under Category D and judged to be critical by the transmission planning entity(ies) will be selected for evaluation. It is not expected that all possible facility outages under each listed contingency of Category D will be evaluated.

Appendix 4 ERCOT Transmission Planning Criteria

I. INTRODUCTION

The Electric Reliability Council of Texas (ERCOT) Power System consists of those generation and transmission facilities (60 kV and higher voltages) which are controlled by individual ERCOT members and which function as part of an integrated and coordinated power supply network. Each reference in this document to ERCOT members includes generation entities, load entities and transmission providers connected to the transmission system as well as all other electric industry participants.

In order to maintain reliable operation of the ERCOT power system, it is necessary that all systems observe and subscribe to certain minimum planning criteria. The criteria set forth herein, combined with the NERC Planning Standards, constitute these minimum-planning criteria. Tests outlined herein shall be performed to determine conformance to these minimum criteria; however, because ERCOT recognizes that events more severe than those outlined in this criteria could cause separation, other tests may also be performed if necessary for information purposes.

The complexity and uncertainty inherent in the planning and operation of the ERCOT power system make exhaustive testing impracticable; therefore, to gain maximum benefit from the limited number of tests which are performed, the selection of the specific tests and the frequency of their performance will be made solely upon the basis of the expected value of the reliability information obtainable from the test.

It is the responsibility of each ERCOT member to perform tests appropriate to ensure the reliability of its own system, and to recommend for further study by the ERCOT Engineering Subcommittee (ES) tests which examine effects of importance to multiple ERCOT members or the ERCOT power system. Upon consideration of such recommendations, the ES shall perform tests in accordance with its Procedures as necessary to assess the reliability of the planned ERCOT power system.

The ERCOT Planning Assessment and Review Task Force (PAR) will review the ERCOT Planning Criteria every three years to ensure it meets the requirements in the NERC Planning Standards. PAR will periodically review the planning criteria and practices of individual ERCOT members to insure consistency with NERC and ERCOT criteria.

II. FORECASTS

Each ERCOT load entity shall provide forecasts as outlined in the NERC Planning Standards “System Modeling Data Requirements” section, Part D. “Actual and Forecast Demands.”

III. RESOURCE CAPABILITY

On an annual planning basis, forecasted Net Capability will be provided by each ERCOT load entity to ensure a reserve margin of at least 15 percent of its forecasted annual maximum hourly firm demand (alternatively expressible as a capacity margin of 13 percent. Individual ERCOT members are responsible for developing resource plans which provide sufficient generating capacity plus firm power purchases to ensure that their reserve margin meets the 15 percent minimum required by the ERCOT Planning Criteria.

The ERCOT staff, under the direction of the ES, maintains a database containing existing and proposed generating capability and firm power purchases; historical and projected values for demand and energy; and proposed major transmission system additions. This database is updated semi-annually and the Capacity Demand Reserve (CDR) Working Papers are produced. The ES reviews these Working Papers to ensure that the expected reserve margin meets the 15 percent minimum stated in the ERCOT Planning Criteria.

The ERCOT staff, under the direction of the ES, collects data in the Annual Planned Service Request that is used to determine what planned resources are needed. This data is used by ERCOT members to build load flow cases, which are utilized to analyze transfer capability, system loses, wheeling impacts, reliability concerns and perform studies as required in the ERCOT Planning Criteria.

The Generation Adequacy Task Force (GATF) maintains and annually updates a database of ERCOT generation data, including forced outage probabilities and projected maintenance schedules for existing and proposed units, and an hourly load database. These databases are used by the GATF to perform system reliability tests as directed by the ES. The GATF prepares a working paper reporting the results of these tests and submits it to the ES for its review.

IV. TRANSMISSION RELIABILITY TESTING

The interconnection philosophy of ERCOT members is to minimize loss of load by remaining interconnected. Interconnected system planning will include steady state and dynamic simulated testing to represent specific occurrences for each type of contingency specified below or listed in Table I of the NERC Planning Standards. The contingency tests will be performed for reasonable variations of load level, generation schedules, planned transmission line maintenance outages, and anticipated power transfers. At a minimum, this should include projected loads for the upcoming summer and winter seasons and a ten-year planning horizon. The ERCOT transmission providers involved should plan to resolve any unacceptable test results through the provision of transmission facilities, the alteration of operating procedures, or other means as appropriate.

While the requirements listed in Table I address most ERCOT planning concerns, tests will also be conducted to ensure that the planned system conforms to the following additional requirements:

1) The contingency loss of a double-circuit transmission line that exceeds 0.5 miles in length (either without a fault or subsequent to a normally-cleared non-three-phase fault) with all other facilities normal should not cause a) cascading or uncontrolled outages, b) instability of generating units at multiple plant locations, or c) interruption of service to firm demand or generation other than that isolated by the double-circuit loss, following the execution of all automatic operating actions such as relaying and special protection systems. Furthermore, the loss should result in no damage to or failure of equipment and, following the execution of specific non-automatic predefined operator-directed actions such as redispatch, curtailment of interruptible load, or curtailment of unplanned transfers, should not result in applicable voltage or thermal ratings being exceeded.

2) With any single generating unit unavailable, and with any other generation preemptively redispatched, the contingency loss of a single transmission element (either without a fault or subsequent to a normally-cleared non-three-phase fault) with all other facilities normal should not cause a) cascading or uncontrolled outages, b) instability of generating units at multiple plant locations, or c) interruption of service to firm demand or generation other than that isolated by the transmission element, following the execution of all automatic operating actions such as relaying and special protection systems. Furthermore, the loss should result in no damage to or failure of equipment and, following the execution of specific non-automatic predefined operator-directed actions such as redispatch, curtailment of interruptible load, or curtailment of unplanned transfers, should not result in applicable voltage or thermal ratings being exceeded.

The ERCOT ISO is responsible for gathering load data, along with generation purchase and sale information for use in the ERCOT load flow cases via the Annual Planned Service Request. The ES directs the performance of steady state and dynamic simulation testing of the bulk power system to determine the impact on the planned system of occurrences of the types of contingencies listed in the NERC Planning Standards. The Steady State Task Force (SSTF), Dynamics Task Force (DTF) and System Protection Task Force (SPTF) create databases and perform tests as outlined in the Appendices.

The databases created by the SSTF, DTF and SPTF are available for use by the individual ERCOT members. It is the responsibility of the individual ERCOT members to use these databases to perform steady state and dynamic tests appropriate to evaluate the compliance of their system with the NERC, ERCOT and their own utility criteria, and to recommend, for further study by the ES, tests which examine effects of importance to multiple ERCOT members or the ERCOT bulk power system. The ES discusses these recommended tests at its meetings and makes assignments for the tests to the appropriate task forces. The individual members affected by identified issues will pursue appropriate solutions.

V. <u>REPORTS OF TESTING</u>

The ES annually directs the preparation of the section of the IE-411 Report requested by the Department of Energy which addresses the adequacy of the ERCOT bulk power system as well as input to various NERC reports. The working papers prepared by the various ES task forces to report the results of their system tests and the comments by the individual ES members regarding tests that they have performed provide the basis for statements concerning the adequacy of the planned ERCOT system.

Table I. Transmission Systems Standards — Normal and Contingency Conditions

Category	Contingencies		System Limits or Impacts				
	Initiating Event(s) and Contingency Component(s)	Components Out of Service	Thermal Limits	Voltage Limits	System Stable	Loss of Demand or Curtailed Firm Transfers	Cascading Outages [c]
A – No Contingencies	All Facilities in Service	None	Normal	Normal	Yes	No	No
B – Event resulting in the loss of a single component.	Single Line Ground (SLG) or 3-Phase (3Ø) Fault, with Normal Clearing: 1. Generator 2. Transmission Circuit 3. Transformer Loss of a Component without a Fault.	Single Single Single Single	Applicable Rating [a] (A/R) A/R A/R A/R	Applicable Rating [a] (A/R) A/R A/R A/R	Yes Yes Yes Yes	No [b] No [b] No [b] No [b]	No No No No
	Single Pole Block, Normal Clearing: 4. Single Pole (dc) Line	Single	A/R	A/R	Yes	No [b]	No
C – Event(s) resulting in the loss of two or more (multiple) components.	SLG Fault, with Normal Clearing: 1. Bus Section 2. Breaker (failure or internal fault)	Multiple Multiple	A/R A/R	A/R A/R	Yes Yes	Planned [d] Planned [d]	No No
	SLG or 3Ø Fault, with Normal Clearing, Manual System Adjustments, followed by another SLG or 3Ø Fault, with Normal Clearing: 3. Category B (B1, B2, B3, or B4) contingency, manual system adjustments, followed by another Category B (B1, B2, B3, or B4) contingency	Multiple	A/R	A/R	Yes	Planned [d]	No
	Bipolar Block, with Normal Clearing: 4. Bipolar (dc) Line Fault (non 3Ø), with Normal Clearing: 5. Double Circuit Towerline	Multiple Multiple	A/R A/R	A/R A/R	Yes Yes	Planned [d] Planned [d]	No No
	SLG Fault, with Delayed Clearing: 6. Generator 8. Transformer 7. Transmission Circuit 9. Bus Section	Multiple Multiple	A/R A/R	A/R A/R	Yes Yes	Planned [d] Planned [d]	No No
D [e] – Extreme event resulting in two or more (multiple) components	3Ø Fault, with Delayed Clearing (stuck breaker or protection system failure): 1. Generator 3. Transformer 2. Transmission Circuit 4. Bus Section	Evaluate for risks and consequences. ▪ May involve substantial loss of customer demand and generation in a widespread area or					

removed or cascading out of service	3Ø Fault, with Normal Clearing: 5. Breaker (failure or internal fault) Other: 6. Loss of towerline with three or more circuits 7. All transmission lines on a common right-of way 8. Loss of a substation (one voltage level plus transformers) 9. Loss of a switching station (one voltage level plus transformers) 10. Loss of a all generating units at a station 11. Loss of a large load or major load center 12. Failure of a fully redundant special protection system (or remedial action scheme) to operate when required 13. Operation, partial operation, or misoperation of a fully redundant special protection system (or remedial action scheme) for an event or condition for which it was not intended to operate 14. Impact of severe power swings or oscillations from disturbances in another Regional Council.	areas. ▪ Portions or all of the interconnected systems may or may not achieve a new, stable operating point. ▪ Evaluation of these events may require joint studies with neighboring systems. ▪ Document measures or procedures to mitigate the extent and effects of such events. ▪ Mitigation or elimination of the risks and consequences of these events shall be at the discretion of the entities responsible for the reliability of the interconnected transmission systems.

Footnotes to Table I.

a) Applicable rating (A/R) refers to the applicable normal and emergency facility thermal rating or system voltage limit as determined and consistently applied by the system or facility owner.

b) Planned or controlled interruption of generators or electric supply to radial customers or some local network customers, connected to or supplied by the faulted component or by the affected area, may occur in certain areas without impacting the overall security of the interconnected transmission systems. To prepare for the next contingency, system adjustments are permitted, including curtailments of contracted firm (non-recallable reserved) electric power transfers.

c) Cascading is the uncontrolled successive loss of system elements triggered by an incident at any location. Cascading results in widespread service interruption which cannot be restrained from sequentially spreading beyond an area predetermined by appropriate studies.

d) Depending on system design and expected system impacts, the controlled interruption of electric supply to customers (load shedding), the planned removal from service of certain generators, or the curtailment of contracted firm (non-recallable reserved) electric power transfers may be necessary to maintain the overall security of the interconnected transmission systems.

e) A number of extreme contingencies that are listed under Category D and judged to be critical by the transmission planning entity(ies) will be selected for evaluation. It is not expected that all possible facility outages under each listed contingency of Category D will be evaluated.

Appendix 5 ERCOT Voltage and Reactive Requirements and Compliance Monitoring

(TAC Approved – August 6, 2003)

GENERATOR AND QSE REQUIREMENTS

Application

- All generating units (including self-serve generating units) that have a gross generating unit rating greater than 20 MVA or those units connected to the same transmission bus that have gross generating unit ratings aggregating to greater than 20 MVA, that supply power to the ERCOT transmission grid, and that were not in operation prior to Board approval of this standard shall meet all of the requirements of this Standard.
- Any such generating units in operation earlier than the ERCOT Board approval date for this Standard shall meet the requirements of Standards applicable to that generating unit prior to the Board approval date for this Standard, and shall also meet all of the requirements of this Standard except the Installed Capability Requirements. Previously applicable Standards include the Interim Standards approved by the ERCOT Board, the Standards enumerated in the Protocols Section 6.5.7, and such other Standards outlined in interconnection requirements and Operating Guides.
- Upon submission by a Generation Resource to ERCOT of a specific proposal for requirements to substitute for those of the applicable Standard, ERCOT shall either approve such alternative requirements or provide the submitter an explanation of its objections to the proposal. Alternative requirements may include supplying additional static and/or dynamic reactive power capability as necessary to meet the area's reactive power requirements. Pending changes to PUCT Rules, an induction generator may elect to make a contribution to be credited to TCOS in lieu of meeting the Installed Capability Requirements contained herein. Also, ERCOT shall apply previous standards to new generating units connected within 15 months after Board approval whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to Board approval based upon previous standards.

Installed Capability Requirements

- Power Factor Requirements
  - Generating unit installations to which this Standard applies shall have and maintain an overexcited (lagging) power factor capability, of 0.95 or less and an under-excited (leading) power factor capability of 0.95 or less, both determined at the generating unit's maximum net power to be supplied to the transmission grid and at the transmission system voltage profile established by ERCOT, and both measured at the point of interconnection to the TDSP.
  - Upon request to and with the approval of ERCOT, multiple generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these Power Factor Requirements only. For any unit so

aggregated, specific power factor requirements based upon the reactive power contribution of that unit to the total reactive power obligation of the aggregation will be assigned to that unit and shall become that unit's required installed reactive capability at the generating unit's maximum net active power output.

- No generating unit equipment replacement or modification shall reduce the reactive capability of the generating unit below the requirements to be met by that generating unit prior to the replacement/modification, unless specifically approved by ERCOT.
- Other Installed Capability Requirements
- Generating unit installations to which this Standard applies shall have and maintain the following capability:

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

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

    After allowing temporary field current overload, the limiter shall operate through the automatic AC voltage regulator to reduce field current to the continuous rating. Return to normal AC voltage regulation after current reduction shall be automatic. The over-excitation limiter shall be coordinated with the over-excitation protection so that over-excitation protection only operates for failure of the voltage regulator/limiter.
  - Under-excitation limiters shall be provided and coordinated with loss-of-field protection to eliminate unnecessary generating unit disconnection as a result of operator error or equipment misoperation.

Operating Requirements

- All generating units shall maintain the transmission voltage at the point of interconnection to the transmission grid as directed by ERCOT within the operating reactive power capability of the unit(s).
- At all times a generating unit is on line, the required installed reactive capability must be available for utilization at the generating unit's continuous rated active power output, and reactive power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the reactive power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any reactive power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a Transmission Operator designated by ERCOT.
- Each generating unit shall be operated with any automatic voltage regulator (AVR) set to regulate generator terminal voltage and any power system stabilizers (PSS) in use unless specifically permitted to operate otherwise by ERCOT.
- Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

Information Supply Requirements

- Unit AVR and PSS modeling information required in the ERCOT Planning Criteria shall be determined from actual unit testing described in the Operating Guides. Within 30 days of ERCOT's request, the results of the latest test performed shall be supplied to ERCOT and the TSP.
- When the operating mode of a generating unit's AVR or PSS is changed while the unit is operating, the QSE shall promptly inform ERCOT. The QSE shall also supply AVR or PSS status logs to ERCOT upon request.
- Within 30 days of ERCOT's request, Generation Resources shall provide ERCOT with the operating characteristics of any generating unit's equipment protective relay system or controls that may respond to temporary excursions in voltage with actions that could lead to tripping of the generating unit.
- Any short-term inability of a generating unit to meet its reactive capability requirements shall be immediately reported to ERCOT and the Transmission Operator.
- ERCOT and the TSP shall be notified of any equipment changes that affect the reactive capability of an operating generating unit no less than 60 days prior to implementation of the changes, and any such changes that decrease the reactive capability of the generating unit below the required level must be approved by ERCOT prior to implementation.
- High reactive loading and reactive oscillations on generation units should be immediately communicated to the QSE, the Transmission Operator, and ERCOT.
- The tripping off line of a generating unit due to voltage or reactive problems should be immediately reported to ERCOT, the Transmission Operator, and the QSE.

GENERATOR AND QSE COMPLIANCE MONITORING

- Generation Resources shall conduct generating unit reactive capability tests as specified in ERCOT Protocols and Operating Guides. Test results shall be reported to ERCOT who shall forward them to the TSPs. If reactive output of the generating units is limited by transmission system conditions during the tests, this shall be noted on the test report.
- Failure of a generating unit to provide either leading or lagging reactive up to the required capability of the unit upon request from a Transmission Operator or ERCOT may, at the discretion of ERCOT, be reported to the ERCOT Compliance Office, except under Force Majeure conditions or ERCOT-permitted operation of the generating unit.
- If a Generating Resource fails to maintain transmission system voltage at the point of interconnection with the TSP within 2% of the scheduled voltage while operating at less than the maximum reactive capability of the generating unit, ERCOT may, at its discretion, report this to the ERCOT Compliance Office, except under Force Majeure conditions or ERCOT-permitted operation of the generating unit.
- The ERCOT Compliance Office will investigate claims of alleged non-compliance and Force Majeure conditions using ERCOT Compliance Office Procedures. The ERCOT Compliance Office will use its Compliance Procedures to address confirmed non-compliance situations. The ERCOT Compliance Office will advise the Generation Resource, its QSE, ERCOT and the TSP planning and operating staffs of the results of such investigations.

TDSP REQUIREMENTS

Application

- Each TSP and DSP must meet the requirements specified herein, or at their option, meet alternative requirements specifically approved by ERCOT. Such alternative requirements may include requirements for aggregated groups of facilities.
- This Standard is not intended to apply to retail customers (including any load served by an REP or load not served from the ERCOT transmission grid), since their reactive power supply requirements are addressed in other documents, including tariffs.

Installed Capability Requirements

- Sufficient static reactive power capability shall be installed by a DSP in substations and on the distribution voltage system to maintain at least a 0.97 lagging power factor for the maximum net active power supplied from a substation transformer at its distribution voltage terminals to the distribution voltage system. For any substation transformer serving multiple DSPs, this power factor requirement shall be applied to each DSP individually for its portion of the total load served.
- Assuming optimal use of all other required installed reactive power capability, ERCOT (Regional Planning Groups or Transmission Planning) shall determine and demonstrate the need for any additional static and/or dynamic reactive power capability necessary to ensure compliance with the ERCOT Planning Criteria, and ERCOT (Transmission Planning) shall establish responsibility for any associated facility additions among ERCOT TSPs.
- The ERCOT Planning Criteria shall require voltage stability margin sufficient to maintain post-transient voltage stability within a defined importing (load) area under the following study conditions:

- Peak load conditions, with import to the area increased by 5% of the forecasted area load, and NERC Category A or B operating conditions (see NERC Table I in ERCOT Planning Criteria); and

- Peak load conditions, with import to the area increased by 2.5% of the forecasted area load, and NERC Category C operating conditions;

Operating Requirements

- The operation of all reactive power devices under the control of a Transmission Operator or a QSE will be coordinated under the direction of ERCOT to maintain transmission voltage levels established by ERCOT. Static reactive devices will be managed to ensure that adequate dynamic reactive reserves are maintained at all times.
- The Transmission Operator, under ERCOT direction, is responsible for monitoring and ensuring that all generator dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed reactive capability requirements

Information Supply Requirements

- Any short-term inability to meet these minimum reactive requirements shall be immediately reported to ERCOT by way of the Transmission Operator.

- Any long-term changes to the reactive capability must be provided by the facility owner to ERCOT, as-planned at least 30 days prior to implementation and as-built no later than 30 days after implementation, as changes or upgrades are made during the life of the reactive power facilities.

TDSP COMPLIANCE MONITORING

DSP compliance monitoring

- Annually, ERCOT will review DSP power factors using the actual summer load and power factor information included in the Annual Load Data Request (ALDR) to assess whether DSPs comply with these requirements. All DSP substations whose annual peak load has exceeded 10 MW shall have and maintain watt/var metering sufficient to monitor compliance; otherwise, DSPs will not be required to install additional metering to determine compliance. At times selected by ERCOT, ERCOT will require manual power factor measurement at substations and points of interconnection that do not have power factor metering. ERCOT will endeavor to provide DSPs sufficient notice to perform the manual measurements. Such requests shall be limited to four times per calendar year for each DSP substation or point of interconnection where power factor measurements are not available.
- If actual conditions indicate probable non-compliance, ERCOT will require power factor measurements at the time of its choice while providing sufficient notice to perform the measurements.
- The ERCOT Compliance Office will investigate claims of alleged non-compliance using ERCOT Compliance Procedures. The ERCOT Compliance Office will use its Compliance Procedures to address confirmed non-compliance situations. The ERCOT Compliance Office will advise ERCOT and TSP planning and operating staffs of the results of such investigations.

TSP compliance monitoring

- For monitoring of compliance of the TSP's planned facilities to the ERCOT Planning Criteria performance requirements, a self-certification process with random audits (similar to compliance to NERC Planning Standards), in conjunction with work performed in the ERCOT Regional Planning Groups, shall be used. If a TSP fails to maintain transmission system voltage within 2% of the scheduled voltage while reactive sources under its direct control are not fully utilized, ERCOT may, at its discretion, report this to the ERCOT Compliance Office, except under Force Majeure conditions.
- The ERCOT Compliance Office will investigate claims of alleged non-compliance using ERCOT Compliance Procedures. The ERCOT Compliance Office will use its Compliance Procedures to address confirmed non-compliance situations. The ERCOT Compliance Office will advise ERCOT and TSP planning and operating staffs of the results of such investigations.

ERCOT REQUIREMENTS

- ERCOT shall specify voltage levels that are to be maintained on the transmission system.

- For any market participant's failure to meet the requirements of this Standard, ERCOT shall notify the participant in writing of such failure and, upon a request from the participant, explain whether and why the failure must be corrected.
- ERCOT (Regional Planning Groups or Transmission Planning) shall determine and demonstrate the need for any static and/or dynamic reactive power capability in excess of the explicit requirements of this Standard that is necessary to ensure compliance with the ERCOT Planning Criteria, and ERCOT (Transmission Planning) shall establish specific DSP and/or TSP responsibility for any associated facility additions.
- ERCOT shall consider specific stakeholder proposals for alternate requirements and, upon approval by ERCOT, post a description of such alternative requirements and any associated compliance monitoring procedures on a secured ERCOT website.

EXHIBIT C

*[*A PRELIMINARY REPORT*]*

INTERCONNECTION STUDY – STEADY STATE STUDY REPORT

GAMESA ENERGÍA SOUTHWEST COMPANY

Longhollow Wind
120 MW at Jack County

Generation Interconnection Request 06INR0021

TXU Electric Delivery
Transmission Grid Planning
July 27, 2005

GAMESA ENERGÍA SOUTHWEST COMPANY
INTERCONNECT STUDY –06INR0021
JACK COUNTY, TX

STUDY ASSUMPTIONS

1. The ERCOT 2007 Summer base case created 2/2005 was used.
2. Rate C was used in evaluating needed improvements.
3. The latest transmission plans that will have a material impact on the area were modeled.
4. New generation in the area with signed interconnection agreements were modeled.
5. All other North Texas generation, except for the following, were modeled as dispatched in the ERCOT case:
   - Graham was on full.
   - Oklaunion was on full and North HVDC tie was at max import.
   - Wichita Falls was on full.
   - Wise County was on full.
   - Jack County (BEC's Boonsville) was on full.
   - Morgan Creek was mothballed (except in the West-to-North transfer cases).
   - North Lake was mothballed.
   - Valley was mothballed.
6. A benchmark case was created without Gamesa Wind Generation.
7. The study case included the above assumptions in addition to the new proposed generation.
8. Ultimately, the load/generation balance was achieved by scaling generation in Houston.
9. The proposed generation was connected using one of the following options:
   Option 1: TXU ED's Parker SS – Graham 345 kV line approximately 16 miles southeast of Graham
   Option 2: TXU ED's Graham – Benbrook 345 kV line approximately 16 miles southeast of Graham
   Option 3: TXU ED's Graham – Oran 138 kV line approximately 16 miles southeast of Graham
10. The West-to-North transfer was increased by approximately 1000 MW over the Market Dispatch shown in the ERCOT case as a variant to test transfer impacts.
11. The results contained in this report were based on steady-state load flow studies and do not include short-circuit or stability concerns.

CONTINGENCY STUDIES

Contingency studies were run on the 07sum1 base case along with the above assumptions with and without the proposed generation. The benchmark case was used for comparison with the studies that contain the new 120 MW generation facility with and without the West-to-North transfer. Normally, contingencies that resulted in transmission element loading above emergency ratings that were not present in the benchmark case, and resulted in more than a 3% flow change, were deemed to be attributable to the new generation; however, many of the overloaded facilities identified in this study were near the point of becoming overloaded in the base case. The results of these studies, after screening out overloads that did not change by more than 3% with the proposed plant, are summarized below.

<u>Option 1: TXU ED's Parker SS – Graham 345 kV Line Approximately 16 Miles Southeast of Graham</u>

The contingency of concern for this configuration is either outage of the Graham – Benbrook / Gamesa – Parker double circuit 345 kV line section. Taking either of the lines out did not cause overloads on TXU ED's transmission system. There are no other system enhancements necessary for the proposed 120 MW.

<u>Option 2: TXU ED's Graham – Benbrook 345 kV Line Approximately 16 miles southeast of Graham</u>

As in the above Option 1, the proposed generation did not cause any overloads or voltage problems before or after contingencies were taken. The contingency of concern for this configuration is the outage of the Parker – Graham / Gamesa – Benbrook 345 kV double circuit line.

<u>Option 3: TXU ED's Graham – Oran 138 kV Line Approximately 16 Miles Southeast of Graham</u>

Connecting the additional 120 MW of proposed generation at this location, as seen in Figure 1~~3~~, did not cause any adverse effects on the transmission system.

<u>WEST-TO-NORTH TRANSFERS</u>

Another concern for the proposed generation site is the impact on the West-to-North transfer limit that currently exists in ERCOT. At a transfer level of 1000 MW above base case levels, the addition of the proposed generation did not result in any significant overloads that were caused by the proposed generation or the West-to-North transfer. Nonetheless, there are known limitations that may be encountered in the future. If the West-to-North limit is bumped, the proposed generation may be limited.

As stated previously, the comparison resulted in the identification of several overloaded facilities; these facilities were already or close to being overloaded in the base case after contingencies were taken. The loading only increased by 1% - 2% due to the proposed generation. There are system improvements currently proposed as part of the DFW/NE Congestion Relief Study that are not directly related to this proposed generation. The proposed generation did not cause any significant voltage problems, but it should be able to regulate to voltage specified by ERCOT (0.95 lead / 0.95 lag) when online.

RESULTS

The contingency results are in the following table:

Base Case and Study Case	Microsoft Excel Worksheet

Table 1

SUMMARY

Three alternatives were evaluated that successfully connected the proposed 120 MW of generation. The alternatives are listed below:

Any one of the three site proposals is allowable; but looking from a rough cost standpoint, the logical choice would be to tie into TXU ED's Graham – Oran 138 kV line assuming the generation is not expected to be increased above 120 MW.

RECOMMENDATION

It is recommended here, if there are no plans to expand this wind project above 120 MW that the interconnection be made at 138 kV using a three breaker ring bus.

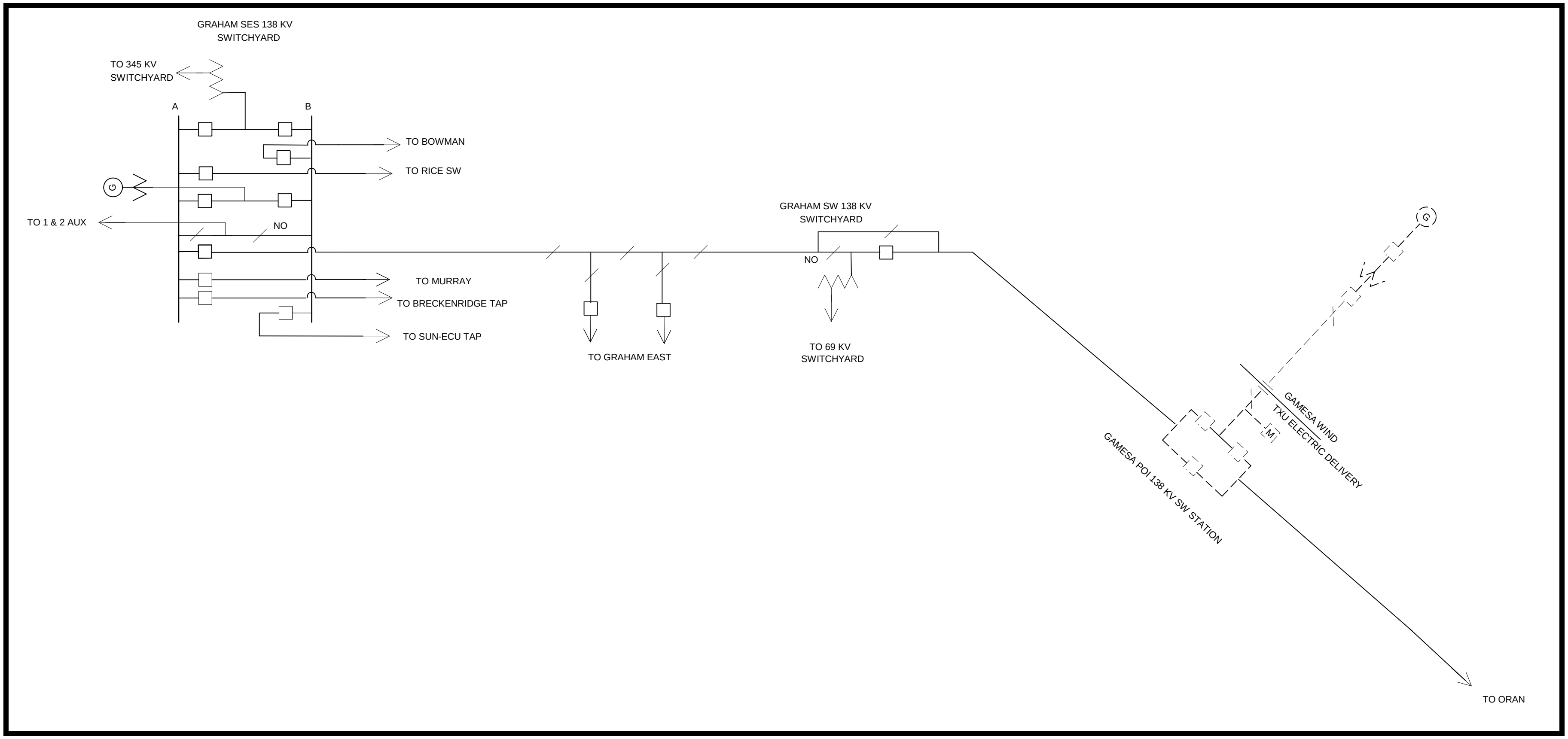

GRAHAM SES 138 KV
SWITCHYARD
TO 345 KV
SWITCHYARD
A
B
TO BOWMAN
TO RICE SW
G
TO 1 & 2 AUX
NO
TO MURRAY
TO BRECKENRIDGE TAP
TO SUN-ECU TAP
TO GRAHAM EAST
GRAHAM SW 138 KV
SWITCHYARD
NO
TO 69 KV
SWITCHYARD
G
GAMESA WIND
TXU ELECTRIC DELIVERY
M
GAMESA POI 138 KV SW STATION
TO ORAN

Figure 1

EXHIBIT D

2705 West Lake Drive
Taylor, Texas 76574

June 5, 2009

Mr. Brett Hunsucker
Authorized Representative
BARTON CHAPEL WIND LLC (RE)
1125 NW Couch St Suite 700
PORTLAND OR, 97209

RE: BRTSW BCW1

Dear Mr. Hunsucker:

Electric Reliability Council of Texas, Inc. (ERCOT) has reviewed your Resource Asset Registration Form(s) and, based on available information, it appears that your Generation Resource(s) are not able to comply with the 0.95 Lead/Lag requirement mandated by Protocol Section 6.5.7.1(2).[1] Attached as Attachment 1 are the latest Reactive Curve data on file with ERCOT. Accordingly, ERCOT respectfully requests that you respond to the following information requests by **Monday, June 22, 2009**. All inquiries regarding this request and responses should be provided to your ERCOT Client Services Representative.

1. Does the URL on file match the generating unit's reactive capability? If not, please update the RARF data and attach the updated data with your response to these questions.
2. Does the URL on file include reactive switching device capability, or does it only contain the reactive capability of the generating unit?
3. Do you have additional reactive capability that will contribute to the 0.95 Lead/Lag requirements? If so, did you seek ERCOT's approval of the alternative means to meet the URL requirements pursuant to Protocol Section 6.5.7.1(6)[2]?

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1 Protocol Section 6.5.7.1(2) states the following:

Generation Resources required to provide VSS except as noted below in items (3) or (4), shall have and maintain a URL which has an over-excited (lagging) power factor capability of ninety-five hundreths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundreths (0.95) or les, both determined at the generating unit's maximum net power to be supplied to the transmission grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the point of interconnection to the TDSP.

2 Protocol Section 6.5.7.1(6) states:

Upon submission by a Generation Resource required to provide VSS to ERCOT of a specific proposal for requirements to substitute for these URL requirements, ERCOT shall either approve such alternative requirements or provide the submitter an explanation of its objections to the proposal. Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements.

Electric Reliability Council of Texas, Inc.

Austin
7620 Metro Center Drive
Austin, Texas 78744
Phone: 512-225-7000
Fax: 512-225-7020

Taylor
2705 West Lake Drive
Taylor, Texas 76574
Phone: 512-248-3000
Fax: 512-248-3176

4. If you have additional reactive switching devices, are these devices capable of automatically switching in order to follow the voltage set point? Are they capable of being remotely controlled through SCADA? Please provide a list of the devices, their sizes, and a detailed description of how the devices are controlled / operated.

5. To the extent your Generation Resource(s) cannot comply with Protocol Section 6.5.7.1(2), please submit a mitigation plan no later than Monday, June 15, 2009, that describes how and when you intend to bring the Generation Resource(s) into compliance with the Reactive Power requirements.

Failure to respond by **Monday, June 22, 2009**, as directed above, may result in additional actions being taken. ERCOT appreciates your prompt attention to this request.

Sincerely,

Kent Saathoff

Kent Saathoff
Vice President, System Planning and Operations

Cc: Patrick Coon (ERCOT Client Services)
Chad Seely (ERCOT Legal)

Enclosures:

EXHIBIT E

TEXAS REGIONAL ENTITY
An Independent Division of ERCOT

INCIDENT REPORT

This form is to be completed by ERCOT or by a Market Participant to report the possible non-compliance of a NERC Reliability Standard or an ERCOT Protocol or Operating Guide. This form should **only** be used for reporting non-compliance related to the matters pertaining to **Bulk Electric System Reliability** of ERCOT; not commercial or retail matters.

Completed forms should be sent to Texas RE:

Via Mail: Texas Regional Entity
2700 Via Fortuna, Suite 225
Austin, Texas 78746

Via E-mail: complaint@texasre.org

Via FAX: Texas Regional Entity
Attn: TRE Complaint
(512) 225-7165

PART A: INFORMATION ABOUT THE ENTITY SUBMITTING THE INCIDENT REPORT

Market Participant or Interested Party

Organization Name:	Electric Reliability Council of Texas, Inc. ("ERCOT ISO")		
Address:	2705 West Lake Dr.		
City, State:	Taylor, Texas		
Zip Code:	76574		
Phone:	()	Fax:	()
E-mail Address:			

Contact (person to whom the response will be directed)			
Name:	John Dumas, Manager of Operations Planning		
Phone:	(512) 248-3195	Fax:	(512) 248-6560
E-mail Address:	jdumas@ercot.com		

Is this Submission made on a Confidential Basis? *(please check one)*

Yes ☒ No ☐

PART B: <u>DETAILS OF THE INCIDENT REPORT</u>

Non-Compliance Type (check one):

NERC Reliability Standard ☐	ERCOT Protocol/ERCOT Operating Guide ☒
NERC Reliability Standard:	
ERCOT Protocol Section:	6.5.7.1 (Generation Resources Required to Provide VSS Installed Reactive Capability)
ERCOT Operating Guide Number:	

Please outline below (or attach) details of the incident.

*(Note: Include the **name of the entity** that is the subject of the incident, the date(s) of the alleged non-compliance, and other relevant details)*

Name of Entity: Barton Chapel Wind LLC
Period of Non-compliance:
BRTSW_ BCW1: 12/1/2007 (Unit Start Date) - Present

Please check box if additional details are attached: ☐

PART C: FACTS OR INFORMATION THAT SUPPORT THE INCIDENT REPORT

Please outline below any facts or information that support the incident:

Protocol Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, provides the Reactive Power capability requirements for the ERCOT Region. Specifically, subparagraph (2) states the following:

> (2) Generation Resources required to provide VSS except as noted below in items (3) or (4), shall have and maintain a URL which has an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the transmission grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the point of interconnection to the TDSP.

ERCOT ISO discussed the Reactive Power capability requirements for Wind-powered Generation Resources (WGRs) at the Wind Workshop-II on August 22, 2008. Several months later, ERCOT ISO issued a Market Notice re-confirming the Reactive Power capability requirements under Protocol Section 6.5.7.1. ERCOT ISO believes the Protocol language requires all WGRs (excluding those already exempted under the current Protocol Section) to provide Megavolts Ampere Reactive (MVARs) equivalent to 0.95 power factor calculated at the unit maximum capacity, at all generation levels. For modeling purposes, a Reactive Power capability curve of a unit in compliance with the Protocol requirement should create a rectangle shape as opposed to a cone shape curve when the unit is not capable of sustaining a maximum amount of MVARs at all generation levels and therefore not in compliance with the Protocol requirement.

In December 2008, several Entities filed a complaint against ERCOT ISO at the Public Utility Commission of Texas (PUCT) regarding the Market Notice on the Reactive Power capability requirements (*See* Docket No. 36482). Although ERCOT ISO withdrew the Market Notice on procedural grounds, the PUCT complaint ultimately prompted ERCOT ISO to evaluate all Resource Asset Registration Form (RARF) data submitted by WGRs to confirm compliance with the Reactive Power capability requirements. In June 2009, ERCOT ISO sent a letter to Barton Chapel Wind, LLC (Barton Chapel) indicating that the Generation Resource (BRTSW_BCW1) appears not to comply with the 0.95 Lead/Lag requirements in Protocol Section 6.5.7.1(2). Attached is the June 5, 2009 ERCOT ISO letter to Barton Chapel. ERCOT ISO requested that Barton Chapel submit additional data to show compliance with the Reactive Power capability requirements or submit a mitigation plan to bring the Generation Resource into compliance with Protocol Section 6.5.7.1. Attached is the July 8, 2009 Barton Chapel's response, which indicated that it believes it is in compliance with the ERCOT Protocols and therefore did not provide a mitigation plan to meet ERCOT ISO's expectations. ERCOT ISO has attempted in good faith to work with Barton Chapel to resolve these issues, but there has been no progress in seeking a resolution. ERCOT ISO believes that Barton Chapel's failure to meet the Reactive Power requirements in the ERCOT Protocols is a material occurrence of non-compliance and has the potential to affect reliability of the ERCOT Transmission Grid.

Please check box if additional facts or information are attached: ☒

BChapel Response to ERCOT Reactive Cap

Barton Chapel Wind LLC.pdf

BRTSW - Reactive Capability.doc

PART D: SIGNATURE OF INDIVIDUAL OR AUTHORIZED REPRESENTATIVE OF THE MARKET PARTICIPANT OR ERCOT ISO MAKING THE INCIDENT REPORT

Signature:	
Name:	John Dumas
Title:	Manager of Operations Planning, ERCOT
Date:	10/14/2009

FOR TRE USE ONLY	
Date received by Texas RE:	
Date incident notice was sent of Incident Report Form:	

EXHIBIT F

ERCOT Protocols
Section 6: Ancillary Services

March 1, 2004

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(6) Generation Resource and Loads acting as a Resource accepted for RPRS must be able to respond in the hours for which they have been selected to provide the Ancillary Service.

(7) QSEs using Loads to provide RPRS must be capable of responding to ERCOT Dispatch Instructions in a similar manner to QSEs using Generation Resources to provide RPRS.

(8) Each Generation Resource and Load acting as a Resource providing RPRS must meet additional technical requirements specified in the Ancillary Service Qualification, Testing and Performance Standards, 6.10. QSEs must comply with their Balanced Schedule despite any generation provided by the RPRS unit. For example, the QSE supplying RPRS must adjust other Resources to accommodate the minimum operating output of the RPRS Resource selected by ERCOT in order to comply with their Balanced Schedule and Dispatch Instructions.

(9) QSE bids for RPRS will be in accordance with Section 4, Scheduling.

(10) RPRS may not be self-arranged by the QSE.

6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected to the same transmission bus that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service.

6.5.7.1 Generation Resources Required to Provide VSS Installed Reactive Capability

(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power at rated capability (MW) to maintain a Voltage Profile established by ERCOT. This quantity of Reactive Power is the Unit Reactive Limit (URL).

(2) Generation Resources required to provide VSS whose installations were in operation on September 1, 1999, or later, except as noted below, shall have and maintain a URL which has an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the transmission grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the point of interconnection to the TDSP.

(3) Qualified renewable Generation Resources (as described in Section 14, Renewable Energy Credit Trading Program) in operation before February 17, 2004, required

to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the URL as stated above, will be required to maintain a URL that is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and criteria as described in the Operating Guides.

(4) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the URL as stated above, will be required to maintain a URL that is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and criteria described in the Operating Guides.

(5) Upon request to, and with the approval of ERCOT, multiple generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these URL requirements only.

(6) Upon submission by a Generation Resource required to provide VSS to ERCOT of a specific proposal for requirements to substitute for these URL requirements, ERCOT shall either approve such alternative requirements or provide the submitter an explanation of its objections to the proposal. Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements.

(7) Reserved

[PRR473: Replace item (7) above and the boxed language shown below after alternate Protocol language for making a contribution to the construction of reactive capability is approved.]

(7) Pending development of Protocols to provide for the contribution to reactive capability construction, an induction generator may elect to make a contribution to the construction of reactive capability in lieu of meeting the Installed Capability Requirements contained herein.

(8) For Generation Resources required to provide VSS, no unit equipment replacement or modification shall reduce the capability of the unit below the requirements to be met by that unit prior to the replacement/modification, unless specifically approved by ERCOT.

(9) Generation Resources required to provide VSS shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

[*PIP210: When block deployment for Loads acting as a Resource can be implemented, add the following paragraph*:]

(11) A Load acting as a Resource has the option to request a load bid to be deployed only as a complete block. To the extent that ERCOT deploys a bid by a Load acting as a Resource that has chosen a block deployment option, ERCOT shall either deploy the entire bid or, if only partial deployment is possible, skip the bid by the Load acting as a Resource and proceed to deploy the next available bid.

6.7.5 Deployment of Replacement Reserve Service

(1) All units selected to supply this service based on capacity bids will have their Balancing Energy Service bid associated with the service placed in the Balancing Energy Service Bid Stack and will be deployed in accordance with these Protocols.

(2) Replacement Reserve Service providers are required to provide incremental Balancing Energy Service bids for the full megawatt quantity of capacity accepted by, and purchased by, ERCOT in the Replacement Reserve market. Energy bids from Replacement capacity reserves will be treated as any other incremental energy bid.

(3) The QSEs providing Replacement Reserve Service shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Services Deployment Performance Measures.

6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or TSPs designated by ERCOT, will instruct Generation Resources required to provide VSS to make adjustments for voltage support within the URL capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional megavolt-amperes reactive, nor will they be requested to operate on a voltage schedule outside the Unit Reactive Limits (URL) specified by the QSE without a Dispatch Instruction requesting unit-specific dispatch or an OOME instruction.

(2) ERCOT and TDSPs shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, step-up transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

(3) The TSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed reactive capability requirements.

(4) All Generation Resources required to provide VSS shall maintain the transmission voltage at the point of interconnection to the transmission grid as directed by ERCOT within the operating Reactive Power capability of the unit(s).

(5) At all times a Generation Resource unit required to provide VSS is On-line, the URL must be available for utilization at the generating unit's continuous rated active power output, and Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any Reactive Power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP.

(6) The QSEs providing Voltage Support Service shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Services Deployment Performance Measures.

6.7.7 Deployment of Out-of-Merit Energy Service

Deployment of units for OOME Service will follow Balancing Energy Service deployment guidelines as specified in Section 5, Dispatch.

6.7.7.1 Deployment of Zonal OOME

(1) During circumstances when command and control actions are required, ERCOT may instruct one or more specific QSEs to adjust their total ERCOT generation level or their generation level in a specific Congestion Zone. The Dispatch Instruction includes the quantity of energy required and the Congestion Zone(s), if applicable, but does not specify which Generation Resource(s) the QSE(s) should move. Such a Dispatch Instruction will be referred to as a "Zonal OOME Dispatch Instruction."

ERCOT Protocols

Section 6: Ancillary Services

October 1, 2008

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(11) For RPRS procurements due to Local Congestion, on or before the second (2^{nd}) Business Day after each Operating Day, ERCOT will post on the MIS, for such Operating Day:

(a) Each Resource receiving an RPRS Dispatch Instruction;

(b) Intervals for which each Resource received an RPRS Dispatch Instruction;

(c) The Low Sustainable Limit for each Resource receiving an RPRS Dispatch Instruction; and

(d) The binding transmission constraint (contingency and/or overloaded element(s)) causing the RPRS deployment.

(12) For RPRS procurements due to Zonal Congestion, on or before the second (2^{nd}) Business Day after each Operating Day, ERCOT will post on the MIS, for such Operating Day:

(a) The amount of RPRS procured by zone; and

(b) The Market Clearing Price for Capacity (MCPC) by zone.

(13) On or before the second (2^{nd}) Business Day after each Operating Day, ERCOT will post on the MIS, for such Operating Day, the total amount of RPRS procured by hour for;

(a) Local Congestion;

(b) Zonal Congestion; and

(c) System capacity.

6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected to the same transmission bus that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service.

6.5.7.1 Generation Resources Required to Provide VSS Installed Reactive Capability

(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power at rated capability (MW) to maintain a Voltage Profile established by ERCOT. This quantity of Reactive Power is the Unit Reactive Limit (URL).

(2) Generation Resources required to provide VSS except as noted below in items (3) or (4), shall have and maintain a URL which has an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the

generating unit's maximum net power to be supplied to the transmission grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the point of interconnection to the TDSP.

(3) Qualified renewable Generation Resources (as described in Section 14, Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the URL as stated above, will be required to maintain a URL that is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and criteria as described in the Operating Guides.

(4) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the URL as stated above, will be required to maintain a URL that is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and criteria described in the Operating Guides.

(5) Upon request to, and with the approval of ERCOT, multiple generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these URL requirements only.

(6) Upon submission by a Generation Resource required to provide VSS to ERCOT of a specific proposal for requirements to substitute for these URL requirements, ERCOT shall either approve such alternative requirements or provide the submitter an explanation of its objections to the proposal. Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements.

(7) Reserved

[PRR493: Replace item (7) above upon filling ERCOT staffing requirements.]

(7) An induction generator may elect to make a contribution in aide of construction in lieu of meeting the installed capacity VSS requirements contained herein. In order to comply with the VSS requirements under this Section, 6.5.7.1 (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to that used to collect payments for the direct assignment of interconnection Facilities under applicable PUCT rules. The level of payment shall reflect the cost to the TDSP of procuring, installing, operating, and maintaining any Reactive Power equipment required to replace the Reactive Power capability that otherwise would be necessary for the interconnection of the generator. In order for this Section 6.5.7.1(7) to be effective for VSS compliance, the TDSP shall certify to ERCOT

that the induction generator has complied with these requirements.

(8) For Generation Resources required to provide VSS, no unit equipment replacement or modification shall reduce the capability of the unit below the requirements to be met by that unit prior to the replacement/modification, unless specifically approved by ERCOT.

(9) Generation Resources required to provide VSS shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

6.5.7.2 QSE Responsibilities

(1) QSE Generation Resources required to provide VSS are expected to have and maintain Reactive Power capability at least equal to the Reactive Power capability requirements specified in these Protocols and the Operating Guides.

(2) Each QSE's Generation Resource providing VSS is expected to be compliant with the Operating Guides for response to transient voltage disturbance.

(3) Each Generation Resource providing VSS must meet technical requirements specified in Section 6.10, Ancillary Service Qualification, Testing and Performance Standards.

(4) Each QSE's Generation Resource providing VSS shall operate with the unit's Automatic Voltage Regulator (AVR) set to regulate generator terminal voltage in the voltage control mode unless specifically directed to operate in manual mode by ERCOT, or when the unit is going On- or Off- line. If the QSE changes the mode, other than under ERCOT direction, then the QSE shall promptly inform ERCOT. Any QSE-controlled power system stabilizers will be kept in service unless specifically permitted to operate otherwise by ERCOT. QSEs' control centers will monitor the status of their regulators and stabilizers, and shall report abnormal status changes to ERCOT.

(5) QSEs shall meet, within established tolerances, and respond to changes in the Voltage Profile established by ERCOT subject to the stated QSE Reactive Power and actual power operating characteristic limits and voltage limits.

(6) The reactive capability required must be maintained at all times the plant is On-line.

(7) QSE shall advise ERCOT Operations whenever their Generation Resources are not operating at a power factor level as specified in the Operating Guides. Upon such notice, ERCOT Operations, in conjunction with the appropriate TSP, shall investigate the situation with the goal of restoring the reported unit's operation to within the specified power factor range. Actions that ERCOT may take include the addition or removal of transmission reactive devices to/from service or a request to another Generator Resource within electrical proximity for the production of leading or lagging VARS (as appropriate) so as to equitably share the need for voltage support among Generation

6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or TSPs designated by ERCOT, will instruct Generation Resources required to provide VSS to make adjustments for voltage support within the URL capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional megavolt-amperes reactive, nor will they be requested to operate on a voltage schedule outside the Unit Reactive Limits (URL) specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

(2) ERCOT and TDSPs shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, step-up transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

(3) The TSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed reactive capability requirements.

(4) All Generation Resources required to provide VSS shall maintain the transmission voltage at the point of interconnection to the transmission grid as directed by ERCOT within the operating Reactive Power capability of the unit(s).

(5) At all times a Generation Resource unit required to provide VSS is On-line, the URL must be available for utilization at the generating unit's continuous rated active power output, and Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit’s continuous rated active power output, and any Reactive Power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP.

(6) The QSEs providing Voltage Support Service shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Services Deployment Performance Measures.

6.7.7 Deployment of Out-of-Merit Energy Service

Deployment of units for OOME Service will follow Balancing Energy Service deployment guidelines as specified in Section 5, Dispatch.

ERCOT Protocols
Section 6: Ancillary Services

November 1, 2009

operating output of the RPRS Resource selected by ERCOT in order to comply with their Balanced Schedule and Dispatch Instructions.

(9) QSE bids for RPRS will be in accordance with Section 4, Scheduling.

(10) RPRS may not be self-arranged by the QSE.

(11) For RPRS procurements due to Local Congestion, on or before the second (2^{nd}) Business Day after each Operating Day, ERCOT will post on the MIS, for such Operating Day:

(a) Each Resource receiving an RPRS Dispatch Instruction;

(b) Intervals for which each Resource received an RPRS Dispatch Instruction;

(c) The Low Sustainable Limit for each Resource receiving an RPRS Dispatch Instruction; and

(d) The binding transmission constraint (contingency and/or overloaded element(s)) causing the RPRS deployment.

(12) For RPRS procurements due to Zonal Congestion, on or before the second (2^{nd}) Business Day after each Operating Day, ERCOT will post on the MIS, for such Operating Day:

(a) The amount of RPRS procured by zone; and

(b) The Market Clearing Price for Capacity (MCPC) by zone.

(13) On or before the second (2^{nd}) Business Day after each Operating Day, ERCOT will post on the MIS, for such Operating Day, the total amount of RPRS procured by hour for;

(a) Local Congestion;

(b) Zonal Congestion; and

(c) System capacity.

6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected to the same transmission bus that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

6.5.7.1 Generation Resources Required to Provide VSS Installed Reactive Capability

(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power at rated capability (MW) to maintain a Voltage Profile

established by ERCOT. This quantity of Reactive Power is the Unit Reactive Limit (URL).

(2) Generation Resources required to provide VSS except as noted below in items (3) or (4), shall have and maintain a URL which has an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the transmission grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the point of interconnection to the TDSP.

(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the URL as stated above, will be required to maintain a URL that is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and criteria as described in the Operating Guides.

(4) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the URL as stated above, will be required to maintain a URL that is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and criteria described in the Operating Guides.

(5) Upon request to, and with the approval of ERCOT, multiple generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these URL requirements only.

(6) Upon submission by a Generation Resource required to provide VSS to ERCOT of a specific proposal for requirements to substitute for these URL requirements, ERCOT shall either approve such alternative requirements or provide the submitter an explanation of its objections to the proposal. Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements.

(7) An induction generator may elect to make a contribution in aide of construction in lieu of meeting the installed capacity VSS requirements contained herein. In order to comply with the VSS requirements under this paragraph (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to that used to collect payments for the direct assignment of interconnection Facilities under applicable Public Utility Commission of Texas (PUCT) rules. The level of payment shall reflect the cost to the TDSP of procuring, installing, operating, and maintaining any Reactive Power equipment required to replace the Reactive Power

capability that otherwise would be necessary for the interconnection of the generator. In order for this paragraph (7) to be effective for VSS compliance, the TDSP shall certify to ERCOT that the induction generator has complied with these requirements.

(8) For Generation Resources required to provide VSS, no unit equipment replacement or modification shall reduce the capability of the unit below the requirements to be met by that unit prior to the replacement/modification, unless specifically approved by ERCOT.

(9) Generation Resources required to provide VSS shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

6.5.7.2 QSE Responsibilities

(1) QSE Generation Resources required to provide VSS are expected to have and maintain Reactive Power capability at least equal to the Reactive Power capability requirements specified in these Protocols and the Operating Guides.

(2) Each QSE's Generation Resource providing VSS is expected to be compliant with the Operating Guides for response to transient voltage disturbance.

(3) Each Generation Resource providing VSS must meet technical requirements specified in Section 6.10, Ancillary Service Qualification, Testing and Performance Standards.

(4) Each QSE's Generation Resource providing VSS shall operate with the unit's Automatic Voltage Regulator (AVR) set to regulate generator terminal voltage in the voltage control mode unless specifically directed to operate in manual mode by ERCOT, or when the unit is going On- or Off- line. If the QSE changes the mode, other than under ERCOT direction, then the QSE shall promptly inform ERCOT. Any QSE-controlled power system stabilizers will be kept in service unless specifically permitted to operate otherwise by ERCOT. QSEs' control centers will monitor the status of their regulators and stabilizers, and shall report abnormal status changes to ERCOT.

(5) QSEs shall meet, within established tolerances, and respond to changes in the Voltage Profile established by ERCOT subject to the stated QSE Reactive Power and actual power operating characteristic limits and voltage limits.

(6) The reactive capability required must be maintained at all times the plant is On-line.

(7) QSE shall advise ERCOT Operations whenever their Generation Resources are not operating at a power factor level as specified in the Operating Guides. Upon such notice, ERCOT Operations, in conjunction with the appropriate TSP, shall investigate the situation with the goal of restoring the reported unit's operation to within the specified power factor range. Actions that ERCOT may take include the addition or removal of transmission reactive devices to/from service or a request to another Generator Resource within electrical proximity for the production of leading or lagging VARS (as appropriate) so as to equitably share the need for voltage support among Generation

(12) NSRS procured from a LaaR Block Bid shall be deployed as a block.

6.7.5 Deployment of Replacement Reserve Service

(1) All units selected to supply this service based on capacity bids will have their Balancing Energy Service bid associated with the service placed in the Balancing Energy Service Bid Stack and will be deployed in accordance with these Protocols.

(2) Replacement Reserve Service providers are required to provide incremental Balancing Energy Service bids as specified in Section 6.4.2, Determination of ERCOT Control Area Requirements, item (5). Energy bids from Replacement capacity reserves will be treated as any other incremental energy bid.

(3) The QSEs providing Replacement Reserve Service shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or TSPs designated by ERCOT, will instruct Generation Resources required to provide VSS to make adjustments for voltage support within the URL capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional megavolt-amperes reactive, nor will they be requested to operate on a voltage schedule outside the Unit Reactive Limits (URL) specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

(2) ERCOT and TDSPs shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, step-up transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

(3) The TSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed reactive capability requirements.

(4) All Generation Resources required to provide VSS shall maintain the transmission voltage at the point of interconnection to the transmission grid as directed by ERCOT within the operating Reactive Power capability of the unit(s).

(5) At all times a Generation Resource unit required to provide VSS is On-line, the URL must be available for utilization at the generating unit's continuous rated active power

output, and Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any Reactive Power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP.

(6) The QSEs providing Voltage Support Service shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

6.7.7 *Deployment of Out-of-Merit Energy Service*

Deployment of units for OOME Service will follow Balancing Energy Service deployment guidelines as specified in Section 5, Dispatch.

6.7.7.1 Deployment of Fleet/Zonal OOME

(1) During circumstances when command and control actions are required, ERCOT may instruct one or more specific QSEs to adjust their total ERCOT generation level or their generation level in a specific Congestion Zone (Zonal) or across all zones (Fleet). The Dispatch Instruction includes the quantity of energy required and the Congestion Zone(s), if applicable, but does not specify which Generation Resource(s) the QSE(s) should move. Such a Dispatch Instruction will be referred to as a "Fleet/Zonal OOME Dispatch Instruction."

(2) A Fleet/Zonal OOME Dispatch Instruction will be treated as an instructed deviation for Settlement purposes. When ERCOT issues a Fleet/Zonal OOME Dispatch Instruction, the resulting instructed deviation from the Fleet/Zonal OOME Dispatch Instruction will be defined by the MW amount as specified in the Fleet/Zonal OOME Dispatch Instruction.

(3) A Fleet/Zonal OOME Dispatch Instruction will be included in the calculation of the SCE. The Dispatch Instruction will not be constrained by ramp rate; therefore, the change will be considered a step change.

(4) ERCOT will send Fleet/Zonal OOME Dispatch Instructions to QSEs concurrent with Balancing Energy Service Dispatch Instructions for the target interval.

[PRR 422: Replace (4) above with the following when the system changes are implemented.]

(4) For manual deployment of Fleet/Zonal OOME before market clearing, the instructed deviation will be balanced using the Balancing Energy Service Bid Stack. ERCOT will send Fleet/Zonal OOME Dispatch Instructions to QSEs concurrent with Balancing Energy Service Dispatch Instructions for the target interval. The Balancing Energy

EXHIBIT G

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 plants[6] to

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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

(continued)

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

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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-though 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. **<u>Case-by-Case Application/Burden of Proof for Applying the Low Voltage Ride-Through Standard</u>**

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/APPA, 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/APPA 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/APPA 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/APPA 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/APPA 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 at 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.

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[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 at 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 <u>only</u> 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]

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[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

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[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 that +/- 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 that +/- 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. <u>Point of Measurement of Power Factor</u>

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

[29] <u>Id.</u> at P 55.

[30] <u>Id.</u> 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

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[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

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[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/APPA 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/APPA 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/APPA'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.

<u>List of Subjects in 18 C.F.R. Part 35</u>

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
EEI – 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/APPA – 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. <u>Supervisory Control and Data Acquisition (SCADA) Capability</u>

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. <u>Special Procedures Applicable to Wind Generators</u>

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

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[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

EXHIBIT H

DRAFT
Reliability and Operations Subcommittee (ROS) Meeting
ERCOT Austin – 7620 Metro Center Drive – Austin, Texas 78744
Thursday, September 10, 2009– 9:30 a.m. – 3:30 p.m.

Attendance

Members:

Allen, Thresa	Iberdrola Renewables	
Armke, James	Austin Energy	
DeTullio, David	Air Liquide	
Franklin, John	E. ON	
Garrett, Mark	Direct Energy	
Gutierrez, Fernando	BP Energy	
Hatfield, Bill	LCRA	
Helyer, Scott	Tenaska Power Services	
Holloway, Harry	SUEZ	
Jones, Liz	Oncor	Alt. Rep. for K. Donohoo
Jones, Randy	Calpine	
Keetch, Rick	Reliant Energy	
Kunkel, Dennis	AEP	
McDaniel, Rex	Texas-New Mexico Power	
Moore, John	South Texas Electric Cooperative	
Rocha, Paul	CenterPoint Energy	
Vanderlaan, Dirk	Exelon Generation	Alt. Rep. for W. Kuhn
Wagner, Marguerite	PSEG Texas	
Williams, Blake	CPS Energy	

Proxy assigned:

- Tony Marsh to Rick Keetch
- Marguerite Wagner to Randy Jones

Guests:

Barnes, Bill	J Aron	Via Teleconference
Barry, Victor	Texas Regional Entity	
Bruce, Mark	MJB Energy Consulting	
Doty, Jeanie	Austin Energy	
Firestone, Joel	Direct Energy	
Gibbens, David	CPS Energy	
Grimes, Mike	Horizon Wind Energy	
John, Ebby	CenterPoint Energy	Via Teleconference
Jones, Dan	Potomac Economics	
Kolodziej, Eddie	Customized Energy Solutions	
Martin, Steve	Oncor	
Niemeyer, Sydney	NRG Energy	
Ögelman, Kenan	CPS Energy	
Owens, Frank	TMPA	
Pieniazek, Adrian	NRG	
Reid, Walter	Wind Coalition	

Soutter, Mark	Invenergy
Thormahlen, Jack	LCRA QSE
Troutman, Jennifer	AEP Energy Partners
Ward, Jerry	Luminant
Wittmeyer, Bob	DME

ERCOT-ISO Staff:

Albracht, Brittney	
Brenton, Jim	Via Teleconference
Dumas, John	
Frosch, Colleen	
Kota, Naga	
Landin, Yvette	
Mereness, Matt	
Teixeira, Jay	
Villanueva, Leo	

Unless otherwise indicated, all Market Segments were present for a vote.

ROS Vice Chair Rick Keetch called the ROS meeting to order at 9:30 a.m.

Antitrust Admonition

Mr. Keetch directed attention to the displayed ERCOT Antitrust Admonition and noted the requirement to comply with the ERCOT Antitrust Guidelines. A copy of the guidelines was available for review.

Agenda Review

Mr. Keetch announced that the ROS Chair would not be present at the ROS meeting.

Approval of Draft ROS Meeting Minutes (see Key Documents)[1]

Harry Holloway requested that his affiliation be corrected to reflect SUEZ on both the July 16 and August 13, 2009 draft ROS meeting minutes.

Randy Jones moved to approve the July 16 and August 13, 2009 ROS meeting minutes as amended. Mr. Holloway seconded the motion. The motion carried unanimously.

Technical Advisory Committee (TAC) Update (see Key Documents)

Mark Bruce noted that all Operating Guide Revision Requests (OGRRs) under consideration at the September 3, 2009 TAC meeting were approved as recommended by ROS. Mr. Bruce also noted a TAC assignment to ROS to follow-up on issues raised at the recent Public Utility Commission of Texas (PUCT) wind integration workshop; and that TAC Procedures were modified to require all participants at

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[1] Key Documents referenced in these minutes may be accessed on the ERCOT website at: http://www.ercot.com/calendar/2009/09/20090910-ROS

ERCOT stakeholder meetings to clearly identify themselves and who they are representing at that specific meeting. Mr. Bruce added that tent cards are deemed adequate for seated representatives.

Nodal Single Entry Model (SEM) Implementation (see Key Documents)

Matt Mereness provided the SEM Go-Live transition summary and an early report of the SEM Go-Live details from the August 31, 2009 implementation date. Mr. Mereness reported that prior to SEM Go-Live, ERCOT's stress-testing included 50 concurrent users, and to-date there had been a maximum of 20 concurrent users; that submissions of the Network Operations Model Change Request (NOMCR) were being processed and staged to be incorporated into zonal; and that additional training for Transmission Service Providers (TSPs) would be available at the end of September 2009.

Ebby John added that more clarification is needed regarding unregistered Entities; that once the final model is validated, someone must be responsible for all sections of the model; that name changes are having more impact then expected regarding outages; that ERCOT has been very responsive to working through issues; and that the Network Data Support Working Group (NDSWG) will bring an issues update to the October 15, 2009 ROS meeting.

Inter-Control Center Communications Protocol (ICCP) Handbook v2.09

Mr. Mereness noted that the ICCP Handbook is the guiding technical reference regarding how telemetry comes to ERCOT from the field; reviewed revisions to the document and tables; and opined that the technical issues had reached a maturity level to allow for the coordination of next-level telemetry changes by year-end.

Market Participants discussed that certain items, such as change control language and the calculation of MVA, which are either still being vetted or will be gray boxed, may be set aside in favor of consideration of only technical aspects; and discussed the removal of Controllable Load Resource telemetry from the data table, as Security-Constrained Economic Dispatch (SCED) does not dispatch Controllable Load Resources. Mr. Keetch opined that no technical issues had been identified by ROS, and directed ERCOT to move forward as planned. There were no objections to Mr. Keetch's direction.

ROS Voting Items (see Key Documents)

Protocol Revision Request (PRR) 822, Removing Access to Restricted Computer Systems, Control Systems and Facilities

Steve Martin reviewed the 9/2/09 Critical Infrastructure Protection Working Group (CIPWG) comments regarding PRR822, noting stakeholder consensus that PRR822 as submitted duplicated the North American Electric Reliability Corporation (NERC) Standards, and that CIPWG offers language to revise PRR822 to be an informational Protocol to inform the Texas Regional Entity (TRE) that an event has occurred and is being reported per NERC requirements.

Market Participants discussed that the revised language proposed in the 9/2/09 CIPWG comments is an improvement and provides TRE with the transparency into an event. Victor Barry conveyed concerns that the revised language would apply to only 41 Entities in ERCOT who report that they own critical assets, and may be too limiting to address TRE Board concerns. Market Participants asserted that Entities that arguably do not have critical assets would be unduly burdened by requirements of PRR822; that efforts should be focused on issues that have a reliability impact consistent with the definition of a reportable event; and that regulators might pursue working with Entities believed to be incorrectly reporting critical asset ownership, rather than broadening the scope of PRR822.

Mr. R. Jones moved to endorse PRR822 as amended by the 9/2/09 CIPWG comments. Liz Jones seconded the motion. The motion carried with one abstention from the Investor Owned Utility (IOU) Market Segment.

Nodal Protocol Revision Request (NPRR) 194, Synchronization of Zonal Unannounced Generation Capacity Testing Process

Ms. Landin noted that PRS referred NPRR194 to ROS for further review. Jerry Ward expressed concern regarding the translation of the test from zonal to nodal; and noted that ERCOT will have more information in the nodal market than was available in the zonal market.

John Dumas responded that ROS was heavily involved with the development of PRR750, Unannounced Generation Capacity Testing, and reminded Market Participants that on April 17, 2006, 1700MW of reserves appeared to be available but were not deployable, leading to the development of a 7% discount factor, then a temperature-dependent discount factor, then unannounced testing; and that ramp rates were part of the discussion, including that the Qualified Scheduling Entity (QSE) may manage the High Sustainable Limit (HSL) in the Current Operating Plan (COP). Mr. Dumas added that unannounced testing has been very successful.

Market Participants discussed that not every event it short-term and that the ability to call on all Reserves, not just those that are available in one hour, should be preserved; that it was not the intention of the stakeholders to burden units with moving from Low Sustainable Limit (LSL) to HSL within one hour, as it was not envisioned that solid-fuel units would be at the bottom; and that the test might be altered for the nodal market, rather than directly translated, to indicate what capability may be provided in one hour, and increments beyond one hour, up to 1.5 hours.

Mr. Dumas noted that the issue at hand is managing the reserves on the ERCOT System, which is done via the 24 numbers in the COP; and that if a unit requires 12 hours, that the HSL may be adjusted as the unit is coming up. Mr. Dumas recognized the burden on the QSE to manage the HSL during the operating hours, but noted that a majority of stakeholders agreed that the burden would be properly placed with the QSEs given the system conditions.

Market Participants further discussed that PRR750 was designed for the zonal market; that the current definition of HSL has no delivery time requirement; and that as all ramp rates are known in the nodal market, the HSL for each unit should be easily calculated.

Ms. L. Jones moved to table NPRR194 for one month to allow interested parties to consult with ERCOT and develop alternative language that would address concerns regarding possible change to unit testing parameters during Nodal operations. Dennis Kunkel seconded the motion. The motion carried unanimously.

Nodal Operating Guide Revision Request (NOGRR) 030, Synchronization – Total Transmission Capacity Correction

OGRR235, Total Transmission Capacity Correction

PRR829, Total Transmission Capacity Correction - URGENT

Ms. Landin reported that PRR829 had been granted Urgent status via ROS email vote, but that NOGRR030 and OGRR235 had not been granted Urgent status via ROS email vote due to a lack of quorum. Mr. Dumas noted that the revisions are an effort to avoid terminology confusion during upcoming NERC audits. Market Participants discussed whether Urgent status would be necessary; and that synchronizing ERCOT Protocol terminology with NERC terminology should be a comprehensive rather than piecemeal effort.

Ms. L. Jones moved to endorse PRR829 as submitted, and to grant Urgent status to NOGRR030 and OGRR235. Paul Rocha seconded the motion. The motion carried with two abstentions from the Independent Retail Electric Provider (IREP) Market Segment.

Mark Garrett moved to recommend approval of OGRR235 as submitted. Fernando Gutierrez seconded the motion. The motion carried with one abstention from the IREP Market Segment.

Mr. Garrett moved to recommend approval of NOGRR030 as submitted. Mr. Gutierrez seconded the motion. The motion carried unanimously.

OGRR225, Quick Start Units Qualification Ramp Period
Mr. Holloway moved to recommend approval of OGRR225 as recommended by the Operations Working Group (OWG) in the 08/19/09 OWG Recommendation Report. Mr. Gutierrez seconded the motion. The motion carried unanimously.

Mr. Holloway inquired as to the progress of ramp rate testing. Mr. Dumas noted that 16 of 79 QSEs have submitted attestations, while 11 have tested, and that a reminder would likely be sent out the following day.

Operations Working Group (OWG) Scope
Frank Owens presented proposed revisions to the OWG Scope, and noted OWG agreement with CenterPoint comments to the language.

Mr. Rocha moved to approve revisions to the OWG Scope as recommended by OWG. Mr. Kunkel seconded the motion. The motion carried unanimously.

Addition of Member to SAR-003 Standard Drafting Team – BAL-001-TRE
Mr. R. Jones moved to approve the addition of Rick Terrill, Luminant Generation, to the SAR-003 Standard Drafting Team – BAL-001-TRE. Mr. Gutierrez seconded. The motion carried unanimously.

Transmission Project Information Tracking (TPIT) Timing Modification
Brad Woods reported that the Steady State Working Group (SSWG) would bring a TPIT timing modification recommendation to the October 2009 ROS meeting.

<u>Generation Re-interconnection Issues List</u>
Bob Wittmeyer reported the Wholesale Market Subcommittee (WMS) formation of the Multiple Interconnection for Generators Task Force (MIG TF) and reviewed a list of issues regarding Generators with multiple interconnections developed initially by a small group of Market Participants and then distributed for stakeholder input. Mr. Helyer suggested that ROS consider endorsing the list and then decide whether or not to participate in a joint ROS/WMS MIG TF.

Mr. Rocha moved to endorse the non-exclusive list of questions and concerns regarding Generators with multiple interconnections; and direct Mr. Wittmeyer to chair the joint ROS/WMS MIG TF. Mr. Helyer seconded the motion. Market Participants discussed that the MIGTF would be addressing an assignment from TAC to develop a list of issues by year-end, but would not report them directly to TAC unless directed by ROS and WMS; and that otherwise, ROS and WMS leadership would apprise TAC of progress on the issues list. **The motion carried unanimously.**

ERCOT Reactive Capability Testing Requirements

PRR830, Reactive Power Capability Requirement

Mr. Keetch noted that recently-posted PRR830 would not be taken up for consideration by ROS at this time, but that Mr. Dumas would present the item for informational purposes. Mr. Dumas added that an email vote is underway by PRS to grant PRR830 Urgent status, and reviewed the proposed language, as well as the new term Point of Interconnect (POI) and the revised definition of Wind-powered Generation Resource (WGR) to require that each turbine aggregated be the same model and size, and behind the same step-up transformer.

Mr. Dumas noted that the revised definition of WGR is for modeling purposes and alleviates concerns for impacts to the curve when one or more turbines are down for maintenance; and that the Reactive Power requirement shall be available at all MW output levels at or about 10% of the WGRs nameplate capacity and addresses questions such as who controls the breaker at the POI. Mr. Dumas added that an ROS endorsement is not requested at this time, but that language is presented for informational purposes; and that PRR830 does not represent a change in philosophy, but that ERCOT is only seeking to clarify language.

Mr. Keetch noted that PRR830 will be considered at the September 17, 2009 PRS meeting if granted Urgent status; that individuals may provide comments at any time; and that PRS may or may not refer the item to ROS. Market Participants expressed disappointment that the document had only recently been posted; discussed that ERCOT has the right to submit PRR language directly to PRS, but that TAC would have discomfort should the item not have been vetted by ROS; and requested that PRS remand the item. Mr. Dumas added that a month delay to the item would be tolerable if granted Urgent status, but that ERCOT would not support significant revisions to PRR830. Mr. Barry noted that there would be serious reliability implications should PRR830 be unreasonably delayed.

TAC Assignments

Mr. Keetch noted the assignment from TAC for ROS and WMS to take up generic discussion of the Ancillary Service procurement methodology, Replacement Reserve Service (RPRS) decommitment and Load forecast accuracy, and report back to TAC with issues for consideration. Mr. Bruce added that ROS is requested to work with ERCOT to develop the Ancillary Service Procurement Methodology document for 2010.

Mr. Dumas noted that the PUCT raised the issue of whether it would be beneficial to have the ability to decommit units in the zonal market; and that the Independent Market Monitor (IMM) had questioned what might be done to address positive bias in Load forecasting during summer months. Dan Jones added that if there is a reliability benefit from the positive bias in Load forecasts during peak hours in summer months, it would be more market-friendly to address the benefit through reserve policies rather than over-commitments.

ERCOT Reports – Questions Only (see Key Documents)

August Operations Report

Naga Kota was available to answer questions. Mr. R. Jones requested on behalf of Ms. Wagner a report on the frequency and magnitude of Block Load Transfers (BLTs) from Comisión Federal de Electricidad (CFE); whether use was for instances other than emergencies; and added that AEP had noted CFE's concern that it is not receiving proper Settlement. Colleen Frosch noted that BLTs or emergency transfers across the Direct Current (DC) Tie will be listed on the daily grid report. Market Participants discussed that there is a process if a unit is taken Out of Merit; whether an effort is underway to address CFE's concerns; and that further discussion of the topic would best be suited to WMS.

Mr. R. Jones noted that the forecast error for July-August 2009 increase by 8%. Mr. Villanueva answered that the increase might be attributable to pop-up rain showers; Mr. Dumas added that the causes had not been specifically researched.

August System Planning Report (Includes Congestion)
Mr. Armke noted that Phase I and Phase III of the Voltage Ride-Through study is the same, save for wind models. Mr. Teixeira noted that Phase III is a re-run of Phase I using improved models, and that Phase I is run to get immediate information. Mr. Teixeira also noted that in-service dates are posted in the monthly report for Generation Interconnects, and that the three units listed in the August 2009 System Planning Report, Section 1.1, New Generation Registered for Commercial Operations, are still in testing and are not full-time commercial units.

<u>TRE Compliance Report</u>
Mr. Barry noted that no formal report had been filed and invited questions. No questions were offered.

<u>ROS Working Group Reports (see Key Documents)</u>
CIPWG
Steve Martin reported that the next meeting of NERC Critical Infrastructure Protection Committee (CIPC) is September 16-17, 2009. There were no questions regarding the posted CIPWG report.

Dynamics Working Group (DWG)
There were no questions regarding the posted DWG report.

NDSWG
Mr. John clarified the process regarding the posting of telemetry reports, noting that Market Participants are in communication with ERCOT regarding discrepancies, removal of certain telemetry points from the list, and working to ensure accuracy.

OWG
There were no questions regarding the posted OWG report.

Performance Disturbance Compliance Working Group (PDCWG)
Sydney Niemeyer reviewed the 8/25/09 PDCWG comments to PRR824, Primary Frequency Response from WGRs, noting that due to the possible extensive changes to Operating Guides and ERCOT Protocols, PDCWG had requested to table PRR824 for one month to allow time for further review and to ensure that clarified definitions are applicable throughout. The 9/10/09 PDCWG comments proposed clarifications to the definitions of concern. Mr. Niemeyer applauded the efforts of Yvette Landing in assisting PDCWG in developing the comments, and officially thanked Bob Green for his recent leadership on PDCWG.

Mr. Niemeyer noted that many Market Participants have set the deadband at +/- .017 Hz with the thought that it will cause less maintenance; reported that plant operators are pleased with the results; and added that Tony Grasso had much to do with the development of the approach, believing that reducing the deadband would result in less unit movement.

System Protection Working Group (SPWG)
The SPWG report was posted with the day's Key Documents.

SSWG
There were no questions regarding the posted SSWG report.

Wind Operations Task Force (WOTF)
There were no questions regarding the posted WOTF report.

Adjournment
Mr. Keetch adjourned the meeting at 3:16 p.m.

EXHIBIT I

DRAFT
Reliability and Operations Subcommittee (ROS) Meeting
ERCOT Austin – 7620 Metro Center Drive – Austin, Texas 78744
Thursday, October 15, 2009– 9:30 a.m. – 3:30 p.m.

Attendance

Members:

Allen, Thresa	Iberdrola Renewables	
Armke, James	Austin Energy	
DeTullio, David	Air Liquide	
Donohoo, Ken	Oncor	
Garrett, Mark	Direct Energy	
Green, Bob	Garland Power and Light	
Gutierrez, Fernando	BP Energy	
Helyer, Scott	Tenaska Power Services	Via Teleconference
Holloway, Harry	SUEZ	
Jones, Randy	Calpine	
Keetch, Rick	Reliant Energy	
Kunkel, Dennis	AEP	
Marsh, Tony	Texas Power	
McDaniel, Rex	Texas-New Mexico Power	
Moore, John	South Texas Electric Cooperative	
Rocha, Paul	CenterPoint Energy	
Ryno, Randy	Brazos Electric Power Cooperative	
Soutter, Mark	Invenergy	Alt. Rep. for J. Franklin
Vanderlaan, Dirk	Exelon Generation	Alt. Rep. for W. Kuhn
Wagner, Marguerite	PSEG Texas	
Williams, Blake	CPS Energy	
Willms, Jerry	LCRA	Alt. Rep. for B. Hatfield

Guests:

Alvarel, Eli	BPUB
Ashley, Kristy	Exelon
Brandt, Adrianne	AE
Bruce, Mark	NextEra Energy Resources
Burkhalter, Bob	ABB
Carroll, Marianne	Brown McCarroll
Cochran, Seth	Sempra
Cook, Tim	CTT
Davison, Brian	PUCT
DeLaRosa, Lewis	PUCT
Gibbens, David	CPS Energy
Goff, Eric	Reliant
Grammer, Kent	Texas Regional Entity
Grasso, Tony	PUCT
Gresham, Kevin	E.ON Climate and Renewables
Grimes, Mike	Horizon Wind Energy
Hutson, Michael	RES Americas
Jackson, Pat	Cities

John, Ebby	CenterPoint Energy	Via Teleconference
Jones, Dan	Potomac Economics	
Jones, Liz	Oncor	
Kimbrough, Todd	NextEra Energy Resources	
Kolodziej, Eddie	Customized Energy Solutions	
Kremling, Barry	GVEC	
Lima, Leonardo	Siemens PTI	
Ögelman, Kenan	CPS Energy	
Owens, Frank	TMPA	
Palmisano, Augie	CSU	
Reid, Walter	Wind Coalition	Via Teleconference
Roberts, Terry	Duke	
Robinson, Lane	Bluarc	
Schwarz, Brad	E.ON	
Shields, Tom	Iberdrola Renewables	
Shumate, Walt	Shumate and Associates	
Stephenson, Randa	Luminant	
Thormahlen, Jack	LCRA QSE	
Ward, Jerry	Luminant	
Whittington, Pam	PUCT	
Wittmeyer, Bob	Longhorn Power	
Wybierala, Pete	NextEra	

ERCOT-ISO Staff:
Albracht, Brittney
Dumas, John
Kota, Naga
Landin, Yvette
Maggio, David
Rickerson, Woody
Teixeira, Jay

Unless otherwise indicated, all Market Segments were present for a vote.

ROS Chair Ken Donohoo called the ROS meeting to order at 9:30 a.m.

Antitrust Admonition
Mr. Donohoo directed attention to the displayed ERCOT Antitrust Admonition and noted the requirement to comply with the ERCOT Antitrust Guidelines. A copy of the guidelines was available for review.

Agenda Review
There were no changes to the agenda.

Approval of Draft ROS Meeting Minutes (see Key Documents)[1]

Randy Ryno moved to approve the September 10, 2009 ROS meeting minutes as posted. Randy Jones seconded the motion. The motion carried unanimously.

Technical Advisory Committee (TAC) Update (see Key Documents)

Mr. Donohoo reported extensive discussion of Protocol Revision Request (PRR) 822, Removing Access to Restricted Computer Systems, Control Systems and Facilities, at the October 1, 2009 TAC meeting; and that TAC had proposed language revisions and sent it for consideration at the October 20, 2009 ERCOT Board meeting.

2010 ERCOT Membership Record Date/Segment Elections

Brittney Albracht reported that the ERCOT Membership date-of-record is November 13, 2009; that Market Segment representative elections would begin on November 16, 2009; and that potential Bylaw revisions would prevent ERCOT Board members and Board alternates from voting on TAC and TAC subcommittees.

Renewable Technologies Working Group (Questions Only)

Mark Garrett noted that the RTWG report was posted with the day's Key Documents. There were no questions.

Nodal Single Entry Model (SEM) Implementation (see Key Documents)

Woody Rickerson provided a SEM implementation update and noted that owner/operator issues will not need to be revisited once corrected, unless a breaker is moved or added, or ownership changes. Mr. Rickerson reviewed Transmission Service Provider (TSP) model change activity and Network Data Support Working Group (NDSWG) coordination efforts. Market Participants discussed that modeling responsibilities in the nodal market are shifted to TSPs, with ERCOT providing validation, and that TSPs are encountering modeling details that are, in many instances, new to them.

NDSWG Update

Ebby John reviewed Network Model Management System (NMMS) issues. Market Participants discussed that TSPs cannot knowingly falsify a record and cannot state owner/operator for convenience; and that "modeling authority" might be a suitable term. Mr. Donohoo opined that modeling is a unique skill, and directed NDSWG to bring a timely recommendation for ERCOT consideration.

ERCOT Reactive Capability Testing Requirements (see Key Documents)

Mr. Donohoo reminded Market Participants that ROS' chief focus is grid reliability; that there are planning and operating considerations; that review is given to normal, contingency, and secondary contingency conditions; and that there are a number of variables beyond anyone's control. Mr. Donohoo opined that the greatest problem with voltage is dynamic Meg Volt-Amperes reactive (MVArs), and reviewed temporary solutions; and noted that Oncor has taken much more interest recently in MVArs for all units. Mr. Donohoo expressed concern that procedure to ensure the planning and operating models are correct is incomplete.

Market Participants discussed that enforcement is a missing key component; that audits provide a failsafe for the system, and that the Texas Regional Entity (TRE) might need additional resources to ensure that

[1] Key Documents referenced in these minutes may be accessed on the ERCOT website at: http://www.ercot.com/calendar/2009/10/20091015-ROS

testing is being done. Mr. Donohoo confirmed that transmission is built with the understanding that Generators are compliant with Protocols and with what is in the models; and expressed concern for how data in the data bases are confirmed to the operations and planning models. John Dumas noted that for operations, the test results are reviewed against the stated curve for 90% comportment and that a test is then designed to validate the data.

Market Participants discussed that the Steady State Working Group (SSWG) is responsible for updating the planning cases; Mr. Donohoo opined that a procedure is needed to ensure that planning and operations models match the data provided in the Resource Asset Registration Form (RARF). Market Participants discussed non-coordinated and coordinated testing; that the Public Utility Commission of Texas (PUCT) should provide direction if Wind-powered Generation Resources (WGRs) are to be treated differently than other forms of Generation; and that the PUCT supports the stakeholder process and ROS is responsible to provide technical advice as it pertains to reliable operation of the grid.

Market Participants further discussed that the Standard Generations Interconnect Agreement represents a compromise; that in exchange for providing Reactive Power capability, Generators are connected to the grid without charge; that there are times in the summer months when systems are both stressed and expected to be tested, and that the 90% criteria is a recognition of system conditions; in recognition of system conditions, 90% capability is accepted; and that due to changes in the grid, many voltage events are now off-peak.

<u>ROS Voting Items (see Key Documents)</u>

PRR830, Reactive Power Capability Requirement

Mr. Dumas stated that PRR830 does not represent a change in philosophy, and that at issue is not the capabilities of various technologies but what is required for planning and reliable operation of the ERCOT grid; that the revised definition of WGR is for modeling purposes and alleviates concerns for impacts to the curve when one or more turbines are down for maintenance; and that the 0.95 lead/lag requirement is still met at the Point of Interconnect (POI). Mr. Dumas added that a change in philosophy from a base set of standards will have impacts to the planning process and will open the door for continuous challenges any time Generation is connected to the system. Mr. R. Jones opined that a homogenous set of rules is needed for the reliable operation of the grid.

Mr. R. Jones moved to endorse PRR830 as submitted. Bob Green seconded the motion.

Mr. R. Jones recalled that during deliberations for the development of the ERCOT Protocols, he was disabused of the notion of a proportional degradation in obligation. Mr. R. Jones also recalled that Unit Reactive Limit (URL) was not referred to in the plural, but rather in the singular for a unit; that intent was to measure maximum output at 0.95 power factor; and that PRR830 maintains fidelity to the intent of the Protocols. Mr. R. Jones invited Market Participants to confirm his assertions with others that participated in the deliberations. Market Participants discussed the potential for catastrophic system failure due to the loss of dynamic capability and extreme frequency swings with minimal reaction time.

Mark Soutter asked what a unit is expected to do when the High Sustainable Limit (HSL) changes, and if the 0.95 ration would remain the same. Mr. Dumas stated that though output changes, the capability remains the same, and the requirement would be 33 MVArs 0.95 at the POI. Mr. Soutter asked if units below their Low Sustainable Limit (LSL) are not expected to produce Reactive Power. Mr. Dumas noted that a WGR can be online with the breaker closed, and that a compromise was inserted to recognize that LSL can be zero, but that at cut-in must provide 30 MVAr, as WGRs can sit at zero and be stable, while other units cannot.

Todd Kimbrough asked Mr. Dumas how the Protocols and the RARF are reconciled. Mr. Dumas reiterated that he believes the Protocols require the rectangle obligation and that pictures in the RARF are for example and do not reflect the requirement; that the RARF is to reflect accurate capability so that power flows may be run; and that whether a unit's capability is compliant is a separate matter. Harry Holloway added that ERCOT requires an updated Corrected Unit Reactive Limit (CURL), and that during times that his units have not been able to produce a 0.95, the CURL has been submitted and not rejected by ERCOT. Marguerite Wagner opined that PRR830 maintains a consistent standard; that the technical issues are complex but the solution is straightforward; and that the question to be solved is which party pays for the upgrades for those units that do not meet the requirement.

Mike Grimes opined that a lack of communication is at play; that Horizon Wind Energy and others interpreted the Protocols differently; that installations were made in the belief that units would be operating as required; and that the offering was not questioned, though some additional equipment was installed. Mr. Grimes opined that PRR830 represents rule changing and expressed concern for expensive retrofitting and regulatory uncertainty for Entities planning to relocate to Texas.

Walter Reid provided a presentation asserting that "virtual" units do not make sense; that the triangle has always been acceptable; that conventional generators are not required to comply with the rectangle, citing the CURL; that PRR835, Reactive Capability Requirement, provides modeling solutions; and that PRR830 established a new requirement. Mr. R. Jones countered that CURL establishes a new Reactive Power obligation and is still a rectangle, but on a smaller scale; that Mr. Reid's assertions that other facilities test in aggregate is not true, that facilities test regularly for real power and Reactive Power individually; and that conventional generators have never considered anything less than the rectangle to be their obligation. Mr. Reid expressed confidence that CURLs may be found that encroach on the rectangle. Mr. Dumas requested that Mr. Reid produce a list of those units not meeting the requirement and without exemptions, and noted that in the Protocols any conventional generation older than 1999 has an exemption, and that any WGR older than 2004 has an exemption from the requirement. Mr. Donohoo encouraged Market Participants to utilize the services of their ERCOT Client Services Representative, and not just read the Protocols and act.

Mr. Reid opined that many engineering firms arrived at an interpretation of the Protocols allowing the triangle; that Entities signed agreements with TSPs with more experience with ERCOT Protocols; and that some TSPs did studies resulting in more reactive requirements. Mr. Donohoo added that interconnect agreements state that ERCOT Protocol requirements must be met. Mr. Rocha recalled that the requirement is 0.95 at the unit's maximum output.

Mark Bruce stated that NextEra filed PRR835 rather then filing the elements of PRR835 as comments to PRR830, as it was understood that PRR830 would be easier to consider without the elements contained in PRR835. Mr. Bruce added that NextEra requested that the presentation regarding PRR835 be made available for discussion in conjunction with PRR830 discussion, and expressed his disappointment that the PRR835 presentation would not be reviewed; and that should the motion to endorse PRR830 carry, the time of ROS need not be taken to consider PRR835.

Mr. Donohoo directed Mr. Bruce to be ready to make the PRR835 presentation promptly upon reconvening. Upon reconvene, Mr. R. Jones stated that a motion remained on the floor, that he did not object to the presentation regarding PRR835, but that ROS should recognize that he was yielding the floor to Mr. Bruce.

Mr. Bruce expressed his appreciation to pause before the vote to review PRR835 and, he opined, complete the discussion. Peter Wybierala asserted that the current ERCOT Protocols regarding Reactive Power capability requirements is obsolete; that retroactive measures adversely affect systems already in operation; that PRR835 is forward-looking, based on need and not just obligation, and adapts to changing technology. Mr. Wybierala stated that PRR835 avoids fixing a problem that NextEra does not believe exists, and opined that there is not a need in West Texas for additional reactive capability.

Mr. Wybeirala introduced Leonardo Lima of Siemens-PTI, noting that NextEra engaged the services of Siemens-PTI to assess the current need for additional reactive resources in western ERCOT. Mr. Lima reviewed the study assumptions, sensitivity scenarios, and results. Clayton Greer asserted that the analysis performed under the presented scenario is meaningless; and that the operating stakes are not available without knowledge of the location of maintenance Outages. Mr. Donohoo added that planning is frequently trumped by operations. Ms. Wagner opined that NextEra posed good points for other markets, but that ERCOT has different technical requirements and does not provide compensation for Reactive Power. Mr. Rocha added that the Siemens-PTI study is not independent analysis, as is ERCOT's. **The motion carried via roll call vote.** *(Please see ballot posted with Key Documents.)*

Mr. Donohoo directed the Dynamics Working Group (DWG), the Operations Working Group (OWG), SSWG, and ERCOT Operations and Planning Staff work to verify that the correct data go into all models; suggested that a procedure might need to be developed, or that existing procedures might require modification; and requested that an update be provided at the January 2010 ROS meeting.

PRR835, Reactive Capability Requirement
No vote was taken on PRR835. See discussion above.

Ancillary Service Methodology
Mr. Dumas noted that ERCOT is required to receive annual ERCOT Board approval of the Ancillary Service methodology, and that ERCOT is reviewing proposed revisions with ROS, Wholesale Market Subcommittee (WMS) and TAC before presenting language to the ERCOT Board. Mr. Dumas reviewed proposed revisions, opining that the proposed approach accomplishes market goals without posing a risk to reliability.

Mr. Green moved to endorse the 2010 Ancillary Service methodology as proposed. Blake Williams seconded the motion. Market Participants commended ERCOT Staff for supporting more market-based tools for Ancillary Services, and discussed that a North American Electric Reliability Corporation (NERC) Disturbance Control Standard (DCS) event is defined as 80% of the largest unit; whether maximum coincident loss or geographic concentrations should also be considered; and that ERCOT should develop procedures, parameters, and communication for its operational choices. Mr. Dumas noted that uncertainty and risk has changed with the increase of wind on the system; that Ancillary Service needs are determined on the 20th of each month and posted to provide transparency.

Mr. Green and Mr. Williams accepted Ms. Stephenson's amendment that hour 2300 be included. Ms. Stephenson contended that hour 2300 represents the second highest interval for deployment of NSRS. Market Participants discussed the possibility that NSRS deployment at hour 2300 is due to schedule changes and depletion of Regulation Service rather than capacity issues; that a floor cannot be applied to a single hour, but only to a four-hour block; that an exception would have to be written to redefine the block; and that the methodology should move forward as proposed by ERCOT for observation before additional measures are taken. Ms. Stephenson stated that she would not want to affect an entire four-hour block; would not object to the initial proposal of hours 0700-2200; and that she would highlight the issue at the WMS. **Mr. Green and Mr. Williams then rejected Ms. Stephenson's hour 2300 revision. The initial motion carried unanimously.**

PRR833, Primary Frequency Response Requirement from Existing WGRs

Mr. R. Jones moved to endorse PRR833 as submitted. Mr. Ryno seconded the motion. Mr. Soutter opined that PRR833 would retroactively apply standards inappropriate except for in extreme circumstances; and stated that data had not been supplied in support of PRR833. Mr. R. Jones stated that PRR833 was submitted by a wind-only Qualified Scheduling Entity (QSE). **The motion carried with two objections from the Independent Generator and Independent Power Marketer (IPM) Market Segments.**

NPRR194, Synchronization of Zonal Unannounced Generation Capacity Testing Process

Jerry Ward noted that Luminant submitted comments in an effort to address ERCOT's operational needs; opined that the proposed language changes the meaning of HSL; and expressed concern that HSL is used for other purposes that would be impacted by a change in definition. Mr. Ward proposed that QSEs provide ERCOT a telemetry stating what may be achieved from the current position; and noted that the proposal would require each Generator to make a non-trivial calculation.

Mr. Dumas expressed understanding for Resource concerns, but stated that NPRR194 is a synchronizing revision request; that the issues were previously vetted during consideration of PRR750, Unannounced Generation Capacity Testing; and that in an emergency situation, reserves need to be responsive within an hour, rather than four hours. Mr. Dumas agreed that managing 24 HSLs is challenging, but was a compromise made during PRR750 discussions; and reiterated that PRR750 improved confidence in reserves and drove much uncertainty from the market.

Mr. Ward stated that HSL is used in many additional calculations in the Nodal market; agreed that PRR750 is improving confidence in the availability of reserves; and opined that the information should be provided to ERCOT in a different manner, such as a calculation that is telemetered at the time a test is called. Mr. Ward argued that in the nodal market, ERCOT controls where a unit is, and that the only way a unit may pass the test in nodal is to raise the LSL to 80-85%. Market Participants discussed that PRR750 allowed for the discontinuation of the Reserve Discount Factor (RDF) and improved market function; that NPRR194 would require submission of a number that is called an HSL but does not comport with other Protocols; and that telemetering a new number to ERCOT will require a system change.

Mr. Green moved to endorse NPRR194 as submitted. The motion failed for lack of a second.

Mr. Holloway moved to table NPRR194 for one month. The motion failed for lack of a second.

Market Participants discussed that there is technical merit to the proposal by Luminant, but requires every QSE to input the calculation; that implementation impacts to ERCOT should be considered. Mr. Dumas stated that the same concerns were raised at the consideration of PRR750; that QSEs have been able to manage their HSLs; that ERCOT Operations has gained confidence in the availability of reserves; and that while Mr. Ward's points are well taken, the greater good is to move forward with NPRR194.

Mr. Green moved to endorse NPRR194 as submitted. Mr. Rocha seconded the motion. The motion carried with three objections from the Independent Generator (2) and IPM Market Segments, and four abstentions from the Independent Generator (2), Investor Owned Utility (IOU) and Municipal Market Segments.

Nodal Operating Guide Revision Request (NOGRR) 026, Change the name of Emergency Electric Curtailment Plan (EECP) to Energy Emergency Alert (EEA) and Synchronization of EEA Steps with Protocols
Operating Guide Revision Request (OGRR) 223, Real Time Production Potential
OGRR226, Generation Resource Response Time Requirement
Market Participants noted that ERCOT submitted comments to OGRR226; that clarification might be made to language regarding voice communication; that one minute for voice communication might be insufficient; and that further discussion of OGRR226 by OWG might be necessary.

Mr. Rocha moved to recommend approval of NOGRR026 and OGRR223 as recommended by OWG in the respective 09/15/09 OWG Recommendation Reports; and to remand OGRR226 to OWG. Mr. Ryno seconded the motion. The motion carried unanimously.

TAC Assignment
Review TAC Open Action Items Assigned to ROS
RPRS Decommitment
Load Forecast Accuracy
Mr. Donohoo recommended that, due to time constraints, discussion of these TAC assignments to ROS be postponed to November 12, 2009 ROS meeting. There were no objections.

Multiple Interconnection for Generators Task Force (MIG TF) (see Key Documents)
Bob Wittmeyer reported that a draft spreadsheet was posted with the day's Key Documents; and that a white paper is in development.

ERCOT Reports – Questions Only (see Key Documents)
September Operations Report
Ms. Wagner asked why Regulation Service Up was depleted in five periods in September. Ms. Frosch responded that there could be a number of reasons, including QSEs being off their schedules or changes in the wind, and that each instance would need to be reviewed individually to determine an answer. Market Participants discussed that AEP will work with ERCOT to define operating parameters for phase shifters being placed in the south zone; and that understanding their operation is important for modeling and optimization.

September System Planning Report (Includes Congestion)
The September 2009 System Planning Report was posted with the day's Key Documents. No questions were offered.

ROS Working Group Reports – Questions Only (see Key Documents)
Critical Infrastructure Protection Working Group (CIPWG)
There were no questions regarding the posted CIPWG report.

DWG
There were no questions regarding the posted DWG report.

OWG
There were no questions regarding the posted OWG report.

Performance Disturbance Compliance Working Group (PDCWG)
There were no questions regarding the posted PDCWG report.

System Protection Working Group (SPWG)
There were no questions regarding the posted SPWG report.

SSWG
The SSWG report was posted with the day's Key Documents. Market Participants discussed that the Transmission Project Information Tracking (TPIT) timing modification was not a delay but rather a synchronization to cases by one month.

Wind Operations Task Force (WOTF)
There were no questions regarding the posted WOTF report.

<u>Other Business (see Key Documents)</u>
2009 Accomplishments/2010 Goals
Mr. Donohoo reminded Market Participants to review 2009 accomplishments and 2010 goals at their upcoming working group and task force meetings.

2010 ROS Meeting Dates
Mr. Donohoo noted that 2010 ROS meeting dates were posted for review. Market Participants briefly discussed that the schedule remains similar to recent years and would be suitable.

ROS Procedures
Due to time constraints, this item was not taken up.

Other
Mr. Reid noted that he would work with PDCWG to develop and submit an OGRR regarding a testing procedure governor response for future WGRs. Mr. R. Jones recommended that Mr. Reid and PDCWG also develop an OGRR regarding testing procedures for existing WGRs as well. There were no objections.

<u>Adjournment</u>
Mr. Donohoo adjourned the meeting at 3:31 p.m.

EXHIBIT J

DRAFT
Protocol Revision Subcommittee (PRS) Meeting
ERCOT Austin – 7620 Metro Center Drive – Austin, Texas 78744
Tuesday, September 17, 2009, 2009 – 9:30am

Attendance

Members:

Bailey, Dan	Garland Power & Light	
Bivens, Danny	OPUC	Alt. Rep. for G. Torrent
Boehnemann, Robin	Exelon Generation	
Carr, Pam	Stream Energy	
Cochran, Seth	Sempra Energy Trading	
Detelich, David	CPS Energy	
Durrwachter, Henry	Luminant	
Helpert, Billy	Brazos Electric Power Cooperative	
Jones, Randy	Calpine	
Madden, Steve	StarTex Power	
Morris, Sandy	LCRA	
Pieniazek, Adrian	NRG Texas	
Walker, DeAnn	CenterPoint Energy	
Wardle, Scott	Occidental Chemical Corp.	

Guests:

Allen, Thresa	Iberdrola
Brandt, Adrianne	Austin Energy
Brown, Jeff	Shell Energy
Bruce, Mark	NextEra
Coleman, Katie	TIEC
Comstock, Read	Direct Energy
Davison, Brian	PUCT
DeLaRosa, Lewis	PUCT
Dickson, Andrew	Duke
Goff, Eric	Reliant
Greer, Clayton	Morgan Stanley
Grimes, Mike	Horizon Wind Energy
Hammons, Daniela	CenterPoint Energy
Harryman, Carla	BP Alternative Energy
Helton, Bob	IPA
Jarvis, Tracy	AES Corp
Jones, Dan	Potomac Economics
Jones, Liz	Oncor
Kimbrough, Todd	NextEra
Liebmann, Diana	Horizon
McKeever, Debbie	Oncor
Moast, Pat	Texas Regional Entity
Nease, Nelson	Nucor Steel
Ögelman, Kenan	CPS Energy
Reid, Walter	Wind Coalition

Ross, Richard	AEPSC	
Rowe, Evan	PUCT	
Schwarz, Brad	E.ON Climate and Renewables	
Smith, Mark	Chaparral	
Soutter, Mark	Invenergy	
Troutman, Jennifer	AEP Energy Partners	
Whittington, Pam	PUCT	
Woodson, Patrick	E.ON	

ERCOT Staff:	
Albracht, Brittney	
Anderson, Troy	
Boren, Ann	
Dumas, John	
Flores, Isabel	Via Teleconference
Gonzalez, Ino	
Hobbs, Kristi	
Levine, Jonathan	
Reedy, Stephen	
Seely, Chad	
Seibert, Dave	

Unless otherwise indicated, all Market Segments were present for a vote.

PRS Chair Sandy Morris called the meeting to order at 9:30 a.m.

Antitrust Admonition

Ms. Morris directed attention to the Antitrust Admonition, which was displayed. A copy of the Antitrust Guidelines was available for review.

Approval of Draft PRS Meeting Minutes (see Key Documents) [1]

Henry Durrwachter recommended clarifications regarding the discussion of Nodal Protocol Revision Request (NPRR) 194, Synchronization of Zonal Unannounced Generation Capacity Testing Process.

Randy Jones moved to approve the August 25, 2009 PRS meeting minutes as amended by PRS. David Detelich seconded the motion. The motion carried unanimously.

Urgency Votes (see Key Documents)

Protocol Revision Request (PRR) 828, Remove QSE SCE Performance Exemption for QSEs with only Uncontrollable Renewable Resources On-line - URGENT

PRR829, Total Transmission Capacity Correction - URGENT

PRR830, Reactive Power Capability Requirement - URGENT

PRR831, Annual Transmission Congestion Rights (TCR) Auction Amount – URGENT

Ms. Morris reported that PRR828, PRR829, PRR830, and PRR831 had been granted Urgent status.

[1] Key Documents referenced in these minutes may be accessed on the ERCOT website at: http://www.ercot.com/calendar/2009/09/20090917-PRS

Technical Advisory Committee (TAC) and ERCOT Board of Directors (ERCOT Board) Reports (see Key Documents)
Ms. Morris reported TAC approval of revised TAC Procedures, noting the new requirement that all participants at ERCOT stakeholder meetings clearly identify themselves and the party they are representing at that specific meeting. Ms. Morris reviewed revision requests approved at the September 15, 2009 ERCOT Board meeting, and noted that TAC Chair Mark Bruce addressed enforcement issues associated with performance requirements versus metrics. Ms. Morris added that the ERCOT Board expressed a preference for metrics, but will accept performance requirements at this time in consideration of constraints posed by the Nodal project.

Project Update and Summary of Project Priority List (PPL) Activity to Date (see Key Documents)
Troy Anderson provided a Project Management Office (PMO) update; reported that there are no unfunded market projects at this time, noting that "unfunded" does not include parking deck items; and reviewed revisions to the Chief Executive Officer (CEO) Revision Request Review Form.

Parking Deck (Possible Vote)
Mr. Anderson reviewed the history of the parking deck concept; reported that changes to the Nodal systems post-Texas Nodal Market Implementation Date (TMNID) will be managed in structured releases, with the parking deck serving as input to release planning. Mr. Anderson reviewed data elements to be captured during the Market Participant approval process, and requested stakeholder input.

Mr. Anderson reported that a complete list of parking deck items from each TAC subcommittee has not been compiled. Mr. Bruce recommended that the subcommittees be consulted as to which items should populate the parking deck list, with discussion at PRS as to item priority and ranking, and asked for Mr. Anderson's insight regarding ERCOT's plan for subsequent iterations of the nodal market and engagement with the stakeholder process via TAC and the subcommittees. Mr. Anderson noted there is some limited discussion as to timing of post-TNMID releases and a five-year funding plan.

Mr. Bruce reminded Market Participants that Mike Cleary has consistently conveyed that achieving TNMID is its own project, and that stabilizing the Nodal market is a separate project; expressed concern that Market Participants might not be giving adequate consideration to the evolution of the Nodal market as they bring forward revision requests; suggested that there should be a coordinated view of the next Nodal market iteration, possibly requiring a Texas Nodal Team (TNT)-style process; and added that it would be inaccurate to characterize ERCOT as lacking a plan or a vision regarding the evolution of the Nodal market.

Eric Goff opined that, given various constraints, the parking deck process is an excellent primary tool to address market evolution, as it groups revision requests into thoughtful releases for market design. Clayton Greer echoed Mr. Goff and stated that Independent ERCOT Board members should be reminded that Market Participants have already worked through at least one market launch and stabilization; and that the Nodal market will have thoughtfully clustered revisions for systems. Ms. Morris noted that the item would be considered further at the November 19, 2009 PRS meeting.

Other Binding Documents (see Key Documents)
Dave Seibert reported that the draft NPRR for Other Binding Documents is currently under internal review and includes provisions to address the change control process.

Review of Recommendation Report, Impact Analysis and Cost/Benefit Analysis (see Key Documents)
PRR811, Real Time Production Potential
Billy Helpert moved to endorse and forward the 08/25/09 PRS Recommendation Report and Impact Analysis for PRR811 to TAC. DeAnn Walker seconded the motion. The motion carried unanimously.

PRR823, Clarifying Language for Resource 12-Month Rolling Planned Outage Schedule
NPRR189, Ancillary Service Deployment Clarification
NPRR191, Synchronization of PRR819, Changes to Support Revisions to the PUCT POLR and Expedited Switch Rules
NPRR193, Application of Nodal Implementation Surcharge in Verifiable Costs
NPRR195, Removal of McCamey Congestion Management from Nodal Protocols
Ms. Walker moved to endorse and forward the respective 08/25/09 PRS Recommendation Reports and Impact Analyses for PRR823, NPRR191, NPRR193, and NPRR195 to TAC; and to endorse and forward the 08/25/09 PRS Recommendation Report, as amended by the 09/17/09 ERCOT comments, and Impact Analysis for NPRR189 to TAC. Mr. Helpert seconded the motion. The motion carried unanimously.

Review of PRR Language (see Key Documents)
PRR821, Update of Section 21, Process for Protocol Revision
In response to Mr. Goff's question, ERCOT Staff clarified that PRR821 does not require additional language revisions in order to incorporate the Nodal parking deck process.
Mr. Durrwachter moved to recommend approval of PRR821 as submitted. Mr. Detelich seconded the motion. The motion carried unanimously.

PRR822, Removing Access to Restricted Computer Systems, Control Systems, and Facilities – URGENT
Mr. Barry reiterated the intention of PRR822 stating that this revision was in response to a directive by the Texas Regional Entity (TRE) Board; expressed concern that the Critical Infrastructure Protection Working Group (CIPWG) comments to PRR822 actually results in a co-mingling of the ERCOT Protocols and North American Electric Reliability Corporation (NERC) Standards and limits compliance requirements to effectively 41 Entities in ERCOT; and opined that comments supplied by CPS Energy matches the intent of the TRE Board in the creation of PRR822. Market Participants expressed appreciation for the efforts of CPS Energy in responding to the TRE Board's concerns regarding revisions to PRR822; requested additional time to review comments for unintended consequences; and offered to participate in a special PRS meeting for the timely consideration of PRR822.

Scott Wardle moved to table PRR822 and to convene a special PRS meeting prior to the next TAC meeting. Dan Bailey seconded the motion. Market Participants discussed that PRS would need to consider PRR822 in time for ERCOT to develop an Impact Analysis and perform a CEO Revision Request Review, and to post supporting materials in time for TAC consideration; and that the Impact Analysis should include not only implementation costs, but costs for ERCOT's ongoing compliance. Ms. Morris requested that comments to PRR822 be submitted as soon as possible, and noted that the date for the special PRS meeting would be announced before the day's adjournment. **The motion carried unanimously.**

PRR824, Primary Frequency Response from WGRs
Market Participants discussed operational implications of primary and secondary frequency response and that responsibility transfer involves secondary frequency response; that nuclear units are subject to Nuclear Regulatory Commission (NRC) requirements and provide a different type of governor response; and that there are a variety of technologies with varying capabilities. Mr. Bruce suggested that Wind-

powered Generation Resources (WGRs) in the planning and development phases should be addressed first, with a subsequent PRR addressing existing WGRs. Mr. R. Jones stated that reliability issues are at hand; that the idea of performing a system assessment to determine which wind generators should provide governor response is a bad idea due to the changing, growing system and that it would be more conducive to establish requirements for capability so that there is always coverage from an obligation standpoint. Mr. Dumas agreed that a study is not needed to confirm the need for primary frequency response, and added that should WGRs have governor response during light Load periods, ERCOT would have improved capability to integrate more wind, and that better primary frequency response will minimize the action needed to be taken through Regulation Service.

Market Participants also discussed whether Urgent status should be considered for PRR824 in order to maintain the December 2009 effective date; that the Nodal Operating Guides will also need clarification regarding performance and compliance; and how to relate the 5% droop to the number of turbines that constitute WGRs. Mr. Barry added that renewable technologies must provide primary frequency response, with the recognition that those technologies have different operating conditions; and cautioned any Entity planning to install WGRs in Texas that cannot provide primary frequency response does so at its own risk.

Mr. Bruce requested 30 days to work through compliance issues and stated that an NPRR would be required to address future concerns, rather than a PRR that will only be in effect for 14 months prior to the Nodal market. Market Participants discussed the benefits of advancing prospective requirements. Mr. R. Jones stated that ERCOT faces uncertainty in trying to recover from a frequency event and suggested that consideration should be given to making primary frequency response a paid service.

Mr. Durrwachter moved to recommend approval of PRR824 as amended by the 09/16/09 CPS Energy comments and as revised by PRS. Jennifer Troutman seconded the motion. Mr. Ögelman stated that he would submit a separate PRR to address retrofitting. Mr. Bruce requested an effective date of January 1, 2010 for PRR824 to maintain a consistent prospective application; and noted that NextEra would abstain from the vote in order to preserve the right to address compliance language at a later date. **The motion carried with one abstention from the Independent Generator Market Segment.**

PRR826, Clarification of Resource Definitions and Resource Registration of Self-Serve Generators for Reliability Purposes,
NPRR190, Clarification of Resource Definitions and Resource Registration of Self-Serve Generators for Reliability Purposes
Mr. Greer moved to table PRR826 and NPRR190 for one month. Ms. Walker seconded the motion. The motion carried unanimously.

PRR827, Find Transaction and Find ESI ID Functions on the MIS
Ms. Walker moved to recommend approval of PRR827 as amended by the 09/02/09 Texas Standard Electronic Transaction (TX SET) Working Group comments. Ms. Troutman seconded the motion. The motion carried unanimously.

PRR829, Total Transmission Capacity Correction – URGENT
Ms. Walker expressed frustration that only ERCOT-sponsored revision requests to address synchronization of terminology in the Protocols with NERC standards have been allowed to proceed through the stakeholder process; and stated that ERCOT Staff has assured her that they will work with Market Participants to move forward in a comprehensive effort to review Protocol terminology rather than a piecemeal effort

Ms. Walker moved to recommend approval of PRR829 as submitted. Mr. Greer seconded the motion. The motion carried with one abstention from the Municipal Market Segment.

PRR830, Reactive Power Capability Requirement – URGENT
Ms. Morris noted a request from the Reliability and Operations Subcommittee (ROS) that PRR830 be tabled and referred to ROS; and also noted a current related appeal before the Public Utility Commission of Texas (PUCT). Diana Liebmann stated that Horizon Wind Energy is an interested party in the contested case; that abatement of ERCOT's interpretation or Protocols regarding Reactive Power occurred in February 2009; and that WGRs desire a prospective requirement that will not require many retrofits. Ms. Liebmann argued that PRR830 is another effort to address issues already before the PUCT. Mr. Bruce noted ROS' request for time to review definitions.

Mr. Bruce moved to table PRR830 pending resolution of the contested case currently before the PUCT; and to request that ROS deliberate and file comments to PRR830. Mr. Detelich seconded the motion. Mr. Dumas stated that ERCOT's interpretation of the Protocols stands; that PRR830 provides a framework for what ERCOT believes is required; and that ERCOT has no issue with ROS reviewing PRR830.

Market Participants discussed that any fundamental change to voltage support should be reviewed by ROS, but debated whether or not ROS would be able to provide any additional insight without new information; and that ERCOT may report Entities not compliant with its current Protocol interpretation. Chad Seely stated that PRR830 has no relation to the PUCT docket and is a stand-alone issue. Ms. Liebmann stated that PRR830 language is more stringent; would require multi-million dollar retrofits; and would be applicable to all WGRs, many of which are currently exempt from such requirements, and would inordinately impact one portion of the market. Katie Coleman countered that Entities continually encounter new environmental standards, and that applying new standards via a PRR that require retrofits does not make the standard retroactive.

Mr. Bruce reminded Market Participants of procedural concerns and that the author of PRR830 is party to the contested case; and cautioned that the market should not act when a ruling of the PUCT is imminent. Mr. Seely opined that PRR830 could proceed independently of the contested case. Ms. Morris requested that a roll call vote be taken. **Mr. Bruce stated that, in the interest of expediency, he would withdraw the motion.**

Mr. Bruce moved to table PRR830 for one month and to encourage ROS to provide comments on PRR830. Mr. Detelich seconded the motion. Market Participants asked if ERCOT would be amenable to the tabling of PRR830; Mr. Dumas answered that ERCOT would be amenable to a one month delay only. **The motion carried unanimously.**

PRR831, Annual Transmission Congestion Rights (TCR) Auction Amount – URGENT
Adrianne Brandt stated that some Entities prefer to hedge risk with TCRs and asked what prompted ERCOT to select 25% as the appropriate level for the amount of TCRs sold in the annual TCR auction. Isabel Flores stated that TCRs would still be oversold at 25% but in consideration of other Commercially Significant Constraints (CSCs) did not want to go lower than 25%. Ms. Brandt suggested that 25% be replaced with 30% for the annual auction.

Ms. Brandt moved to recommend approval of PRR831 as revised by PRS. Mr. Greer seconded the motion. Market Participants discussed other percentages; that the annual TCR auction does not take outages into account and that something might be sold that is not available; and that 25% might not offer enough supply to Entities that wish to hedge with the annual product. Brandon Whittle opined that Consumers should not subsidize Entities' chosen hedging strategy. Mr. Wardle asked if ERCOT took into account the way West-to-North would be addressed in 2010; Ms. Flores responded that a better estimate cannot be made until the Closely Related Elements (CREs) are known.

The motion carried with two objections from the Independent Generator and Independent Power Marketer (IPM) Market Segments, and three abstentions from the Consumer, IPM and Investor Owned Utility (IOU) Market Segments.

PRR828, Remove QSE SCE Performance Exemption for QSEs with only Uncontrollable Renewable Resources On-line - URGENT

Mr. R. Jones moved to recommend approval of PRR828 as submitted. Robin Boehnemann seconded the motion. Mr. R. Jones stated that the value that wind brings to the ERCOT System is undisputable, but that the Market Clearing Price for Energy (MCPE) sets prices and that wind does not provide free energy; and that WGRs have responsibilities towards reliability.

Mr. R. Jones expressed frustration that comments offering compromise or grandfathering language were not submitted; and stated that PRR828 is not complex, but only discontinues what is characterized as a temporary exemption from Schedule Control Error (SCE) metrics that has been extended to WGRs; and that subsequent WGR metrics are beyond the scope of PRR828. Mr. R. Jones added that PRR828 has no system impact and disputed that the issue should be before the ERCOT Board or PUCT, as Market Participants instated the exemption; and opined that maintaining exemptions hamper the development of appropriate metrics.

Mr. R. Jones stated that most WGRs demonstrate some ability to achieve metric-level control and that performance gaps for other WGRs must be closed; that consideration should be given to billing WGRs for costs associated with wind performance issues, rather than socializing costs via the ERCOT Administrative Fee.

In reference to the presentation given by Mr. R. Jones, Mr. Bruce asked if the two highest and lowest performing WGRs were the same Qualified Scheduling Entities (QSEs), and if consideration had been given to the geo-location of the units, the number of turbines, or the MWs produced. Mr. R. Jones noted that the highest performances were not necessarily the same QSEs but that there were some repeat performers; that the low performers were fairly consistently the same QSEs; and that consideration had not been given to location, turbines, or MWs, but neither had those considerations been given to non-WGR QSEs.

Mr. Bruce noted that the written record of ERCOT Board discussions do not reflect a call for the action proposed by PRR828 and opined that the directive to develop wind metrics is a different issue. Mr. Bruce added that the TRE Board has stopped reviewing SCE metrics; and that the TRE Staff reported that SCE is not the appropriate metric for wind, but a replacement metric has not been identified as this time. Mr. Bruce reminded Market Participants that a performance metric regarding ramp rates had been developed for most installed WGRs; that much incremental progress has been made on wind issues in the past two years; and that PRR828 exposes Entities to significant regulatory and compliance risk with no mention of the reliability issues resolved by the passage of PRR828. Mr. Bruce added that the ERCOT Board's preference for metrics is tempered by the understanding that TNMID is the first priority, and that the ERCOT Board agreed with recent PRS and TAC decisions to take additional time to develop correct metrics.

Dan Jones expressed concern that Mr. R. Jones presentation might influence some individuals that are unfamiliar with the issues; that the Independent Market Monitor (IMM) does not have a position as to which parties should bear costs associated with wind, but that should PRR828 cause even one WGR to leave the market, there would be efficiency impacts; and that ERCOT has a centralized market for efficiencies.

Mr. Bailey stated that though he initially supported PRR828, after further consideration he does not believe that reliability issues will be solved; but that wind interests are clearly causing Ancillary Service costs being born by Loads; and that WGRs are obligated to pay for the risks and associated costs that they bring to the ERCOT System. Mr. Barry opined that exemptions were granted without a full understanding of the evolution of the ERCOT Transmission Grid; that as WGRs are challenged in providing according to plan, if reliability were the only consideration, wind would never be put on the ERCOT Transmission Grid; that a line must be drawn to stop the installation of facilities that run free with the wind unless the market funds a compensation mechanism; and that PRR828 might not be the correct response, but that wind cannot continue to operate as they have been when ERCOT is faced with 25GW of wind on the ERCOT Transmission Grid.

Market Participants discussed that additional consideration should be given to Ancillary Service cost causation; that reliability is at risk without primary frequency response capability; and that the Nodal market will address some issues associated with wind, but TNMID is more than a year away. Mr. Bruce stated his commitment to continue to work to develop meaningful metrics for WGRs. Mr. R. Jones reiterated that PRR828 is an effort to remove wind's exemption from SCE and require the same responsibilities of all Generators. Mr. Bailey asked for a commitment from wind interests to participate in a task force to consider cost allocation, should PRR828 not be recommended for approval.

Mr. Durrwachter moved to call for the question. Mr. Greer seconded the motion. The motion carried unanimously.

The motion to recommend approval of PRR828 as submitted carried on roll call vote. *(Please see ballot posted with Key Documents.)*

Several Market Participants inquired as to the possibility of reconsidering the motion. Mr. Seibert reminded Market Participants that a motion to reconsider must be made by a prevailing party to the initial motion.

Mr. Helpert moved to reconsider the vote regarding PRR828. Mr. Bruce seconded the motion. Market Participants discussed that a motion to reconsider may only address the previously decided question; that a motion to reconsider is an extraordinary action; that the movant must be party to the prevailing side, but that any party may provide a second to the motion to reconsider; that should PRR828 carry, QSEs would be in compliance jeopardy; and that cost allocation has twice been considered by a task force to no avail. Mr. Bruce stated that he would be supportive of a subsequent motion regarding the possible formation of a task force and pledged that NextEra would be engaged in the discussion; and encouraged any interested party to bring forward a PRR proposing a methodology for allocation. **The motion carried on roll call vote.** *(Please see ballot posted with Key Documents.)*

Mr. Seibert reminded Market Participants that the effect of the adoption of the motion to reconsider is immediately to place before the assembly again the question on which the vote is to be reconsidered, in the exact position it occupied the moment before it was voted on originally.

Upon reconsideration of Mr. R. Jones's motion to recommend approval of PRR828, as submitted, and Ms. Boehnemann's second, the motion failed on roll call vote. *(Please see ballot posted with Key Documents.)*

Mr. R. Jones expressed disappointment that the motion failed upon reconsideration and encouraged Entities with WGRs to deliver on promises to address meaningful metrics for wind. Mr. Bailey stated that he would be very disappointed to not see immediate action by wind interests.

Mr. Helpert moved to recommend to TAC that a task force be established under TAC or the Wholesale Market Subcommittee (WMS) to consider the allocation of Ancillary Services costs according to cost causation regarding WGRs. Mr. Ross seconded the motion. Market Participants discussed the need to develop and file a PRR quickly; that the scope of the task force should be limited to how to assign Ancillary Service costs caused by WGRs; and that a PRR may be filed independent of any task force, and that TAC may then form a task force or refer the PRR to the appropriate subcommittee. **The motion carried with one abstention from the IOU Market Segment.**

Mr. Greer asked if the motion to establish a task force was in order or required notice of vote to be waived. Mr. Seely opined that the motion was in order and stemmed from the notice of vote for PRR828.

Review of NPRR Language (see Key Documents)

NPRR196, Synchronization of Nodal Protocols with PRR827, Find Transaction and Find ESI ID Functions on the MIS

Ms. Troutman moved to recommend approval of NPRR196 as amended by the 09/02/09 TX SET Working Group comments. Ms. Walker seconded the motion. The motion carried unanimously.

Notice of NPRRs with CEO Determination of "Not Needed for Go-Live"

NPRR169, Clarify the Calculation and Posting of LMPs for the Load Zone and LMPs for each Hub

Mr. Goff expressed appreciation for the CEO review process, but stated that NPRR169 was filed prior to PRR799, ERCOT CEO Approval of NPRRs and SCRs Prior to Posting on MIS. Mr. Goff acknowledged the challenges associated with generating Impact Analyses, and stated that to the extent that one for NPRR169 is available, the market would appreciate the opportunity to review it. Mr. Anderson noted that there is an estimate for the initial coding work, but that concerns are largely centered around system degradation in attempting the change; and that he would take the request back for internal discussion and a determination if any analysis might be brought forward.

Notice of Withdrawal

There were no notices of withdrawal.

Other Business

PRR754, Resource Settlement Due To Forced Transmission Outage (Possible Vote)

Ms. Morris noted that prior to passage of PRR804, Revisions to Section 21 Appeal Process, PRR754 failed to be recommended for approval, and conveyed ERCOT Legal's request for formal rejection of PRR754. Kristi Hobbs added that the motion to recommend approval of PRR754 failed due to a lack of Market Segment vote majority, and that no appeal was filed.

Mr. Wardle's motion to reject PRR754 failed for lack of a second. Market Participants discussed that additional time should be allowed to review the background information and issues associated with PRR754.

Mr. Bruce moved to table PRR754. Mr. R. Jones seconded the motion. The motion carried with one objection from the Consumer Market Segment.

Special PRS Meeting
Ms. Morris announced that PRS would convene at 8:00 a.m. on Tuesday, September 22, 2009 at ERCOT Austin to consider PRR822. Ms. Morris urged Market Participants to file comments to PRR828 as soon as possible.

Adjournment
Ms. Morris adjourned the meeting at 3:45 p.m.

EXHIBIT K

DRAFT
Protocol Revision Subcommittee (PRS) Meeting
ERCOT Austin – 7620 Metro Center Drive – Austin, Texas 78744
Tuesday, October 22, 2009, 2009 – 9:30am

Attendance

Members:

Bailey, Dan	Garland Power & Light
Carr, Pam	Stream Energy
Cochran, Seth	Sempra Energy Trading
Detelich, David	CPS Energy
Durrwachter, Henry	Luminant
Helpert, Billy	Brazos Electric Power Cooperative
Jones, Randy	Calpine
Madden, Steve	StarTex Power
Morris, Sandy	LCRA
Pieniazek, Adrian	NRG Texas
Torrent, Gary	OPUC
Walker, DeAnn	CenterPoint Energy
Wardle, Scott	Occidental Chemical Corp.

Guests:

Allen, Thresa	Iberdrola
Ashley, Kristy	Exelon
Bevill, Rob	GMEC
Brandt, Adrianne	Austin Energy
Bruce, Mark	NextEra
Burt, Matthew	RES Americas
Comstock, Read	Direct Energy
Davison, Brian	PUCT
DeLaRosa, Lewis	PUCT
Gresham, Kevin	E.ON Climate and Renewables
Grimes, Mike	Horizon Wind Energy
Harryman, Carla	BP Alternative Energy
Jones, Dan	Potomac Economics
Jones, Liz	Oncor
Lee, Jerry	EPE
Moast, Pat	Texas Regional Entity
Ögelman, Kenan	CPS Energy
Reid, Walter	Wind Coalition
Robinson, Lane	Bluarc/Babcock Brown
Soutter, Mark	Invenergy
Taylor, William	Calpine
Troutman, Jennifer	AEP Energy Partners
Wagner, Marguerite	PSEG TX
Ward, Jerry	Luminant
Wybierala, Pete	NextEra

ERCOT Staff:
Albracht, Brittney
Boren, Ann
Dumas, John
Gonzalez, Ino
Hobbs, Kristi
Lasher, Warren
Levine, Jonathan
McMahon, Patrick
Rajagopal, Raj
Seely, Chad
Seibert, Dave

Unless otherwise indicated, all Market Segments were present for a vote.

PRS Chair Sandy Morris called the meeting to order at 9:30 a.m.

Antitrust Admonition
Ms. Morris directed attention to the Antitrust Admonition, which was displayed. A copy of the Antitrust Guidelines was available for review.

Approval of Draft PRS Meeting Minutes (see Key Documents) [1]
September 17, 2009
Mark Bruce and Mike Grimes offered revisions to the draft September 17, 2009 PRS meeting minutes.

DeAnn Walker moved to approve the draft September 17, 2009 PRS meeting minutes as amended by Mr. Bruce and Mr. Grimes, and as revised by PRS. David Detelich seconded the motion. The motion carried unanimously.

September 22, 2009
Ms. Walker moved to approve the draft September 22, 2009 PRS meeting minutes as posted. Gary Torrent seconded the motion. The motion carried unanimously.

Urgency Votes (see Key Documents)
Protocol Revision Request (PRR) 834, ERCOT Load Forecast Accuracy – URGENT
PRR835, Reactive Capability Requirement – URGENT
PRR836, Revised Minimum Ramp Rate for Balancing Energy Service Down to Comport with PRR803 – URGENT
Ms. Morris reported that PRR834, PRR835, and PRR836 had been granted Urgent status via PRS email votes.

[1] Key Documents referenced in these minutes may be accessed on the ERCOT website at: http://www.ercot.com/calendar/2009/10/20091022-PRS

Technical Advisory Committee (TAC) and ERCOT Board of Directors (ERCOT Board) Reports (see Key Documents)

Ms. Morris reported that TAC recommended approval of PRR822, Removing Access to Restricted Computer Systems, Control Systems and Facilities, after a long discussion, and noted that the ERCOT Board removed physical facilities language from PRR822 before approving it. Ms. Morris also reported that Trip Doggett will serve as interim ERCOT Chief Executive Officer (CEO).

Project Update and Summary of Project Priority List (PPL) Activity to Date (see Key Documents)

Parking Deck (Possible Vote)

Kristi Hobbs reviewed the nodal parking deck concept and noted that PRS would vote on recommended NPRR language as well as recommend priority and rank for NPRRs and System Change Requests (SCRs) that received a "Needed prior to the Texas Nodal Market Implementation Date" status from the CEO revision request review process. Ms. Hobbs noted that some revision requests are ready for parking deck consideration; encouraged Market Participants to review the parking deck within their organizations; and added that it would be the pleasure of the PRS as to when revision requests are addressed, though it is requested that large numbers of items not be delivered to the ERCOT Board at once. Mr. Bruce offered that subcommittees should not be concerned with overwhelming TAC with parking deck items, adding that TAC would take the opportunity to consider issues strategically and might take action to table items as necessary.

Other Binding Documents (see Key Documents)

Dave Seibert reported that the draft Nodal Protocol Revision Request (NPRR) for Other Binding Documents is currently under internal review, and encouraged Market Participants to contact him with any questions.

Review of Recommendation Report, Impact Analysis and Cost/Benefit Analysis (see Key Documents)

PRR821, Update of Section 21, Process for Protocol Revision

Ann Boren reviewed ERCOT comments to PRR821, noting clarifications to what actions might be taken before a PRR is deemed rejected.

Ms. Walker moved to endorse and forward the 09/17/09 PRS Recommendation Report as amended by the 09/29/09 ERCOT comments and the Impact Analysis to TAC. Adrian Pieniazek seconded the motion. The motion carried unanimously.

PRR824, Primary Frequency Response from WGRs

Market Participants discussed that PRR824-related Operating Guide Revision Requests (OGRRs) would soon be submitted; and proposed language revisions for clarifications and administrative items.

Mr. Durrwachter moved to endorse and forward the 09/17/09 PRS Recommendation Report as revised by PRS and the Impact Analysis to TAC. Randy Jones seconded the motion. The motion carried unanimously.

PRR827, Find Transaction and Find ESI ID Functions on the MIS

NPRR196, Synchronization of Nodal Protocols with PRR827, Find Transaction and Find ESI ID Functions on the MIS

Regarding PRR827, Ms. Hobbs recommended deleting "Public Area" from the language referencing "MIS Public Area" as the term "Public Area" applies to the Nodal Protocols. Ms. Hobbs also informed PRS that the black line language in the 09/17/09 PRS Recommendation Report was incorrectly updated and would be corrected with the 10/22/09 PRS Recommendation Report to properly reference the grey-boxed language for PRR805, Adding POLR Customer Class and AMS Meter Flag to the Database Query Function on the MIS.

Ms. Walker moved to endorse and forward the 09/17/09 PRS Recommendation Report as revised by PRS and the Impact Analysis for PRR827 to TAC; and to endorse and forward the 09/17/09 PRS Recommendation Report and the Impact Analysis for NPRR196 to TAC. Mr. R. Jones seconded the motion. The motion carried unanimously.

<u>Review of PRR Language (see Key Documents)</u>

PRR826, Clarification of Resource Definitions and Resource Registration of Self-Serve Generators for Reliability Purposes

NPRR190, Clarification of Resource Definitions and Resource Registration of Self-Serve Generators for Reliability Purposes

ERCOT Staff reported that internal work continues on some of the issues raised by Market Participants regarding PRR826, and requested that it be tabled for an additional month.

Scott Wardle moved to table PRR826 and NPRR190 for one month. Clayton Greer seconded the motion. The motion carried unanimously.

PRR830, Reactive Power Capability Requirement – URGENT

John Dumas noted that PRR830 was discussed at length at the October 15, 2009 Reliability and Operations Subcommittee (ROS) meeting; and stated that PRR830 does not represent a changed philosophy of what ERCOT believes the current Protocols require; that PRR830 provides a framework for existing Wind-powered Generation Resources (WGRs) to install devices to become compliant with the current Protocol requirements; and that PRR830 also provides a definition for modeling WGR turbines. Mr. Dumas added that aggregate modeling of turbines of different sizes and characteristics result in reactive curve inaccuracies when various turbines are, for example, down for maintenance. Mr. Dumas noted that modeling only like turbines, which will have like Unit Reactive Limit (URL) capabilities, addresses turbine availability status and provides an accurate representation of each WGR's Reactive Power capability. Mr. Dumas noted that PRR830 allows existing machines to meet requirements with static devices.

Mr. Bruce suggested that a revised WGR definition be limited to a specific use, and expressed concern that a broadly applied revised WGR definition would yield many unintended consequences to compliance reporting, settlement, and financial arrangements; and asked if there were methods to address modeling concerns via telemetry. Mr. Dumas answered that ERCOT believed the revised WGR definition would be appropriately applied throughout ERCOT Protocols; that telemetry addresses Mega Volt-Amperes reactive (MVAr) and MW output, rather than modeling; and that modeling affords the running of power flow studies to simulate line and unit loses. Mr. Dumas clarified that he is not privy to Qualified Scheduling Entity (QSE) processes, settlement contracts, and financial arrangements, but is answering from the prospective of Protocol requirements and modeling considerations.

Mr. Bruce asked how Voltage Profiles were determined, and if the process is described in the Operating Guides or other documents. Mr. Dumas answered that the Voltage Profile is defined in the ERCOT Protocols; that ERCOT works with Transmission Service Providers (TSPs) and Market Participant groups within ROS twice each year to run studies to establish a default voltage schedule; that Entities that do not know their voltage schedule should contact ERCOT, but it is known that the number will be between 0.95 and 1.05, based on system conditions; and that units need the capability to supply a 100 MW machine plus or minus 33 MVAR at the Point of Interconnection. Mr. Dumas opined that PRR835 represents a change in philosophy in positioning the MVAR requirement as a sliding number along output levels.

Mr. Bruce noted that PRR835 was filed by NextEra; that there was some discussion at the October 15, 2009 ROS meeting as to whether PRR835 should be withdrawn and filed as comments to PRR830; that NextEra believes PRR835 is the better solution and will not withdraw PRR835; and that NextEra will work to achieve some middle ground between the two PRRs. Mr. Bruce expressed hope that PRS would be reluctant to recommend approval of PRR830, and opined that ERCOT makes recommendations in PRR830 that do not take into consideration extended market effects.

Mr. R. Jones countered that ROS held a robust discussion of PRR830 and voted overwhelmingly to endorse PRR830; that there are commercial issues involved with PRR830, in addition to reliability concerns; and that fundamentally, voltage support is a community service. Mr. R. Jones recalled that when the Standard Generation Interconnection Agreement (SGIA) was developed, compromises were struck to require Load to pay for Transmission costs according to Load Ratio Share (LRS) in exchange for Generators supplying voltage support for the system without compensation. Mr. R. Jones added that Generators are only compensated for Reactive Power when they are asked to back down real power and are paid an opportunity cost; and that when Generators do not provide their portion of the voltage support obligation, risks and costs are transferred to Load via Out Of Merit (OOM) actions and Transmission Cost of Service (TCOS). Mr. R. Jones opined that PRR830 is appropriate and timely, and that without PRR830, the ERCOT System will become a dumping ground for outdated machines.

Mr. R. Jones moved to recommend approval of PRR830 as endorsed by ROS. Mr. Greer seconded the motion. Mr. Reid opined that a full discussion of PRR830 language and concepts had not been held; that clear guidance for new WGRs is needed to ensure voltage support; that PRR835 is more appropriate; and that PRR830 will require WGRs to spend funds to supply a rectangle that will not be used. Mr. Reid added that approval of PRR830 would eliminate language that, he opined, describes the triangle; and would subvert the process underway at the PUCT regarding PUCT Docket No. 36482, Appeal of Competitive Wind Generators Regarding the Electric Reliability Council of Texas' (ERCOT) Interpretation of the Reactive Power Protocols. Mr. Seely clarified the current procedural posture, stating that there was an order to dismiss Docket No. 36842; that WGRs have filed an appeal of the dismissal; and that there is a timeline for ERCOT to respond to the motion to appeal. Mr. Seely added that the proposed language in PRR830 may require retrofits for existing WGRs but is not retroactive.

Mr. Dumas noted that the obligation to provide the rectangle is defined in Protocol Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability. Mr. Reid argued that language proposed to be struck by PRR830 makes interpretation of a legal document. Market Participants discussed that ERCOT Protocols are continually revised and clarified. Mr. Grimes opined that WGRs came to Texas due to favorable grid access rules; and that PRR830 changes requirements and could have a chilling effect on other WGRs entering the ERCOT market. Mr. Grimes noted that Horizon Wind Energy discovered that they had been operating in contravention to ERCOT Protocols; sought clarification of requirements to ensure compliance; and installed additional reactive capability per the TDSP. Mr. Grimes also noted that per the 10/22/09 Vestas comments, Vestas owns units that provide Reactive Power via static and dynamic devices. Some Market Participants opined that ERCOT may set the Voltage Profile, but should not mandate how the profile is achieved; and that Entities should be allowed to demonstrate the viability of hybrid solutions for providing Reactive Power.

Mr. Greer cited Protocol Section 6.5.7.1 (2) as requiring 0.95 installed through the entire capability of a unit, regardless of restrictions on deployment. Mr. Detelich stated that he would be amenable to a proven hybrid solution for providing reactive capability, and would be opposed to requiring existing WGRs to separate and resubmit Resource Asset Registration Forms (RARFs). Ms. Wagner expressed concern that different requirements at each Point of Interconnection makes planning difficult, adversely impacts Consumer costs, and has fairness and grid stability implications.

Mr. Bruce stated that PRR835 sets a minimum standard but allows for the imposition of additional standards, and that each unit that is connected to the grid has undergone three studies; and opined that PRR830 is short-sighted for not addressing other technologies such as solar and storage, and is bad policy. Mr. Bruce drew similarities between PRR830 discussions and the disposition of OGRR208, Voltage Ride-Through (VRT) Requirement; argued that a lack of data erodes the reason for the process; and questioned why another 30-60 days could not be taken to further debate the issues. Mr. Bruce expressed concern that another appeal before the PUCT would spotlight deficiencies in the stakeholder process and would cost time, effort and money for all parties. Mr. Bruce suggested that PRS generate a list of questions for consideration by ROS.

Mr. R. Jones opined that PRR835 tacitly admits that the rectangle is the requirement, as the rectangle will be required upon assessment; and complained that the ROS discussion of PRR830 was mischaracterized as incomplete. Mr. R. Jones expressed concern that an assessment methodology would result in dueling studies by various consultancies and additional delays; and that eventual installation of additional Reactive Power capability would fall to TDSPs as a result. Mr. R. Jones noted that ERCOT's and other Entities' lack of study horsepower has been cited in numerous forums; and recalled discussions held at the development of interim requirements where it was made clear that the obligation for Reactive Power was not proportional to output, that the shape was rectangular and not conical.

Mr. Reid complained that the issues underlying PRR830 had not been remanded to a working group or task force; and that while modeling issues must be addressed, altering the definition of WGR has far-reaching impacts, including impact to the use of the word "units". Liz Jones reminded Market Participants that the discussion of PRR830 at the October 15, 2009 ROS meeting consumed at least three hours, and opined that the characterization of the ROS discussion of PRR830 was disrespectful of the members of ROS who brought their experience and perspective to the meeting and held the discussion they felt was necessary. Ms. L. Jones requested recognition of the difference between dynamic and static capacity on the system, and that they are not perfectly substitutable, depending on system conditions.

Ms. L. Jones rejected the notion that ERCOT and Market Participants are doomed to repeat history as it pertains to an appeal, noting that PRR830 discussions and votes do not have an 11th hour element; that Order 15 is on appeal and that parties believing that ERCOT should be precluded from taking action should make that case to the PUCT; that it has not been ERCOT's habit to not take action; and that ERCOT has usually been directed to act affirmatively. Ms. L. Jones concluded that PRS should take the action it deems appropriate.

Mr. Grimes registered his objection to the characterization that WGRs are trying to push costs to other parties; and added that Entities will provide additional equipment that is demonstrated to be necessary, but does not wish to undertake costs based on presumed needs.

Mr. Greer stated that good voltage response is needed where Load is heavy, but internal Generation is lacking, and where there is an excess of Generation and low Load. Mr. Greer noted that a 400 mile capacitor is about to be installed in West Texas, and that grid conditions will vary tremendously with lines continuously in and out of service; and opined that any study may be generated to demonstrate any need. Mr. Greer concluded that as grid conditions are dynamic, reactive response should be solid at all times.

Mr. Dumas agreed with Ms. L. Jones that OGRR208 and PRR830 are completely different, noting that when OGRR208 was contested, Federal Energy Regulatory Commission (FERC) Order 661A was not being applied in Texas, and as it was considered a new requirement, some consideration was given to studies. Mr. Dumas added that PRR830 does not represent a new requirement, and should not be delayed due to Competitive Renewable Energy Zone (CREZ) build-out and coming WGR installation; that ROS has provided input as requested; that standards equalize the playing field and planning process; and that PRR830 should move forward at this time.

Ms. Wagner opined that while other regions have a different construct for connecting Generation, the ERCOT interconnection system is successful due to consistent standards; and added that NextEra was granted time to present PRR835 considerations at the October 15, 2009 ROS meeting, and that votes were not swayed.

Warren Lasher noted that on a recent call, the New England Independent System Operator manager of renewables integration stated their proposed Reactive Power requirement for the rectangle, rather than the cone; that there is increased interest for WGRs in South Texas where Private Use Networks (PUNs) and Load issues will be at play; that a reactive study for CREZ lines will commence that very week; and that assumptions will have to be made as to whether units will provide the cone or the rectangle. Mr. Lasher stated his conviction that to assume that the requirement is cone shaped would yield a different answer.

Dan Jones asked what underlying assumption – whether the cone or rectangle requirement – supported the multimillion dollar decision in the CREZ proceeding. Mr. Lasher stated that all analysis was executed using the rectangle assumption. Mr. Wybierala stated that PRR835 was proposed to provide flexibility going into CREZ. Mr. Lasher allowed that per-unit requirements based on studies seems appropriate, but leads to equity issues at minimum, and that permutations grow so quickly that the methodology does not make sense and is impractical and extremely difficult to implement.

Mr. Bruce stated that the ROS comments did not alter the language of PRR830, and that the motion should be stated "as submitted by ERCOT"; Mr. R. Jones countered that "as endorsed" was not an illegal motion element and would remain in the motion. Kevin Gresham clarified that E.ON does not agree that the rectangle, as opposed to the cone, is the requirement, but would abstain from the vote.

The motion carried on roll call vote with seven objections from the Independent Generator Market Segment, and five abstentions from the Independent Generator (2), Independent Power Marketer (IPM) (2), and Investor Owned Utility (IOU) Market Segments. *(Please see ballot posted with Key Documents)*

Ms. Morris requested that interested parties file comments to PRR830 prior to the November 5, 2009 TAC meeting.

PRR832, Deletion of Schedule Control Error (SCR) Posting Requirement
Mr. Dumas reported that in reviewing the ERCOT Protocols, it was discovered that the report referred to in PRR832 was never implemented and does not exist. Mr. Dumas expressed concern that to create the report would remove resources from Nodal efforts, and recommended deleting the requirement. Pat Moast stated that while the TRE does not agree with the possible implication that what is proposed for removal has a substitute that the TRE produces, the TRE does not oppose the ERCOT proposal.

Mr. Bailey moved to recommend approval of PRR832 as submitted. Mr. Detelich seconded the motion. Mr. Moast stated that the TRE had no language modification to propose. **The motion carried with one abstention from the Independent Generator Market Segment.**

PRR833, Primary Frequency Response Requirement from Existing WGRs
Mr. Dumas clarified that ERCOT will interpret “technically infeasible” as relating to whether turbines are able to pitch their blades or physically respond to control signals; and that clarification is needed regarding “on” or “prior to” January 1. Mr. Reid opined that such interpretation would have significant investment impacts, as many turbines are not part of a central control system. Mr. Dumas added that PRR833 only requires ERCOT consideration as to whether WGRs can technically be equipped with Primary Frequency Response, not consideration of dollar figures.

Mr. Reid opined that PRR833 would remove all Type 1 and Type 2 turbines from operation with no supporting study and that PRR833 is retroactive in nature. Mr. Gresham thanked Mr. Dumas for clarifying ERCOT’s likely interpretation; stated that organizations would need to further consult with their engineering and construction resources; and opined that without a study, required retrofits would be for only possible enhancements to reliability. Mr. R. Jones disagreed that enhancements to reliability would only be potential; and opined that any additional governor response that is tuned properly affords better reliability, and that the obligation has always been in place for all units.

Mr. R. Jones moved to recommend approval of PRR833 as revised by PRS. Mr. Greer seconded the motion. Mr. Bruce argued that Protocol Section 5.9.1.1, Governor in Service, does not address what is to be done with a Resource that does not have or cannot have a governor; and expressed dismay that a TSP would interconnect a Generator, that ERCOT would accept a RARF, and that units would be in operation for eight years before learning of compliance issues. Mr. Bruce noted that nuclear units operate differently than other units, but that pains are not taken to minutely define the differences, and opined that another section is needed in the ERCOT Protocols to address Generation units without governors. Mr. Bruce suggested that issues associated with PRR833 be approached in the same manner as ramp rates, and that PRR833 be tabled so that further work may be done.

Mr. R. Jones opined that language that is solely prospective creates different classes of WGRs. Mr. Grimes offered that the speed with which a unit is able to feather blades might also be a feasibility consideration, and questioned how capability might be demonstrated; Mr. R. Jones noted that officer attestations are accepted in other areas of ERCOT and might be applicable in this instance. Mr. Dumas reminded Market Participants that the language references only “technically infeasible”; that costs are not listed as a consideration, that ERCOT is not suggesting that costs should be a consideration and is not taking a position on costs; and that he raises ERCOT’s likely interpretation in an effort to avoid ambiguity and any eventual argument that the capability is “technically infeasible” because of cost.

Mr. R. Jones opined that PRR833 should move forward; noted that additional language regarding technical infeasibility has not been provided during the comment period to date; and stipulated that improvements in system performance are due to thermal Generators providing governor response. Mr. R. Jones acknowledged that portions of PRR833 language remain challenging; recommended interested parties offer comments with improved language for consideration at the November 5, 2009 TAC meeting; and offered that should suitable revisions not be achieved at TAC, he would move to remand PRR833.

Mr. Gresham offered appreciation for ERCOT’s efforts to avoid ambiguity, but clarified that new information was provided at the day’s PRS meeting. Mr. Bruce expressed concern that new language would be sent to TAC without prior vetting by task forces, working groups and subcommittees, and opined that the appropriate action would be to reject the motion on the floor and then approve a subsequent motion to table PRR833. Mr. R. Jones countered that the base language for PRR833 came out of the Operations Working Group (OWG). **The motion carried on roll call vote with four abstentions from the Independent Generator, IOU, and IPM (2) Market Segments.** *(Please see ballot posted with Key Documents.)*

PRR834, ERCOT Load Forecast Accuracy – URGENT
Mr. Durrwachter noted that the newly revised ERCOT Ancillary Service procurement methodology is proceeding through the stakeholder process and might address some of the issues related to PRR834.

Mr. Durrwachter moved to table PRR834 for one month. Mr. R. Jones seconded the motion. The motion carried with one abstention from the Independent Generator Market Segment.

PRR835, Reactive Capability Requirement – URGENT
Mr. Greer moved to reject PRR835. Mr. R. Jones seconded the motion. The motion carried on roll call vote with six objections from the Independent Generator (5) and IPM Market Segments, and five abstentions from the Independent Generator (2), IPM (2) and IOU Market Segments. *(Please see ballot posted with Key Documents.)*

PRR836, Revised Minimum Ramp Rate for Balancing Energy Service Down to Comport with PRR803 – URGENT
Mr. Durrwachter moved to recommend approval of PRR836 as submitted. Mr. Bailey seconded the motion. The motion carried unanimously.

Review of NPRR Language (see Key Documents)
NPRR194, Synchronization of Zonal Unannounced Generation Capacity Testing Process
Mr. Durrwachter moved to table NPRR194 for one month. Mr. R. Jones seconded the motion. Market Participants discussed how the benefits of driving uncertainty from the system, achieved via PRR750, Unannounced Generation Capacity Testing, might be retained in the Nodal market; that ERCOT needs to ascertain that the numbers provided in Real Time Reserve monitoring are achievable in an emergency without risking damage to units that might have just been backed down for Responsive Reserve Service (RRS); whether telemetered High Sustainable Limit (HSL) might be used rather than Current Operating Plan (COP) HSL; and whether ERCOT might consider running the test when a unit is already at 80 percent of Load. **The motion carried unanimously.**

NPRRs with CEO Determination of "Not Needed for Go-Live" (Possible Vote)
NPRR131, Ancillary Service Trades with ERCOT
NPRR153, Generation Resource Fixed Quantity Block
NPRR156, Transparency for PSS and Full Interconnection Studies
NPRR164, Resubmitting Ancillary Service Offers in SASM
NPRR169, Clarify the Calculation and Posting of LMPs for the Load Zone and LMPs for each Hub
NPRR181, FIP Definition Revision
Market Participants discussed methods for advancing parking deck items, and determined to sort items into vetted and approved categories for the November 19, 2009 PRS meeting, with remaining items to be taken up at the December 17, 2009 PRS meeting.

Notice of Withdrawal
There were no notices of withdrawal.

Other Business

PRR754, Resource Settlement Due To Forced Transmission Outage (Possible Vote)

Ms. Morris noted that PRS refrained from voting to reject PRR754 at the September 17, 2009 PRS meeting, as Mr. Bruce had submitted PRR754 and was absent at the time PRR754 would have been considered for rejection. Mr. Bruce expressed his appreciation for the delay, stated that discussions had been held with affected parties in the intervening month, and that PRR754 may be disposed of at the will of PRS.

Mr. Helpert moved to reject PRR754. Mr. Detelich seconded the motion. The motion carried with on objection from the Independent Generator Market Segment, and four abstentions from the Independent Generator, IOU (2), and IPM Market Segments.

Nodal Protocol/Reliability Standards Alignment (NPRSA) Task Force Discussion

Ms. Walker noted that the NPRSA TF was formed the previous year to address misalignments between terminology in the Nodal Protocols and the North American Electric Reliability Corporation (NERC) Standards; that while ERCOT had not asked her to halt efforts, concerns for system impacts were expressed, and items were regularly routed to the now-disbanded Transition Plan Task Force (TPTF); that ERCOT had filed PRRs and NPRRs to address some terminology issues that would affect ERCOT specifically, but that efforts to address terminology affecting all Market Participants had not advanced; and that she had received recent assurances from ERCOT to assist in a renewed effort to address needed terminology revisions in a comprehensive rather than piecemeal effort.

Market Participants expressed concern for any effort that might be interpreted as potentially detrimental to the Nodal schedule; the potential for fines and compliance issues due to confused terminology; and the difficulty of reviewing a potentially 25-Section NPRR. Mr. R. Jones recommended that consideration should be given to developing a comprehensive review schedule of when each Section would be edited, as well as a master translation table. Ms. Morris reinstated the NPRSA TF and directed that an approach for moving forward be discussed at the November 19, 2009 PRS meeting.

PRR837, Load Used in RMR Studies

Ms. Wagner stated that PRR837 provides guidance for ERCOT regarding the forecast to use for Load forecasts and Reliability Must Run studies. Market Participants discussed potential Congestion implications; and that the peak determined by the Steady State Working Group (SSWG) is not necessarily coincident with the ERCOT peak.

2010 ERCOT Membership/Market Segment Elections

Brittney Albracht reminded Market Participants that the ERCOT Membership date-of-record is Friday, November 13, 2009; that Market Segment Representative elections for the ERCOT Board and all committees and subcommittees will begin on Monday, November 16, 2009; and that a potential ERCOT Bylaws revision will prevent ERCOT Board members from serving and voting on TAC or any TAC subcommittee.

Adjournment

Ms. Morris adjourned the meeting at 3:00 p.m.

EXHIBIT L

APPROVED
Minutes of the Technical Advisory Committee (TAC) Meeting
ERCOT Austin – 7620 Metro Center Drive – Austin, Texas 78744
Thursday, November 5, 2009 – 9:30am – 4:00pm

<u>Attendance</u>

Members:

Ashley, Kristy	Exelon Generation	
Barrow, Les	CPS Energy	
Bivens, Danny	OPUC	
Boyd, Phillip	City of Lewisville	
Brewster, Chris	City of Eastland	
Briscoe, Judy	BP Energy	Alt. Rep. for E. Schubert
Bruce, Mark	NextEra Energy Resources	
Cochran, Seth	Sempra Energy Trading	
Comstock, Read	Direct Energy	
Downey, Marty	TriEagle Energy	
Dreyfus, Mark	Austin Energy	
Fox, Kip	AEP Corporation	Alt. Rep. for R. Ross
Houston, John	CenterPoint Energy	
Jones, Brad	Luminant Energy	
Jones, Randy	Calpine	
Lange, Clif	South Texas Electric Coop.	Alt. Rep. for H. Wood
Lenox, Hugh	Brazos Electric Power Coop.	
McCann, James	Brownsville PUB	Alt. Rep. for F. Saenz
McClendon, Shannon	Residential Consumer	
Morris, Sandy	LCRA	Alt. Rep. for B. Belk
Moss, Steven	First Choice Power	
Pieniazek, Adrian	NRG Texas	
Singleton, Gary	GEUS	Alt. Rep. for D. McCalla
Smith, Bill	Air Liquide	
Smith, Mark	Chaparral Steel	Alt. Rep. for O. Robinson
Wagner, Marguerite	PSEG Texas	
Whittle, Brandon	DB Energy Trading	
Zlotnik, Marcie	StarTex Power	

The following proxies were assigned:

- William Lewis to Marcie Zlotnik
- John Sims to Clif Lange

Guests:

Brandt, Adrianne	Austin Energy
Burkhalter, Bob	ABB
Clemenhagen, Barbara	Topaz Power
Cooper, Tammy	TIEC
Daniel, Matthew	Horizon Wind Energy
Daniels, Howard	CNP
Davison, Brian	PUCT
Diehl, Phillip	Texas Admin

DeLaRosa, Lewis	PUCT
Donohoo, Ken	Oncor
Durrwachter, Henry	Luminant
Emery, Keith	Tenaska
Goff, Eric	Reliant
Greer, Clayton	Morgan Stanley
Gresham, Kevin	E.ON Climate and Renewables
Grimes, Mike	Horizon Wind Energy
Helton, Bob	IPA
Jones, Don	Reliant
Jones, Liz	Oncor
Kimbrough, Todd	NextEra Energy
Kolodziej, Eddie	Customized Energy Solutions
Lee, Jerry	Electric Power Engineers
Lee, Jim	Direct Energy
Liebmann, Diana	Horizon Wind Energy
McKeever, Debbie	Oncor
Patrick, Kyle	Reliant Energy
Paysinger, Robby	CPS Energy
Reid, Walter	Wind Coalition
Richard, Naomi	LCRA
Rowley, Chris	TXU Energy
Sandidge, Clint	Sempra Energy Solutions
Santos, Juan S.	Vestas
Schwarz, Brad	E.ON Climate and Renewables
Scott, Kathy	CenterPoint Energy
Seymour, Cesar	SUEZ
Siddiqi, Shams	LCRA
Smith, Chris	Austin Energy
Stewart, Roger	LCRA
Trenary, Michelle	Tenaska Power Services
Troutman, Jennifer	AEP Energy Partners
Vincent, Susan	Texas Regional Entity
Walker, DeAnn	CenterPoint Energy
Whittington, Pam	PUCT
Wittmeyer, Bob	Longhorn Power

ERCOT-ISO Staff:
Albracht, Brittney
Bohart, Jim
Day, Betty
Dumas, John
Flores, Isabel
Gates, Vikki
Goodman, Dale
Hobbs, Kristi
Kleckner, Tom
Levine, Jonathan
Manning, Chuck
Middleton, Scott
Sills, Alex

Unless otherwise indicated, all Market Segments were present for a vote.

TAC Chair Mark Bruce called the meeting to order at 9:33 a.m. and reviewed assigned proxies and Alternate Representatives.

Antitrust Admonition

Mr. Bruce directed attention to the Antitrust Admonition, which was displayed. A copy of the Antitrust Guidelines was available for review.

ERCOT Board of Directors (ERCOT Board) Update (see Key Documents)[1]

Mr. Bruce reported ERCOT Board approval of Protocol Revision Request (PRR) 822, Removing Access to Restricted Computer Systems, Control Systems and Facilities, noting that the ERCOT Board removed language regarding physical facilities and revised language to require that the Texas Regional Entity (TRE) be apprised within 48 hours of knowledge of an event, rather than within 48 hours of an event's occurrence; that the ERCOT Board remanded PRR811, Real Time Production Potential, to TAC with instructions to include language for the Real Time Production Potential (RTPP) calculation methodology; and that ERCOT reported that cost-cutting measures have been successful against the budget shortfall resultant of the economic downturn. Mr. Bruce noted Mark Armentrout's announcement that he will not seek another term as an Independent Board member; and that Trip Doggett is serving as interim ERCOT Chief Executive Officer (CEO).

Proposed Revisions to the ERCOT Bylaws

Mr. Bruce reported that no comments had been received regarding the proposed revisions to the ERCOT Bylaws; that the item would not return to the December 3, 2009 TAC agenda; and that disclosure requirements and TRE separation remain the two major revisions. Mr. Bruce encouraged Market Participants to review proposed ERCOT Bylaw revisions within their organizations. Market Participants characterized language regarding Affiliates as particularly difficult and potentially problematic.

PRR811, Real Time Production Potential

Kip Fox moved to remand PRR811 to the Wholesale Market Subcommittee (WMS). Randy Jones seconded the motion. The motion carried unanimously.

Texas Renewables Integration Plan (TRIP) Update

Mr. Bruce noted that a TRIP workshop was held with ERCOT Board members the morning of October 16, 2009 and that there is a revised expectation of what the ERCOT Board requires of TAC. Originally, TAC was to develop the renewables integration plan; however, TAC is limited on what they can do. The new expectation is for TAC to develop the key elements of the plan to deliver to the ERCOT Board who can then assign to ERCOT management to turn the plan into the budget process. Mr. Bruce noted that the next meeting of the Renewable Technologies Working Group (RTWG) is December 7, 2009 and that a proposal should come to the February 2010 TAC meeting in order for consideration at the March 2010 ERCOT Board meeting.

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[1] Key Documents referenced in these minutes may be accessed on the ERCOT website at: http://www.ercot.com/calendar/2009/11/20091105-TAC

Approval of Draft TAC Meeting Minutes (see Key Documents)

October 1, 2009

Mr. R. Jones moved to approve the October 1, 2009 TAC meeting minutes as posted. Brad Jones seconded the motion. The motion carried unanimously.

Texas Nodal Implementation (see Key Documents)

Mr. Bruce noted that the Nodal market is approximately one year away and that all meeting agendas will now lead with Nodal issues and updates.

Protocol Traceability

Betty Day provided a Protocols traceability effort update; reported what the full trace report would and would not provide; and reviewed the gap identification and resolution process flow. Ms. B. Day noted that the full trace report demonstrates ERCOT's understanding of how the Nodal Protocols match to a functional requirement; will include desk procedures per Mr. Doggett's commitment, but that all business procedures will not necessarily be published due to confidentiality requirements; and that ERCOT will host WebEx meetings to review full trace reports. Ms. B. Day added that the goal is to have traceability completed by the end of December 2009.

ERCOT Program Update

Jason Iacobucci provided a program update and reviewed the Nodal systems blueprint, market trials roadmap, and completed milestones.

Market Connectivity

Mr. Iacobucci provided an update on Phase 2.1 Market Connectivity, noting that the program is early into execution; that non-critical functional issues have been found on the ERCOT side as expected; and that issues will continue to be worked through with the hope of resolution before January 2010. Mr. Iacobucci noted that 16 Entities, a combination of Market Participants and vendors averaging 12 unique digital certificates, participated in recent testing; and that ERCOT desires that more Market Participants participate in testing now so that more advanced testing may be accomplished later. Mike Cleary reported that three full days have been run; that ERCOT is having to manipulate some data to achieve operation as a single suite of applications; that efforts continue to prove technical feasibility, but the quality of solutions is currently very low.

Regarding Nodal program risks and issues, Mr. Iacobucci noted that specific dialogues need to be held around Service Level Agreements (SLAs) and Operating Level Agreements; that ERCOT will approach Entities with the perspective of what ERCOT systems can and cannot perform currently; and that Market Participants and ERCOT will not always agree on volumes, performance, and timelines. Mr. Cleary added that there are restrictions around what ERCOT can technically manage; that there is a balance between incenting right behavior in the market, and the need to understand where bottlenecks will form; and that there will never be enough budget to develop systems for every scenario.

Mr. B. Jones asked if there are impacts to how the market engages beyond technical considerations, such as participation restrictions. Mr. Cleary answered that ERCOT should be able to state what is believed to be reasonable and incent behavior, perhaps by a charge above a certain transaction level; and that the Nodal Advisory Task Force (NATF) will be approached to understand impacts. Eric Goff opined that it is reasonable and necessary that Entities do not overwhelm the system; that it would be helpful to know as soon as possible what the restrictions are; that fees might be added to the fee schedule approved by the ERCOT Board; and that Market Participants would appreciate the opportunity to hear of ERCOT's intent and provide input. Mr. Cleary agreed with Mr. Goff's assertions and added that ERCOT first needs to understand processes, high volume times, and technical restrictions.

Mr. R. Jones opined that much progress has been made in a short period of time and requested that once ERCOT has an understanding of feasible throughput, that a white paper be brought to the stakeholders for a cut at a pricing solution. Mr. R. Jones added that some Market Participants are already paying for bandwidth and expect a base level of functionality, and that the Market Participants should sort out which Entities will pay extra. Mr. Iacobucci stated that the discussion next month needs to begin with that base level expectation, the numbers and types of transactions. Mr. Cleary added that current levels must be supported, but discussion should be given to expectations for additional transactions in light of the complexity of the convergence in the Nodal market. Clayton Greer noted that the market is realizing that the Nodal systems are not an infinite resource, and suggested that discussions regarding rationing might be appropriately housed at WMS.

Market Participant Readiness

Vikki Gates provided a review of Market Participant Readiness efforts, noting that no Market Participants have chosen the same site visit agenda, and that providing questions approximately five days in advance of the visit improves the team’s ability to prepare and provide thorough information; that the Readiness Center has been relaunched, and that Market Participants desire notice before the metrics are posted; and that while Market Participant feedback is requesting a one-to-one ratio for Market Participant and ERCOT metrics, metrics should be meaningful for both sides, but will expand beyond the currently listed two metrics for ERCOT.

<u>NATF Report (see Key Documents)</u>

Don Blackburn reviewed recent NATF activities, and encouraged Market Participants to participant in the Protocol Traceability conference calls.

Posting of Network Operations Model (NOM) to Qualified Scheduling Entities (QSEs) per Nodal Protocols

Mr. Blackburn reviewed NATF discussion of posting options; noted identified impacts of various options; and highlighted ERCOT’s understanding of what would be posted should no further clarification or Protocol language be provided.

Mr. R. Jones stated that Calpine remains in favor of market transparency efforts, but stipulated that market transparency is very different from Market Participant transparency; that Calpine wants to share all necessary information with ERCOT and Transmission Service Providers (TSPs), but does not wish to share all information with the entire market; expressed concern for changed bidding behavior resulting in higher prices for Loads; and opined that the Independent Market Monitor (IMM) and the Public Utility Commission of Texas (PUCT) provide sufficient market oversight. Marguerite Wagner echoed Mr. R. Jones’ concerns for the protection of proprietary information.

Market Participants discussed concerns for Private Use Networks (PUNs); linkages between the NOM and the State Estimator; and that TAC is making a policy cut and that subsequent Protocol revision language must be drafted and vetted by the stakeholders. Mr. Rickerson noted that impacts to systems could vary greatly depending on the categories and amount of data to be removed; but that once a list is determined, the Impact Analysis can be done quickly.

Ms. Wagner moved to endorse the NATF recommendation:

> **In consideration of the fact that there is not a separate resource registration system, move to endorse the approach below to TAC in response to ERCOT's Staff question regarding Network Operations Model posting and Resource Asset Registration Form (RARF)**

confidentiality as presented to NATF. The recommendation includes posting the topology version of the NOM with some Resource data:

- **Wires, ratings, connectivity, no resource data listed in green in presentation "update on disclosure issues, including NMMS data discussion" 10/27/09**
- **Further consideration of items in black in presentation as per presentation above, with the addition of the PUN transmission system**
- **Includes Generator Switchyard**
- **Does not include PUN 168-hour Load data**

And direct to NATF to develop a Nodal Protocol Revision Request (NPRR) to clarify posting requirements, and to consider black data, per the policy decision of TAC.

Ms. Wagner noted that the NOMCR posting issue would be addressed secondarily and is not part of the motion. **Adrian Pieniazek seconded the motion. The motion carried unanimously.**

Posting of State Estimator Results per Nodal Protocols

Mr. Blackburn reported that NATF views the posting of State Estimator results as a policy issue and presents the item for TAC consideration. Mr. Pieniazek opined that the posting would violate posting requirements of the Public Utility Regulatory Act (PURA), §25.505, Resource Adequacy in the Electric Reliability Council of Texas Power Region, and that transmission flows and voltages should be redacted; Mr. Blackburn offered that ERCOT Legal did not see a conflict.

Mr. B. Jones opined that without the level of data, Market Participants cannot have confidence in the operation of the Nodal market; and that it is possible that Entities will receive signals that are indecipherable without certain data. Mr. Pieniazek countered that transparency is good to a point, as is independent auditing, but opined that the current requirement allows large Entities with extensive resources the ability to do what small Entities cannot. Kristy Ashley added that no other market posts this level of data and yet runs successfully. Mr. Seely opined that there is no inherent conflict in the Nodal Protocols, and that there are cases that put the Protocols on the same level as Substantive Rules.

Market Participants argued that there is an order of precedence between the PUCT Substantive Rules and the ERCOT Protocols; that the Federal Energy Regulatory Commission (FERC) would not allow this level of data to be released, and therefore it is not released in other markets; and that revision language should be drafted for the Nodal Protocols. Mr. R. Jones opined that Mr. B. Jones makes the case that ERCOT should publish data to the individual Entities to confirm that ERCOT is receiving the correct unit status and telemetry, and that the practice will give Market Participants assurance that they are communicating correctly. Mr. B. Jones countered that other Independent System Operators (ISOs) do not provide the data not out of confidentiality concerns, but that Entities do not want others checking their work; and that the information will require Entities to develop a business process to answer questions regarding high prices.

Mr. Bruce noted the issue's time sensitivity and that TAC may either direct NATF to take direction, or that an interested party may draft language for vetting in the stakeholder process. Mr. Pieniazek offered to draft NPRR language.

<u>WMS Report (see Key Documents)</u>

Barbara Clemenhagen provided a brief review of the October 21, 2009 WMS report, and notified TAC that the issue of generic costs have been again raised at the Verifiable Cost Working Group (VCWG) due to concerns that verifiable costs are becoming unwieldy and burdensome.

Additional 2010 Closely Related Element (CRE)
Shannon McClendon moved to approve the WMS recommendation for the addition of three CREs. Mr. R. Jones seconded the motion. The motion carried unanimously.

Nodal Verifiable Cost Affidavit Document
Mr. R. Jones moved to endorse the WMS recommendation regarding the Nodal Verifiable Cost Affidavit document. Mr. Fox seconded the motion. The motion carried unanimously.

Reliability and Operations Subcommittee (ROS) Report (see Key Documents)
Ken Donohoo presented revision requests for TAC consideration.

Operating Guide Revision Request (OGRR) 223, Real Time Production Potential
Ms. McClendon moved to remand OGRR223 to WMS. John Houston seconded the motion. The motion carried unanimously.

Nodal Operating Guide Revision Request (NOGRR) 026, Change the name of Emergency Electric Curtailment Plan (EECP) to Energy Emergency Alert (EEA) and Synchronization of EEA Steps with Protocols
Marty Downey moved to approve NOGRR026 as recommended by ROS in the 10/15/09 ROS Recommendation Report. Ms. Ashley seconded the motion. The motion carried unanimously.

Texas Admin Survey
Mr. Bruce introduced Phillip Diehl, CEO of Texas Admin. Mr. Diehl noted that Texas Admin currently webcasts ERCOT Board and ERCOT Board committee meetings which are funded directly by ERCOT; and requested that Market Participants complete a survey indicating their interest in subscribing to webcasts of TAC and TAC subcommittee meetings.

Market Participants expressed concerns regarding which body may authorize the webcasting of stakeholder meetings; that an interest survey by the vendor is not a suitable forum for discussion of the implications of webcasting and archiving meetings; and that current Procedures address voting by phone, but are not standard across all bodies. Market Participants discussed that webcast meetings would be archived; that the NATF was missing from the list of offered meetings; that the service would be offered on a subscription basis; and that the survey would be posted with the day's Key Documents.

Protocol Revisions Subcommittee (PRS) Report (see Key Documents)
Sandy Morris presented revision requests for TAC consideration.

PRR821, Update of Section 21, Process for Protocol Revision
Market Participants reviewed NextEra Energy comments to PRR821 and discussed that appellate rights are appropriately maintained at the ERCOT Board level; and that analogous revision language should also be applied to the NPRR and SCR processes.

Mark Dreyfus moved to recommend approval of PR821 as recommended by PRS in the 10/22/09 PRS Recommendation Report as amended by the NextEra Energy comments and as revised by TAC. Les Barrow seconded the motion. The motion carried unanimously.

PRR824, Primary Frequency Response from WGRs

Mr. R. Jones moved to recommend approval of PRR824 as recommended by PRS in the 10/22/09 PRS Recommendation Report and as revised by the 10/28/09 ERCOT comments. Clif Lange seconded the motion. Market Participants discussed the need to develop language in the Operating Guides to address testing requirements for Wind-powered Generation Resources (WGRs); and that the Performance, Disturbance, Compliance Working Group (PDCWG) currently receives and reviews reports to address units not meeting the five percent droop characteristic, and that ERCOT performs similar reviews, but that a testing methodology does not exist. John Dumas stated that he fully expects PDCWG to begin flagging WGRs not performing to the five percent droop characteristic upon passage of PRR824. **The motion carried unanimously.**

PRR827, Find Transaction and Find ESI ID Functions on the MIS

Mr. Houston moved to recommend approval of PRR827 as recommended by PRS in the 10/22/09 PRS Recommendation Report. Mr. Fox seconded the motion. The motion carried unanimously.

PRR830, Reactive Power Capability Requirement – URGENT

Mr. Bruce suggested that TAC survey comments filed to PRR830, noting that only four comments proposed language modifications, and that of the comments that would not modify PRR830 language, three are in support of PRR830, and one opposed PRR830. Walter Reid added that Wind Coalition comments were filed prior to the 10/22/09 PRS Recommendation Report.

Reviewing the 10/29/09 ERCOT comments, Kristi Hobbs noted proposed language revisions are administrative in nature, with the exception of a date change made to accommodate the one-month tabling of PRR830.

Reviewing the 11/02/09 Invenergy comments, Mark Soutter noted the addition of paragraph twelve (12) to Section 6.5.7.1, Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS, for clarification that WGRs are treated as a unit behind the Point of Interconnection (POI), and to bring treatment of Reactive Power in line with other types of units. Mr. R. Jones stated that he agreed with the concept but not necessarily the language proposed by the Invenergy comments. Mr. Dumas opined that the current language of PRR830 should be maintained in order that the intended information is captured, and suggested that turbine availability be addressed with improved language so that turbines are not reported as in service when not spinning due to a lack of wind. Mr. Soutter countered that a turbine without fuel cannot be in service.

Reviewing the 11/04/09 Vestas comments, Juan Santos noted the addition of language in Section 6.5.7.1 regarding dynamic VAR capable devices to include hybrid solutions. Mr. Santos added that hybrid solutions are documented in other parts of the United States, and stated that utilizing a hybrid solution that includes a small temporary overload costs four times less than full dynamic response. Mr. Dumas noted that existing language allows Market Participants to bring ERCOT alternative proposals which could include static or dynamic solutions, adding that the type of hybrid solution proposed by Vestas should be presented to ERCOT through channels for evaluation to ensure that the solution meets the dynamic requirement. Mr. Santos welcomed the opportunity to bring numerical examples to ERCOT, but expressed concern that should the language not be added, benefits to ERCOT customers would be limited by the limiting of turbine choices.

Reviewing the 11/03/09 NextEra comments, Mr. Bruce noted that PRR835, Reactive Capability Requirement, would have permitted WGRs to provide the triangle for Reactive Power, unless a need for the rectangle was demonstrated, and then the rectangle would be required. Mr. Bruce stated that NextEra now recommends ERCOT's position on a prospective basis, and incorporates elements of the comments offered by Invenergy, LCRA and the Wind Coalition. Mr. Bruce noted that language in PRR830 that allows ERCOT to disconnect a WGR, and asked if ERCOT intends the language to allow for temporary or permanent disconnection. Mr. Dumas stated that ERCOT understands that it has authority to order any unit off line and maintain that order until the voltage issue ceases.

Mr. Bruce expressed concern that the redefinition of WGR as proposed in PRR830 would have repercussions throughout the ERCOT Protocols, particularly in instances where Resource or Generation or unit is used and not specified, and offered language that, he opined, addressed the necessary points without posing impacts to all ERCOT Protocols.

Mr. Bruce expressed greatest concern for the possibility of retrofits required with the approval of PRR830. Mr. Bruce stipulated that NextEra does not argue that the ERCOT Board cannot adopt a PRR that imposes costs on existing units, but that the stakeholders are not elected representatives and cannot make policy at the level reached by PRR830. Mr. Bruce stated that stakeholders approve ERCOT Protocols on a prospective basis; that in instances where Protocols have reached back, it has been based upon evidence of need; and that NextEra voted in favor of ramp rate limitations, despite costs to NextEra, because of the need. Mr. Bruce likened PRR830 to OGRR208, Voltage Ride-Through (VRT) Requirement, and opined that PRR830 would impose costs of tens of millions of dollars. Regarding OGRR208, Mr. Bruce added the ERCOT Board stated that upon demonstrated need, Entities will be forced to spend money on retrofits, and opined that similar issues are present in PRR830.

Mr. Bruce noted that thousands of MWs of wind are soon to be on the grid, and opined that Reactive Power requirement language needs to be clarified in the ERCOT Protocols; and that language offered by NextEra requires new entrants to the ERCOT market to provide the rectangle, provides clarified language for an immediately implementable standard, and carves out legacy issues for the PUCT to address. Mr. Bruce added that the PUCT dismissed the Administrative Law Judge's (ALJs) dismissal of PUCT Docket No. 36482, Appeal of Competitive Wind Generators Regarding the Electric Reliability Council of Texas' (ERCOT) Interpretation of the Reactive Power Protocols; that the next appeal period was underway; and that Entities will implement according to the PUCT decision.

Regarding modeling, Mr. Dumas noted that WGRs are allowed to aggregate turbines to form a unit; that aggregate modeling of turbines of different sizes and characteristics result in reactive curve inaccuracies when various turbines are, for example, down for maintenance; that aggregating and modeling only like turbines, which will have like Unit Reactive Limit (URL) capabilities, addresses turbine availability status and provides an accurate representation of each WGR's Reactive Power capability, and will not require WGRs to form different QSEs. Mr. Dumas added that it is common for plants to have different types of units. Mr. Bruce reiterated his concern that redefining WGR would have significant repercussions with a multitude of unintended consequences; and that NextEra proposed language leaves the WGR at the POI and addresses all of ERCOT's concerns.

Mr. Dumas stated that the purpose of PRR830 is not to change the standard; that the rectangle has been the Reactive Power requirement for many years and was in the Protocols at market open; and that the rectangle requirement has long been the basis of studies and grid operation. Mr. Bruce stated that it is immaterial what Entities think the standard has been; that an answer is likely forthcoming as to what the standard has been; and that any Entity that relies on their own interpretation of the standard does so at their own risk. Mr. Bruce opined that the Protocols cannot be clarified, but only amended.

Mr. Greer asked if Mr. Bruce would be ceding the gavel, adding that he was not complaining about Mr. Bruce's conduct, but only reminding Mr. Bruce that he should exercise caution in possessing the floor. Mr. Bruce agreed with Mr. Greer and stated his intention to have a full discussion of the issues with input from all parties. Ms. McClendon stated that she would be abstaining from the vote and would preside if requested, and complimented Mr. Bruce's attention to granting speakers the floor in order of request.

Mr. R. Jones opined that the 11/03/09 NextEra comments are a one-sided compromise, and addressed the 10/22/09 NextEra comments, stating that currently, any excessive Reactive Power capability above URL is always on call up to a unit's stability limit. Mr. R. Jones complained that WGRs repeatedly offer the same excuses for not meeting requirements, adding that the playing field should be level. Mr. R. Jones noted that ROS Chair Ken Donohoo provided a presentation at the October 15, 2009 ROS meeting demonstrating the need for Reactive Power and for every Resource to meet its own obligation, and that the ROS also witnessed a presentation from Siemens sponsored by NextEra as to why PRR830 is not needed.

Mr. R. Jones likened Reactive Power to the foundation of a house; stated that in other ISOs the service is compensated, but in ERCOT is viewed as a community service and was part of the agreement when the Standard Generation Interconnection Agreement (SGIA) was created; and recalled that when the reactive standards were in development, he once opined in a meeting that a unit's lead and lag could be different based on where the unit was and was quickly disabused of the notion by engineers at the meeting. Mr. R. Jones opined that the work of both ROS and PRS should be honored by TAC; and that PRR830 should be approved for the sake of reliability.

Diana Liebmann noted that reliability is cited as a need for PRR830, and asked if the grid is in an unreliable condition today with existing wind. Mr. Dumas answered that ECOT has a number of tools to monitor the grid; that contingency analyses are run; that at times conventional generation is brought on line to absorb MVARs; and at times Outages are denied. Mr. Dumas noted that due to a condition in the spring of 2009, a line had to be opened to maintain reliability, and that had WGRs been able to provide the rectangle requirement, the line likely would not have needed to be opened. Mr. Dumas concluded by saying that ERCOT is able to maintain reliability and does so.

Ms. Liebmann noted that in November of 2008, ERCOT sent "congratulatory letters" to Generators indicating that the RARF passed submittal and would be loaded; that thousands of MWs interconnected to the ERCOT grid submitted RARFs containing the triangle pictorial; and that the triangle pictorial mirrors what was in the application form. Ms. Liebmann asserted that pre-1999 conventional Generation units are not providing the rectangle even though they are able; that PRR830 is not about leveling the field, as it only addresses WGR and not all Generators, and that language offered by NextEra does level the field. Ms. Liebmann added that the study presented at the October 15, 2009 ROS meeting is the only existing study, and asserted that WGRs lower prices for Consumers; that requiring retrofits to WGRs will drive Consumer costs up as WGRs either come off line for retrofitting or an inability to comply due to what Ms. Liebmann characterized as a change in the rules.

Ms. Liebmann stated that ERCOT has allowed the interconnection of thousands of MWs of generation that provides the triangle; and that though ERCOT takes the position that it does not approve interconnects, ERCOT communicates with operators at Transmission Distribution Service Providers (TDSPs) regarding interconnections. Ms. Liebmann added that installed WGR assets, while providing the triangle, have been repeatedly told that they are in compliance.

Todd Kimbrough noted that the day's PUCT vote regarding PUCT Docket No. 36482 was procedural, and that the Commissioners noted that the issue would be before them again, and that to suggest that the PUCT has opined is incorrect. Mr. Kimbrough also noted that many, though not all, other ISOs assign Reactive Power costs via a separate market, which is not the design of the ERCOT market, and that FERC Order 661A requires of wind, at maximum, the triangle, which PRR830 exceeds; opined that altering the definition of WGR would have rippling effects through the Protocols and yield unintended consequences; and questioned why PRR830 was being rushed for approval without study. Mr. Kimbrough stated that PRR830 addresses only one type of technology and does not consider other technologies, such as storage; that NextEra offers compromise language and is willing to make further investment where there is a demonstrated need; and encouraged Market Participants to consider that PRR830 language in its current form is not in the best interest of the market.

Ms. Wagner expressed appreciation for ERCOT's vigilance for grid reliability, but expressed concern for impacts dues to line opening and bringing units on line; and opined that the letters of RARF acceptance only spoke to the successful completion of a step, and not to the nature of the attributes contained therein. Mr. Dumas added that ERCOT needs an accurate representation of a unit's physical capability; that acceptance of the RARF in no way exempts anyone from Protocol requirements; and that pre-1999 and pre-2004 units that carry exemptions are still required to communicate accurate capability data, but that receipt of that communication should not be construed to mean that obligations have been met.

Mr. Dumas noted that the planning process makes assumption of what units can provide; that reactive studies for Competitive Renewable Energy Zones (CREZ) are about to begin and that the system will be designed expecting a certain capability; and that as discussed during OGRR208 deliberations, FERC Order 661A did not apply to Texas.

Mr. Dreyfus expressed his desire for a resolution of the issues that assures the reliability of the transmission grid and does not impose unnecessary requirements on specific Generators. Mr. Dreyfus noted communications from his office regarding reliability concerns due to the expansion of wind and the need for consistent voltage control from all WGRs. Mr. Dreyfus stated his sensitivity to the argument that specific studies on each POI and technology are not available; opined that a wise decision was made in 2008 regarding Low Voltage Ride Through (LVRT), with deferred decisions on specific points; and offered to support PRR830 with the incorporation of Wind Coalition comments regarding WGR definition, as well as Invenergy and Vestas comments; and declined to support comments from NextEra. Mr. Dreyfus expressed hope that the resolution would bring the issue of retrofits before the PUCT.

Ms. Wagner noted that the grid has been designed assuming 0.95 at each POI, and expressed concern that studies resulting in different requirements for different areas will not promote a competitive market.

Mr. Houston moved to recommend approval of PRR830 as recommended by PRS in the 10/22/09 PRS recommendation report and as amended by the 10/29/09 ERCOT comments. Mr. R. Jones seconded the motion. Mr. Greer noted that every permutation of the grid cannot be captured in a study, and opined that any study may be assembled to demonstrate anything and would result in arguments over the validity of the study. Market Participants further discussed whether the WGR definition should be given additional consideration. Mr. Reid asserted that to approve PRR830 burdens future Generation with disagreements over existing Generation; Mr. Bruce opined that there remain unresolved issues, and that the 11/03/09 NextEra comments provide some progress without unintended consequences.

Mr. R. Jones stated that split metering is now commonplace, and that the software problems described by Mr. Reid are resolved with the Energy Management System (EMS). Mr. R. Jones expressed concern that the same vigor for prescribing future requirements is not evident in addressing existing issues, and that ERCOT will gain a reputation for protectionism.

Mr. Houston opined that PRR830 is needed for reliability and should be in place and understood by all Market Participants. Mr. Houston noted that earlier in the week, 23 percent of the minimum Load was being met by wind that possibly cannot provide Voltage Support Service (VSS) for an entire region, and expressed concern for voltage collapse. Mr. Houston asserted that though the ERCOT Board may take another position, the technical advisors assembled in the Technical Advisory Committee should not take any position that adversely affects reliability.

Mr. Whittle asked if the motion is for cost allocation rather than reliability, if the TDSPs will install fixes outside of PRR830, and if there are impacts to reliability based on WGRs or TDSPs providing the solution. Mr. Dumas stated that ERCOT will always take action to maintain reliability; that there is a cost issue if WGRs do not have to provide the rectangle; that capacitors will have to be installed and will go through a different cost structure; that the CREZ study will be based on the rectangle; that the answers will change if less Reactive Power is provided by Resources; and that should the rules be changed, the cost allocation will change.

Mr. Bruce questioned if a study would be run, in the event that the TDSPs rather than the Generators provide the solution. Mr. Dumas reminded Market Participants that the grid is always changing, and noted that the CREZ reactive study will be run for needs going forward and should not be confused with making installations based on a snapshot of the grid. Mr. Dumas added that the RARF contains data indicating what is possible and is used for operations, and that units may still not be meeting Protocol obligations, which is a compliance issue and is separate.

Mr. Houston stated that the current system design is based on a rectangle and asserted that if an increasing number of Generators are not providing the rectangle, costs are being run up and the grid is not being operated as planned, which is a reliability issue.

Ms. Wagner moved to call for the question. Mr. Dreyfus seconded the motion. Citing *Robert's Rules of Order,* Article V, Section 29, Ms. McClendon reminded Market Participants that a motion to call for the question must be approved by two-thirds of the body. **The motion to call for the question carried.**

The motion to recommend approval of PRR830 as recommended by PRS with ERCOT comments carried on roll call vote. *(Please see ballot posted with Key Documents.)*

PRR836, Revised Minimum Ramp Rate for Balancing Energy Service Down to Comport with PRR803 – URGENT
Mr. Pieniazek moved to recommend approval of PRR836 as recommended by PRS in the 10/22/09 PRS Recommendation Report. Mr. Downey seconded the motion. The motion carried unanimously.

NPRR196, Synchronization of Nodal Protocols with PRR827, Find Transaction and Find ESI ID Functions on the MIS
Market Participants discussed that NPRR196 is a synchronizing NPRR and might be tabled in order to allow it to be considered by the ERCOT Board at the same time as PRR827, Find Transaction and Find ESI ID Functions on the MIS.

Ms. McClendon moved to table NPRR196 for one month. Marcie Zlotnik seconded the motion. The motion carried unanimously.

PRR754, Resource Settlement Due To Forced Transmission Outage
PRR835, Reactive Capability Requirement – URGENT
Ms. Morris provided notice that PRR754 and PRR835 had been rejected by PRS.

Commercial Operations Subcommittee (COPS) Report (see Key Documents)
Michelle Trenary reported noted that the October 13, 2009 COPS report was posted with the day's Key Documents.

Load Profiling Guide Revision Request (LPGRR035), Addition of Time Of Use Schedules (TOUS) to Profiles with Interval Data Recorder (IDR) Meter Data Type Codes for Advanced Meters – URGENT
Mr. Fox moved to approve LPGRR035 as recommended by COPS in the 10/13/09 COPS Recommendation Report. Mr. Houston seconded the motion. The motion carried with one abstention from the Independent Generator Market Segment.

<u>RTWG Report (see Key Documents)</u>
Henry Durrwachter reviewed highlights of the October 6, 2009 RTWG meeting and the 3rd Quarter TRIP Report.

3rd Quarter TRIP Report
Mr. Pieniazek moved to approve the 3rd Quarter TRIP Report as submitted by RTWG for distribution to the ERCOT Board and the PUCT. Mr. Downey seconded the motion. The motion carried unanimously.

<u>ERCOT Operations, Planning, and IT Reports</u>
2010 Ancillary Service Methodology
Mr. Dumas noted that each year ERCOT is required to renew its Ancillary Service methodology; that the ERCOT Board approves the methodology, but ERCOT annually seeks stakeholder input on the proposed methodology. Mr. Bruce expressed appreciation for the time ERCOT Staff took in reviewing the proposed revision with stakeholder groups, and reminded TAC that it is not required to take action on the item.

Mr. B. Jones expressed concern that hours ending 2300, 2400 and 0100 are sufficiently procured. Mr. Dumas opined that issues in those hours are related to schedule transition rather than capacity deficiencies. IMM Staff recommended capping the total number of MWs rather than the forecast bias, and added that the Load adjustment would have to change accordingly. Mr. Dumas noted that ERCOT would be open to a 2000MW cap.

Market Participants expressed concern for how the cap might interrelate with other capacity products; and suggested that the over-forecast bias should be removed rather than shifted to Non-Spinning Reserve Service (NSRS). Mr. Dumas noted that the summer bias runs in the two- to three-percent range, and that overforecasting in the summer is generally due to pop-up rain showers. Chris Brewster complained that the methodology provides a backstop and floor, is excessive, and is paid for by Loads.

Ms. Wagner moved to recommend approval of the 2010 Ancillary Service methodology as modified by the IMM. Ms. Morris seconded the motion. Mr. Dumas noted that the methodology comes before Market Participants at least once each year, but may be reviewed more often as needed. Market Participants discussed that 2000MW is the cap of the total NSRS procured in a given hour; that the proposed methodology solves part but not all of the concerns; that it is assumed that if the obligation increases by 500MW, the market will bring resources to cover the increased obligation and ERCOT will not have to procure to cover the increase; and that with the proposed revision by the IMM, the cap is on the total rather than on the bias. **The motion carried with three objections from the Consumer Market Segment and four abstentions from the Cooperative (2) and Investor Owned Utility (IOU) (2) Market Segments.**

Ms. Wagner expressed concern that the Consumer Market Segment opposed her motion for endorsement of the methodology, and requested that an improved proposal be brought forward if possible. Mr.

Brewster opined that the addition of a floor does not correlate to forecast issues, and expressed concern for the accounting for historical over-forecasting in NSRS. Mark Smith added that a slower approach should be taken to ensure the methodology accomplishes its intent.

ERCOT Independent Review of AEPSC Corpus Christi Area Improvements Project
Jay Tex reviewed the AEPSC Corpus Christi Area Improvements project and noted that ERCOT would present the project to the ERCOT Board. Mr. Bruce reminded Market Participants that ERCOT presents such projects as a courtesy, and that TAC may endorse they project, but that a TAC endorsement is not required.

Mr. B. Jones moved to endorse the project as recommended by ERCOT. Mr. Downey seconded the motion. Ms. Clemenhagen expressed support for the project; Bill Smith expressed appreciation for the work of the Regional Planning Group (RPG), but expressed a desire for additional time to review the project, opining that further study should be given to reliability issues, and that a way might be found to make improvements while minimizing impacts to industrial customers. Mr. Fox also complimented the effort, but expressed concern that the solution falls short of a robust solution; and opined that maintenance will affect industrial customers; that TAC should raise the standard for projects; and that the project is suboptimal as it is only a five-year solution and will require additional upgrades later. Ms. Wagner countered that 100 percent access 100 percent of the time is contentious and is not applied in planning. **Citing Mr. Fox's concerns, Mr. B. Jones withdrew his motion.** Mr. B. Jones added that ERCOT could move forward without a TAC endorsement.

Tammy Cooper expressed concern that the opportunity to engage with RPG without having to submit a new plan remain open, and that nothing be foreclosed because it is under the threshold. Mr. Woodfin suggested that additional elements might be treated as incremental and subsequently reviewed at RPG, as long as elements were additional and not in replacement. Ms. Clemenhagen expressed frustration that this particular item had been on the table for 852 days and opined that the projects should move forward to the ERCOT Board so that work can begin. Mr. B. Smith stated that the intent is not to delay, but requested additional time to review and include enhancements.

Approval of 20 Most Voltage Critical Buses per Nodal State Estimator Standards
Mr. Houston expressed concern that critical buses are posted publicly and suggested that a revision to the process may be required for the sake of security. Market Participants noted that the item is a TAC-approved document, but echoed Mr. Houston's concerns.

Mr. Fox moved to the 20 voltage critical buses as presented by ERCOT. Mr. Houston seconded the motion. ERCOT Staff noted that State Estimator results outside of a certain telemetry tolerance or the accuracy requirement for that telemetry would be included on an informational report; and that at the direction of TAC, items may be removed from the State Estimator standards document. Mr. Bruce directed the NATF to review the approved State Estimator standards document and return to TAC with a recommendation for addressing Market Participant concerns; there were no objections to Mr. Bruce's direction. **The motion carried unanimously.**

Increase in Local Congestion / Out of Merit Energy Report
Dan Woodfin reviewed the increase in Local Congestion and Out of Merit Energy (OOME) volume between 2008 and 2009, attributing the increase in OOME instructions to an increase in installed wind capacity and Outages taken to maintain and improve the transmission system. Market Participants discussed ERCOT's announcement that the Waco line will be left closed for the 2010 Transmission Congestion Right (TCR) calculation; that there have been topology changes that lead ERCOT to believe that 2009 issue will not recur; and that the TCR does not take into account outages in the annual calculation.

Retail Market Subcommittee (RMS) Report (see Key Documents)
Kathy Scott noted that the October 14, 2009 RMS report was posted with the day's Key Documents, and reported that the Advanced Metering Service (AMS) implementation date has slipped to November 21, 2009, due to an outage caused by routine maintenance and requiring a complete restoration of the test environment.

TRE Report (see Key Documents)
Susan Vincent reported TRE Board approval of TRE separation from ERCOT, provided a TRE Bylaws update, and reviewed the proposed governance structure. Ms. Vincent reviewed the six TRE Membership Sectors and noted that TRE is in the process of seeking Board members; that the North American Electric Reliability Corporation (NERC) will accompany TRE to the FERC meeting where approval of the TRE Bylaws will be sought; and that the PUCT will take new action to determine which entity will provide ERCOT Protocol compliance monitoring. Market Participants discussed that consideration should be given to TAC making a recommendation to the ERCOT Board regarding ERCOT Protocol compliance monitoring. Mr. B. Jones offered to initiate the discussions, noting that care should be exercised to not overstep TAC authority.

Other Business (see Key Documents)
There was no other business.

Adjournment
Mr. Bruce adjourned the meeting at 5:20 p.m.

EXHIBIT M

TRANSCRIPT OF PROCEEDINGS
BEFORE THE
ELECTRIC RELIABILITY COUNCIL OF TEXAS
AUSTIN, TEXAS

BOARD OF DIRECTORS MEETING
TUESDAY, NOVEMBER 17, 2009

BE IT REMEMBERED THAT at 10:06 a.m, on Tuesday, the 17th day of November 2009, the above-entitled matter came on for hearing at the Electric Reliability Council of Texas, 7620 Metro Center Drive, Austin, Texas, before JAN NEWTON, Chairman, and MARK G. ARMENTROUT, DANNY BIVENS, BRAD COX, ANDREW J. DALTON, MIGUEL ESPINOSA, NICK FEHRENBACH, BOB HELTON, CHARLES JENKINS, TRIP DOGGETT, CLIFTON KARNEI, ALTON D. "DEE" PATTON, BARRY T. SMITHERMAN, ROBERT THOMAS and DAN WILKERSON, Members of the Board, and the following proceedings were reported by Lou Ray and Kim Pence, Certified Shorthand Reporters of:

♀ 2

TABLE OF CONTENTS

PAGE

TABLE OF CONTENTS (Continued)

PAGE

♀

P R O C E E D I N G S

TUESDAY, NOVEMBER 17, 2009

(10:06 a.m.)

1. CALL OPEN SESSION TO ORDER

CHAIRMAN NEWTON: Okay. I'd like to go ahead and convene the November ERCOT Board of Directors meeting.

First of all, we have the evacuation plan up on the board. I think we will, in a moment, have the anti-trust admonition, which we -- Okay. It's at the top. Thank you, Mike. I don't have my

(1:18 p.m.)

12. TECHNICAL ADVISORY COMMITTEE REPORT

(a) PRR830

(b) APPEAL OF PRR830

CHAIRMAN NEWTON: Okay. I believe that we're back on the webcast, and I'm going to reopen our open session of the Board meeting this afternoon. I'm going to handle these next couple of items a little bit differently than what's outlined on the agenda. What we have on our agenda is a presentation on PRR 830, and then we have next an appeal of that PRR. This is a little unusual in terms of process, but we have a number of parties who have asked to make comments relative to this PRR.

If this is all right with the Board -- and I will be open for suggestions -- but rather than us discussing and voting on PRR 830 and then hearing all the comments relative to the appeal, what I would like to do is let's open up the discussion on PRR 830 and let's hear the TAC position, and then let's go through the various parties who have comments so that the Board has the benefit of all the comments before we ask the Board to vote on the PRR, rather than

115

having us vote and then hear and have to potentially make a different decision.

So I'm seeing some heads nod, but I would open it for any concerns if that causes anyone any concerns relative to process.

Okay. Seeing none, with that, Mark, would you kind of kick this off and kind of step us through how we're going to try to approach this from this point?

MR. BRUCE: Yes, ma'am. Thank you. As you noted, we've got the one PRR that was not approved on the consent agenda for your discussion this month. That is PRR 830 reactive power capability requirement. The PRR clarifies the reactive power capability requirement for all generation resources, including existing WGRs who are not able to meet the 0.95 lead/lag requirements with the resources -- within the resources unit reactive limit.

This PRR was recommendeded for approval by the TAC. It was a roll call vote. There was one opposing vote from the independent generator segment. There was six abstentions from the IOU, the generator, the two consumers and two independent power marketers. All the market segments were present for the vote.

The impact analysis shows only minor

changes to ERCOT databases to incorporate additional SCATA points. These impacts can be managed through the O&M budget. So the CEO determination on the PRR is no opinion and no impact to nodal.

So as you mentioned, there will be a presentation next by the TAC advocate. I just wanted to mention that, number one, I recused myself as Chair from selecting the advocate of the TAC position. I was the opposing vote to the PRR, and it's my client NextEra Energy Resources, that filed the appeal. So the vice chair, Shannon McClendon, who abstained from the vote, selected Mr. Houston of CenterPoint Energy, who actually made the motion to recommend approval of the PRR.

So, Mr. Houston, if you want to come up? And he will outline for you the TAC's position on the PRR.

CHAIRMAN NEWTON: Thank you, Mark.

MR. HOUSTON: Can everyone hear me?

CHAIRMAN NEWTON: Yes.

MR. HOUSTON: Help me out here -- oh, here we go.

Okay. As mentioned, I'm John Houston with CenterPoint Energy. And Shannon had asked for me to present the appeal of PRR -- to be the TAC advocate

for the process.

I'd like to start with -- let me see if I can make this work here. Just a little bit as Mark went through the history, but I just wanted to go through a couple of items here.

ERCOT originally proposed this to clarify reactive power requirements applicable to all generators, and to provide a framework for people who might not be compliant to be able to comply with this requirement of the protocols.

In September the PRS tabled this by unanimous vote to send it to ROS for review of reliability effects of this proposed revision. The ROS vote was -- recommended approval after considerable comments and discussions and presentations in its October 15th meeting.

It was then forwarded to the Protocol Revision Subcommittee. They considered it, again extensive discussion took place, and market participant involvement was heavy. It was recommended approval and sent forward to TAC.

On November 5th we again took up this -- we at TAC then took up this revision. And after considerable discussion -- as Mark just mentioned, we had considerable discussion at TAC -- and it was

approved. I believe the vote was 23 to 1, and Mark did recuse himself from selecting the TAC advocate.

Again, we're talking about ERCOT reactive power requirements required of generators. The existing protocol had been vetted through the stakeholder process I want to say back in 2003 and 2004, with significant involvement of the stakeholders in development and provision of comments with regard to how reactive power would be supplied by generators.

Those requirements have been in place for several years. And under that approach, the requirements for both loads and generators are fixed at a set level; i.e., those requirements don't change after time passes and in the future. So loads and generators are not subjected to the topography changes, the addition of new generators to the system, new lines. Those become the responsibility of ERCOT planning and transmission providers.

So that adds the certainty that generators look for with regard to they can build the generating plant at its location, and they can achieve meeting the requirements for their output and their interconnection, in particular in this case their reactive requirements.

Incremental needs that the system may

need going forward are identified by engineering analysis and Mr. Woodfin's folks and others at ERCOT. All of that is to ensure voltage stability for the transmission system in ERCOT and that that can be provided by facilities and changes made by transmission providers.

There seems to be a lot of discussion -- and I'm sure we'll have a bit here in a moment more -- but PRR 830 was proposed to clarify, not change, the existing requirements. So this in -- all of these considerations at ROS and PRS and at TAC, stakeholders heard many of the arguments that you will hear this afternoon and rejected arguments that clarification of PRR 830 should not apply to certain existing generators because existing requirements were ambiguous.

Now, that's just not true. They were clearly understood. And, in fact, they're recognized and have been by most of the members of ERCOT for many, many years. This PRR -- and I want to be very clear here, I am not discussing at all any pending proceedings at the Commission or ADRs or -- that are applicable toward past compliance. That's not -- as the TAC advocate, I'm not discussing that this afternoon. We're talking PRR 830, if you were to vote it in, would become effective upon your approval.

PRR 830 provides the means and the time frame for anyone who happens to be not compliant to fairly and equitably comply with the requirements of the protocol revision of the current protocols. And they can do so without necessarily having to retrofit their unit, because they could provide a payment in lieu of -- a payment of contribution or they can submit alternatives to changing their generation.

As far as the need for studies, this again was brought up at -- I would say at all of the considerations of this protocol revision. TAC and the other stakeholder groups heard and, in my opinion, the votes suggest rejected arguments that studies should be performed to determine whether compliance with the requirements are needed for reliability. That included presentations by NextEra and Siemens that you'll probably hear or see some of those this afternoon.

As previously noted, the requirements for generators are fixed. I think that's a good thing if I was a generator. I think that would be appropriate for my ability to finance projects and be -- my ability to have certainty about what my performance requirements were. They don't vary over

time. Those needs for the dynamic support of the system are provided by the transmission providers after significant studies.

So taking the fixed capability of generators and loads as input, that enables the transmission planning to take place, to assess the incremental needs as we change the topography, as we continue forward. They are then provided by the transmission owners.

So as to the current state of affairs, my belief -- and I think the members of TAC indicated it with their vote -- that this protocol is in existence and that these requirements are how we went about planning this transmission system. I think that's a very important part. How we got to where we are is the assumptions under this clarification or how we got to the transmission plan that we're now operating under.

Now, if -- that plan has resulted in us making decisions about investments in the transmission system to enable reliable operation of ERCOT, the ERCOT grid. We're about to embark on a significant study of the reactive requirements associated with the many billions of dollars associated with the CREZ investment. It's intended that if this protocol is

passed that that will give certainty to those decisions that need to be made with regard to the dynamic reactive compensation that needs to be added in CREZ by the transmission providers who are constructing the transmission assets that will bring this large amount of wind power to loads.

So, in my opinion, this approach is fair and workable. It adds certainty, and it provides us the path forward for doing the CREZ studies. It also enables people who might not be compliant with a path to become compliant and provide the reactive support that the ERCOT system needs.

And I think I would encourage this Board to consider reliability. I know you will hear a lot of comments about who has to pay what. But bear in mind that the situation that you as Board members are operating ERCOT under right now, if there are people who are non-compliant, they have basically taken some of the margin out of the reliability of the ERCOT system. That's being made up by ERCOT operations and being provided by other generators or operational constraints or considerations or decisions that are being made every day because of that noncompliance.

Going forward, it's essential that we understand where we are when we plan this system.

When we complete the recommendations and the planned installations and investments by transmission providers to enable this 18,000 megawatts to seek loads in this state. So I would ask you, as Board members to consider your responsibility as members of the Board of the Electric Reliability Council of Texas.

That is basically, Madam Chairman, my comments this afternoon.

CHAIRMAN NEWTON: Thank you, John. Are there any questions or comments for John at this

point?
Appreciate you stepping up and providing us TAC's perspective on this.
My plan at this point is behind Tab 12(b) of the Board material is a memo that Mike Grable was gracious enough to put together that kind of summarizes some of the companies who were wanting to make appellate positions. Before I get into that, Mark, did you have something else you wanted to add or --
MR. BRUCE: No, I was going to introduce, I thought, Mr. Markarian from NextEra was going to --
CHAIRMAN NEWTON: Well, actually what I

think I'm going to do is go in alphabetical order, if that's okay. And I will just go according to the alphabetical list of companies as they're defined behind Tab 12(b).
So we will start out -- and then I will also ask if there are any other parties. I had understood that we potentially had one or two other parties that had desired to make comments that did not have an opportunity to get the materials to the Board packet. So I will ask for those after we go through this list of the companies who have provided materials. So I'll start with AES Corporation, Robert Sims. Is he here?
MR. SIMS: Yes.
CHAIRMAN NEWTON: Oh. Thank you.
And before we start the comments, if I

could, I want to be sure that everyone has an opportunity to be heard on this. The Board had put together procedures to handle appeals and so forth, and I appreciate the companies that have tried to adhere to those procedures. But we do want to provide an opportunity for the Board to hear any comments from any parties. However, in the sake of time, because this is -- could be fairly lengthy, I would ask that as the presentations are made that we not hear the

same comments repeated over and over again. So I would ask that the presenters try to kind of keep that in mind as you go through your comments so that you will be presenting new ideas to the Board. And if you choose to endorse a prior-made comment, that's fine, but not to just restate the same positions over and over if possible.

MR. SIMS: Thank you. Good morning. Robert Sims with AES Corporation, and my presentation is a little different. I thought it might be helpful to give the Board a little perspective on the power factor issue by looking at what's been done in other regions of the United States. So I'll just briefly cover that.

Basically, in 2005 and 2006, a considerable amount of work was performed by a large and broad group of grid operators and stakeholders, including wind generators, and ultimately this work lead to FERC issuing Order 661A, which is included in Exhibit G to the FERC Large Generator Interconnection

Agreement. That's now the standard and required agreement across most of the USA. It's used by all investor-owned utilities under FERC jurisdiction, and it's been adopted by a lot of non-FERC jurisdictional entities in many regions of the country.

♀ 126

Just a little chronology on the work that went together over that two-year period. Initially in 2003 FERC issued Order 2003, and that standardized the interconnection process requirements and agreement for all large generators over 20 megawatts or 20 megawatts in aggregate.

In March 2004, as a result of stakeholder comments, FERC issued Order 2003A, an amendment of that. And that recognized that electrical machine technology differences affect the interconnection requirements. And with that they provided what was termed Exhibit G, which was a blank sheet of paper to be completed by stakeholders in the wind power industry, recognizing that wind energy technology was a little different.

So following on to that, September 2004, FERC hosted a technical conference on requirements for the interconnection of wind generators. The conference was broadly attended. It was in Denver. I was there. It went on for a full day with the FERC commissioners there hearing positions about the requirements for wind turbines. That was followed a few months later in December 2004 NERC created the Wind Generation Task Force. And they were chartered with "review the bulk electric system reliability implications and concerns of wind generation." So under NERC, under the Transmission Working Group, their group looked at this issue. They looked at power factor. They looked at low voltage ride through. And they looked at other aspects of integrating large amounts of wind energy into the bulk power system. That group began a series of regular working meetings.

In July 2005, FERC issued Order 661, termed The Interconnection Requirements for a Wind Generator Plant. The order defined the technical requirements, including low voltage ride-through, which is now at issue coming up in ERCOT; power factor, which is relative to PRR 830. And also SCADA communication requirements for meteorological information, units availability and so forth. And those were all included in Exhibit G of the standard large generation interconnection agreement, as I mentioned, and are now law under FERC jurisdiction.

In 2005 NERC requested a rehearing on 661 based on some continuing work with a Generator Task Force, primarily relating to finer details of the timing of low voltage ride-through, the level of voltage and the duration. There were no comments on the power factor requirement.

That was finally followed in December of 2005 when FERC issued Final Order 661A and the final

Exhibit G, the requirements for wind generator plants. Under the 661A process, there were a large number of parties that participated. I put together a list here from the FERC filing of all the parties that participated in that process. CenterPoint was the only one from the ERCOT region. Otherwise you see many of the grid operators here: ISO New York, midwest ISO, NERC themselves, New York ISO. A large working group that participatend in this project -- PJM, Southern California Edison, et cetera, Xcel Energy.

And here's the wording that was decided upon under 616 A, which basically, "The wind generating plant shall maintain a power factor within a range of .95, leading to .55 lagging as measured at the point of interconnection". I won't go through and read this entire thing, but it's basically the triangle requirement or the cone requirement you are hearing discussed in the dialogue today.

Most wind turbine manufacturers then, based on the ruling in 2005, designed wind turbines for deployment in the United States based on this requirement, and that is now what's available through

129

most of the country. So we now have a situation where ERCOT is asking for high level -- higher level of reactive support than required by FERC and NERC under the standardized large generation interconnection agreement, without really any technical basis or studies to demonstrate that need for a higher standard.

Thank you.

You want to do questions now or does that come later on?

CHAIRMAN NEWTON: No, I think we should -- are there any questions for Robert?

Dr. Patton?

MR. PATTON: Tell me how this is different from the proposed PRR?

MR. SIMS: Well, 661, that's the triangular requirement or the cone requirement where the power factor of the generator is maintained with an ability of plus or minus .95.

MR. PATTON: Please go back to the previous language.

MR. SIMS: Sure.

MR. PATTON: Where does it talk about a triangle?

MR. SIMS: It really doesn't. It

doesn't say triangle.

MR. PATTON: Thank you.

MR. SIMS: Questions?

Thanks.

CHAIRMAN NEWTON: Andrew?

MR. DALTON: In have one quick question. This kind of relates to the 661A and how we're looking at FERC -- I mean, kind of more globally as, you know, some support for what we're doing here in ERCOT on wind. I know back when we had the LBRT discussion several months ago, I think the wind generation community took the position that 661A, even though it had standards for LBRT, that didn't apply in ERCOT, it never happened in ERCOT, and now here you seem to be taking the opposite position that, well, FERC set a standard, so we should go with it.

And I'm trying to understand how we should be looking at the FERC precedent and are we picking and choosing when we want to rely on it or should we be doing this more systematically to be consistent with the federal standards, or should we be recognizing that ERCOT is probably unique in the country because we have a lot more wind than any other state?

MR. SIMS: Well, I don't think I'm

♀ 131

taking a position on any of those points. I'm letting you know what a large body of stakeholders determined was the appropriate power factor requirement for wind generators in much of the US.

MR. DALTON: All right.

CHAIRMAN NEWTON: Mike Grable --

MR. GENT: On one of your previous slides I represented NERC in filing protests, and I can recall vividly -- this is prior -- just prior to my retirement -- that this was sprung on us and, I will say, given very little attention or time to respond. The FERC employee that was largely responsible for this was a former employee of AWEC, whatever that wind associate -- AWEA. Is that it?

Oh, yeah. And you'll notice, if you read through, which I have on my screen now, read through 661A, you'll see all sorts of protests from the industry, mostly having to do with low voltage ride-through. So we never really got around to all of the issues and then FERC just went ahead and passed it anyway. So I don't think using 661A as a basis for an argument is really something that's going to gain a lot of traction within my circles.

MR. SIMS: Well, I do agree that most of the discussion was around the low voltage

132

ride-through. I don't think there was much discussion at all as far as the power factor requirement.

CHAIRMAN NEWTON: Anything else for Robert?

Yes, Mike?

MR. GRABLE: Just a brief comment. I do agree with Dr. Patton's point that there is no triangle or rectangle mentioned in this quote.

Robert, would you flip to the last slide, which I think is what Mike Gent was referencing?

MR. SIMS: The very last?

MR. GRABLE: Yeah, asking for a higher level than that required by FERC and ERCOT. I think whether it's higher that that required by FERC is debatable, and 661A can be interpreted. But it's the end NERC part of this that troubles me a little bit. NERC did express grave reservations with the wind position in 661A, and Chairman Kelliher pointed that out, that NERC was troubled. So I don't think it's quite right to say that NERC was signed on to your version of the approach here. But I just want to highlight that.

MR. SIMS: Okay. Very well.

CHAIRMAN NEWTON: Okay. Thank you,

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Robert.

Okay. The next company ahead is AEP, Kip Fox.

MR. FOX: Thank you, Madam Chairman. Let's see -- I believe you have our comments in your Board package. The only thing I would like to add to that from AEP's perspective is that one of the things that we do find -- and not to belabor on some of the points that John has brought up -- is that we fight these issues every day. The question that came up during TAC is what's the indication that we have problems in the system, and the fact is every life in the day of operations from the operations side of -- as a TSP, we see the warning indicators every day. I mean, the fact that we have lot of operations going through, and the fact that we're going through different kinds of requirements, we're doing switching and all kinds of other things from an operational standpoint, tells us that this issue is becoming more and more critical.

And as the Board considers this alternative and this PRR, we need to understand that there are operational things out in the field that we're almost at the point that we can't handle anymore. It should be -- it's not a reliability crisis right now, but it's growing. And we see this more in ERCOT than we do at AEP in some of the other RTOs that we operate where there's wind available.

And I would say from an AEP perspective, we see this issue in the west more prevalent than we do in our other locations. So to us these requirements have been very clear in being a rectangle rather than a cone for many years and in our other jurisdictions, and that's all I would like to add at this point in time.

CHAIRMAN NEWTON: Thank you. Any questions for AEP?

Okay. Thank you very much.

Again going in alphabetical order, ERCOT. Kent, are you handling ERCOT?

MR. SAATHOFF: Yes. I just wanted -- you know, the written comments you can read. I just want to go into a little bit of the history very briefly. As John mentioned, the PRR was passed in 2004. And really the issue of compliance or non-compliance with the PRR didn't raise up until last summer. And it became an issue in a wind workshop that we had back in August.

And back in August, John Dumas made a presentation where he stated the rectangle requirement

was what the protocol required, which is that generators are to provide a constant source of reactive power over their entire operating range, which is based on the plus or minus .95 at their maximum power level. That was followed subsequently by a market notice to that effect.

In the interim, it became apparent that wind generators were having -- existing wind generators were having problems with that interpretation and that requirement. So we worked with them since the end of last year to determine a way that they could comply with what we believe was in the existing protocol. Unfortunately, we couldn't reach agreement with all of them, but we felt like we should file this protocol to establish a way of compliance and, hopefully, go in that direction and get full compliance.

Back in June, we contacted -- we reviewed the resource asset registration forms that were filed earlier last year, and contacted those generators that, you know, appeared not to meet the reactive requirement in the protocol based on that information. And the resource asset registration forms, which is mentioned in other comments and I'm sure will be mentioned later, their purpose was really

not compliance. Their purpose is for us to get accurate data on what is out there in real life so we can appropriately model it. So they weren't established for checking protocol compliance.

But nevertheless, we did go back and look at them and see if the information reflected there showed compliance with the rectangle, and we contacted those that it appeared that they didn't meet that requirement and to get additional information -- or additional reactive resources that aren't reflected in your RARF, and, you know, we got various responses.

But we contacted 70 wind generators. Of those 70, 16 met the requirement, the rectangle; 29 met the triangle requirement, which, you know, we believe is not what the protocol requires; 9 didn't meet either the triangle or the rectangle; and 16 were pre-2004 wind generators that were exempt from the requirement.

So we essentially filed the protocol to establish a way for those 38 generators that don't comply to comply, and that was the primary purpose of the protocol.

CHAIRMAN NEWTON: Okay. Any questions for Kent?

Yes.

MR. BIVENS: Kent, you said -- I'm trying to remember what you said -- you said that the particular requirement in this PRR, when you established it in 2004, was not necessarily for compliance but --

MR. SAATHOFF: No, the RARF --

MR. BIVENS: The RARF --

MR. SAATHOFF: -- the Resource Asset Registration Forms that were created last year, mainly to get a good set of data for the -- for our nodal model, yeah.

MR. BIVENS: So with most protocols, when you find non-compliance, what do you do?

MR. SAATHOFF: Well, this issue has come up before. We at ERCOT ISO do not have a compliance staff. So what we do is when we have a system incident that has occurred and we look into that incident and it looks like to us there may be some issues of protocol compliance, we will forward a report on that to the TRE.

MR. BIVENS: Why was there a four-year period before this became an issue?

MR. SAATHOFF: You know, frankly, it didn't come to our attention, and I assume everybody thought they knew what it meant. And apparently there

is a difference of opinion on what it meant.

MR. BIVENS: Okay.

CHAIRMAN NEWTON: Andrew?

MR. DALTON: Thank you. Kent, a couple of questions. As I was reading through your memo, a couple of thoughts occurred to me on this concept of parity among the generation resources. And it seems that there are some pre-'99 units that are exempt, some pre-2004 units that are exempt. Then there's this 2004 to 2009 group of generators, and then there's another group 2009 -- December 1, 2009 going forward. I mean how many generators are in each of those buckets?

MR. SAATHOFF: You know, I don't have that information at hand. The 1999 for conventional generators, and February 2004 for wind generators, that was established in the protocol. The -- from 2004 to now and future, that's at issue right now. But the protocol just had those two groups.

I do know in 2004 we had about 1300 megawatts of wind, and right now we have over 8500 megawatts of wind.

MR. DALTON: Okay. How much conventional generation was on at that time that's still on today, a decade later.

MR. SAATHOFF: I certainly don't have an exact number, but I would say, you know, 10, 20,000 megawatts, somewhere in there. That's just a guess.

MR. DALTON: And I support this parity concept. I think it's a good one that we keep all the generators on the same foot. I'm just tying to kind of get a sense for what are we talking about and how does that affect the system, too? Because I'm somewhat sympathetic to making changes when the rules might not have been clear to everyone.

But to get to that point, as we went through the interconnection process with these generators or they were submitting their RARFs, I mean, at what point did ERCOT know that there was an issue with some of these generators, and how quickly did ERCOT react to that?

MR. SAATHOFF: Well, we really only became aware that there was an issue back last summer. As a result of discussions with wind generators and other parties, we did the review of the resource registration -- of the RARFs last summer -- excuse me, this summer, back in June.

MR. DALTON: Okay. So this is -- we learned it through the RARF process because ERCOT doesn't really directly participate directly with the

interconnection requests?

MR. SAATHOFF: That's right. Generation interconnection agreements are between the generator and the transmission provider.

MR. DALTON: Okay.

MR. SAATHOFF: ERCOT is not a party to those agreements.

MR. DALTON: Okay. And there's not some communication process between the TSPs and ERCOT regarding what the standards that are being imposed to the interconnection process are?

MR. SAATHOFF: There's -- I believe there's a standard -- fairly standard generation interconnection agreement that I believe the PUC approved. But as far as us being a party to generation interconnection agreements, no, we're not. And we have not been reviewing all those.

MR. DALTON: Okay. And then, I guess, if we didn't pass 830 today, what would that do to all the modeling and the studies that have been done in the CREZ docket? I mean, would that throw everything kind of into disarray, or would we be able to modify that information or -- what does it do? How does it interplay with the CREZ work that's already been done?

MR. GRABLE: Kent, do you mind if I

answer this one? I think it's a procedural question.

MR. SAATHOFF: Okay.

MR. GRABLE: If 830 doesn't pass, ERCOT's belief is that the protocol says what it says and we require the rectangle and we will model according to that. There is more uncertainty as to whether -- you know, in what venue and how far down the road it will reach -- other people deciding one way or the other on the issue, but that's how we'll proceed.

MR. DALTON: Okay. That's all I have for now. Thank you.

CHAIRMAN NEWTON: Mike?

MR. GENT: Kent, did you say that there were -- from your study that you surveyed there were 28 that could meet the requirement?

MR. SAATHOFF: No, there were 16.

MR. GENT: 16 that could --

MR. SAATHOFF: That met the rectangle and 16 were exempt.

MR. GENT: All right. The question has to do with those 16, and it is how do they meet the requirement physically and is there a high voltage issue with these 16?

MR. SAATHOFF: Of the 16, five

apparently meet the requirement with the generator. Apparently they have some of the newer generators that can provide a full dynamic requirement. Six met it after they provided additional information that was not reflected in the their RARF. Four met it with essentially the way PRR 830 says, that you can meet it by the addition of additional static and dynamic devices in addition to the generation. And one submitted a mitigation plan committing to do that in the future.

MR. GENT: I guess my question would -- second question only deals with those four then. It just seems to me if you put in static capacitors you're looking at a possible overvoltage situation under certain system conditions as well, unless they're operating properly.

MR. SAATHOFF: That's right. And we reviewed that to make that sure we were comfortable with -- that that amount of capability could be operated within the requirements.

CHAIRMAN NEWTON: Is that all, Mike?

MR. GENT: Yes. Thank you.

CHAIRMAN NEWTON: Bob Helton, I think you were next.

MR. HELTON: Just real quick question,

Kent. Is there a problem then with our procedures for connecting to the grid itself? And what models -- I know whenever we turned in all of our data for our generation units we had to have every model and every test and everything we did turned in to both planning and operations. Is there a different process or did we just do that and that's -- it's not in the procedure that you actually review that against the OGRs -- you know the operating guides protocol requirements? I'm trying to figure out where there may be a hole where we could catch something like this --

MR. GRABLE: Kent, can I jump in here, too? I mean, there are two things I think we ought to look at. One is we rely on, as you know better than anyone -- you know better than I do, Bob, the generator itself certifies that it understands and complies with all protocols. I think we need to make sure going forward that ERCOT staff and individual generation owners and operators are on the same page with respect to all those items. We probably need to go through them one by one and make sure that when a generator certifies that they're fully compliant with the protocols, they understand what that means. They understand what ERCOT staff understands that that

means.

I think we also had some miscommunication here between the TSPs and ERCOT. And I don't want to speak for them or our staff or get into who knew what or who thought what, but you've heard from the TSPs -- you've heard from one and you'll hear from -- well, you've heard from two and you'll hear from a third today as we go through this list -- that they believe it's the rectangle, that were there interconnection agreements signed up where the generator is going to tell us they should have known we were talking about the triangle here, you know, yeah. So there clearly are some communication issues we need to work on.

MR. HELTON: Right. And that's what I was getting at. I mean if -- because if the test data and the model data was all -- which exists for every unit, then we would be able to know that right off the bat. I was just curious to see if we do need to change some procedures on that issue.

MR. GRABLE: I think we ought to flag that regardless of the PRR, regardless of any NOVs and regardless of any PUC action as a separate issue to take up and make sure that we report back to the Board that we're all on the same page.

Danny, I wanted to go back and make sure your RARF question -- that's a form we created for nodal readiness to make sure we understood what was out on the grid -- setting aside compliance, just what can you actually do. And, of course, the date of that form is only within the last year. It's not something that existed in 2004 or prior years, but it has a different -- you had a question about protocol compliance, and I think we've covered that. But I just wanted to make sure we had returned back to that initial question.

CHAIRMAN NEWTON: Did you have another question?

Okay. Dee?

MR. PATTON: Kent, you said that you became aware of this issue last year? This year?

MR. SAATHOFF: Last year.

MR. PATTON: What flagged that to you?

MR. SAATHOFF: Well, there were a couple of events early last year where we had some high voltage in the west and we -- we called on some wind generators involved to deploy their reactive to lower the voltage, and that couldn't be done. So the transmission operator, to avoid equipment damage, opened up the line. So that was the first hint we

♀ 146

got.

But then as we went to the wind workshops and discussions on this issue, you know, we were certainly aware it was an issue at that point last summer.

CHAIRMAN NEWTON: Danny?

MR. BIVENS: This may be a question for I think every speaker, but one of the issues today is probably going to be whether we vote this thing up or down or whether it gets remanded back to TAC for further study or more looking at. And there's a statement in Mr. Houston's comments of November 10th and it's also on his slides. He basically says he -- the reactive capability requirements for generators and load are fixed and that if there's any variance at all, then that's going to be done by the transmission owners.

So with respect to whether studies are needed, he makes a statement, "Studies are performed to identify the variable transmission owner requirements," so it's on the transmission owner. And I -- my question is -- I mean, probably everybody -- do you agree that there are no -- there's no need for any further studies? And I think you said the same thing in your comments as well.

MR. SAATHOFF: Yes, the whole premise is that the protocols set out the standards that generators have to meet. In other words, what they bring to the table. Under those assumptions that those requirements are being met, then the transmission operators perform the studies to determine what additional equipment they may need to put on the transmission system.

CHAIRMAN NEWTON: Yes, John?

MR. HOUSTON: Yes. In answer to your question, I think CenterPoint would again design and plan the system in conjunction with ERCOT to make all the changes, assuming that the generators are performing as per the protocols, and assuming loads of meeting their requirements. As I pointed out in some of my comments, for example, in Houston, we've just invested over 25 million in dynamic reactive because there isn't adequate dynamic reactive capability in the existing generators in the Houston area to prevent voltage collapse.

So, yes, we do make those, and we would not go back to the generators. That would basically be every few years, if the study indicated it, instead of building $25 million worth of dynamic reactive I would have had to go back to the local generators and say how about producing .9? How about producing .85? I wouldn't hear that millions and millions and millions of dollars comment many times over.

So I -- that's not how it works. This works. It's fair. It's equitable. It's how we planned the system. It's important to reliability.

CHAIRMAN NEWTON: Dee?

MR. PATTON: I would just observe that -- an observation on the actual system is the best study of all, requires no assumptions whatsoever.

CHAIRMAN NEWTON: Bob?

MR. HELTON: Just real quickly. On the study -- on the CREZ study, the effect this would have on the CREZ study -- correct me if I'm wrong, Ken -- the whole situation is if it was determined that every generator needs to be in the rectangle, then the CREZ study would base on that issue that everyone was in that and then any additional stuff that needed to be done would be done by the transmission providers. Correct?

MR. SAATHOFF: The current CREZ reactive study is assuming the rectangle.

MR. HELTON: Right.

MR. SAATHOFF: And so anything additional to that would be, you know, provided by the

transmission operator.

MR. HELTON: Right. So if something

happens and somebody decides that that's not the case, what would the actual change be, and say that somebody said it was the triangle, then you would need -- knowing that, what that would change is the calculation on what the TDSPs would have to do to ensure stability. Correct?

MR. SAATHOFF: We would have to go back and redo the study with that changed assumption.

MR. HELTON: Right. Okay. Thanks.

CHAIRMAN NEWTON: Dee?

MR. PATTON: And that changed assumption would result in greater uplift to the consumer.

MR. SAATHOFF: Depending on what it showed. If it showed that you needed more reactive equipment because of that, yes. But you don't know until you've done it.

CHAIRMAN NEWTON: Okay. Any other questions for Kent?

Oh, Mike?

MR. GRABLE: Bob, if I were a thermal generator and wind were victorious in their interpretation of the protocol at whatever level, whatever finality we end up with, Kent's right that

that would immediately change the transmission reactive support assumption. But if I were a thermal generator, I would want to clamber onto the deal that wind got and we would need certainty as to that outcome and then that could further affect what we need from transmission.

MR. HELTON: I'm not sure it being a

thermal I would agree with that aspect, because, you know, we've already designed and put up our -- we're in as a triangle -- I mean, a rectangle, so we're already there. So there's not a deal to go get, I don't believe.

MR. GRABLE: I understand. I've heard that from your peers.

CHAIRMAN NEWTON: Okay. We'll move on. I have down next in alphabetical order Brian Hayes with Horizon Wind Energy.

MR. HAYES: Okay. So before I get started, I just wanted to first thank you guys. I appreciate the time to come and present our side of the story on this and, you know, just to give you a little background. So horizon is active in the ERCOT market. We have a 400-megawatt plant in Albany, Texas just outside of Abilene. And it's been in operation since 2006 and 2007 is when it came on line. So it

151

was post the 2004, you know, that we're talking about here. And, you know, I just want to let you guys know, the reason I'm here today is because reliability is, you know, paramount to us and to, I would say, almost any wind generator in the room. So it's not a thing about concern about -- so we are concerned about reliability.

But the concern that's been raised through this PRR is just the methodology that we're going through to require the retrofitting of facilities to have this -- to meet this rectangle for the wind generators, which I'll go through and discuss why our interpretation of the protocols at the time of interconnect was not the rectangle. And it's going to be -- so it's a cost for us as a generator that will in turn get passed on to consumers. So I just want to make sure that ERCOT and the community is doing the prudent practices to make sure that we're going at this in the right way before we subject to a large investment.

So let me just tell you a little bit about how we interconnected just to give the story on how it worked for us. So as I said, our plant came online in 2006. We did, you know, numerous studies with the TSP to -- providing them all the information

of our plant, what the generators were, what the equipment they were going to have in addition to that.

We even -- through this study the TSP recommended that we needed to have additional capacitor banks to provide voltage support, and we did comply and we put those capacitor banks in. But through all of this study, the requirements that we were meeting were based off this curve here. And this is the infamous triangle that we're talking about.

So if you read through the protocols in 6 .5 .7.1 it talks about that a generator must meet the .95 lead/lag requirement. So if you take the .5 lead/lag requirement, effectively what it means is as your generation goes up, you provide more voltage support as your output goes. So this is a sliding scale effectively with how much you generate. So this is how our plant is designed to operate.

We actually provide a little bit more on the top because of the capacitor banks, but in the end this was the -- this is how we were designing the plant and how we interconnected, and this is what was approved by the TSP and ERCOT prior to any -- prior to us putting any megawatts onto the grid.

And, you know, I will say also that, you know, all the parties were involved with this. So as

the -- after the studies were completed, we completed the GARF, which, you know, now they're on the RARF. Right? But at the time this was the GARF, the Generation Asset Resource Form, that was completed and went through and submitted and approved. And then on the day the plant was energized, there was ERCOT on the line -- I believe it was Oncor and then ourselves ensuring that the plant was interconnected and working as it was designed to do.

So all these things have been checked. And then, as you know, which was discussed previously, then in August of last summer, there was -- there was actually a conflicting message which I think wasn't discussed prior, that in the morning ERCOT sent out a page that basically shows that this is the -- this is how a wind generator resource provides reactive support. And you see the triangle. And then on the top is what a conventional does which is more similar to the rectangle. And I will say that this was not presented. This was sent out to all the people who were going to go to the workshop in the morning. And then by the afternoon, the chart on the bottom right had changed to the rectangle.

But I will point out that the -- actually the example did not change. And so when you

can see the second bullet point it says, "Wind generation output equals zero megawatts and the megavar requirement is zero megavars," which is the exact same definition that we're saying here, that it -- as your output goes down to zero, you stay at zero; whereas, the protocol change that is in discussion is effectively trying to get us to provide the reactive support at the highest levels, even when we're at zero.

So these were the conflicting messages that then resulted in the interpretation that went out by ERCOT. And then this is the -- and I guess further support of that will support the cone -- or the cone or the triangle in 6.7.6, the language in red here. Basically if you read this, it says, "The required installed reactive capability multiplied by the ratio of the lower active power outut to the generating unit's continuous rated active power output."

So if you go through and you turn that into a formula, it's effectively the triangle, and it's a sliding scale. So as your output goes up, the amount of reactive power that you have to provide increases. And so when you're at zero, it's zero. So this is how again we've operated and throughout -- you know, since the plan has been energized and why we're here today to talk to you about this further.

So I guess, you know, taking this all in context, this is -- the issues that we have, you know, with this change that is come down and that we're discussing is that, one, since 2004 there's been 7,000 megawatts that have interconnected into ERCOT. And as was described earlier, some of these meet the requirements, some of them don't.

We have significant concern that there's going to be a lot of money spent to get all of these generators to align with the rectangle. And there's not been one study done to determine if this reactive -- if this equipment that we're going to put in the ground is actually going be used. I mean, it could very well be the case that we could -- that all these generators could go back and retrofit, spend the money, which for our client we have looked at is in the tens of millions of dollars, put the equipment in the ground and then that equipment could sit idle and never be used. It could be a stranded cost just because maybe it wasn't in the right place or maybe because it was never needed in the first place. So there is a big concern to us that the studies not being done will end up being a poor use of dollars for the generators, which will then be, in the end result,

on to the consumers.

And I think the other thing that I --

that has been somewhat frustrating is just that this has been described as a clarification. And, you know, as -- I think it's pretty clear, based on the number of generators that don't meet this requirement today, that it is much more than a clarification. And then with the dollars that are at stake and the amount of investment that's required, again it's hard to call this a clarification. It's a very significant deal, and something that we think needs to make sure that there is a prudent study to ensure that the dollars are going in the right place.

Then I guess the -- I guess the last issue that we have has been brought up recently, and that's just that, you know, there's this disconnect between what was planned in the transmission versus how we're actually interconnecting and operating has raised a lot of concern. It seems counterintuitive that instead of actually going back and looking at how we're actually generating and then making the right decision on what is -- where the investment were to occur, to just go back and unilaterally make us meet whatever what was modeled to begin with.

So anyway, those are my comments, and I

appreciate any questions.

CHAIRMAN NEWTON: Are there any comments or questions?

Kent?

MR. SAATHOFF: Start with this, that is deployment of voltage support. Right? It's not voltage -- it's not reactive requirement, is it?

MR. HAYES: Yes. Yes.

MR. SAATHOFF: Okay. And the reactive requirement is in a different section of the protocol.

MR. HAYES: Right.

MR. SAATHOFF: In the slide that you had up before from Mr. Duma's presentation --

MR. HAYES: Yes.

MR. SAATHOFF: -- is that his entire presentation?

MR. HAYES: No, it is not.

MR. SAATHOFF: Okay. Thank you.

CHAIRMAN NEWTON: So it's an excerpt or has it been modified?

MR. SAATHOFF: Yeah. The point is there's a preceding slide that stated that we believe the requirement was a rectangle.

CHAIRMAN NEWTON: Okay. Mike?

MR. GENT: Yes. In your background

158

material and in the material you presented here, there's an implication that this information has been made clear to ERCOT, and then I heard in Kent's explanation that the data is provided to the transmission owner. And in fact I have before me where -- if I hadn't heard this, I would make the assumption that you're doing these studies at ERCOT's request and behalf and that you presented all this to them and they signed off on it. Is that what you're trying to say here, that they signed off on your inability to provide vars as they think are necessary?

MR. HAYES: The transmission service provider has signed off that the studies were completed.

CHAIRMAN NEWTON: And maybe it's in your background material, but for my clarification are you supportive of the rectangle prospectively and only opposed to it retroactively?

MR. HAYES: Yes. So -- yes. So retrofitting in our view is -- it's much more costly to do retrofits than to do -- than to build when you're actually building a new plant. So the prospective we have no concerns with doing anything prospective because we can build it into the plant. And we can even make requirements from our turbine

suppliers that we meet certain requirements.

CHAIRMAN NEWTON: Well, I guess again, just for clarification, my simple mind --

MR. HAYES: Yes.

CHAIRMAN NEWTON: -- you don't have a problem --

MR. HAYES: -- no problem --

CHAIRMAN NEWTON: -- with the requirement for reliability to be the rectangle?

MR. HAYES: Going forward prospectively.

CHAIRMAN NEWTON: Thank you.

Yes, Miguel.

MR. ESPINOSA: Explain to me then why, if you go back and retrofit, you might have stranded assets, but if you go forward and install them going on, you don't?

MR. HAYES: That's a fair point. So there is the risk that they could be stranded assets, even if you do it going forward. But I would say that the amount of economic impact that you're contributing is a lot less just because you're designing it into when the plant is being built. You don't have to take the plant down. There's a lot of factors that go into it that make retrofits much more -- a whole different game.

CHAIRMAN NEWTON: Okay. Andrew?

MR. DALTON: Just one quick question, kind of a follow-up clarification. So it would be your position then essentially what we should be doing is setting up a tiered process here, prior to 2004 no reactive power for wind from 2004 until December 1, 2009 or November 30th, 2009 the cone applies. From December 1, 2009 forward the rectangle applies. Is that a fair characterization?

MR. HAYES: That is correct.

MR. DALTON: Okay.

CHAIRMAN NEWTON: Okay. Any other comments for Brian?

Okay. Thank you, Brian.

Next we have NextEra.

MR. MARKARIAN: Good afternoon. We actually brought this appeal. I'm Dave Markarian, managing attorney for NextEra Resources for litigation and state regulatory, and we appear most respectfully before this body because we believe that reinterpreting existing protocols and applying them retroactively is a bad idea.

We believe we too are a reliability leader. And we understand and take this very seriously and we seek to do the right thing. But we

also believe that we're being entirely reasonable here, and we fear that we're straying a little bit from common sense, which is why we're here.

We have made a proposal or, if you will, a counterproposal that we think is entirely reasonable, which is this: If a study demonstrates that more than a triangular reactive power configuration is required, we're all in. No problem. We believe it would be appropriate to examine carefully any reliability events. I'm going to come back and tell you about what we have been told, because we have been asking about this for a long time, nearly six months.

But clearly, as of last night, we were told -- and today you were today -- that 21 and 17 months ago there were two events. There's been no study done as to those two events, and yet those events are being used to suggest that between 30 and $100 million in investment be deployed. I just watched with respect, bewilderment and amazement at your diligent debate over $11 million. This is a big deal, and that's why we're here. And we hope no one feels as though we're wasting your time. I know it's been up before, but we believe we can demonstrate to you that it hasn't been considered the right way or quite enough.

This proposal is a one size fits all proposal, when we all know that reactive power capability should be a bus-to-bus analysis. Providing reactive power far from load doesn't always make sense. Even one of the parties that got up and spoke to us in support of PRR 830 has stated embedded in its comments that if you don't quite do it this way, give us the money and we'll use it more appropriately where it should be properly located, where reactive power isn't necessary out in the hinter lands, we can tell you a better way to get this done, AEP.

We essentially focus on what we believe are two myths, the first being that reliability requires it. We have been diligently questioning whether there have been any true events. As recently as July and August of this year, we were told there were no events in several meetings on several calls with numerous witnesses. There have been no system emergencies. There have been no advisories or alerts that are tied to non-compliance of 6571 or 67. And the first mention of any of that, ladies and gentlemen, was at the TAC meeting on November 5th.

So we began to ask a lot of questions. We couldn't get from ERCOT staff any dates, no

descriptions, no analysis of these events, where they were, when they were. But we did our own investigation and determined that not a single event related to voltage -- not a single event related to voltage in 2009 in West Texas was reported in the system operations reports to reliability and operations subcommittee or the Board of Directors or in ERCOT public operations reports. We asked about any events and were told as recently as two days ago that there has been no technical analysis that's been fully performed by ERCOT staff as to these events. No analysis as to the cause of events, no study. Most importantly, that the procedures you're being urged to adopt today would be the proper action to take and would avoid these events.

The second myth, respectfully, is that PRR 830 is nothing new. How can you possibly explain ERCOT's report to you today that far more than half of the wind farms have been deployed with something less than the rectangle configuration of reactive power?

The TAC advocate in its presentation told you that this requirement has been in place for several years. But if you look at PRR, it has been entirely rewritten. The red in the center of this document reflects everything new. The red on the

164

outside of these documents reflects everything deleted, striking entire existing paragraphs, inserting entirely new paragraphs, inserting new technical standards and inserting new compliance deadllines and plan approval processes. These are clearly not the same thing. Moreover, as we just went over, ERCOT has produced documents -- I think someone said it best this afternoon, there might be a communication problem. I think that's probably the best you can say about it.

ERCOT itself has produced documents that demonstrate different requirements for wind than what the current PRR 830 requirements would provide. And that's the document you focused on. This is clearly an ERCOT document. It's not been doctored. It's from 2008. It talks about a requirement. It talks about a triangle.

And on the page that you were focused on earlier, look at this. Shown to the right are the reactive capability curves for a conventional generator and a wind turbine. It points you to this D curve, and it points the wind generator to what we have commonly called the triangle. Despite what ERCOT might be saying today, just last year they were not saying the triangle was bad. They were not saying it

had to be applied retroactively. They called it, in this document, the requirement.

So regardless of whether you call this confusion or a communication issue, one thing it is not is clear. We knew that because wind farms don't just spring up. Wind farms are built and interconnected in conjunction with the very best engineering minds in this state and from outside of the state that operate in this state. That is the TSPs play a key role. And even though we've heard some of them come up today and say they approve of PRR

830, they in fact have approved interconnection of wind farms with something less than a rectangular configuration and have taken a slightly different position today.

What I think we've all overlooked is that ERCOT has a statutory obligation to stay on top of -- in fact, to be the ultimate in providing supervision and responsibility as it relates to transmission interconnection service. It is absolutely in the statute that governs this body -- I should say PUCT Substantive Rule 25.361.

And I know very well that ERCOT would not approved anything that adversely affected reliability either implicitly or tacitly and allow it

to continue for three or four years and only discover 17 or 20 months earlier that there was some reliability event and, therefore, a problem, and then failed to study it, failed to bring that study before you, but urge action on a matter that would be so costly, ultimately those costs being borne by those we're here to protect.

25.361 says shall, "ERCOT shall accept and supervise all requests for interconnection, shall plan the transmission system." We've heard excuses, or at least explanations, to be a little more polite, but clearly what was known to ERCOT was that at least 80 RARFs were submitted to -- I should say this, it's been set forth by the opponents of this protocol revision review -- at least 80 RARFs have been submitted to and approved by ERCOT. I think the explanation was given to us today that ERCOT has these, but they don't use them for the particular purpose the statute suggests is their obligation.

These RARFs demonstrate, if you examine them and use them, look at them, that wind was not designed to meet the rectangle, the rectangle at least in many, many instances. Local TSPs, some of the best minds in the business, performed interconnection studies based upon the triangle. No problems with the

triangle have been identified. And probably most significantly, where there was an additional reactive component necessary, it was imposed upon the wind generators. They put those components in, and did so based upon the studies.

This information, these studies, as is appropriate pursuant to Substantive Rule 25.361, is available to ERCOT. Those were available for study and for compliance with ERCOT's obligations under 25.361. So we contend that not only were these things known to the TSPs and studied by the TSPs, but ultimately, pursuant to the operation of 25.361, approved by ERCOT.

The real question we have with regard to this proposal is retroactivity because it sets bad precedent. It can be imposed on anyone literally under any situation. It imposes huge regulatory risk on future business decisions, affecting again anyone. And if you look at the long view, a matter that should be of grave concern and something we shouldn't rush to judgment on. Again, the NextEra position is if a study justifies something beyond the triangular configuration, we'll step up, pay for it and implement it.

And third, we have to look at the long

view of how this decision will affect investment decisions in Texas. Here we believe that the Board has only imposed retroactive application of technical requirements where there was compelling evidence supporting it. I think we've emphasized the point enough that there hasn't been a study. And the one study that's underway -- that could be used to answer some of these questions is underway. We heard about it this morning. And it probably won't be done until the end of this year or early in the next.

What we would respectfully ask you to consider is that under Protocol 1.2, whatever you do, and whatever you decide is governed by ensuring access to the transmission and distribution systems on non-discriminatory -- excuse me, non-discriminatory terms, and to act in a manner that's reasonable.

And ask yourselves and guide yourselves by whether what we're asking be done is fair, whether it's reasonable, whether it's non-discriminatory, whether it's necessary. Because clearly if you have a system in which ERCOT tells you that more than half the wind farms it polled cannot state that they're in compliance with what is now being read as consistent with 830, then we are asking for something new to be imposed.

ERCOT did publish the triangle under the guise of it's a, quote, unquote, "requirement" and there's a sea of wind farms conforming to something other than a rectangular configuration of reactive power configurations. And, you know, the definition of good utility practice, if you look at the statute, is any practice, method or act engaged in or approved by a significant portion of the electric utility industry during a relevant time period.

In our case alone LCRA, Brazos, AEP, took the wind farms in question that we have built and operate, looked at our reactive capabilities and approved us for interconnection. All interpreting the protocol essentially the way most if not all of the wind generators have been interpreting it.

There shouldn't be any real question that this didn't exist as a requirement or it just doesn't make sense that so much of the system would be out of compliance. I don't think ERCOT would allow that to happen. This is new. It's being applied retroactively. There's no study confirming that it is necessary, and as soon as there is one that confirms it's necessary, we'll be the first people to sign on and support it.

More importantly, there's no study that

suggests that what's being proposed here will fix the problem. And although it's been stated that there was a lot of analysis of this, we really believe that there was a rush to judgment. This was not assigned to a working group. There was no task force assigned to it. There were several amendments, even some supported by ERCOT staff, that were never voted on.

And so in closing, before we rush to spend huge dollars, tens to hundreds of millions of dollars that is retroactively applied, that will chill investment and result essentially in what is consumer-friendly pricing, that keeps electricity prices low for consumers, and we'll just wipe that out. Especially we believe this is unwise when there have been no reliability events triggered by non-compliance -- that is by non-compliance with what the proponents state is the proper application of the protocol. And no study of the reliability benefits that 830 would trigger. Thank you.

CHAIRMAN NEWTON: I'm going to ask you the same question, and based upon a couple of your comments, I just want to be clear of my understanding of NextEra's position: Without a study you would not support the rectangle prospectively? Or you would?

MR. MARKARIAN: I think we stated that

we would support it going forward.

CHAIRMAN NEWTON: Well, that's what I was wanting to clarify based upon the comments you made because --

MR. MARKARIAN: I really meant to say both things. If the study demonstrates -- well, I guess we're actually saying exactly the same thing.

CHAIRMAN NEWTON: Okay. Well, but, no, I guess my question is are you saying you would not -- will you support prospective rectangle without a study?

MR. MARKARIAN: I think we're taking that position, yes, ma'am.

CHAIRMAN NEWTON: It's only the retroactive piece that's at question.

MR. MARKARIAN: That's correct.

CHAIRMAN NEWTON: Okay. Thank you. Any other questions?

Yes, Clifton?

MR. KARNEI: Did I hear you throw out a number of the estimated capital cost to be in the range of 30 million to 130? And where does that come from?

MR. MARKARIAN: Our estimated number for our system would be about $27 million. And I think

172

some of our competitors are -- if you will, sister wind companies -- have indicated that in addition to our expenditures it would total industry-wide $100 million.

MR. KARNEI: How much?

MR. MARKARIAN: 100.

MR. KARNEI: Okay. Thank you.

CHAIRMAN NEWTON: Charles?

MR. JENKINS: I'd like to understand a little bit more about your offer. You said if a study shows that something else is needed, you would be glad

to go back and install that on your existing farms --
MR. MARKARIAN: We absolutely have taken that position.
MR. JENKINS: How far into the future hold? If we study it next year and we figure out you need $5 million worth, and then 10 years after that we discover it needs 60 million. Are you okay with that?
MR. MARKARIAN: That's right. There's no limit, and it would be an indefinite commitment.
CHAIRMAN NEWTON: Is that all, Charles?
MR. JENKINS: Yes. Sorry.
CHAIRMAN NEWTON: Dee.
MR. PATTON: Why would you agree to without a study comply proactively ---

173

CHAIRMAN NEWTON: Prospectively.
MR. PATTON: -- period, I guess?
MR. MARKARIAN: Doctor, would you mind if I ask Peter wYBIERALA to answer that. He's much more technically astute and can perhaps --
MR. PATTON: No, it's -- it doesn't require an engineering analysis. Please answer the question.
CHAIRMAN NEWTON: Whichever one y'all want to is fine.
MR. MARKARIAN: Got it. Doctor, I'm sorry, I actually knew that and I had to get it whispered back in my ear. We could easily have made a decision prospectively to rely more heavily on the Siemens technology, which would have taken these concerns off the table.

MR. PATTON: But you're perfectly willing to go forward into it in infinity without a study. Correct?

MR. MARKARIAN: I think it's preferable to know that everything we do has a purpose and makes sense. But so much of this -- I mean, I know that ERCOT is a quasi-public body. But so much of this is compromise. And although we might from an engineering perspective have one view, we also recognize that the

reality is we all have to work together to try and do the very best we can. And I think what you see in that position is not some sort of hypocrisy but a recognition that we all have to work together and sometimes make compromises.

MR. PATTON: Thank you.

CHAIRMAN NEWTON: Andrew?

MR. DALTON: I'm going to hold back.

CHAIRMAN NEWTON: Okay. Mike?

MR. GENT: You may have heard earlier Kent Saathoff said that they had done a survey of 70 wind farm owners, and that 16 of the 70 they surveyed let -- were able to meet the requirements that they feel is put out in the original version of this standard?

MR. MARKARIAN: Yes, sir, I heard that.

MR. GENT: Would you suggest to us that they should no longer be required to be held to that as well?

MR. MARKARIAN: No, what I'm guessing --

and it's purely a guess -- is that those are probably units that opted for a particular technology. And as technology marched forward -- you probably know that in and around 2000 I don't think there was a wind turbine capable of producing reactive power, and as

technology evolved there were options. And although I don't know the specifics of what the gentleman spoke of, that would be my guess.

MR. GENT: So how would you feel about if we exempted wind generators from this requirement in those installed after 2004 and before 2009? What about the combustion turbines and all the other units that are installed? Would we not also hold them to the same requirement?

MR. MARKARIAN: You're at the edge of my technological knowledge, but I don't know that that would be an applicable concern for us for anybody.

MR. GENT: Okay. You're not concerned?

CHAIRMAN NEWTON: Bob?

MR. HELTON: One quick question, because I'm a little confused about Charles' question and your answer. We were talking about doing the triangle prospectively and then you're talking about doing another study later for $60 million and you're agreeing to that --

CHAIRMAN NEWTON: Bob, can you get a little closer to the mic?

MR. HELTON: -- I'm not sure what that question meant and what that answer meant. Because if we're looking at prospectively saying we're going to do the triangle, then that is what would be from that point forward. So I'm not sure what you were asking and I'm not sure what your answer meant.

MR. JENKINS: I'll clarify what I thought I was asking.

MR. HELTON: Okay.

MR. JENKINS: And that was -- I was assuming that discussion was leading toward there would be some time frame of units between 2004 and 2009 perhaps that would be held initially as a minimum to the triangle standard and be subject to further modifications in order to meet whatever a study showed actually was necessary for reliability. And say a year into it we figured out through study that a certain amount of stuff was needed, and then over a period of time conditions change in that part of the grid and it turns out more is needed, would they be willing to continue to hold open the requirement that they -- that they do retrofit when a study showed it was necessary indefinitely, and they said they would.

MR. HELTON: Were -- okay. So just to clarify because I'm just trying to make sure we're all listening, because I'm not sure he got that.

MR. MARKARIAN: That's absolutely what I intended to say.

MR. HELTON: Okay. So in other words, what you're saying if he -- you're not -- if you do agree to go with the triangle and not the rectangle, then you're basically saying that they need to take over -- the question was would you take over the responsibility the TDSPs generally take over after the original interconnection is done?

MR. JENKINS: That was the thrust of my question, and I'm quite surprised by their answer, quite frankly.

MR. MARKARIAN: I don't think that's exactly --

MR. HELTON: That's why I'm --

MR. MARKARIAN: Sir, I'm sorry, maybe I misunderstood. I don't think anyone suggested we take over the job of TDSPs. I thought the suggestion was that we do what studies demonstrate is appropriate to ensure system reliability. And that I did agree with.

MR. HELTON: Yeah, see what the question was is, like today -- and this is one of the things that John Houston talked about and some of the others -- is when a generator connects, he's on the -- the rectangle, then anything that changes in the system around that generator that creates an issue with voltage is taken care of through the TDSP adding

178

reactive or dynamic stability components on the system.

What Charles is talking about is saying if you agree to do a triangle, are you also agreeing that any upgrades that happen after that point, which traditionally would be taken care of and paid for through TCOS, that you're going accept that responsibility was what I understood. And I understood that you agreed with that? Isn't that right, Charles?

MR. JENKINS: Yeah.

MR. HELTON: I'm just trying to make sure that you fully understand what you answered there.

MR. MARKARIAN: Would you kindly mind repeating the question for us? Thank you.

MR. HELTON: Well, it wasn't my question. I'm just trying to figure out what you agreed to. But what -- the way traditionally things are done is whenever I hook up one of my units and it's hooked up through the typical rectangle situation, I'm on the system. As topology changes and things happen on the system that create different needs for voltage support and studies are done by the TDSP and/or ERCOT, and they have to -- and they say,

♀ 179

oh, we've got a stability problem here and so they will go to the TDSP. The TDSP will put in whatever dynamic or static devices need to go in to ensure voltage control in that area. And what Charles' question was, was if you're going to do -- or would you agree that if you're doing the triangle, that any changes therefore that came about on the system for whatever reason around those assets, that you would take the cost of upgrading those devices.

MR. SCHAFER: Sir, the answer to that question is no.

MR. HELTON: That's what I'm trying to get to. Okay?

MR. MARKARIAN: Yeah. I understood the original question to mean if there was some issue that was directly related to the reactive capability limitations of the wind turbine, we would stand up for that.

THE REPORTER: I'm sorry, I don't know who the gentleman was walking across the room.

MR. SCHAFER: Matt Schafer.

CHAIRMAN NEWTON: Are you with NextEra?

MR. SCHAFER: Yes.

CHAIRMAN NEWTON: Okay. Andrew?

MR. DALTON: I think this question --

MR. GRABLE: Let me interrupt for just a second. I apologize. This is Mike.

If anybody who speaks who isn't on the agenda or they don't have your information, please give them a business card. Thanks.

MR. DALTON: I think this question will be more simple. If -- I want to try to recharacterize your position a little bit similar to what I did with AES. It would be your position that prior to February 17th of 2004, no reactive power applies. From February 17th, 2004 until December 1, 2009, the cone or triangle should apply, unless a study shows something more is necessary? And prospectively, after December 1st, 2009, the rectangle should apply. Is that fair?

MR. MARKARIAN: Essentially, yes.

MR. DALTON: Okay. Another point -- and this kind of gets into the retroactivity issue that --
MR. MARKARIAN: Remember we sort of positioned ourselves in the alternative as you probably know from reading the submission. So -- but, yes. Essentially yes.
MR. DALTON: Okay. With regard to this retroactivity issue that you're raising, I mean, am I correct to read the PRR that the standard doesn't kick
♀ 181

in until December of 2010, December 31st, 2010?
MR. MARKARIAN: I think the concern is it would require us -- when we use the term retroactivity, we simply mean it would require us to go back and retrofit existing wind farms and spend significant sums of money to do so.
MR. SCHAFER: Yeah, the standard is compliance by that date.
MR. DALTON: Yes. But what I would suggest is I think throwing this term retroactivity into the debate I think is disingenuous and really unhelpful at this point, because everybody who's in the business, whether it's refining, generating power, chemical plants, you get changed regulations that affect your business all the time. And they happen and you have to make adjustments to your business going forward.
This is a proposed adjustment to your business going forward. You may not agree with it, but it's not in any case I think retroactive. And I

think that's an unhelpful path to discuss. I think there are other realistic points that we need to debate and consider as a Board. I know I too am concerned about having any group of parties in the market have to pay $100 million that may or may not

♀ 182

have significant benefits, but the idea that this is retroactive I think is unhelpful.

MR. MARKARIAN: Sir, if I could just clarify a bit, respecting what you said about the use of the term, I think our concern is a little bit different and a little more nuanced. It is not retroactivity alone and in a vacuum. It's retroactivity without any sort of precise study.

CHAIRMAN NEWTON: I think we've got it. Okay.

MR. DALTON: And what I'm suggesting is it's not retroactive in either event.

CHAIRMAN NEWTON: Yeah. I think we've got it.

Mike, did you have something else?

MR. GRABLE: I did very briefly. I don't want to debate points. I do want to say I love your slide about entirely new on the PRR, and Christy you should keep that for future stakeholder meetings. If we limit the amount of revisions as a PRR goes through the process, Mark, I think you'd love that, too. So let's definitely hang onto that one.

There were two comments related to ERCOT staff and either their nonresponsiveness or their statements against interest, and I just want to respond to those very briefly. Regarding the two reliability events, Dave, sometimes as you know events can happen that -- for example, a nuclear event in South Florida can ripple the frequency through the entire Eastern Interconnect. That's going to be public. Other times events are more confidential and they may be referred to Texas Regional Entity here, for example. So there may be reasons that staff is not communicating with a party who wasn't involved in those events. I don't want to dispute your conclusion, but I did want to respond to that point.

You made a lot about the August 2008 ROS slide, Slide 3 that John Dumas sent out. And I think you kind of acknowledged that there were -- you know, there's been some wind comments that said, "Oh, there are multiple versions. We don't know what to believe." I think it's important to note for the record that that slide did go out as you highlighted it in the morning. And at 5:10 on the same day John Dumas revised it and sent it out again and told everyone on the ROS list, "The presentation that I sent out on voltage control covers an example of reactive capabilities of a wind farm. The example does not meet the protocols."

And I'm not going to go through his

whole email, but, you know, there is not exactly confusion on that point. We did send out an incorrect slide and it did refer to the triangle as the requirement. But that mistake was corrected hours later the same day, and I don't think there can be confusion 5:10 p.m. last August 21st as to what at least ERCOT staff believes is required. So I just wanted to clarify those two points and thank you for joining us.

MR. MARKARIAN: And, Mr. Grable, if anything I said led you to believe that we believe that our working relationship with ERCOT is anything other than --

MR. GRABLE: You don't need to -- I don't have any concerns personally on that score whatsoever.

MR. MARKARIAN: My only point was we've been very concerned about finding out about these reliability events and trying to dig in.

CHAIRMAN NEWTON: Okay. Thank you, gentlemen, very much. We appreciate it. We have two more that I'm aware of, and then I'll open it for any others who may be in the audience. Next would be Oncor, Ken Donohoo.

MR. JENKINS: Yeah, Ken's not here and

185

didn't intend to make a presentation. We'll just stand by the comments. I will observe that I've interviewed our transmission planners and I've interviewed our staff that does the work on generation interconnection, and there's been no uncertainty in their mind that they've been planning for the wind farms to have a rectangular-type configuration since

2004.

CHAIRMAN NEWTON: Thank you, Charles.

The Wind Coalition, Walter Reid?

MR. REID: And in your Board packets you should have found a brief slide presentation called PRR 830 issues, and I will try to find it on here. If anybody can -- there it is. Right there.

Okay. Got it. That's me.

Y'all have been handling some pretty weighty matters up to this point -- oh, by the way, just to introduce myself briefly, I've been with ERCOT since -- in ERCOT working for -- since 1970. And about 15 years ago I went into independent consulting and five years ago started consulting with the wind coalition that represents over 30 members and, I'd say, roughly two-thirds of the wind that's on ground in ERCOT.

The issues you've -- you know, hit are,

186

of course, what do the protocols say and what do they really mean as they're written today? And we've got many thousands of megawatts that believe that, you know, it says something different than what ERCOT is saying. And, of course, that's a major issue that needs to be resolved and, I suppose, is fundamentally a legal matter.

But I guess the point I'd like to make here is that we do need clarification. Because we've got so many folks that have already apparently interpreted it one way, we can't allow the next 8,000 megawatts that are about to sign up relative to CREZ to not have some clear direction of what it is that we really intended to say. So we may not have meant what is in those protocols. Maybe we meant something different. And if that's true, we need to make it clear.

What I'm about to talk about is going to be a very technical issue. It's partly coming up to you -- and I apologize that I'm having to bring it to the Board level because we've had such a rapid development of this issue. The first time that this was discussed at the ROS meeting to today it's 30 days. So in 30 days we've taken a very weighty, major issue, with a lot of concerns by a lot of people, and

187

we've brought it to the Board in 30 days.

One of the issues is that ERCOT has intended to do a better modeling job. And as I understand primarily focused on their realtime systems so that they can reflect what the actual reactive capability of wind generators is. And in doing that, in coming up with that, they are coming up with a redefinition of this thing called a WGR. And a WGR has been -- that term has been in the protocols for I don't know how long, but years. And it fundamentally applies to the whole wind turbine ranch facility.

The new definition that ERCOT is putting forward creates fictitious subunits. We have great support for the idea of the modeling. We needed to do that years ago. So I'm thrilled with us doing this. But the problem that we're running into is WGR, as written today, before 830 is adopted, WGR applies to that interconnect point, that big red rectangle up there. And all of these wind turbines -- there's 70 wind turbines in this diagram -- are feeding in via some transformers up to that interconnect point, maybe a transmission line between the substation for the wind generator and the interconnect point with the transmission service provider.

The new definition of WGR says that

below each transformer -- so in this particular diagram -- let's see, I think I can use this somehow.

In this diagram there is one transformer shown that is bringing all of these wind generators up to transmission voltages. If there were connections over here, there might be two transformers, which by the way is pretty common in ERCOT, lots of two-transformer installations for a number of reasons.

What ERCOT is asking is that we identify generators of a same type. So this might be -- just to pull some names out of a hat -- these might be GE wind generators. These red ones over here and here, they might be Siemens. And the rest of these might be Mitsubishi. And they all have different reactive characteristics, and what ERCOT wants to know is how many of them are operating today and, as a result, they can then calculate and model what is it that my reactive capability today is for this particular wind range.

By taking the WGR definition and moving

it from there and saying all of these blue -- these six blue ones -- are now WGR No. 1, these three red ones are WGR No. 2. And, of course, the rest are WGR No. 3. We have all of a sudden created fictitous things that don't have meter points. And, as a

result, we're going to treat them just like units. And if you look in the protocols, the word resource and units occurs in the protocols and the guides over 2,000 times. Now all of those don't apply to WGR no matter how you define them. But all of a sudden what we've been using and interpreting at this interconnect points has now got to be applied here.

And so, for instance, we're going to have to treat them like any other generator would treat their units, and there's a lot of things that don't make sense because of that. I'll be happy to get into the details of why it doesn't make sense, but what we proposed -- and you'll see it in the Wind Coalition comments -- is alternative wording that, in our opinion, provides 100 percent of the data that ERCOT needs to do its modeling without changing the definition of WGR.

So this is a very, very simple thing, and I apologize that we're having to bring it up to the Board, but we just haven't had the opportunity to vet this yet. This whole 830 has not been discussed in any working group or in any task force where we can have the kind of give and take that it takes for us to understand the problems that ERCOT is going to have with this modeling and the ones that we're going to have.

In addition, I did want to point out on kind of the issues that were raised by some other speakers, if I'm permitted.

CHAIRMAN NEWTON: Very quickly.

MR. DALTON: Walter, one second. Could you hold off for one second on that? I wanted to follow up with John or Kent.

Is there a reason why we're going back behind the point of interconnect in PRR 830 as opposed to just characterizing the wind farm as a whole?

MR. DUMAS: Yes.

MR. DALTON: Could you explain that to me?

MR. DUMAS: Sure. First of all, wind, as Walter said, wind turbines have been aggregated together to form a unit. In some cases it may be, you know, one unit or multiple units. The concern is if you've got turbines that are very different in characteristics -- reactive capability for instance. You've got maybe a group -- say you've got 20 turbines that have great reactive performance, and then you have -- a lot with that, another 20 turbines that doesn't have any.

If you lump those together in 40

turbines to form one unit, our models require one reactive curve. So how are you going to design or draw one reactive curve that represents 40 units with very dissimilar capability?

So what we've proposed in PRR 830 is, well, you can aggregate turbines, but you need to aggregate turbines that are the same model, same size, have the same characteristic. So when we're running a power flow analysis or running realtime contingency analysis with one reactive curve for that unit, that that reactive curve is representative of the capability of those turbines that it represents. Because you can run into -- not only would you have difficulty creating a reactive curve to represent 20 dissimilar capabilities. What happens when you have all -- say 10 of your good performing turbines down for maintenance? Then you've got little to no reactive capability, but yet you've got a curve that shows that you have more than you need to.

Now, a couple of points I want to make here. The point of interconnect, where that meter -- that red meter that Walter has drawn -- is talking about -- I assume he's referring to the EPS meter, the poll settlement meter, it's very common on conventional units that we may have -- I can think of

192

one case where we've got five different power lines coming into a power plant and there's an EPS meter for those five lines, but the individual units have realtime telemetry provided from an RTU of their individual megawatt output, their individual limits provided through SCADA. So, I mean, that's a common practice and that's how it's done with, you know, almost all of our units with -- providing telemetry that's from -- either from our control system or from a transducer that's out at the field.

The other thing I wanted to point out, Walter made a comment earlier that this PRR has only been out there a month. We've been dealing with this issue for a long time now as we've been talking about, and we've had quite a few discussions. This PRR was actually submitted, I believe, September 8th date. It was tabled -- it was presented at ROS to cover what's in the PRR, what we're trying to do. Then that went to the PRS. PRS tabled it for a month for ROS to have a discussion, and John Houston covered the history of those discussions.

MR. DALTON: Just follow up on that --

MR. REID: If I could follow up on that -- oh, I'm sorry.

MR. DALTON: I'm okay with the concept

of the telemetry and why you want the telemetry on the units. But it would seem to me that from a grid reliability perspective, what you really want is wherever they're connected to the grid to know what capability they're expected to deliver at that point of interconnection -- I mean, if the generators, for whatever reason, can't deliver because there are some units down, that should be on them. And if they create a violation or if they create a grid problem, you know, the TRE or someone is going to come calling on them for that. That's for them to deal with as opposed to trying to -- I'm worried that creating these little subunits inside of a single interconnection potentially creates more reliability issues for the grid than it solves, or am I wrong in that assumption?

MR. DUMAS: No, sir. Let me trot it out a little deeper and see if I can answer your questions.

MR. DALTON: Okay.

MR. DUMAS: You've got to have a reactive curve that represents the capability of that unit, where it can go to. At the point of interconnect, each unit has a -- what's called a voltage schedule where they're trying to hold the

♀ 194

voltage. And the way they hold the voltage is they supply either more vars or absorb vars if the voltage is high.

We also run realtime contingency analysis where we simulate taking lines out of service, and we look to see what the voltage would go to if we took that line out of service.

Well, the way the software is going to calculate where the voltage can go to is based on a capability curve supply. And it's going to look at that capability curve and say, okay, well how many vars can you produce or how many vars can you take in? So it's very important that that capability curve is representative of what that unit can do.

You also -- if you have any devices in the substation such as cap banks, reactors, stack house, whatever the device is, you model those separately. So they all contribute, but it's very important that you know what the capability of that units is. It's not just the realtime output of the unit. It's what it can do when you simulate these contingencies.

MR. DALTON: Are you aggregating all of that at the point of interconnection or are you aggregating at some other point on the grid?

MR. DUMAS: It's aggregated however they submit it in a resource plan. So as Walter pointed out, in a lot of cases it may be all the units at the farm, whether it's -- you know, no matter what type they are, whether it's a mixture of different turbines.

MR. DALTON: So say for example they had these three sets of turbines, all different sizes, and they had two capacitor banks and they aggregated that and they said at the point of interconnection we can deliver you "x" reactive power. Is that sufficient for this or do you need more detail and granularity than that?

MR. DUMAS: It's not sufficient because what you need is to be able to hold the voltage. And you may need varying amounts of vars to be able to do that. So the var varies. What you're trying to do is hold the voltage. And what the requirement is with the .95 rectangle from a hundred megawatt unit, you've got to be able to deliver up to 33 megavars. That's the requirement.

So if the voltage goes low -- say it's a 345 bus -- and the voltage goes low to 340, and the unit is putting out 33 megavars but it can't get the voltage up past 340, then it met the requirement.

But it could be that it could go -- depending on the conditions of the grid -- it could be it could go to 345 and only put out 10 megavars. So you need to know how that capability is going to vary based upon your curve when you run your study and the need of the simulation that you're doing.

CHAIRMAN NEWTON: Okay, gentlemen, if I could --

MR. DALTON: I'll yield.

CHAIRMAN NEWTON: Well, we really need to get going here. Did you have a couple more comments, things that haven't been said by the other parties?

MR. REID: A response to a couple of things. First of all, to this reactive -- this discussion on the modeling. I 100 percent agree with everything John has just said in terms of the need to do the modeling and that it needs to be the extra detail. You really need to get to the low side of the transformer and show the pieces. If you look at my wording, it does that. It just doesn't redefine WGR in the process.

So we're totally supportive of this. I've been on about this for over a year, maybe even two years, that we need this kind of detail in load flow and operations, totally supportive, just don't redefine WGR in the process.

I would footnote that we've taken more time here at the Board to discuss this one issue than at all the committees or subcommittees that have discussed this PRR to date. And I can discuss the flow of this. It's 30 days since this was first discussed that it came to here.

The other things that I'd like to mention and be a little cutesy on it, but what we have here is a failure to communicate. We've got a whole bunch of folks out there that I think were trying to do the best job they could, whether they were transmission service providers or wind generators or ERCOT.

And my analysis of this over now -- over a year of being involved in it, is we've just had people talking in conventional generator terms and people talking in wind generator terms. If you look at the forms that they were asked to fill out, if they didn't fill them out, they weren't going to get interconnected. If they did fill them out, they had to use a lot of engineering judgment, because what they were asked to respond to doesn't fit their hardware and their systems. So you've got a lot of

issues that were just very difficult, and we're all learning on this.

The voltage issues that we've had, the one that I'm aware of, that I think was -- highlighted here was a communication issue, as I recall it, where various parties were trying to make something happen. This was, what, over a year ago -- in fact more than a year ago. And as a result of that in some of the workshops we had a lot of discussion. I applaud AEP and Oncor. Oncor sent their operators, every single shift operator from Oncor went to a wind ranch to understand what they're doing, how they're built, how they operate. I believe Ross Phillips gave them a questionnaire to go get answered when you go out to the field so that all those operators understood.

We've got a history in ERCOT of all the folks really working well together. And when they get on the phone or they see a typed message or an automatic display on their computer, they've all had a lot of communication together. They all understand what we're saying. We tend to speak in short words, take shortcuts on our communication.

We've got a new industry that's trying to integrate. I think everybody has been working real hard to do it. We're all running together. I really

encourage you to please do what we need to make it clear for the new generators. And the generators that are there, they're there today, they're there tomorrow, they're there next month. Let's take the time it takes to figure out how we're going to handle that. And I don't want to get into discussing from my point of view what the right way to do that is. It's certainly not in this forum. Thank you for your time.

CHAIRMAN NEWTON: Okay. Thank you. Did the Wind Coalition take a position about this prospective and retroactive piece?

MR. REID: Yes. And I say the Wind Coalition, we have not had a vote on it. And, as I say, we have 30 members. And I think someone when they were speaking from -- one of the Wind Coalition members -- used the word competitor. So getting all these guys in the same boat much less paddling in the same direction is a challenge --

CHAIRMAN NEWTON: That's okay. If the answer is just no, that's fine.

MR. REID: So most of those guys have all agreed that this rectangle is definitely where we need to go, and I know of no one that is going to oppose it.

CHAIRMAN NEWTON: On a prospective

basis?

MR. REID: On a prospective basis.

CHAIRMAN NEWTON: Okay. Thank you very much.

Okay. Do we have any other comments or people who would like to make any comments?

Okay. Please identify yourself and who you're representing.

MR. R. JONES: Thank you, Madam Chairman. My name is Randy Jones. I'm with Calpine Corporation, and we're in the independent generator segment. I have the unique privilege of serving this year on ROS, WMS, PRS and TAC. And I can certify to you that you have not met longer today than all those groups have on this issue. Trust me on that.

I come at this issue with a fairly deep background in system operations, although I'm not an engineer. I worked in realtime operations and managed realtime operations for TNP for 13 years, both on a control air generation side as well as the wire side, managing voltage support and reactive compensation.

Our view at Calpine is that voltage support is a community service. No one gets paid for it. And as you're all aware, in the area of discipline of market design, the biggest enemy to any

community service is a free rider. It always creates problematic areas.

We view voltage support as an obligation, one that we all share as generating resources. And we believe that there have been enough provisions made in the protocols that everybody can carry their fair share.

As I look around the room, I can also tell you that I'm probably the only person here who participated in the Interim Voltage and Reactive Standards Task Force many years ago that ROS put together. And in at least one of those meetings at the old HL&P building, I asked the question not once but twice: Does this mean that generators can provide a proportional amount of reactive output at lower real power levels? And the resounding answer I got both times was no. I think maybe one time it was hell no -- excuse my French.

But I was disabused of the idea of a system, particularly one operating in the shoulder months at very low loads, where generators would only provide the triangular reactive capability. I still to this day believe that the folks who participated in that group understood very clearly what the requirements had to be. And if developers of wind

facilities would have asked any of us, I'm certain they would have gotten the same answer. It's a rectangle, folks.

We believe that PRR 830 has been fully vetted. The debate has been beyond vigorous at times. Despite what you've heard, we think that the time that the stakeholders have had to evaluate this PRR has been more than adequate.

It's a fundamental component of system reliability and security. And the idea that you can take a snapshot and do a study today and that's good enough to determine what a generator ought to provide we believe is a huge myth. Over the life cycle of a unit you just can't continue to perform studies. And I think you saw the fallacy in that kind of approach when Charles Jenkins asked that question. There was a lot of trepidation about how you would approach that. That's why we believe there's a standard; that all resources ought to meet it. And once they meet it going forward, there's no question about where the rest of the reactive compensation has to come from.

We would ask that you affirm the work of the stakeholders, recognize the overwhelming votes for PRR 830 through the stakeholder community, and affirm the work of TAC in denying the appeal of NextEra and

approving PRR 830. Thank you.

CHAIRMAN NEWTON: Any questions? Comments?

Okay. I think where that takes us -- oh, I'm sorry. I didn't see her. We do need need to take a very brief break after this presentation because we've got our court reporters here that her fingers are probably about to fall off. I tried to assure them I would try not to go more than two hours and we are already past it, both this morning and this afternoon. So after this presentation, we are going to take just a two- or three-minute break.

I would ask for people not to go real far -- I'll say five minutes, but be back. Okay? So that's a forewarning ahead of time.

Excuse me. Now you can go ahead.

MS. DIFFEN: That's okay. I'm going to make this really short. I'm Becky Diffen representing Duke Energy. In the interest of time and as requested I'm not going to repeat any of the comments made today. But Duke owns several hundred megawatts of wind generation in ERCOT, and we would just like the Board to know we support the comments made today and filed previously by Horizon, NextEra, AESCS and the Wind Coalition. That's all.

CHAIRMAN NEWTON: That was very brief. Thank you.

Anyone else?

I'm not trying to cut anyone off. We'll come back and take further comments. I would just like a hands up or notification.

Okay. Five minutes and we'll come back.

(Recess: 3:20 p.m. to 3:27 p.m.)

CHAIRMAN NEWTON: Okay. I'm going to go ahead and get started. I think we've got enough Board members in the room, at least, and hopefully they will be in their seat shortly.

I think what I'd like to do right now is before we actually discuss the path forward for the board, there has been some nuances and discussions regarding some of the other activities relative to this issue that have been at the Commission. So, Mike, can you touch on those?

MR. GRABLE: Yeah, I'll be real brief and try to be neutral. John Dumas touched on that there have been a lot of staff and wind generator and TSP interactions, that this wasn't a blank slate that began with PRR 830. One of the things that's been occurring is we actually got an interpretation request, which is a little known protocol where you

can ask ERCOT legal to issue an interpretation of the protocols, came from an interested party who was looking at building generation, and we replied to it and published an interpretation, and it said this is what we think the PRR -- the protocols existing protocols mean.

Wind generators took that, appealed it to the PUC, requested relief, essentially stating that the triangle was the appropriate -- or the cone was the appropriate interpretation, and we kind of went back and forth on that. We both mutually updated it, tried to resolve the issues. We were unable to do so.

That docket has been dismissed, and the dismissal was upheld by the Commissioners. On a procedural basis, you know, I can't discuss any pending ADRs or whether there will be a future commission action. I also can't discuss any referrals to Texas Regional Entity and whether or not there is or may ever be an enforcement action related to any of this, but there's nothing public at this point in time on those fronts.

CHAIRMAN NEWTON: I appreciate that. I think it's important for the Board to understand kind of all of the activities that are going on relative to these issues.

206

Okay. We've had a lot of discussion. What I'll do at this point is bring up the recommendation by TAC for approval of PRR 830 and see if we have any further discussion among the Board members, and then I will see whether there will be a motion for approval.

So, Bob, do you want to start?

MR. HELTON: Yeah, I can start. I'm sure cards are going to come up all over here in a minute.

From listening to all this -- and I know there's been a lot of confusion, there's been a lot of miscommunications, and a lot of what I was sitting here and watching and saw what we had going on was it was basically -- I felt like I was an appellate Judge there for a while on making a decision, and that's kind of the way I felt about it. Are the protocols right or wrong is really a lot of what I heard today.

So what I see is in 830, so I'll talk about that first. 830 sits out there and says here is -- as John and Kent have said, "Here is what the requirement was, and here is a way to comply," and says there's people out there that do not comply.

My problem with that is, if we have people out there that aren't complying with the

protocols, as written, as you guys define them, you need to be filing notices of violations. Okay? That needs to be done, referred to -- or not ERCOT do that. They are referred to the TRE for that. I'll get the procedure correct, and the TRE takes that.

As part of the NOV process, you figure out who is right, who is wrong, what those are. And then if there's mitigation that needs to take place, that's done through that process to get people to where the protocols are -- or tell you you have to be, and if that's retrofit, that's retrofit.

What I think that 830 does for the retrofit piece is circumventing that process. I understand what it was trying to do. It was trying to give people an avenue out there in the protocols to do that, but it also looks like ERCOT is changing the rules and trying to make entities retrofit, and I think doing this process takes that away. Let that be thought out through the NOV process, who is right, who is wrong and then what has to takes place. That would be my suggestion, let the process work instead of circumventing it with a 30 on the retrofit.

The other side going forward, if we feel the need, which I think we might want to ensure that from this point forward it needs to be clarified to

say it is the rectangle, then we can do that. But, you know, my first thought when I first saw this whole thing was 830 isn't needed. If you say that this is what the protocols say, that's what they say. Everybody has to comply, period. And then if there's a disagreement with that, there are processes to take care of that. You don't have to -- you would not need this at all for retro or moving forward. But I can see with everything going on we might want to go ahead and push 830 back to do -- make sure that it addresses only the going forward part and letting the NOV ADR processes take their place and let the process work rather than circumventing it. So that's kind of where I would kind of throw out right now.

CHAIRMAN NEWTON: So can I put that in other words? I think what you're saying is you're recommending that the Board remand back the prospective decision, that the rectangle applies to everyone, all generation types, but remand it back from some period of time so it can come back to be explicit about the prospective piece --

MR. HELTON: Be prospective, right.

CHAIRMAN NEWTON: -- but not to address the retroactive piece, let that go through the NOV process?

MR. HELTON: We've already heard from ERCOT staff, from the TAC representative that that's what they believe the requirements were, were rectangle. So protocols in their eyes and what they said are there. There are processes to get that taken care of, which is, you turn it over to the TRE, the TRE makes a determination, and then they fight it out wherever -- in whatever venues that is, and whoever wins, wins. If there's retrofit, then retrofit takes place through mitigation plans that are done through that process. It takes us from being looking like that we are turning around and changing the rules and making retrofits. It allows the process to work, and I think this circumvents it the way it's written.

CHAIRMAN NEWTON: Okay. Brad?

MR. COX: Yeah, I think, you know, we've seen the split into the two pieces obviously, the prospective piece and what do we do with the existing system and the existing wind farms, and I'm fine with -- and it seems like everyone that's spoke is fine with having this requirement on a prospective basis for new facilities, I guess.

So the question is, what do we do with the system as it exists today, and the thing that concerns me is I would -- you know, I would really

like to see some type of a study that says, "Here are the problem areas, and here is the most cost-effective way to deal with those." And I don't -- I don't think we have that, at least I haven't heard or seen anything about that, that type of an analysis.

You know, I think Bob makes a good point about letting the ADR process play itself out. I don't have a problem with that, but I would -- you know, if we decide to go down that path, let's go ahead and figure out what the circumstances are and what needs to be done and what's the most cost-effective way to -- you know, if there are changes that need to be made so that we don't, you know, lose time, you know, in respect to that. That's -- you know, after listening to all the discussion and reading the materials, that's where -- it seems to me the most reasonable approach.

CHAIRMAN NEWTON: Charles?

MR. JENKINS: I was going to talk on a slightly different issue, and that was the WGR definition issue that Walter Reid brought up. And if we do end up sending this back to TAC, I guess I would encourage them to address the point he made. I think it was a pretty valid one.

If we go the direction Bob is suggesting of just letting the ADR process -- those that are appealing 830 are sort of rolling the dice. Right now they've been offered somewhat of an "It's okay," and you've just got to get in compliance by this date out, and so the mitigation is sort of already worked out and it's known.

If we just let it go, what does the existing rule require, and if it's determined that it does require something different than what they can deliver today, you know, I don't know what the mitigation is going to be. It may be worse or better than what's in 830 today.

So I sort of don't know how -- how to deal with that. I don't like the position that the Board is in on this matter. I think we need to remand at least on the issue that Walter raised. I'm still -- I'm still not sure where I am on the broader issue.

CHAIRMAN NEWTON: Okay. Mark?

MR. ARMENTROUT: I'd just like to point out that Chairman Smitherman is not in the room for a reason, and that reason is that the Commission will rule on the retroactive issues, so just to put a leveling agent and how much time we want to put in to voting that piece.

The second point I wanted to make -- and Charles has made some comments that made me rethink this, but I'll say it anyway. We could do what you said, Bob, here in this meeting right now without remanding it to TAC. I'm not recommending it. I'm just pointing it out.

CHAIRMAN NEWTON: John?

MR. DUMAS: Just one comment on the -- something that Brad said about studies. Obviously I think John Houston made the point earlier that we have standards that apply to generators and apply to loads, and we've studied the transmission system to determine what variability, what variable equipment we need there.

I think we don't want to get in the position where in the future -- you know, the system is dynamic, the system changes, the needs change all the time. I think Charles alluded to that earlier. Needs are constantly changing. We don't want to be in a position where the standard gets challenged and we're asked, "Well, okay, show me a study where I have to put this in or I have to meet this standard." That's a bad position for ERCOT to be in, number one.

Number two, we are making some assumptions. We have been making some assumptions

about the capability of resources in all our planning studies going forward. We will be doing the CREZ reactive study, and we will be making assumptions in that study as to what the capabilities are of generators moving forward. So it's important that, you know, we make the right assumptions and don't have to go back and redo some of those analysis.

CHAIRMAN NEWTON: Mike?

MR. GRABLE: Yeah, I first want to say something real quick that I should have said at the beginning, and that is I think you-all know I wear two hats when I sit here, one is as counsel to the corporation and this Board, and the another is an officer of ERCOT similar to the other officers sitting at the table. I think you understand I've spoken today as an ERCOT staff member and on behalf of the ERCOT staff a proponent of PRR 830, but I just want to be absolutely clear on that, except for asking people to give a business card to the court reporters.

Bob, I want to go back to why we filed this PRR and explain why, from a staff perspective, we would have concerns with sending this back to TAC to be rewritten to be prospective. I'm certainly glad the wind generators are okay with prospective for new units rather.

But I kind of had three thoughts in mind. One was create a grace period for compliance for the generators that we know today are not compliant with our version of how things should be, and we understand there are major capital investments that would be facing them to get compliant.

The second was to clarify and increase the flexibility that we already have, but to kind of spell it out a little better, to help wind generators who can't do fuel dynamic with a mix of dynamic and static or other alternatives to more better explain the process by which we will be open to negotiations on alternative compliance.

And third, do our best, as John Dumas just said, to avoid erroneous assumptions flowing into the CREZ studies, fully understanding that the Commission and possibly beyond the Commission are the ultimate decisionmakers on all of these points. We do want to try to get it right, if we can.

To do any of those three things, we have to understand what the protocols require today. If the protocols do not support -- you know, if the Board does not share our sense of the protocols, we can't accomplish any of the goals for which this PRR was filed. So that would be my concern with that

approach, and obviously NOVs from TRE or PUC enforcement, there are none that I know of today and PUC appeals on this or other matters, ADRs and the like are certainly not precluded.

CHAIRMAN NEWTON: Bob, do you want to address that?

MR. HELTON: Yeah, I do actually because there's actually something you said there that concerns me greatly, and I'll address just 2 and 3 first.

I think that it's great to increase -- part of what 830 and looking forward, I think it's great to increase that flexibility of the mix of what they could do to comply with the protocols, and you're absolutely right, you need to avoid. And I think you're looking at this wrong. I think that if -- if the Board says, "Let the NOV process work," we're not disagreeing with you. We're saying, "You said the protocols are that, go file and put that over to the TRE and do what the protocols say."

My problem with No. 1 is, is I don't believe ERCOT has the leeway on any compliance issue to create a grace period. You find a protocol violation, you file and turn it in, and then you let the TRE and the process work. I'm really concerned

about the grace period piece because then you're making it to where I'm saying, "Well, you, I'm going to give you a grace period." "You, no, I'm not giving you a grace period on this assumption," and I have a real issue with that.

That's why I'm saying -- for right now I could say I agree with your interpretation even though I know that's going to be challenged. I could say it right now if I wanted to. I agree with where you're at. Go file with the TRE and say you have protocol violations. Let that process work. That's why I'm saying that 830 -- and I understand what you're trying to do. You're trying to help.

The wind -- you know, talking about what Charles was talking about, this is -- there's a roll of the dice. The winds are -- the wind group says "We're right, they are wrong." Let them have their day in court, go through the process.

By doing this, I think you're trying to help it with them, but you're boxing them in and circumventing that NOV process. I think we need to let the process work, and there is no grace period, as far as I'm concerned. That's the only reason I was trying to push that out there.

MR. GRABLE: Yeah, respectfully I think

you misunderstood --

MR. HELTON: I was hoping I did.

MR. GRABLE: -- what my intent was and really what I said. If this protocol revision request passes today and creates a 12-month, or whatever the time period is, timeline for compliance could -- you know, was the protocol what it was in November, October, September? Yes. Could Texas Regional Entity or PUC enforcement and oversight bring an action based on noncompliance in October of 2009, you know, if they agree with ERCOT staff's position? Yes. Does it color their evaluation of whether to do so if we have a plan for compliance and ERCOT operations have signed off on it as acceptable down the road? Yes.

So don't misunderstand. I'm not offering on behalf of staff or anyone else carte blanche for interpretation of the existing protocol. I'm just suggesting that it would -- that's our plan, is to develop a path to meet them over time, granted with our interpretation, and I think that that would color any enforcement decision. I don't think it's a given that NOVs must come first.

CHAIRMAN NEWTON: Okay. Danny?

MR. BIVENS: This may have been covered already, but I just -- you know, to the extent that there's been a circumvention of a process that's already in place, you know, I kind of thought the same thing at first, but as many of you in the room -- my background comes from a lot of years of just being in the regulatory world, and that world, to try these things on a case-by-case basis instead of coming up with a rule, and in this case protocol, that would apply to all so that everyone applies with the same rules of the road, I think is always superior.

And I don't know what ERCOT's thinking was in coming up with this protocol, but, you know, when you go to doing the NOV process and start taking each one of these -- and how many of those generators are noncompliant? What was the number? You know, you start doing that, you know, everyone is going to be done on a different timeline. You're going to expend a lot of resources, and December 2010 gets here, which is the date that's in the protocol, you're not even going to be close. So I don't know, for whatever that's worth. I don't prefer piecemeal or a piece-by-piece approach to a rule.

CHAIRMAN NEWTON: Andrew?

MR. DALTON: Yeah, Kent, I have kind of a question for you or for John. We're talking about potentially having the wind folks spend a nontrivial

sum of money. We already have the LVRT study underway. Would it be even possible to add the reactive power issues to the LVRT study without delaying the LVRT study? Is that a possibility, or is that not a possibility?

MR. SAATHOFF: Let me get Dan up here. He's more familiar with the LVRT study.

MR. WOODFIN: Yeah, I think at this point we've made a lot of the assumptions about what the characteristics of the units are and those kinds of things. As a part of that process, they are gathering the information. It's going to be a dynamic study. So it's going to include -- essentially it's looking at the actual requirements, the actual capabilities, I believe, in that study from a dynamic perspective, so -- and it's only studying the timeframe. It's studying a topology that's pre-CREZ, and that was specified in how the study was set up.

So it may study kind of the in between now and CREZ requirements. I don't think it would be that difficult to actually address that issue in the LVRT study for that timeframe. It will not cover the ongoing needs of the system post-CREZ. We'd have to include that in as an additional work item somehow to the CREZ reactive study to look at kind of the

incremental needs if the -- that generation doesn't -- isn't able to meet the protocol requirements.

MR. DALTON: What's the timeframe for the CREZ study, the reactive study?

MR. WOODFIN: The current scope of it is intended to be completed mid July of next year.

MR. DALTON: July 2010?

MR. WOODFIN: Yes.

MR. DALTON: So it's basically on a similar timeframe as the LVRT study.

MR. WOODFIN: A little longer, yes.

MR. DALTON: A little longer, okay.

CHAIRMAN NEWTON: Okay. Nick?

MR. WOODFIN: Okay. Thank you.

MR. FEHRENBACH: And this has indeed been a nice, long discussion, and it's always good to see energetic discussion on an issue. And, you know, I listened to all the presentations, and the one thing I was looking for is really an explanation from the wind resources on why they thought this triangle or cone applied. When you get down to it and you read the actual existing protocol language that's been there since 2004, I concur with ERCOT that it's a rectangle, and it's always been a rectangle.

I have a problem if we decide to remand

this or pass on it or drag this out further that, you know, we have a group of entities that have essentially been in noncompliance with the protocols. And should we send an NVI? Probably. And even if we pass this PRR, we can still do the notice of violation for October or prior months, and that certainly can be done. Do they have -- if they are complying with this timeframe or window to get in compliance, that would probably be a good defense to the NVI, but it shouldn't -- it doesn't stop the process from going through.

But, you know, the only explanation people could say why they misinterpreted is some errant slide that may or may not have been in an ERCOT presentation that was corrected or some other language dealing with deployment rather than the actual requirement, and to me that's not compelling, and I think the protocols were clear that it should have been a rectangle. I'm sorry if that costs money to, you know, the wind generation folks to retrofit, but the protocols have been there since 2004. It shouldn't be a retrofit. It should have been stalled initially, and I think it's time to move forward. If through the ADR process or NV --

MR. DALTON: NOV.

MR. FEHRENBACH: -- NOV process, you know, people seek to get some other mitigation, they can certainly do that, and they can do that even if we adopt this and -- just to see if we can get a second and move forward, I will move that we adopt PRR 830 and reject the appeal.

MR. DOGGETT: I'll second.

CHAIRMAN NEWTON: Okay. We have a motion from Nick Fehrenbach, and we have a second from Trip Doggett. Charles?

MR. MANNING: I was just going to say I'm going to support that motion.

CHAIRMAN NEWTON: And I'm sorry to interject. Just for clarification, it was kind of a double motion. It was a motion to approve the PRR and reject the appeal. Correct?

MR. FEHRENBACH: Which I think actually by approving the PRR we pretty much reject the appeal, but I just wanted to make it clear that we were doing both.

(inaudible)

CHAIRMAN NEWTON: I think we probably need to do both. We have them both noted for vote.

MR. JENKINS: I think the quickest path to resolution on this is for us to put this PRR

♀ 223

forward. I agree with Mark the decision is going to be made down the street, and kicking it back to TAC is not going to accomplish anything other than spend more time.

CHAIRMAN NEWTON: Dan?

MR. WILKERSON: I just wanted to say I support the motion. I believe reactive capability curves are a standard, and you don't really mess with standards. If it's going to be messed with, it needs to be done down the street, and that's -- kicking it back to the technical folks who sent it to us with an overwhelming majority doesn't accomplish anything.

CHAIRMAN NEWTON: Okay. Trip?

MR. DOGGETT: I was going to clarify that I would be flexible on the -- Walter's issue of WGR if there was an interest in a friendly amendment to ask TAC to revisit that issue. I talked to Walter and John out in the hall, and I think there might be an opportunity to have further discussion on that issue.

CHAIRMAN NEWTON: Okay. Before we continue with comments, Nick, you made the motion. Would you be amenable to that friendly amendment?

MR. FEHRENBACH: I don't have issue with that --

CHAIRMAN NEWTON: Okay.

MR. FEHRENBACH: -- if, you know, we want to fix that little piece of it.

CHAIRMAN NEWTON: Okay. We'll continue. Bob?

MR. HELTON: Yeah, just real quickly I agree that sending it back to TAC is not the right thing to do. It was just one of the thoughts I had. We could fix it like you had talked about, Mark, doing that prospectively here.

And I understand what's trying to be done. I'm having a problem. I still believe that the retrofitting piece in this, while I understand the full thing, I think it is a circumvention of the process, and I don't think I can support it for that reason. But I also know that this is a faster way of getting it over to the Commission because no matter what we do here, it's going to get there. I was just trying to get it through a process that when they get over there it's not going to be kicked back over an appeal on a procedural issue because it didn't go through the right process, like they had on the other side whenever they tried to circumvent the process to get it over there the first time. And I'm concerned that by doing that, it could end up back again over --

over a procedural issue. So that's my concern with that.

CHAIRMAN NEWTON: Okay. Bob Thomas?

MR. THOMAS: Thank you. I'm going to support Nick's motion. I think the Board is good at setting policy and rules, but it's not good at resolving legal and factual disputes that we have in front of us. We need to get this out of here up to the Commission and let them apply their process to the dispute.

One thing I'll be listening for in that proceeding is the following: Very clear positions that the requirement has been set for a number of years, and I guess one question that hasn't been answered today that I'm going to be listening for is why would -- if it's so clear, why would anyone spend all that money knowing they were making a mistake?

CHAIRMAN NEWTON: Andrew?

MR. DALTON: Yeah, I guess I have kind of a more pragmatic concern to address. I mean, it seems any way you look at this PRR, we were going to potentially give wind until December 31, 2010 to kind of build in to compliance. We have two studies underway right now that might be able to give us a very good picture of what compliance really ought to

look like from a standpoint of total system reliability.

You know, we're going to have a lot of issues integrating more and more wind through the CREZ process, integrating the wind that's on there now as we increase our transmission capabilities to move that wind to market. In doing so, it's going to cost money to wind generators, to everybody else on the system to make that.

Before we would embark on spending a hundred million dollars or anything in that ballpark, I would like to know that we are spending that money in the most wise and efficient manner possible to the ultimate benefit of the grid long term. If there is a way to address this type of issue in the ongoing studies without prejudicing whatever this PRR does, I would strongly recommend to ERCOT staff to take that into consideration because I don't think whatever -- when this gets over to the Commission, this isn't going to be resolved by April or May. We're going to have these studies coming out June and July. They might give us the picture of what the grid really ought to look like going forward, and we ought to be working towards that as a solution because the Commission solution isn't going to help us fix the way

the grid ought to look and what wind generators ought to do going forward.

We've been talking about getting the right metrics and the right requirements for wind for the better part of a year now. I think we have an opportunity to work that in, regardless of what we do with this PRR, and I think we should take it.

CHAIRMAN NEWTON: All right. Thank you, Andrew?

Clifton?

MR. KARNEI: Yeah, I support the motion, but I guess my question is a little bit different, and it's to Grable. Since it's clear that ERCOT staff has a position in this and since Trip is technically an ERCOT staff member, I question whether he should be the second on the motion and should vote on this or possibly recuse himself. I'm just raising that as a procedural thing for the second to the motion and would like your comments on that, Mike.

MR. PATTON: I'll second that.

MR. KARNEI: If Trip withdraws his motion -- I'm not one to put Trip on the spot. I'm just saying --

MR. GRABLE: There's no distinction really in terms of importance between being the second

and being a voting person. Let's say it were a Brazos line and you were either an affirmative vote, say, ten to five vote, and you were either the second or just an affirmative vote, it would be a problem either way.

I will say that the duties with which ERCOT staff are charged are public interest and reliability duties, and although Trip is an ERCOT staffer and is voting in alignment with those interests, I do not read any of our conflict rules or any general ethical dictate to require that the ERCOT CEO recuse himself because ERCOT staff is a proponent.

The ERCOT CEO has voted on countless ERCOT staff-sponsored PRRs, OGRRs, everything. If you were to set that precedent, you might as well just decree -- you might as well -- we've got the bylaws coming up in a bit. You might as well make the CEO a nonvoting member because any action this Board votes on almost by definition has an impact on ERCOT staff.

MR. KARNEI: I'll withdraw my comment. Thank you.

CHAIRMAN NEWTON: All right. Brad?

MR. COX: Yeah, I'm largely in agreement with the direction we're headed. I'll tell you the one thing that I'm hung up on, and it's similar to what Andrew discussed earlier, is, you know, it's less

than certain -- I mean, if we didn't have some ambiguity here, we wouldn't be spending all this time discussing what the requirement is in the protocols as they are written today. And the concern I have is that if the -- you know, if whatever procedural route this takes after it leaves here the -- you know, if the Commission determines that, yeah, there is ambiguity or whatever, you know, it would seem to me there ought to be, again, the flexibility to deal with the existing system as opposed to imposing a blanket requirement over the existing system, so I -- because there may be more cost-effective ways to remedy, you know, whatever problems may exist.

I doubt that my request for that type of flexibility as a friendly amendment would be entertained. I'll throw it out and make -- make that request, Nick, and see what your thoughts are. Do you understand what I'm saying? It's -- they were getting pretty complicated here, but I'm just -- the track we're on right now really will put all of these resources on a -- on this rectangle standard with a grace period. Is that -- would you agree?

MR. FEHRENBACH: I would concur, but, of course, I also think that under the current protocols they should already be there.

MR. COX: Right. And, you know, I'm only trying to leave enough flexibility to -- you know, if circumstances are such that that flexibility is warranted to allow for a more cost-effective solution down the road, and I'm -- this would be -- I'm having a difficult time communicating this perhaps, but that's the one issue I have left with where we're headed.

MR. FEHRENBACH: And, you know, in reading 830 the way it was written, one of the things that I thought was sort of innovative, and Bob Helton would probably say is one of those problematic things, that it allowed the wind generators to come in compliance by actually paying the T&D utility to install devices to make them compliant. And that's sort of a stretch for us because I don't think we've done that in the past, let entities pay someone else to install devices to make them compliant, but -- and I thought that was innovative, and that probably gets into a cost-effective solution for some of those entities, but even that, you'll probably have people not wanting to go that route and possibly going through one of these other processes that are open to them under law.

CHAIRMAN NEWTON: Okay. So I'm assuming

that that is not an acceptable friendly amendment.

MR. FEHRENBACH: And again, I'm not sure exactly what the friendly amendment would be. So I can't really accept it.

CHAIRMAN NEWTON: Okay. John, your card has been up -- down there for a while. I've been trying to take the Board members first.

MR. HOUSTON: Yes. No, and I appreciate that, madam Chairman, and I just wanted to add my view that we really need to address the issue of what is the standard. This Board needs to take a position, if nothing else, for future generators who are walking in the door asking to connect. It needs to be clear. Certainty needs to be taken, and I think our whole compliance regime of both ERCOT and participants is at risk if we do anything other than approve this going forward.

CHAIRMAN NEWTON: Well, I've been relatively quiet here, and I'm speaking as just a Board member myself here, but after listening to the debate, that's where I fall out, is that I specifically asked most of the commenters, and everyone seems to be in agreement, that prospectively everyone getting on the same page relative to this requirement is critical. And based upon that, it looks like the big issue, in my mind, is the retroactive piece.

I fully understand the heartburn that creates for the wind generators from an investment perspective. However, it looks like this thing is going to get resolved, and the fastest way to get that piece resolved is for us to move forward. So I will be supporting it as an independent Board member.

Dee?

MR. PATTON: Madam, I call the question.

CHAIRMAN NEWTON: Okay. I've got one other card, Dee. Can I -- can I just get Miguel's? He's been pretty quiet, too.

MR. PATTON: I call the question.

CHAIRMAN NEWTON: Okay.

(Laughter)

MR. GRABLE: That's a motion that requires a second and would have to be voted on to determine if Miguel is heard or not. So is there a second for the calling?

CHAIRMAN NEWTON: Miguel --

MR. ESPINOSA: Thank you.

CHAIRMAN NEWTON: -- real quickly lets --

MR. ESPINOSA: I support the motion as

proposed. A, it seems to me like we should have been there already, and we're not. I'm heartened by the fact that nobody has gotten up and spoken against the prospective issues for us. And if the looking back the issue has to be resolved at 17th and Congress, sobeit.

CHAIRMAN NEWTON: Okay. We have a motion. We have a second. Everyone clear on the motion?

(No response)

CHAIRMAN NEWTON: And with the friendly amendment. Okay?

MR. GRABLE: And, Madam Chair, let me -- was there a second friendly amendment?

CHAIRMAN NEWTON: No, just -- no, he's talking about the motion included --

(Simultaneous discussion)

MR. GRABLE: Oh, I see, right. The two pieces being approval under Item 12(a) of the protocol revision request and rejection of the appeal under 12(b). And I want to ask Mr. Doggett so we're perfectly clear, his friendly amendment was to clarify that the PRR 830 would be approved "as is" but a separate instruction given to TAC to revisit the WGR issue.

MR. DOGGETT: That's affirmative.

CHAIRMAN NEWTON: Okay. I won't repeat that. We now have a motion and a second for approval of PRR 830 and rejection of the appeal to that PRR.

MR. ESPINOSA: And I accept Dr. Patton's calling of the order.

(Laughter)

CHAIRMAN NEWTON: All in favor?

(All those in favor of the motion so responded)

CHAIRMAN NEWTON: Opposed? We have one -- two oppositions, one from Andrew Dalton and one from Bob Helton.

Abstentions?

(No response)

CHAIRMAN NEWTON: The motion passes.

Andrew?

MR. DALTON: One final point. I would sincerely hope that no one who is a generator comes forward after this meeting today and expresses any confusion or concern that everyone expects the rectangle will be implemented on a going-forward basis.

(Laughter)

MR. DALTON: And if it comes up, we're

♀ 235

going to pull this transcript out.

MR. HELTON: Yes.

CHAIRMAN NEWTON: Okay. Thank you very much.

All right. Mr. Bruce, it's back to you.

MR. BRUCE: Thank you, Madam Chairman. That completes all of the PRRs for Board discussion today.

12(c). LOAD PROFILING GUIDE REVISION REQUEST 035

MR. BRUCE: That leaves us with a Load Profile Guide Revision Request No. 35. This guide

EXHIBIT N

PRR830

830PRR-01 Reactive Power Capability Requirement 090809

830PRR-02 Preliminary Impact Analysis 090809

830PRR-03 CEO Revision Request Review 090809

830PRR-04 Urgency Vote Ballot 091009

830PRR-05 Horizon Wind Energy LLC Comments 091509

830PRR-06 PRS Action Report 091709

830PRR-07 Calpine Comments 092809

830PRR-08 Iberdrola Renewables Comments 100709

830PRR-09 Horizon Wind Energy LLC Comments 100809

830PRR-10 LCRA Comments 100809

830PRR-11 ROS Comments 101909

830PRR-12 ROS Roll Call Vote 101909

830PRR-13 Wind Coalition Comments 102109

830PRR-14 Vestas Comments 102209

830PRR-15 NextEra Energy Resources Comments 102209

830PRR-16 PRS Recommendation Report 102209

830PRR-17 PRS Roll Call Vote 102209

830PRR-18 Impact Analysis 102609

830PRR-19 Calpine Comments 102809

830PRR-20 Oncor Comments 102909

830PRR-21 ERCOT Comments 102909

830PRR-22 AEP Comments 103009

830PRR-23 Invenergy Comments 110209

830PRR-24 NextEra Comments 110309

830PRR-25 Horizon Wind Energy LLC Comments 110309

830PRR-26 Vestas Comments 110409

830PRR-27 TAC Recommendation Report 110509

830PRR-28 TAC Roll Call Vote 110509

830PRR-29 NextEra Energy Resources Appeal 110609

830PRR-30 NextEra Energy Resources Appeal Supporting Documents 1

830PRR-31 AEP Comments 111009

830PRR-32 AES Comments 111009

830PRR-33 Horizon Statement of Position 111009

830PRR-34 ONCOR Comments 111009

830PRR-35 TAC Advocate Position Statement 111009

830PRR-36 ERCOT ISO Position Statement 111009

830PRR-37 Wind Coalition Comments 111009

830PRR-38 TAC Advocate Supporting Document 111109

830PRR-39 RES America Developments Comments 111709

830PRR-40 AES Board Presentation 111709

830PRR-41 Board Action Report 111709

830PRR-42 NextEra Energy Resources Board Presentation 112009

830PRR-01
Reactive Power Capability Requirement
090809

Protocol Revision Request

PRR Number	830	PRR Title	Reactive Power Capability Requirement
Date Posted		September 8, 2009	

Protocol Section(s) Requiring Revision	2.1, Definitions 2.2, Acronyms 6.5.7, Voltage Support Service 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability 6.7.6, Deployment of Voltage Support Service
Requested Resolution	Urgent. On November 13, 2008, ERCOT Legal issued a Protocol Interpretation, which was subsequently withdrawn on procedural grounds, regarding the Reactive Power capability requirements in Sections 6.5.7.1 and Section 6.7.6. This Protocol Interpretation resulted in a complaint filed against ERCOT by certain Wind-powered Generation Entities at the Public Utility Commission of Texas (see PUCT Docket No. 36482, Appeal of Competitive Wind Generators Regarding the Electric Reliability Council of Texas' Interpretation of the Reactive Power Protocols). One of the reasons ERCOT sought to abate and then dismiss that docket is that this issue is better suited to an informal and forward-looking resolution. Therefore, ERCOT files this Protocol Revision Request (PRR) to seek a prospective outcome that maintains reliability while attempting to lessen the costs and burdens of compliance with respect to the Reactive Power capability requirements in the ERCOT Protocols, and that offers a path to compliance for certain Wind-powered Generation Resources (WGRs) that are presently not able to meet 0.95 lead/lag requirement at the Point of Interconnection based solely on the unit's Reactive Power capability.
Revision Description	This PRR clarifies the Reactive Power capability requirement for all Generation Resources, including existing WGRs who are not able to meet the 0.95 lead/lag requirement with the Generation Resource's Unit Reactive Limit (URL). WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before November 1, 2009 may met the Reactive Power requirements through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices.
Reason for Revision	Clarification of Reactive Power capability requirements on a going-forward basis and path to compliance for certain WGRs that are not able to meet the 0.95 lead/lag requirement at the Point of Interconnection based on Generation Resource's URL.

Protocol Revision Request

Overall Market Benefit	Provides additional clarity to the reactive requirements for wind generation.
Overall Market Impact	Unknown.
Consumer Impact	None.
Credit Implications	Unknown.
Relevance to Nodal Market	Yes. The Reactive Power capability requirements exist in Nodal as well.
Nodal Protocol Section(s) Requiring Revision	2.1, Definitions 3.15, Voltage Support 6.5.7.7, Voltage Support Service

Quantitative Impacts and Benefits

Assumptions	1		
	2		
	3		
	4		
Market Cost		**Impact Area**	**Monetary Impact**
	1		
	2		
	3		
	4		
Market Benefit		**Impact Area**	**Monetary Impact**
	1	*Clarifies the reactive requirements for wind generation.*	
	2		
	3		
	4		
Additional Qualitative Information	1		
	2		
	3		
	4		
Other Comments	1		
	2		
	3		
	4		

Protocol Revision Request

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Proposed Protocol Language Revision

2.1 Definitions

Point of Interconnection (POI)
The location(s) where a Generation Entity's interconnection Facilities connects to the Transmission Facilities as reflected in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and a Transmission and/or Distribution Service Provider (TDSP).

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Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind. Wind turbines may be aggregated together to form a WGR if each turbine is the same model and size and located behind the same Generation Step Up Transformer (GSU).

2.2 Acronyms

POI	Point of Interconnection
GSU	Generation Step Up Transformer
SGIA	Standard Generation Interconnection Agreement

6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected at the same Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

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Deleted: transmission bus

6.5.7.1 Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS

Deleted: Installed Reactive Capability

(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT. Generation Resources shall comply with the following Reactive Power requirements: an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ERCOT Transmission Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the POI. The Reactive Power requirements shall be available at all MW output levels and may be met through a combination of the Generation Resource's Unit Reactive Limit (URL), which is the generating unit's dynamic leading and lagging operating capability, and/or dynamic VAR capable devices. For Wind-powered Generation Resources (WGRs), the Reactive Power requirements

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Deleted: required to provide VSS except as noted below in items (3) or (4),

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shall be available at all MW output levels at or above 10% of the WGR's nameplate capacity. When a WGR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT may require a WGR to disconnect from the ERCOT System. The Reactive Power requirements of this paragraph shall apply to all Generation Resources except as otherwise provided in paragraphs (2) through (4) below.

(2) WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before November 1, 2009, must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (1) above. However, the Reactive Power requirements may be met through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices. WGRs shall comply with the Reactive Power requirements of this paragraph by no later than December 31, 2010, unless it is known by July 31, 2010, that related retrofits are required by the Voltage Ride-Through study conducted in accordance with Operation Guide Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-powered Generation Resources, in which event ERCOT may in its discretion modify the deadline for an affected WGR. ERCOT, in its sole discretion, also may grant an extension of time for other reasons.

(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the qualified renewable Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(4) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(5) For purposes of meeting the Reactive Power requirements in paragraphs (1) and (2) above, multiple generation units including wind turbines shall, at a Generation Entity's option, be treated as a single Generation Resource or WGR if the units are connected to the same transmission bus.

(6) Generation Entities may submit to ERCOT specific proposals to meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices. ERCOT may, at its sole

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Deleted: Upon request to, and with the approval of ERCOT, multiple generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these URL requirements only.

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discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall provide the submitter an explanation of its decision.

(7) A Generation Resource and TDSP may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1).

(8) Unless specifically approved by ERCOT, no unit equipment replacement or modification at a Generation Resource shall reduce the capability of the unit below the Reactive Power requirements that applied prior to the replacement/modification.

(9) Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

(10) WGRs must provide a Real Time SCADA point that communicates to ERCOT the number of wind turbines that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid. WGRs must also provide two other Real Time SCADA points that communicate to ERCOT the following:

(a) The number of wind turbines that are not able to communicate and whose status is unknown; and

(b) The number of wind turbines out of service and not available for operation. WGRs must comply with these requirements by no later than six months after the effective date of this paragraph.

(11) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by automatically switchable static VAR capable devices.

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Deleted: Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements.

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6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or Transmission Service Providers (TSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional Megavolt Ampere Reactive (MVAR), nor will they be requested to operate on a voltage schedule outside the URL specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

(2) ERCOT and Transmission and/or Distribution Service Providers (TDSPs) shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For

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Generation Resources required to provide VSS, step-up transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

(3) The TSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed Reactive Power capability requirements.

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(4) All Generation Resources required to provide VSS shall support the transmission voltage at the POI to the ERCOT Transmission Grid, or at the transmission bus in accordance with paragraph (5) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

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(5) The QSEs providing VSS shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

Deleted: (5) At all times a Generation Resource unit required to provide VSS is On-line, the URL must be available for utilization at the generating unit's continuous rated active power output, and Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any Reactive Power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP.¶

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830PRR-02
Preliminary Impact Analysis
090809

ERCOT Preliminary Impact Analysis Report

PRR Number	830	PRR Title	Reactive Power Capability Requirement
Impact Analysis Date	September 8, 2009		
Cost/Budgetary Impact	None.		
Estimated Project Time Requirements* *Unless otherwise indicated, project time requirements begin upon project initiation.	No project required. This Protocol Revision Request (PRR) can take effect upon ERCOT Board approval.		
ERCOT Staffing Impacts (across all areas)	No additional full time equivalents (FTEs) needed.		
ERCOT Computer System Impacts	Minor changes to ERCOT databases to incorporate additional SCADA points, which will be managed under the O&M budgets of affected departments.		
ERCOT Business Function Impacts	Existing business functions can accommodate this revision request.		
Grid Operations & Practices Impacts	No impact to ERCOT grid operations or practices.		

Alternatives for a More Efficient Implementation *(include explanation of impacts)*
None.

Evaluation of Interim Solutions *(e.g., manual workarounds)*
None.

Feasibility of Implementation
Impact on Resource Availability: None   **Impact on Other Projects:** None

Comments
None.

830PRR-03
CEO Revision Request Review
090809

CEO Revision Request Review

I. Revision Request Details	
Date	**9/8/09**
Revision Request Number	PRR830
Revision Request Name	Reactive Power Capability Requirement
ERCOT Position – Provided by CEO	
☐ Needed for Go-Live ☐ Not Needed for Go-Live ☒ No opinion on the need for Go-Live	

Protocol Revision Request (PRR) 830, Reactive Power Capability Requirement, provides clarification on the Reactive Power capability requirement at the Point of Interconnection and specifically addresses existing Wind-powered Generation Resources (WGRs) by allowing WGRs to meet the Reactive Power capability requirement through a combination of the WGR's Unit Reactive Limit (URL) and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices.

After initial review, PRR830 does not impact Nodal systems, budget or schedule; therefore, the ERCOT CEO believes this PRR should proceed through the stakeholder review process.

Because there are no Nodal impacts, the ERCOT CEO has no opinion on whether or not PRR830 is necessary prior to the Texas Nodal Market Implementation Date. The ERCOT CEO has the right to reevaluate the PRR if there are any changes during the stakeholder process.

II. SUGGESTED ERCOT POSITION – PROVIDED BY AREA OWNERS

DECISION CRITERIA - NEEDED FOR GO-LIVE FOR:

- Nodal system to work properly
  - Functionality
  - Quality (system performance, security, usability, efficiency, data accuracy, etc.)
- Reliability (grid performance, system stability, etc.)
- Compliance (Protocols, PUCT rules, NERC, etc.)
- Fair Market Practices
- Synchronization
  - Zonal to Nodal
    - Updating Nodal protocols to reflect changes to Zonal protocols so we aren't reverting back to prior rules when Nodal goes live (Example: NPRR149)
    - Updating Nodal protocols to account for essential Zonal functionality that is missing from Nodal (Example: NPRR156)
  - Nodal to Nodal
    - Updating Nodal protocols to reflect logic that exists in the Nodal systems as currently planned or developed
- Cost-Benefit indicates beneficial to implement prior to Go-Live

Business Perspective

Grid Operations

☐ Does not apply to my area ☒ No opinion on the need for Go-Live	☐ Perform complete impact analysis prior to recommending ERCOT position ☐ High level (1-4) ☐ Full Impact Analysis
☐ "Needed for Go-Live" Indicate criteria not met unless this revision request is implemented ☐ Nodal system to work properly ☐ Reliability ☐ Compliance ☐ Fair Market Practices ☐ Synchronization ☐ Cost-Benefit Explain: ______	☐ "Not Needed for Go-Live" Explain: ______

Indicate potential impact

☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other)

☐ No impact to ERCOT

Explain: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.

Wholesale Markets

☐ Does not apply to my area ☒ No opinion on the need for Go-Live	☐ Perform complete impact analysis prior to recommending ERCOT position ☐ High level (1-4) ☐ Full Impact Analysis
☐ "Needed for Go-Live" Indicate criteria not met unless this revision request is implemented ☐ Nodal system to work properly ☐ Reliability ☐ Compliance ☐ Fair Market Practices ☐ Synchronization ☐ Cost-Benefit Explain: ______	☐ "Not Needed for Go-Live" Explain: ______
Indicate potential impact ☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other) ☐ No impact to ERCOT Explain: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.	

System Planning

☐ Does not apply to my area ☒ No opinion on the need for Go-Live	☐ Perform complete impact analysis prior to recommending ERCOT position ☐ High level (1-4) ☐ Full Impact Analysis
☐ "Needed for Go-Live" Indicate criteria not met unless this revision request is implemented ☐ Nodal system to work properly ☐ Reliability ☐ Compliance ☐ Fair Market Practices ☐ Synchronization ☐ Cost-Benefit Explain: ______	☐ "Not Needed for Go-Live" Explain: ______

Indicate potential impact
- ☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other)
- ☐ No impact to ERCOT

Explain: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.

Compliance

☐ Does not apply to my area ☒ No opinion on the need for Go-Live	☐ Perform complete impact analysis prior to recommending ERCOT position ☐ High level (1-4) ☐ Full Impact Analysis
☐ "Needed for Go-Live" Indicate criteria not met unless this revision request is implemented ☐ Nodal system to work properly ☐ Reliability ☐ Compliance ☐ Fair Market Practices ☐ Synchronization ☐ Cost-Benefit Explain: ______________________	☐ "Not Needed for Go-Live" Explain: ______________________

Indicate potential impact
- ☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other)
- ☐ No impact to ERCOT

Explain: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.

Nodal Perspective

☐ Does not apply to my area ☒ No opinion on the need for Go-Live	☐ Perform complete impact analysis prior to recommending ERCOT position ☐ High level (1-4) ☐ Full Impact Analysis
☐ "Needed for Go-Live" Indicate criteria not met unless this revision request is implemented ☐ Nodal system to work properly ☐ Reliability ☐ Compliance ☐ Fair Market Practices ☐ Synchronization ☐ Cost-Benefit	☐ "Not Needed for Go-Live"

Explain: ____________	Explain: ____________

Indicate potential impact
☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other)
☐ No impact to ERCOT

Explain: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.

IT Perspective

☐ Does not apply to my area ☒ No opinion on the need for Go-Live	☐ Perform complete impact analysis prior to recommending ERCOT position ☐ High level (1-4) ☐ Full Impact Analysis
☐ "Needed for Go-Live" Indicate criteria not met unless this revision request is implemented ☐ Nodal system to work properly ☐ Reliability ☐ Compliance ☐ Fair Market Practices ☐ Synchronization ☐ Cost-Benefit Explain: ____________	☐ "Not Needed for Go-Live" Explain: ____________

Indicate potential impact
☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other)
☐ No impact to ERCOT

Explain: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.

III. Other Views – Provided by Area Owners

Alternate View / Rationale	Person holding alternate view	Alternate view provided by

IV. Suggested ERCOT Position – Provided by COO/CTO/CIO

COO

	Suggested ERCOT Position: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.	☐ Perform complete impact analysis prior to recommending ERCOT position ☐ High level (1-4) ☐ Full Impact Analysis
	☐ "Needed for Go-Live" Indicate criteria not met unless this revision request is implemented ☐ Nodal system to work properly ☐ Reliability ☐ Compliance ☐ Fair Market Practices ☐ Synchronization ☐ Cost-Benefit Explain: ______________________	☐ "Not Needed for Go-Live" Explain: ______________________
	Indicate potential impact ☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other) ☐ No impact to ERCOT Explain: ______________________	
CTO	**Suggested ERCOT Position**: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.	☐ Perform complete impact analysis prior to recommending ERCOT position ☐ High level (1-4) ☐ Full Impact Analysis
	☐ "Needed for Go-Live" Indicate criteria not met unless this revision request is implemented ☐ Nodal system to work properly ☐ Reliability ☐ Compliance ☐ Fair Market Practices ☐ Synchronization ☐ Cost-Benefit Explain: ______________________	☐ "Not Needed for Go-Live" Explain: ______________________
	Indicate potential impact ☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other) ☐ No impact to ERCOT Explain: ______________________	

CIO

Suggested ERCOT Position: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.	☐ Perform complete impact analysis prior to recommending ERCOT position ☐ High level (1-4) ☐ Full Impact Analysis
☐ "Needed for Go-Live" Indicate criteria not met unless this revision request is implemented ☐ Nodal system to work properly ☐ Reliability ☐ Compliance ☐ Fair Market Practices ☐ Synchronization ☐ Cost-Benefit Explain: ______________________	☐ "Not Needed for Go-Live" Explain: ______________________
Indicate potential impact ☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other) ☐ No impact to ERCOT Explain: ______________________	

830PRR-04
Urgency Vote Ballot
091009

ROLL CALL VOTES

ERCOT Protocol Revision Subcommittee - E-Mail Vote			1			2			3			4			5			6			7		
			Yes	No	A	Yes	No	A	Yes	No	A	Yes	No	A	Yes	No	A	Yes	No	A	Yes	No	A
Torrent	OPUC	Consumer	X																				
Wardle	Occidental	Consumer																					
TOTAL		**Consumer**																					
Morris	LCRA	Coop	X																				
Helpert	Brazos	Coop	X																				
TOTAL		**Coop**																					
Jones	Calpine	Generator	X																				
Pieniazek	NRG Texas	Generator																					
TOTAL		**Generator**																					
Walker	CNP	IOU	X																				
Durrwachter	Luminant	IOU																					
TOTAL		**IOU**																					
Detelich	CPS	Municipal																					
Bailey	Garland P&L	Municipal	X																				
TOTAL		**Municipal**																					
Boehnemann	Exelon Generation	PM	X																				
Cochran	Sempra	PM																					
TOTAL		**PM**																					
Madden	StarTex Power	REP	X																				
Carr	Stream Energy	REP	X																				
TOTAL		**REP**																					
VOTE TOTALS	14		9	0	0	0	0	0	0	0	0	0	0	0	0	0	0						

A - Abstain

1	**To grant PRR830 Urgent status - PASSED**
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830PRR-05
Horizon Wind Energy LLC Comments
091509

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	September 15, 2009

Submitter's Information	
Name	Matt Daniel
E-mail Address	Matthew.Daniel@horizonwind.com
Company	Horizon Wind Energy LLC
Phone Number	713-265-0350
Cell Number	
Market Segment	Independent Generator

Comments

Horizon does not agree with the changes proposed in Protocol Revision Request (PRR) 830, Reactive Power Capability Requirement. The PRR as drafted would require significant retrofitting by wind generators that have been providing service to the ERCOT market for years without justification. It would impose additional capital expenditures for existing generation many years after these assets have been financed. The substantial retrofit obligations to be placed on wind developers are tantamount to enforcement of and retroactive application of the ERCOT interpretation of Reactive Power capability requirements that has been withdrawn. Such requirements placed on a single segment of the generation market harms the investment-backed expectations of wind developers like Horizon who have invested hundreds of millions of dollars in the ERCOT market. PRR830 in its current form should be rejected.

The proposed language attempts to remove all Protocol language that conflicts with the legal interpretation ERCOT issued in its notice, M-D111308-01 Legal, issued November 13, 2008, and replace it with language supporting ERCOT's interpretation. This raises questions about the meaning of the deleted language. PRR830 also requires Wind powered Generation Resources (WGRs) to retrofit their equipment to comply with the new requirements in which the expense would be, for individual wind developers, in the tens of millions of dollars. Significantly, ERCOT has performed no studies that demonstrate that these large expenditures need to be made for any reason and has not shown reliability events that would require costly retrofits to existing generation.

The language proposed in PRR830 goes beyond removing Protocol language that conflicts with ERCOT's interpretation; it is contrary to ERCOT's introductory remarks, in that it is retrospective, not prospective. It would require Wind Generation Resources that commenced operation on or after February 16, 2004 and have a signed Interconnection Agreement on or before November 1, 2009 to take necessary actions to comply with ERCOT's interpretation, under a mitigation plan that meets ERCOT approval. There is no basis for this requirement. As discussed by the ERCOT Board in taking up Operating Guide Revision Request, (OGRR) 208, Voltage Ride-Through (VRT) Requirement, ERCOT should study whether there is a need for requirements that burden existing generation by retroactive application of new standards. It is also unclear whether reactive power requirements of the level intended by PRR830 will be at all useful to the market as the system is clearly functioning without these requirements, and the investment in retrofits may in fact be wasted capital investment. This is particularly troubling given that most projects are financed through a variety of means ultimately relying on the value of the asset and based on the capital investment associated with construction. These new and substantial capital outlays cannot be "added" into the financing years later.

There may be, in the future, situations when Market Participants need to provide additional services other than those originally contemplated -- including additional Reactive Power above required capability. Protocols now provide that conventional generation will do so – for compensation. However, the key is that such additional expenditures must be compensated in a market such that there is certainty and that investment backed expectations are met. This is not the case with PRR830. Although it singles out a specific technology for retrofits, this requirement is not supported by studies or independent reviews.

WGRs in general and Horizon, in particular, have been willing to modify their equipment and operating procedures when needed for system reliability. Examples include:

- Changing control systems to limit ramp rates in response to ERCOT Dispatch Instructions.
- Revising operating procedures to use ERCOT's Wind-powered Generation Resource Production Potential (WGRPP) forecast for their Day Ahead schedule instead of WGR's own forecasts.
- PRR811, Real Time Production Potential, which is likely to be approved, would require WGRs to provide their best estimate of production output at all times, in addition to its Resource Plan.

These changes do not reach the level of significance for unrecoverable cost that ERCOT is now asking one segment of the market to bear through PRR830. ERCOT has not shown the need for a change in the reactive requirement for WGRs and any changes to the Reactive Power requirements should truly be prospective in nature, not creating substantially increased costs for existing generation.

Revised Proposed Protocol Language

None.

830PRR-06
PRS Action Report
091709

PRS Action Report

PRR Number	830	PRR Title	Reactive Power Capability Requirement
Timeline	Urgent	Action	Tabled
Date of Decision	September 17, 2009		
Proposed Effective Date	To be determined.		
Priority and Rank Assigned	To be determined.		
Protocol Section(s) Requiring Revision	2.1, Definitions 2.2, Acronyms 6.5.7, Voltage Support Service 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability 6.7.6, Deployment of Voltage Support Service		
Revision Description	This Protocol Revision Request (PRR) clarifies the Reactive Power capability requirement for all Generation Resources, including existing Wind-powered Generation Resources (WGRs) who are not able to meet the 0.95 lead/lag requirement with the Generation Resource's Unit Reactive Limit (URL). WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before November 1, 2009 may meet the Reactive Power requirements through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices.		
Reason for Revision	Clarification of Reactive Power capability requirements on a going-forward basis and path to compliance for certain WGRs that are not able to meet the 0.95 lead/lag requirement at the Point of Interconnection (POI) based on Generation Resource's URL.		
Overall Market Benefit	Provides additional clarity to the reactive requirements for wind generation.		
Overall Market Impact	Unknown.		
Consumer Impact	None.		
Credit Impacts	To be determined.		
Relevance to Nodal Market	Yes. The Reactive Power capability requirements exist in Nodal as well.		

PRS Action Report

Nodal Protocol Section(s) Requiring Revision	2.1, Definitions 3.15, Voltage Support 6.5.7.7, Voltage Support Service
Procedural History	➢ On 9/08/09, PRR830, a preliminary Impact Analysis, and CEO Revision Request Review were posted. ➢ On 9/10/09, PRR830 was granted Urgent status via a PRS e-mail vote. ➢ On 9/15/09, Horizon Wind Energy LLC comments were posted. ➢ On 9/17/09, PRS considered PRR830.
PRS Decision	On 9/17/09, PRS unanimously voted to table PRR830 for one month and to encourage ROS to provide comments on PRR830. All Market Segments were present for the vote.
Summary of PRS Discussion	On 9/17/09, there was discussion regarding the appeal currently at the Public Utility Commission of Texas (PUCT) which stemmed from an ERCOT interpretation of the current Protocols regarding Reactive Power. It was debated whether or not the proposed content of PRR830 was being addressed in the contested case.

Quantitative Impacts and Benefits

Assumptions	1		
	2		
	3		
	4		
Market Cost		**Impact Area**	**Monetary Impact**
	1		
	2		
	3		
	4		
Market Benefit		**Impact Area**	**Monetary Impact**
	1	*Clarifies the reactive requirements for wind generation.*	
	2		
	3		
	4		
Additional Qualitative Information	1		
	2		
	3		
	4		
Other Comments	1		
	2		
	3		
	4		

Sponsor

PRS Action Report

Name	John Dumas
E-mail Address	jdumas@ercot.com
Company	ERCOT
Phone Number	(512) 248-3195
Cell Number	
Market Segment	N/A

Market Rules Staff Contact	
Name	Sandra Tindall
E-Mail Address	stindall@ercot.com
Phone Number	512-248-3867

Comments Received	
Comment Author	**Comment Summary**
Horizon Wind Energy LLC 091509	Recommended that PRR830 be rejected as submitted.

Proposed Protocol Language Revision

2.1 Definitions

Point of Interconnection (POI)
The location(s) where a Generation Entity's interconnection Facilities connects to the Transmission Facilities as reflected in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and a Transmission and/or Distribution Service Provider (TDSP).

Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind. Wind turbines may be aggregated together to form a WGR if each turbine is the same model and size and located behind the same Generation Step Up Transformer (GSU).

2.2 Acronyms

POI	Point of Interconnection
GSU	Generation Step Up Transformer
SGIA	Standard Generation Interconnection Agreement

6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected at the same Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

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6.5.7.1 Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS

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to maintain a Voltage Profile established by ERCOT. (2) Generation Resources shall comply with the following Reactive Power requirements: an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ERCOT Transmission Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the POI. The Reactive Power requirements shall be available at all MW output levels and may be met through a combination of the Generation Resource's Unit Reactive Limit (URL), which is the generating unit's dynamic leading and lagging operating capability, and/or dynamic VAR capable devices. For Wind-powered Generation Resources (WGRs), the Reactive Power requirements shall be available at all MW output levels at or above 10% of the WGR's nameplate capacity. When a WGR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT may require a WGR to disconnect from the ERCOT System. The Reactive Power requirements of this paragraph shall apply to all Generation Resources except as otherwise provided in paragraphs (2) through (4) below.

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(2) WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before November 1, 2009, must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (1) above. However, the Reactive Power requirements may be met through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices. WGRs shall comply with the Reactive Power requirements of this paragraph by no later than December 31, 2010, unless it is known by July 31, 2010, that related retrofits are required by the Voltage Ride-Through study conducted in accordance with Operation Guide Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-powered Generation Resources, in which event ERCOT may in its discretion modify the deadline for an affected WGR. ERCOT, in its sole discretion, also may grant an extension of time for other reasons.

(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that

were in operation prior to September 1, 1999, whose current design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the qualified renewable Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(4) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(5) For purposes of meeting the Reactive Power requirements in paragraphs (1) and (2) above, multiple generation units including wind turbines shall, at a Generation Entity's option, be treated as a single Generation Resource or WGR if the units are connected to the same transmission bus.

(6) Generation Entities may submit to ERCOT specific proposals to meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices. ERCOT may, at its sole discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall provide the submitter an explanation of its decision.

A Generation Resource and TDSP may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1).

(8) Unless specifically approved by ERCOT, no unit equipment replacement or modification at a Generation Resource shall reduce the capability of the unit below the Reactive Power requirements that applied prior to the replacement/modification.

(9) Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

(10) WGRs must provide a Real Time SCADA point that communicates to ERCOT the number of wind turbines that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid. WGRs must also provide two other Real Time SCADA points that communicate to ERCOT the following:

(a) The number of wind turbines that are not able to communicate and whose status is unknown; and

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(b) The number of wind turbines out of service and not available for operation. WGRs must comply with these requirements by no later than six months after the effective date of this paragraph.

(11) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by automatically switchable static VAR capable devices.

6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or Transmission Service Providers (TSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional Megavolt-Ampere Reactive (MVAR), nor will they be requested to operate on a voltage schedule outside the URL specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

(2) ERCOT and Transmission and/or Distribution Service Providers (TDSPs) shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, step-up transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

(3) The TSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed Reactive Power capability requirements.

(4) All Generation Resources required to provide VSS shall support the transmission voltage at the POI to the ERCOT Transmission Grid, or at the transmission bus in accordance with paragraph (5) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

(5) The QSEs providing VSS shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

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(7) An induction generator may elect to make a contribution in aide of construction in lieu of meeting the installed capacity VSS requirements contained herein. In order to comply with the VSS requirements under this paragraph (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to that used to collect payments for the direct assignment of interconnection Facilities under applicable Public Utility Commission of Texas (PUCT) rules. The level of payment shall reflect the cost to the TDSP of procuring, installing, operating, and maintaining any Reactive Power equipment required to replace the Reactive Power capability that otherwise would be necessary for the interconnection of the generator. In order for this paragraph (7) to be effective for VSS compliance, the TDSP shall certify to ERCOT that the induction generator has complied with these requirements.

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For Generation Resources required to provide VSS

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830PRR-07
Calpine Comments
092809

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	September 28, 2009

Submitter's Information	
Name	Randy Jones
E-mail Address	rajones@calpine.com
Company	Calpine
Phone Number	713.830.8846
Cell Number	832.385.3322
Market Segment	Independent Generators

Comments

Calpine supports the passage of PRR830, Reactive Power Capability Requirement. Since the ERCOT Board's passage of PRR493, Induction Generator Exemption, in March of 2004, the pathway to compliance with the Protocols requirements for Voltage Support Service (VSS) has been clear and the "burden" of supporting reliability through VSS on the part of induction Wind-powered Generation Resources (WGRs) has been no more onerous than that faced by other generating Resources in the system.

At the June 2003 meeting of the WMS, when that subcommittee took up the proposed Reactive Standards to replace the Interim Reactive and Voltage Standards, a motion to approve the Standards was amended to include the provision for WGRs who could not meet the installed capacity requirements (Application section) to make a contribution to be credited to Transmission Cost of Service (TCOS) of the respective Transmission and/or Distribution Service Provider (TDSP).

[5/21/03 WMS Meeting Minutes]
"Xxxxx also proposed additional language in the third bullet in the "Application" Section under the "Generator and QSE Requirements" Section ("A renewable generator may elect to make a contribution to be credited to TCOS, at a standard approved rate per MW of generator capability, in lieu of meeting the Installed Capability Requirements contained herein."). ***A motion was made by Xxxxx and seconded by Xxxxx to approve the additional language above to be inserted into the "Application" Section under the "Generator and QSE Requirements". The motion was approved with 2 abstentions."***

PRR Comments

PRR493 provided clarification on the mechanics of how that contribution would be made. Contrary to ERCOT's comment in PRR830, the pathway to compliance has been in place for some time, and the requirement for generating Resources to provide voltage support as a standard requirement of interconnection predates the current market design.

Comments filed by others in this matter assert that ERCOT should conduct a study showing the need for WGRs to spend dollars to provide the required VSS capability and also claiming that there has been no showing that reliability events would justify costly retrofits. This stance would require that the system would always be in a state of "catching up" to system events and system growth. It also fails to recognize that fairness dictates that all Resources support reliability, not just those conventional technology Resources who customarily abide by the Protocols and Operating Guides out of a sense of obligation. Calpine believes that if standards are established that clearly provide what each Resource's Obligation is upon interconnection, then the system's increasing need for dynamic and static reactive sources can be efficiently managed through the TDSPs' expansion of reactive devices. Those standards exist in the form of the Protocols and the Standard Generation Interconnection Agreement (SGIA).

PRR830 provides a clear route for establishing system reactive adequacy in the future and it also illuminates the existing path to compliance that has existed for quite some time.

Revised Proposed Protocol Language

None.

830PRR-08
Iberdrola Renewables Comments
100709

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	October 7, 2009

Submitter's Information	
Name	Tom Shields
E-mail Address	Tom.shields@iberdrolausa.com
Company	Iberdrola Renewables, Inc.
Phone Number	281-374-3064
Cell Number	
Market Segment	Independent Power Marketer

Comments

Please find comments submitted by Iberdrola Renewables in the "track changes" format. Please note, however, that Iberdrola Renewables believes the existing protocol language, as historically interpreted by ERCOT and developers, is sufficiently clear and effective and not in need of change. Iberdrola Renewables submits these comments only as an alternative to the ERCOT proposed changes under PRR830, Reactive Power Capability Requirement. By offering these comments, Iberdrola Renewables does not waive any position taken in Docket No. 36482, Appeal of Competitive Wind Generators Regarding the Electric Reliability Council of Texas' (ERCOT) Interpretation of the Reactive Power Protocols. Furthermore, Iberdrola Renewables notes that despite being described as seeking a "prospective outcome" and clarifying Reactive Power requirements "on a going-forward basis," PRR830 is retroactive in nature and represents a major, after-the-fact reinterpretation of ERCOT's Reactive Power capability requirements.

Revised Proposed Protocol Language

PRR Comments

2.1 Definitions

Point of Interconnection (POI)
The location(s) where a Generation Entity's interconnection Facilities connects to the Transmission Facilities as reflected in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and a Transmission and/or Distribution Service Provider (TDSP).

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Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind.

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2.2 Acronyms

POI	Point of Interconnection
GSU	Generation Step Up Transformer
SGIA	Standard Generation Interconnection Agreement

6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected at the same Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

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6.5.7.1 Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS

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(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT. Generation Resources shall comply with the following Reactive Power requirements: an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's net power output supplied to the ERCOT Transmission Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the POI, as shown in Figure 1 below.

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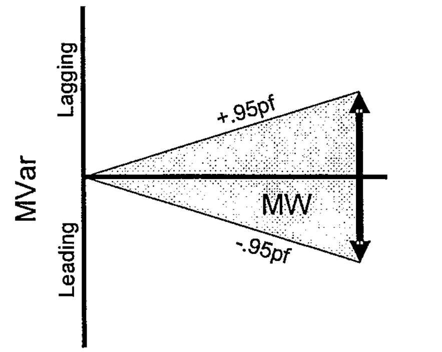

Figure 1: Reactive Power Requirement

The Reactive Power requirements shall apply at all MW output levels and may be met through a combination of the Generation Resource's Unit Reactive Limit (URL), which is the generating unit's dynamic leading and lagging operating capability, switchable static VAR capable devices, and/or dynamic VAR capable devices. ERCOT may require that all or a portion of the Reactive Power requirements be met by dynamic voltage support if the interconnection studies for the Generation Resource show this to be required for system reliability. For Wind-powered Generation Resources (WGRs), the Reactive Power requirements shall apply at all MW output levels at or above 10% of the WGR's nameplate capacity. When a WGR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT may require a WGR to disconnect from the ERCOT System if required for system reliability. The Reactive Power requirements of this paragraph shall apply to all Generation Resources except as otherwise provided in paragraphs (2) and (3) below.

(2) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain the qualified renewable Generation Resource's Reactive Power capability that was submitted to ERCOT and established per the criteria in the Operating Guides.

(3) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain the Generation Resource's Reactive Power capability that was submitted to ERCOT and established per the criteria in the Operating Guides.

(4) For purposes of meeting the Reactive Power requirements in paragraph (1) above, multiple generation units including wind turbines shall, at a Generation Entity's option,

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(5) Generation Entities may submit to ERCOT specific proposals to meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices. ERCOT may, at its sole and reasonable discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall provide the submitter an explanation of its decision.

(6) A Generation Resource and TDSP may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1) above.

(7) Unless specifically approved by ERCOT, no unit equipment replacement or modification at a Generation Resource shall reduce the capability of the unit below the Reactive Power requirements that applied prior to the replacement/modification.

(8) Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

(9) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by automatically switchable static VAR capable devices.

6.7.6 *Deployment of Voltage Support Service*

(1) ERCOT, or Transmission Service Providers (TSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional Megavolt Ampere Reactive (MVAR), nor will they be requested to operate on a voltage schedule outside the URL specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

(2) ERCOT and Transmission and/or Distribution Service Providers (TDSPs) shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, step-up transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

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(3) The TSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed Reactive Power capability requirements.

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(4) All Generation Resources required to provide VSS shall support the transmission voltage at the POI to the ERCOT Transmission Grid, or at the transmission bus in accordance with paragraph (4) of Section 6.5.7.1, Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

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(5) The QSEs providing VSS shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

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(2) WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before November 1, 2009, must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (1) above. However, the Reactive Power requirements may be met through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices. WGRs shall comply with the Reactive Power requirements of this paragraph by no later than December 31, 2010, unless it is known by July 31, 2010, that related retrofits are required by the Voltage Ride-Through study conducted in accordance with Operation Guide Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-powered Generation Resources, in which event ERCOT may in its discretion modify the deadline for an affected WGR. ERCOT, in its sole discretion, also may grant an extension of time for other reasons.

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(2) WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before November 1, 2009, must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (1) above. However, the Reactive Power requirements may be met through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices. WGRs shall comply with the Reactive Power requirements of this paragraph by no later than December 31, 2010, unless it is known by July 31, 2010, that related retrofits are required by the Voltage Ride-Through study conducted in accordance with Operation Guide Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-powered Generation Resources, in which event ERCOT may in its discretion modify the deadline for an affected WGR. ERCOT, in its sole discretion, also may grant an extension of time for other reasons.

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is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and

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Upon request to, and with the approval of ERCOT, multiple generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these URL requirements only.

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An induction generator may elect to make a contribution in aide of construction in lieu of meeting the installed capacity VSS requirements contained herein. In order to comply with the VSS requirements under this paragraph (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to that used to collect payments for the direct assignment of interconnection Facilities under applicable Public Utility Commission of Texas (PUCT) rules. The level of payment shall reflect the cost to the TDSP of procuring, installing, operating, and maintaining any Reactive Power equipment required to replace the Reactive Power capability that otherwise would be necessary for the interconnection of the generator. In order for this paragraph (7) to be effective for VSS compliance, the TDSP shall certify to ERCOT that the induction generator has complied with these requirements.

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A Generation Resource and TDSP may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1)

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(10) WGRs must provide a Real Time SCADA point that communicates to ERCOT the number of wind turbines that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid. WGRs must also provide two other Real Time SCADA points that communicate to ERCOT the following:

(a) The number of wind turbines that are not able to communicate and whose status is unknown; and

(b) The number of wind turbines out of service and not available for operation. WGRs must comply with these requirements by no later than six months after the effective date of this paragraph.

Page 4: [15] Inserted ERCOT 8/19/2009 6:26 PM

11) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by automatically switchable static VAR capable devices.

830PRR-09
Horizon Wind Energy LLC Comments
100809

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	October 8, 2009

Submitter's Information	
Name	Matt Daniel
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Company	Horizon Wind Energy LLC
Phone Number	713-265-0350
Cell Number	
Market Segment	Independent Generator

Comments

Horizon Wind Energy LLC appreciates the opportunity to offer comments on PRR830, Reactive Power Capability Requirement. Horizon believes that Market Participants have the responsibility to provide capabilities required by the market rules, and has ensured that our Wind-powered Generation Resources (WGRs) fulfill that responsibility.

The introductory comments for PRR830 say it is a clarification of Reactive Power requirements and is intended to be prospective, even a cursory review shows that it goes far beyond clarification. In addition to redefining the terms for Reactive Power service and adding new definitions for existing terms, it imposes new requirements on existing generation that can only be accomplished through significant capital investment in retrofits. This re-write of Reactive Power capability requirements occurs at the same time that the Public Utility Commission of Texas (PUCT) is hearing an appeal of an ERCOT Protocol Interpretation regarding the requirements for Reactive Power capability.

PRR830 broadly re-defines Reactive Power capability requirements for Generation Resources interconnected with the ERCOT Transmission Grid. For example, it changes the concept of Unit Reactive Limit (URL) and adds the requirement that all Reactive Power capability be dynamic. By doing so, it imposes new requirements on WGRs and requires retrofits to the majority of operating WGRs. These new requirements are contrary to existing Protocols and practice, and are proposed without any demonstration of need.

At the time the current Protocols were adopted, the technology for WGRs to perform as ERCOT interprets them did not exist. Only one vendor had even announced that their turbines could do so, as was pointed out in the discussions around their adoption. Clearly imposing a requirement now to reach back will penalize existing WGRs that invested in the market based on the market rules at the time. They will have to make substantial investments to implement these new Reactive Power requirements, without any study showing that doing so will improve system reliability.

If the true intent is to level the playing field with regard to Reactive Power capability, this PRR does not accomplish that objective. Instead it singles out one group, WGRs, to which this retroactive standard is applied. The current Reactive Power protocols exempt conventional generation pre-1999 from the Reactive Power requirements, and this PRR only seeks to place the retroactive "rectangle" requirements on WGRs, and not other types of generation to which the retroactive provisions could also be applied if the purpose was to make the playing field level—albeit at significant cost to those conventional generators as well.

Reconsideration of Reactive Power capability required by the ERCOT System, and of the most reliable and cost-effective way to provide it, will be a lengthy project, and should be a separate effort from this PRR as part of a study process—however Horizon does not support the retroactive application of Reactive Power requirements or other standards to existing generation once the capital investment has been made and the generator has no way to recover tens of millions of dollars in new, unanticipated capital outlays.

The background relating to Reactive Power is significant. WGRs have given ERCOT their Resource Asset Registration Forms (RARF & GARF) for years demonstrating compliance with the Reactive Power standards in the shape of the "cone." The RARF example clearly demonstrates what the minimum requirement is, and that is the "cone" as can be seen in the pictorial that accompanies it.

WGRs developed their projects on the understanding that ERCOT required, at most, Reactive Power be provided as shown by the "cone" plot, consistent with the rest of the country. However, PRR830 was precipitated by a new interpretation issued by ERCOT as part of its ERCOT Protocol Interpretation issued November 13, 2008 (Interpretation), which was also subsequently withdrawn as a result of defects in the adoption of the Interpretation. This matter is the subject of a contested case before the PUCT. The PUCT will decide the interpretation of the Protocols as applied to existing generation and has indicated its willingness to do so by twice refusing to grant ERCOT's Motions to Dismiss. Instead of embarking on a lengthy debate about re-defining Reactive Power capability requirements as applied to existing WGRs in the consideration of PRR830, Horizon recommends limiting this discussion to clearly defining what new WGRs need to provide. This will remove financial concerns for operating and prospective wind projects, that otherwise may have to make costly retrofits or install unnecessary equipment.

Reactive Power capability requirements for ERCOT are clear from Protocols and other binding documents. Those requirements are the maximum Reactive Power performance required in FERC Order 661A: WGRs are to maintain a power factor within the range of 0.95 leading to 0.95 lagging, measured at the point of interconnection. All WGRs must maintain at least this capability, using static and/or dynamic reactive equipment, as they decide is most cost-effective. WGRs should only be required to provide additional Reactive Power capability if needed for system reliability, as determined by the Transmission Service Provider (TSP) conducting the interconnection study. Review of the Protocols and of Other Binding Documents show consistent support for this requirement. Examples from those documents are provided below.

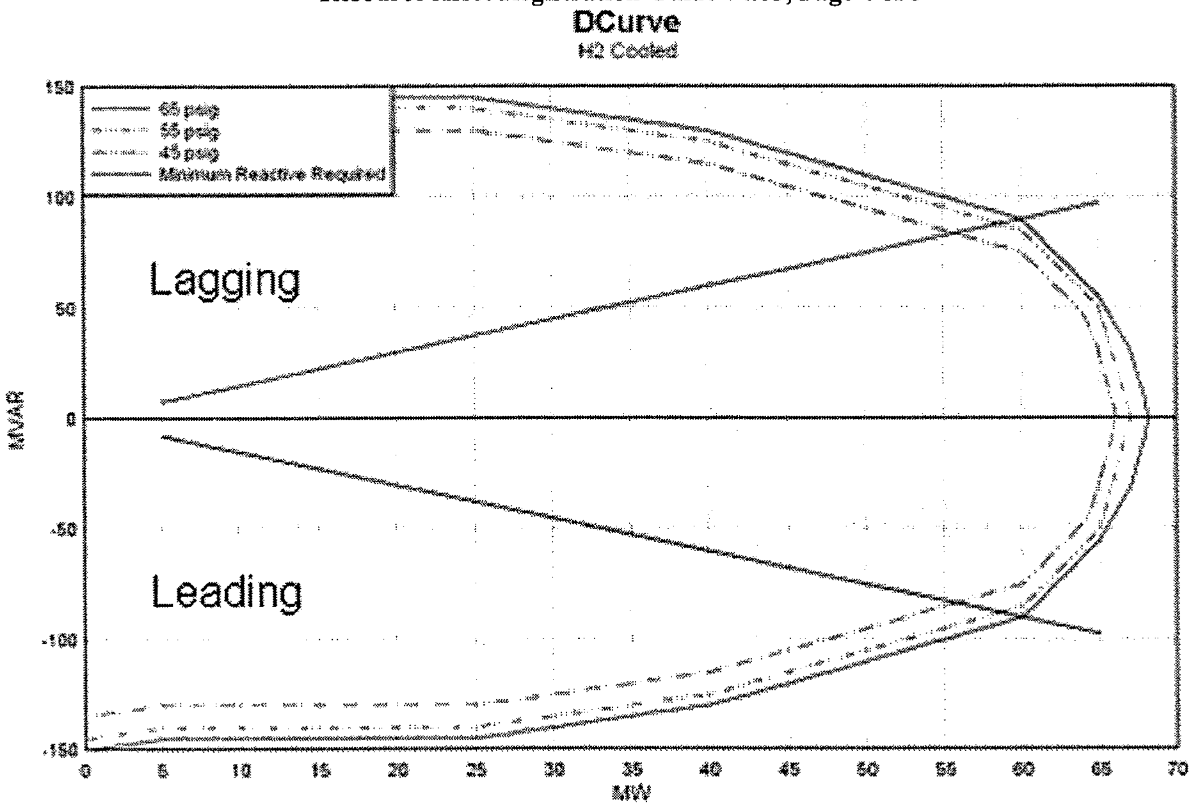
Existing WGRs interconnected with the ERCOT Transmission Grid with the understanding of Reactive Power requirements as described above. Their capabilities were clearly reported in their Interconnection Agreements and Registration Forms. The additional retroactive requirements PRR830 would impose have not been shown to be needed by any study. For all these reasons, in addition to the costly retrofits PRR830 would impose, Horizon recommends rejection of PRR830.

The current Protocols are clear that URL refers to Reactive Power produced when a Resource is operating at its rated capability, and that the required reactive capability varies with the Resource's real power production. At full output, a Resource must be capable of providing reactive power per its URL. There is no confusion there. The Protocols also say: "In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ***ratio*** of the lower active power output to the generating unit's continuous rated active power output…" (emphasis added). There should be no confusion that the Protocols intend for Reactive Power capability to vary with output.

This clear meaning is supported by ERCOT's actions and in Other Binding Documents. WGRs have clearly and repeatedly communicated their Reactive Power capability through the interconnection process, the asset registration process, the synchronization approval process, ERCOT surveys, and in response to request letters from ERCOT.

ERCOT's Resource Asset Registration Guide, effective March 10, 2009, reflects the Protocol requirement that the "Minimum Reactive Required" vary with a Resource's output. The chart reproduced below appears in version 4.03 of the Resource Asset Registration Guide, published two months after ERCOT issued its Reactive Power interpretation. WGRs registering their assets clearly indicated that their Reactive Power capability varies with power production.

Resource Asset Registration Guide v4.03, Page 4 of 5



From the letters ERCOT sent on June 5, 2009, it appears that many, if not all, WGRs registered their assets indicating that their Reactive Power capability varies with power production. ERCOT sanctioned their interconnection while understanding that their Reactive Power varied with real power production. This understanding is reflected in a draft revision to ERCOT's Generation Interconnection or Change Request Procedure, offered for comments in February 2007, which includes the language quoted below. It would accommodate actual WGR Reactive Power capability and provides that Reactive Power can be provided using either static or dynamic equipment.

4.7 Special Requirements for Wind Generation

4.7.1 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 the SGIA. The power factor range standard can be met by using, for example, power electronics designed to supply this level of reactive capability (taking into account any limitations due to voltage level, real power output, etc.) or fixed and switched capacitors if agreed to by ERCOT and the TSP. The GE or PGC 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.[1]

There is still no requirement to provide Reactive Power using dynamic equipment in ERCOT's New Generator Commissioning Checklist. The version effective since April 07, 2009 includes a requirement for each Generation Resource to telemeter the status of its "Station Static Reactive Device(s)" status. Clearly ERCOT accepts that Generation Resources could reliably meet their Reactive Power capability requirements with static devices.

Revised Proposed Protocol Language

None.

1 http://www.ercot.com/content/meetings/ros/keydocs/2007/0215/06._ERCOTGenerationInterconnectOrChangeRequestProcedures0214.doc

830PRR-10
LCRA Comments
100809

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	October 8, 2009

Submitter's Information	
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Cell Number	
Market Segment	Cooperative

Comments

LCRA submits the following comments for clarification purposes in PRR830, Reactive Power Capability Requirement.

In paragraph (1) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, what was paragraph (2), LCRA notes that the language "and at the transmission system Voltage Profile established by ERCOT and both" should be deleted. When running a lagging reactive test in the transmission corridors that are congested, the lagging reactive test often fails to reach an adequate test output due to system voltage constraints if the test is initiated at the ERCOT-established Voltage Profile. LCRA suggests deleting that language to allow Resources to start at a lower voltage level assuming the transmission service provider can lower the voltage to facilitate a meaningful lagging reactive test. In 6.5.7.1(3), LCRA adds the inclusion of all other Generation Resources prior to September 1, 1999 as an exemption.

LCRA also proposes additional modifications in 6.5.7.1(3) related to establishing Reactive Power requirements. If taken literally, the language presumes that the tested value at the maximum net power to the grid can be produced across the entire megawatt (MW) range of a Generation Resource. The reality is that different Resource types have different characteristics and therefore may not be able to completely follow a straight line curve because of electrical or mechanical limitations. Some Resources may follow an erratic curve due to electronic derivations or have other machine specific limitations. LCRA proposes that Resources establish a minimum of a six-point curve to provide a valid unit capability across the generator MW range.

Finally, the ERCOT requirement to disconnect a Wind-powered Generation Resource (WGR) that is operating below 10% of its nameplate capacity and is unable to support voltage at the Point of Interconnection (POI) is too unforgiving. Because there are a number of WGRs often in a region, ERCOT should establish which particular WGR is the appropriate WGR to disconnect by performing a voltage study in Real Time. That study should also help determine if an alternate device might do a better job of meeting the Reactive Power requirements. Finally, if the WGR is required to disconnect as a result of the study, there shall be no repercussions from ERCOT or the Texas Regional Entity (TRE) for the inability to support the POI voltage.

In 6.7.6, Deployment of Voltage Support Service, ERCOT uses the Voltage Profile established by a Protocol-prescribed study. If a Transmission Service Provider (TSP) changes voltage because of changes in system conditions, and they do not alert ERCOT of the change, ERCOT's Real Time studies will not reflect the new Voltage Profiles. LCRA proposes having the TSP provide an end-time to the voltage changes.

Revised Proposed Protocol Language

2.1 Definitions

Point of Interconnection (POI)
The location(s) where a Generation Entity's interconnection Facilities connects to the Transmission Facilities as reflected in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and a Transmission and/or Distribution Service Provider (TDSP).

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Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind. Wind turbines may be aggregated together to form a WGR if each turbine is the same model and size and located behind the same Generation Step Up Transformer (GSU).

~~**Unit Reactive Limit (URL)**~~
~~The maximum reactive capability of a unit at a unit's HSL as determined in biennial tests as required by the ERCOT Operating Guides.~~

2.2 Acronyms

POI	Point of Interconnection
GSU	Generation Step Up Transformer
SGIA	Standard Generation Interconnection Agreement

6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected at the same Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty

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(20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

6.5.7.1 Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS

(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established ERCOT. Generation Resources shall comply with the following Reactive Power requirements:

(a) ~~The Generation Resource shall maintain~~ an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ERCOT Transmission Grid, measured at the POI;

(b) The ~~establishment of~~ Reactive Power requirements ~~in a six point test curve~~ shall be available ~~for~~ all MW output levels. ~~The Unit Reactive Limit (URL) across all levels can be determined by a six-point test curve across the MW capacity of the units;~~

(c) ~~The .95 power factor level~~ may be met through a combination of the Generation Resource's URL, which is the generating unit's dynamic leading and lagging operating capability, and/or dynamic VAR capable devices; ~~and~~

(d) For Wind-powered Generation Resources (WGRs), the ~~URL shall be determined for~~ MW output levels ~~utilizing the six-point test curve beginning~~ at 10% of the WGR's nameplate capacity ~~through the WGR's nameplate capacity~~. When a WGR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI ~~as determined by a Real Time voltage study~~, ERCOT may require a WGR to disconnect from the ERCOT System. The Reactive Power requirements of this paragraph shall apply to all Generation Resources except as otherwise provided in paragraphs (2) through (4) below. ~~If the units are disconnected, they will not be found in violation of the Protocols.~~

(2) WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before November 1, 2009, must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (1) above. However, the Reactive Power requirements may be met through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices. WGRs shall comply with the Reactive Power requirements of this paragraph by no later than December 31, 2010, unless it is known by July 31, 2010, that related retrofits are required by the Voltage Ride-Through study conducted in accordance with Operation Guide Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-

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powered Generation Resources, in which event ERCOT may in its discretion modify the deadline for an affected WGR. ERCOT, in its sole discretion, also may grant an extension of time for other reasons.

(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the qualified renewable Generation Resource's or all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999 that was submitted to ERCOT and established per the criteria in the Operating Guides.

(4) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(5) For purposes of meeting the Reactive Power requirements in paragraphs (1) and (2) above, multiple generation units including wind turbines shall, at a Generation Entity's option, be treated as a single Generation Resource or WGR if the units are connected to the same transmission bus.

(6) Generation Entities may submit to ERCOT specific proposals to meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices. ERCOT may, at its sole discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall provide the submitter an explanation of its decision.

(7) A Generation Resource and TDSP may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1).

(8) Unless specifically approved by ERCOT, no unit equipment replacement or modification at a Generation Resource shall reduce the capability of the unit below the Reactive Power requirements that applied prior to the replacement/modification.

(9) Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

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(10) WGRs must provide a Real Time SCADA point that communicates to ERCOT the number of wind turbines that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid. WGRs must also provide two other Real Time SCADA points that communicate to ERCOT the following:

(a) The number of wind turbines that are not able to communicate and whose status is unknown; and

(b) The number of wind turbines out of service and not available for operation. WGRs must comply with these requirements by no later than six months after the effective date of this paragraph.

(11) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by automatically switchable static VAR capable devices.

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6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or Transmission Service Providers (TSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits ~~and provide the QSE and/or the generator the length of time for the change~~ provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional Megavolt-Ampere-Reactive (MVAR), nor will they be requested to operate on a voltage schedule outside the URL specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

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(2) ERCOT and Transmission and/or Distribution Service Providers (TDSPs) shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, step-up transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

(3) The TSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed Reactive Power capability requirements.

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(4) All Generation Resources required to provide VSS shall support the transmission voltage at the POI to the ERCOT Transmission Grid, or at the transmission bus in accordance with paragraph (5) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

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(5) The QSEs providing VSS shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

Deleted: (5) At all times a Generation Resource unit required to provide VSS is On-line, the URL must be available for utilization at the generating unit's continuous rated active power output, and Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any Reactive Power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP.¶

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An induction generator may elect to make a contribution in aide of construction in lieu of meeting the installed capacity VSS requirements contained herein. In order to comply with the VSS requirements under this paragraph (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to that used to collect payments for the direct assignment of interconnection Facilities under applicable Public Utility Commission of Texas (PUCT) rules. The level of payment shall reflect the cost to the TDSP of procuring, installing, operating, and maintaining any Reactive Power equipment required to replace the Reactive Power capability that otherwise would be necessary for the interconnection of the generator. In order for this paragraph (7) to be effective for VSS compliance, the TDSP shall certify to ERCOT that the induction generator has complied with these requirements.

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A Generation Resource and TDSP may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1).

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For Generation Resources required to provide VSS

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830PRR-11
ROS Comments
101909

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	October 19, 2009

Submitter's Information	
Name	Ken Donohoo on behalf of the Reliability and Operations Subcommittee (ROS)
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Company	Oncor
Phone Number	214-743-6823
Cell Number	
Market Segment	Investor Owned Utility (IOU)

Comments

At its October 15, 2009 meeting, ROS voted to endorse Protocol Revision Request (PRR) 830 as submitted. The motion carried via roll call vote.

Revised Proposed Protocol Language

2.1 Definitions

Point of Interconnection (POI)
The location(s) where a Generation Entity's interconnection Facilities connects to the Transmission Facilities as reflected in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and a Transmission and/or Distribution Service Provider (TDSP).

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Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind. Wind turbines may be aggregated together to form a WGR if each turbine is the same model and size and located behind the same Generation Step Up Transformer (GSU).

2.2 Acronyms

POI	Point of Interconnection
GSU	Generation Step Up Transformer
SGIA	Standard Generation Interconnection Agreement

PRR Comments

6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected at the same Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

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6.5.7.1 Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS

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(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT. Generation Resources shall comply with the following Reactive Power requirements: an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ERCOT Transmission Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the POI. The Reactive Power requirements shall be available at all MW output levels and may be met through a combination of the Generation Resource's Unit Reactive Limit (URL), which is the generating unit's dynamic leading and lagging operating capability, and/or dynamic VAR capable devices. For Wind-powered Generation Resources (WGRs), the Reactive Power requirements shall be available at all MW output levels at or above 10% of the WGR's nameplate capacity. When a WGR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT may require a WGR to disconnect from the ERCOT System. The Reactive Power requirements of this paragraph shall apply to all Generation Resources except as otherwise provided in paragraphs (2) through (4) below.

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(2) WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before November 1, 2009, must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (1) above. However, the Reactive Power requirements may be met through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices. WGRs shall comply with the Reactive Power requirements of this paragraph by no later than December 31, 2010, unless it is known by July 31, 2010, that related retrofits are required by the Voltage Ride-Through study conducted in accordance with Operation Guide Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-powered Generation Resources, in which event ERCOT may in its discretion modify the deadline for an affected WGR. ERCOT, in its sole discretion, also may grant an extension of time for other reasons.

(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004,

required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the qualified renewable Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(4) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(5) For purposes of meeting the Reactive Power requirements in paragraphs (1) and (2) above, multiple generation units including wind turbines shall, at a Generation Entity's option, be treated as a single Generation Resource or WGR if the units are connected to the same transmission bus.

(6) Generation Entities may submit to ERCOT specific proposals to meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices. ERCOT may, at its sole discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall provide the submitter an explanation of its decision.

(7) A Generation Resource and TDSP may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1).

(8) Unless specifically approved by ERCOT, no unit equipment replacement or modification at a Generation Resource shall reduce the capability of the unit below the Reactive Power requirements that applied prior to the replacement/modification.

(9) Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

(10) WGRs must provide a Real Time SCADA point that communicates to ERCOT the number of wind turbines that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid. WGRs must also provide two other Real Time SCADA points that communicate to ERCOT the following:

(a) The number of wind turbines that are not able to communicate and whose status is unknown; and

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(b) The number of wind turbines out of service and not available for operation. WGRs must comply with these requirements by no later than six months after the effective date of this paragraph.

(11) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by automatically switchable static VAR capable devices.

6.7.6 *Deployment of Voltage Support Service*

(1) ERCOT, or Transmission Service Providers (TSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional Megavolt Ampere Reactive (MVAR), nor will they be requested to operate on a voltage schedule outside the URL specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

(2) ERCOT and Transmission and/or Distribution Service Providers (TDSPs) shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, step-up transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

(3) The TSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed Reactive Power capability requirements.

(4) All Generation Resources required to provide VSS shall support the transmission voltage at the POI to the ERCOT Transmission Grid, or at the transmission bus in accordance with paragraph (5) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

(5) The QSEs providing VSS shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

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Page 3: [1] Deleted ERCOT 9/4/2009 11:27 AM

An induction generator may elect to make a contribution in aide of construction in lieu of meeting the installed capacity VSS requirements contained herein. In order to comply with the VSS requirements under this paragraph (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to that used to collect payments for the direct assignment of interconnection Facilities under applicable Public Utility Commission of Texas (PUCT) rules. The level of payment shall reflect the cost to the TDSP of procuring, installing, operating, and maintaining any Reactive Power equipment required to replace the Reactive Power capability that otherwise would be necessary for the interconnection of the generator. In order for this paragraph (7) to be effective for VSS compliance, the TDSP shall certify to ERCOT that the induction generator has complied with these requirements.

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For Generation Resources required to provide VSS

Page 3: [3] Deleted ERCOT 8/19/2009 6:23 PM

, unless specifically approved by ERCOT

830PRR-12
ROS Roll Call Vote
101909

Version 2.2

RJones/Green motion to recommend approval of PRR830 as submitted.

Tally Votes

Date: 20091015

Clear

Prepared by: B. Albracht

TALLY TOTAL			
Voting Structure	Motion Carries		Total Abstentions
ROS/RMS/WMS			
Segment Vote:	5.500	2.000	2
Percentage Vote:	73.3%	26.7%	

Sector / Entity	Representative	Present	Yes	No	Abstain
Coop					
Lower Colorado River Authority	Bill Hatfield (Jerry Willms)	y	0.333		
Brazos Electric Power Cooperative, Inc.	Randy Ryno	y	0.333		
STEC	John Moore	y	0.333		
	Segment Vote:	3	1.000	0.000	0
Municipal					
Brownsville Public Utilities Board	James McCann				
Austin Energy	James Armke	y	0.333		
Garland Power & Light	Bob Green	y	0.333		
CPS Energy	Blake Williams	y	0.333		
	Segment Vote:	3	1.000	0.000	0
Investor Owned Utilities					
Texas-New Mexico Power Company	Rex McDaniel	y	0.250		
CenterPoint Energy	Paul Rocha	y	0.250		
AEP Corporation	Dennis Kunkel	y	0.250		
Oncor	Ken Donohoo	y	0.250		
	Segment Vote:	4	1.000	0.000	0
Independent Generator					
Calpine Corporation	Randy Jones	y	0.250		
E.ON	John Fanklin (Mark Soutter)	y		0.250	
PSEG TX	Margeurite Wagner	y	0.250		
SUEZ	Harry Holloway	y	0.250		
	Segment Vote:	4	0.750	0.250	0
Consumers — **Divide Subsegments?** y	**Consumer Vote Total**	1.5			
City of Dallas — Comm	Jesse Dillard				
Air Liquide — Resi	David DeTullio	y	1.500		
Indu					
Indu					
	Segment Vote:	1	1.500	0.000	0
Independent REP					
Direct Energy	Mark Garrett	y		1.000	
Reliant Energy	Rick Keetch	y			a
Texas Power	Tony Marsh	y			a
	Segment Vote:	3	0.000	1.000	2
Independent Power Marketers					
Exelon Generation Company, LLC	Walt Kuhn (Dirk Vanderlann)	y	0.250		
Iberdrola	Tresa Allen	y		0.250	
BP Energy	Fernando Gutierrez	y		0.250	
Tenaska Power Services Col Co.	Scott Helyer	y		0.250	
	Segment Vote:	4	0.250	0.750	0
All Sectors Voting Totals					Total
	Segment Vote:	22	5.500	2.000	2
	TALLY TOTAL		73.3%	26.7%	

830PRR-13
Wind Coalition Comments
102109

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	October 21, 2009

Submitter's Information	
Name	Walter J. Reid
E-mail Address	w.j.reid@ieee.org
Company	Wind Coalition
Phone Number	512-335-0664
Cell Number	512-335-0664
Market Segment	N/A

Comments

ERCOT's proposed changes include a redefinition of a Wind-powered Generation Resource (WGR) and subsequent changes that are intended to improve the modeling of wind-powered generation reactive capabilities. The Wind Coalition strongly supports the ERCOT initiative to more accurately model wind-powered generators. The method that ERCOT has chosen causes many unintended consequences. These comments provide an alternative which avoids the unintended consequences.

The current protocols define a WGR as the whole wind-powered facility up to the point of interconnection. Applying this definition to all the references to Generation Resources, Resources, units, and WGRs make sense. There is a physical meaning to the WGR, meters exist that measure relevant parameters associated with the WGR, and processes and procedures are in place to schedule and report relative to the WGR.

ERCOT's proposed redefinition of a WGR creates a fictitious unit comprised of an aggregation of Wind-powered Turbine Generators (WTGs) of the same type. This aggregation of WTGs, defined on the low side of the step-up-to-transmission transformer, has no single physical presence. There can be no meter point for the aggregation. Among the various protocol requirements that would now apply to this fictitious unit is a requirement to measure and telemeter KW, KVAR, and voltage. No single point exists where these can be measured. Any synthesis of existing or new measurements to create these quantities would have to be defined. This is just one example of the hundreds of references to "unit" in the protocols that now apply to these fictitious units.

PRR Comments

This revision is intended to provide exactly the same functionality as the one proposed by ERCOT without redefining "WGR". The concept is to leave the definition of WGR as it is today and create an aggregation of WTGs of the same type for modeling purposes. Exactly the same information will be provided for this aggregation as in ERCOT's version and ERCOT can achieve exactly the same modeling objective.

Overall Market Benefit	Improve system voltage management.
Overall Market Impact	Reduce the likelihood of equipment damage or outage.
Consumer Impact	Not clear.

Revised Proposed Protocol Language

2.1 Definitions

Point of Interconnection (POI)
The location(s) where a Generation Entity's interconnection Facilities connects to the Transmission Facilities as reflected in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and a Transmission and/or Distribution Service Provider (TDSP).

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Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind.

Deleted: Wind turbines may be aggregated together to form a WGR if each turbine is the same model and size and located behind the same Generation Step Up Transformer (GSU).

2.2 Acronyms

POI	Point of Interconnection
GSU	Generation Step Up Transformer
SGIA	Standard Generation Interconnection Agreement
WTG	Wind-powered Turbine Generator

6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected at the same Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

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6.5.7.1 Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS

(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT. Generation Resources shall comply with the following Reactive Power requirements: an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ERCOT Transmission Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the POI. The Reactive Power requirements shall be available at all MW output levels and may be met through a combination of the Generation Resource's Unit Reactive Limit (URL), which is the generating unit's dynamic leading and lagging operating capability, and/or dynamic VAR capable devices. For Wind-powered Generation Resources (WGRs), the Reactive Power requirements shall be available at all MW output levels at or above 10% of the WGR's nameplate capacity. When a WGR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT may require a WGR to disconnect from the ERCOT System. The Reactive Power requirements of this paragraph shall apply to all Generation Resources except as otherwise provided in paragraphs (2) through (4) below.

(2) WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before November 1, 2009, must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (1) above. However, the Reactive Power requirements may be met through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices. WGRs shall comply with the Reactive Power requirements of this paragraph by no later than December 31, 2010, unless it is known by July 31, 2010, that related retrofits are required by the Voltage Ride-Through study conducted in accordance with Operation Guide Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-powered Generation Resources, in which event ERCOT may in its discretion modify the deadline for an affected WGR. ERCOT, in its sole discretion, also may grant an extension of time for other reasons.

(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the qualified renewable Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(4) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made

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prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(5) For purposes of meeting the Reactive Power requirements in paragraphs (1) and (2) above, multiple generation units including wind-powered turbines shall, at a Generation Entity's option, be treated as a single Generation Resource or WGR if the units are connected to the same transmission bus.

(6) Generation Entities may submit to ERCOT specific proposals to meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices. ERCOT may, at its sole discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall provide the submitter an explanation of its decision.

(7) A Generation Resource and TDSP may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1).

(8) Unless specifically approved by ERCOT, no unit equipment replacement or modification at a Generation Resource shall reduce the capability of the unit below the Reactive Power requirements that applied prior to the replacement/modification.

(9) Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

(10) A WGR's QSE, selected for this purpose, must provide Real Time SCADA points that communicate to ERCOT the number of Wind-powered Turbine Generators (WTGs) that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid as well as other WTG status information. WTGs of the same model and size and located behind the same generation step-up-to-transmission transformer must be aggregated together to form a WTG aggregation. The following Real Time SCADA points must be communicated to ERCOT for each WTG aggregation:

(a) The number of WTGs that are not able to communicate and whose status is unknown;

(b) The number of WTGs out of service and not available for operation; and

(c) The number of WTGs that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid.

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WGRs must comply with the requirements listed above by no later than six months after the effective date of this paragraph.

(11) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by automatically switchable static VAR capable devices.

(12) ERCOT and the TSPs shall, at a minimum, represent WGRs in the ERCOT and TSP Real Time control systems and their off-line studies to include: step-up-to-transmission transformers, substation reactive devices, and the equivalent of the WTG aggregation connected to each step-up-to-transmission transformer.

6.7.6 *Deployment of Voltage Support Service*

(1) ERCOT, or Transmission Service Providers (TSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional Megavolt-Ampere Reactive (MVAR), nor will they be requested to operate on a voltage schedule outside the URL specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

(2) ERCOT and Transmission and/or Distribution Service Providers (TDSPs) shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, step-up transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

(3) The TSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed Reactive Power capability requirements.

(4) All Generation Resources required to provide VSS shall support the transmission voltage at the POI to the ERCOT Transmission Grid, or at the transmission bus in accordance with paragraph (5) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

(5) The QSEs providing VSS shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

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Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements.

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An induction generator may elect to make a contribution in aide of construction in lieu of meeting the installed capacity VSS requirements contained herein. In order to comply with the VSS requirements under this paragraph (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to that used to collect payments for the direct assignment of interconnection Facilities under applicable Public Utility Commission of Texas (PUCT) rules. The level of payment shall reflect the cost to the TDSP of procuring, installing, operating, and maintaining any Reactive Power equipment required to replace the Reactive Power capability that otherwise would be necessary for the interconnection of the generator. In order for this paragraph (7) to be effective for VSS compliance, the TDSP shall certify to ERCOT that the induction generator has complied with these requirements.

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For Generation Resources required to provide VSS

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WGRs must also provide two other Real Time SCADA points that communicate to ERCOT the following:

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WGRs must also provide two other Real Time SCADA points that communicate to ERCOT the following:

(a) The number of wind turbines

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. WGRs must comply with these requirements by no later than six months after the effective date of this paragraph.

830PRR-14
Vestas Comments
102209

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	October 22, 2009

Submitter's Information	
Name	Henry R. Tilghman
E-mail Address	hetil@vestas.com
Company	Vestas-American Wind Technology, Inc.
Phone Number	(503) 327-7499
Cell Number	(503) 382-7846
Market Segment	N/A

Comments

Vestas Americas submits the following comments on PRR830.

If adopted as proposed, PRR830 may unnecessarily increase the costs of Wind-powered Generation Resources (WGRs) in Texas with no improvements in reliability. PRR830 appears to require a full dynamic solution to meet the reactive power requirements. Vestas would like to make it clear that hybrid systems that have the effective performance of a fully dynamic system should be allowed.

Only a small number of wind turbine manufacturers currently provide a full dynamic solution to reactive power requirements within the turbine. Other manufacturers employ a hybrid solution incorporating a combination of dynamic and switched equipment to meet the necessary reactive power requirements. These hybrid systems rely upon the inherent capability of a statcom type device to operate at multiples of their nameplate rating for several seconds. After a fully dynamic initial response, fast switched static devices come into service to return the statcom to its long term operating range. Vestas has employed this hybrid solution in over twenty (20) projects in North America as well as projects in Europe and Australia. This hybrid solution meets all reliability requirements and is the full functional equivalent of a dynamic solution using only SVC or statcoms. These hybrid systems provide excellent routine voltage control and extremely fast response to sharp changes in voltage.

Vestas estimates that the cost of installing a full dynamic solution to meet the reactive power requirements will increase its costs four fold over using the hybrid solution. These additional project costs would not be accompanied by any increase in reliability.

PRR Comments

Overall Market Benefit	Increased Reliability
Overall Market Impact	Capital cost savings
Consumer Impact	Reduced production costs

Revised Proposed Protocol Language

None at this time.

830PRR-15
Nextera Energy Resources Comments
102209

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	October 22, 2009

Submitter's Information	
Name	Todd Kimbrough
E-mail Address	todd.kimbrough@fpl.com
Company	NextEra Energy Resources
Phone Number	512.466.3190
Cell Number	512.466.3190
Market Segment	Independent Generator

Comments

NextEra Energy Resources respectfully submits these comments regarding PRR 830 and recommends the PRS reject the PRR and instead recommend approval of PRR 835, which addresses the same subject matter in a superior manner.

In the alternative, NextEra recommends PRS table PRR 830 and, as described below, refer certain issues to the appropriate stakeholder groups for resolution.

PRR 830 mandates wasteful spending and harms consumers.

The "one-size-fits-all" approach inherent in the PRR is not an efficient approach to ensuring sufficient reactive power capability exists to meet system needs. The PRR 830 approach has many deficiencies, including:

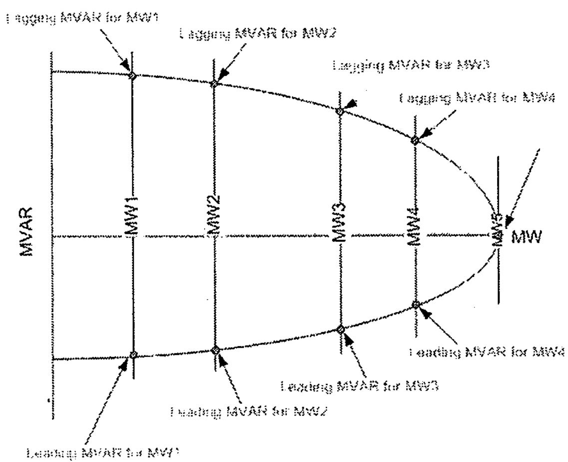
- PRR 830 adds costs to generation projects in some instances where the benefits are minimal or non-existent. These additional costs are ultimately borne by consumers through market prices.
- PRR 830 can actually create costly reliability problems during periods when generators are operating in low load conditions. These problems will require additional expensive measures by TSPs, causing consumers to unnecessarily suffer higher transmission costs – effectively paying a second time to mitigate the problems caused equipment they paid for in the first place due to the PRR 830 requirement. Moreover, this approach fails to consider how such problems will be greatly exacerbated in West Texas by the coming CREZ buildout.

PRR Comments

- PRR 830 not only fails to consider actual system needs but also ignores deliverability issues. Reactive power is a geographically sensitive product. Adding reactive power capability near West Texas wind farms does nothing to address the reactive power needs of far away load centers like Dallas or Houston.

PRR 830 ignores existing unused reactive power capability on the system.

Although arguments have been presented that a universal requirement to provide the "rectangle" is desirable to ensure that ERCOT has an abundance of reactive power capability at its disposal, PRR 830 actually leaves a tremenduos amount of existing reactive capability untapped by all the generation units currently on the system which provide more than the rectangle, as illustrated in the "D curve" example below.



If the PRR instead required all generators to simply make available whatever level of reactive power capability is inherently provided by their units, ERCOT would get an immediate increase in available reactive capability across the system without a penny of additional cost passed to consumers.

PRR 830 is antithetical to a long-held philosophy of the ERCOT market rules and directly contradicts precedent set by the ERCOT Board of Directors.

Although arguments have been presented that ERCOT reactive capability requirements have been crystal clear to all market participants since the dawn of time, NextEra observes that the number of litigants in PUCT Docket No. 36482 and the very fact ERCOT felt moved to "clarify" the requirements indicates otherwise. Since the appropriate interpretation of this section of the Protocols is under active dispute, it is inappropriate for ERCOT and/or any stakeholders to circumvent the processes now underway to resolve legacy issues. What the stakeholders can and should do is provide a clear and unambiguous standard effective from the effective date of PRR 830 going forward to draw a line in the sand which ensures future capacity installations meet the requirements necessary for system security in an efficient manner.

Moreover, PRR 830 makes exactly the same mistake which caused the ERCOT Board of Directors to overrule the recommendation of TAC, ROS, and ERCOT Staff regarding OGRR 208. In that instance, Staff and stakeholders recommended universal application of a voltage ride-through standard which would have forced a number of generators to perform extensive retrofitting of existing units. The recommendation was based on a sense that more capability would be better for the system but there was no study or evidence to support the contention that the benefit would meet or exceed the costs. The Board noted the complete lack of rational basis for the recommendation. Moreover, the Board recognized the danger of sending a signal to investors and developers that no pro forma was safe from arbitrary action ex post facto action and that all investment decisions in ERCOT should be made with the understanding that future financial and capital risk could be boundless.

The Board, therefore, made a reasonable policy decision that retroactive application of technical standards can be applied only when a body of evidence indicates such application is required to maintain system reliability. The Board amended OGRR 208 such that the new VRT standard applied only to units installed after the effective date of the rule change and directed ERCOT to perform a study to determine which specific existing units, if any, should be required to perform retrofits. NextEra recommends stakeholders amend PRR 830 in a similar manner before presenting a recommendation to the Board for approval because evidence has yet to be presented that the tens of millions of dollars required for retrofits to comply with PRR 830 will yield commensurate system reliability benefits.

PRR 830 fails to resolve ambiguity.

NextEra appreciates the effort put forth by ERCOT to clarify Section 6.5.7.1 but believes further work is need to resolve the ambiguity of existing Protocols language. In particular, the phrase, "established by ERCOT," in the first sentence of 6.5.7.1(1) should be more granularly defined or should refer to procedures set forth in the Operating Guide so that project developers and generation owners understand how and when ERCOT shall establish the Voltage Profile to be maintained. Is the profile to be established during the interconnection process? Can the profile requirement be changed one or more times at one or more points in the future? If it is changed, how much time does the generation owner have to effectuate the change? What are the criteria or standards by which ERCOT will establish the profile?

PRR 830 creates unintended consequences.

Whether the triangle, the rectangle, the D curve, or some combination of the three become the new standard for reactive power capability in ERCOT on a prospective and/or retroactive basis, NextEra agrees with Wind Coalition comments that ERCOT's proposed revision to the definition of Wind-powered Generation Resource (WGR) in Section 2 creates more problems than it solves. Although NextEra understands the convenience such a definition would achieve for ERCOT modeling purposes related to the reactive power capability issue, the ripple effect throughout the Protocols of defining WGRs as consisting of only a single turbine type would cause numerous problems for interconnection, metering, settlement, reporting, and compliance.

Furthermore, such a definition change would effectively stifle innovation and investment in technologies which are coming to the fore and which could provide effective solutions to some of the greatest challenges of variable generation technologies – namely the co-siting of solar generation facilities at wind farms or the integration of energy storage solutions at or behind the point of interconnection. ERCOT's proposed change would also effectively prohibit repowering a wind facility with new (and more technically capable) wind turbines unless the entire site were repowered at once or separate interconnections were established.

ERCOT's reactive power modeling issues can be addressed by other means, such as provision through SCADA of real time updates to Pmax, Qmax, and Qmin. NextEra provides redline language below to address this issue. Interestingly, NextEra notes that the same issue presents itself every time a CCGT unit reconfigures its gas and steam turbine combinations but ERCOT does not seem concerned with capturing those variances in reactive capability. NextEra urges ERCOT and stakeholders to spend more time on PRR 830 to comprehensively address the reactive power capability issues and provide unobtrusive, effective, and efficient solutions across all technology types.

PRR 830 should be remanded to ROS with instructions

While NextEra does not disagree with the stakeholders' decision to grant ERCOT's request for Urgent status, it is abundantly clear that PRR 830 is insufficiently vetted to move forward at this time. NextEra recommends the PRR be remanded to ROS for further deliberation with special emphasis on the following tasks:

1. Provide a study or body of evidence which indicates the sufficiency or insufficiency of the existing reactive power capability available to ERCOT and, if possible, provide some indication of likely reactive power capability needs for a reasonable range of scenarios in the future. If such a study or evidence is not available or cannot be completed in a reasonable timeframe, provide an estimated timeline to develop and complete such a study, a reasonable estimate of the cost of such a study, and a brief statement of the ROS as to why such a study would or would not be a good use of ERCOT and stakeholder resources.

2. Identify the best practice for ERCOT to model the reactive power capability of generators which use multiple turbine technologies or configurations behind the point of interconnection.

3. Determine how much existing generation unit reactive power capability is currently unavailable to ERCOT. Determine why it is unavailable. Assess how that unavailable capability compares to the capability which would be made available by retrofitting units currently providing the triangle rather than the rectangle.

4. As currently drafted, PRR 830 distinguishes between WGRs and all other forms of generation. Assess how the reactive power capability requirements of PRR 830 affect solar generation technologies, other non-wind forms of renewable generation, or other emerging technologies such as energy storage devices.

5. Describe the process by which ERCOT establishes a voltage profile in accordance with Section 6.5.7.1(1). Reference the documents or procedures which currently guide this practice. Provide a recommendation to clarify this process in PRR 830.

NextEra further suggests PRS may wish to consider asking the QMWG to respond to Question No. 2 and the RTWG to respond to Question No. 4 to ensure the appropriate subject matter experts are engaged in this important discussion.

Revised Proposed Protocol Language

See PRR 835 as filed by NextEra for alternative proposed Protocols language.

830PRR-16
PRS Recommendation Report
102209

PRS Recommendation Report

PRR Number	830	**PRR Title**	**Reactive Power Capability Requirement**
Timeline	Urgent	**Recommended Action**	Approval
Date of Decision	October 22, 2009		
Proposed Effective Date	December 1, 2009		
Priority and Rank Assigned	Not applicable.		
Protocol Section(s) Requiring Revision	2.1, Definitions 2.2, Acronyms 6.5.7, Voltage Support Service 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability 6.7.6, Deployment of Voltage Support Service		
Revision Description	This Protocol Revision Request (PRR) clarifies the Reactive Power capability requirement for all Generation Resources, including existing Wind-powered Generation Resources (WGRs) who are not able to meet the 0.95 lead/lag requirement with the Generation Resource's Unit Reactive Limit (URL). WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before November 1, 2009 may meet the Reactive Power requirements through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices.		
Reason for Revision	Clarification of Reactive Power capability requirements on a going-forward basis and path to compliance for certain WGRs that are not able to meet the 0.95 lead/lag requirement at the Point of Interconnection (POI) based on the Generation Resource's URL.		
Overall Market Benefit	Provides additional clarity to the reactive requirements for wind generation.		
Overall Market Impact	Unknown.		
Consumer Impact	None.		
Credit Impacts	To be determined.		
Relevance to Nodal Market	Yes. The Reactive Power capability requirements exist in Nodal as well.		

PRS Recommendation Report

Nodal Protocol Sections Requiring Revision	2.1, Definitions 3.15, Voltage Support 6.5.7.7, Voltage Support Service
Procedural History	➢ On 9/08/09, PRR830, a preliminary Impact Analysis, and CEO Revision Request Review were posted. ➢ On 9/10/09, PRR830 was granted Urgent status via a PRS e-mail vote. ➢ On 9/15/09, Horizon Wind Energy LLC comments were posted. ➢ On 9/17/09, PRS considered PRR830. ➢ On 9/28/09, Calpine comments were posted. ➢ On 10/7/09, Iberdrola Renewables comments were posted. ➢ On 10/8/09, a second set of Horizon Wind Energy LLC comments were posted. ➢ On 10/8/09, LCRA comments were posted. ➢ On 10/19/09, ROS comments were posted. ➢ On 10/21/09, Wind Coalition comments were posted. ➢ On 10/22/09, Vestas comments were posted. ➢ On 10/22/09, PRS again considered PRR830. ➢ On 10/22/09, NextEra Energy Resources comments were posted.
PRS Decision	On 9/17/09, PRS unanimously voted to table PRR830 for one month and to encourage ROS to provide comments on PRR830. All Market Segments were present for the vote. On 10/22/09, PRS voted to recommend approval of PRR830 as endorsed by ROS. The motion passed via roll call vote. All Market Segments were present for the vote.
Summary of PRS Discussion	On 9/17/09, there was discussion regarding the appeal currently at the Public Utility Commission of Texas (PUCT) which stemmed from an ERCOT interpretation of the current Protocols regarding Reactive Power. It was debated whether or not the proposed content of PRR830 was being addressed in the contested case. On 10/22/09, ERCOT Staff explained that PRR830 is not intended to change the philosophy of the Protocols. ERCOT Staff also provided clarification of the proposed change to the WGR definition, and noted that dynamic devices will be required going forward, but that existing WGRs can meet the requirement with static devices. There was also discussion regarding the use of the "cone" versus the "rectangle" for Reactive Power capability and that having differing requirements makes planning difficult and may pose fairness and grid stability issues. Some Market Participants expressed concerns that requirements of PRR830 would impose costs to retrofit existing units and that studies should be performed to demonstrate need.

PRS Recommendation Report

Quantitative Impacts and Benefits			
Assumptions	1		
	2		
	3		
	4		
Market Cost		Impact Area	Monetary Impact
	1		
	2		
	3		
	4		
Market Benefit		Impact Area	Monetary Impact
	1	*Clarifies the reactive requirements for wind generation.*	
	2		
	3		
	4		
Additional Qualitative Information	1		
	2		
	3		
	4		
Other Comments	1		
	2		
	3		
	4		

Sponsor	
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E-mail Address	jdumas@ercot.com
Company	ERCOT
Phone Number	(512) 248-3195
Cell Number	
Market Segment	N/A

Market Rules Staff Contact	
Name	Sandra Tindall
E-Mail Address	stindall@ercot.com
Phone Number	512-248-3867

PRS Recommendation Report

Comments Received	
Comment Author	**Comment Summary**
Horizon Wind Energy LLC 091509	Recommended that PRR830 be rejected as submitted.
Calpine 092809	Supported approval of PRR830.
Iberdrola Renewables 100709	Suggested existing Protocol language is clear. Proposed additional revisions only as an alternative to the ERCOT proposed changes.
Horizon Wind Energy LLC 100809	Opined that PRR830 is contrary to existing Protocols, and is proposed without demonstration of need. Commented that PRR830 re-defines Reactive Power capability requirements for Generation Resources interconnected with the ERCOT Transmission Grid, imposing new requirements on WGRs and requiring retrofits to the majority of operating WGRs.
LCRA 100809	Proposed clarifying language which would allow Resources to start at lower voltage levels. Also proposed changes related to establishing Reactive Power requirements.
ROS 101909	Endorsed PRR830 as submitted.
Wind Coalition 102109	Provided alternative language to the definition of a WGR and the subsequent changes that are intended to improve the modeling of wind-powered generation reactive capabilities.
Vestas 102209	Stated that if PRR830 is adopted as proposed, it may unnecessarily increase the costs of WGRs in Texas with no improvements in reliability. Suggested that hybrid systems that have the effective performance of a fully dynamic system should be allowed.
NextEra Energy Resources102209	Recommended that PRS reject PRR830 and instead recommended that PRR835 be approved.

Proposed Protocol Language Revision

2.1 Definitions

Point of Interconnection (POI)
The location(s) where a Generation Entity's interconnection Facilities connects to the Transmission Facilities as reflected in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and a Transmission and/or Distribution Service Provider (TDSP).

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Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind. Wind turbines may be aggregated together to form a WGR if each turbine is the same model and size and located behind the same Generation Step Up Transformer (GSU).

2.2 Acronyms

POI	Point of Interconnection
GSU	Generation Step Up Transformer
SGIA	Standard Generation Interconnection Agreement

6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected at the same Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

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6.5.7.1 Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS

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(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT. Generation Resources shall comply with the following Reactive Power requirements: an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ERCOT Transmission Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the POI. The Reactive Power requirements shall be available at all MW output levels and may be met through a combination of the Generation Resource's Unit Reactive Limit (URL), which is the generating unit's dynamic leading and lagging operating capability, and/or dynamic VAR capable devices. For Wind-powered Generation Resources (WGRs), the Reactive Power requirements

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shall be available at all MW output levels at or above 10% of the WGR's nameplate capacity. When a WGR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT may require a WGR to disconnect from the ERCOT System. The Reactive Power requirements of this paragraph shall apply to all Generation Resources except as otherwise provided in paragraphs (2) through (4) below.

(2) WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before November 1, 2009, must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (1) above. However, the Reactive Power requirements may be met through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices. WGRs shall comply with the Reactive Power requirements of this paragraph by no later than December 31, 2010, unless it is known by July 31, 2010, that related retrofits are required by the Voltage Ride-Through study conducted in accordance with Operation Guide Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-powered Generation Resources, in which event ERCOT may in its discretion modify the deadline for an affected WGR. ERCOT, in its sole discretion, also may grant an extension of time for other reasons.

(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the qualified renewable Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(4) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(5) For purposes of meeting the Reactive Power requirements in paragraphs (1) and (2) above, multiple generation units including wind turbines shall, at a Generation Entity's option, be treated as a single Generation Resource or WGR if the units are connected to the same transmission bus.

(6) Generation Entities may submit to ERCOT specific proposals to meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices. ERCOT may, at its sole

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discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall provide the submitter an explanation of its decision.

(7) A Generation Resource and TDSP may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1).

(8) Unless specifically approved by ERCOT, no unit equipment replacement or modification at a Generation Resource shall reduce the capability of the unit below the Reactive Power requirements that applied prior to the replacement/modification.

(9) Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

(10) WGRs must provide a Real Time SCADA point that communicates to ERCOT the number of wind turbines that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid. WGRs must also provide two other Real Time SCADA points that communicate to ERCOT the following:

(a) The number of wind turbines that are not able to communicate and whose status is unknown; and

(b) The number of wind turbines out of service and not available for operation. WGRs must comply with these requirements by no later than six months after the effective date of this paragraph.

(11) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by automatically switchable static VAR capable devices.

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6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or Transmission Service Providers (TSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional Megavolt Ampere Reactive (MVAR), nor will they be requested to operate on a voltage schedule outside the URL specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

(2) ERCOT and Transmission and/or Distribution Service Providers (TDSPs) shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For

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Generation Resources required to provide VSS, step-up transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

(3) The TSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed Reactive Power capability requirements.

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(4) All Generation Resources required to provide VSS shall support the transmission voltage at the POI to the ERCOT Transmission Grid, or at the transmission bus in accordance with paragraph (5) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

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(5) The QSEs providing VSS shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

Deleted: (5) At all times a Generation Resource unit required to provide VSS is On-line, the URL must be available for utilization at the generating unit's continuous rated active power output, and Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any Reactive Power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP.¶

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830PRR-17
PRS Roll Call Vote
102209

Version 2.1

Tally Votes

	TALLY TOTAL		
Voting Struct	Motion Passes		Total Abstentio
COPS/PRS			
Segment Vote:	5.889	1.111	5

Issue: To approve PRR830 as endorsed by ROS.

Date:10/22/09

Prepared by:

Clear | Record Vote

Sector / Entity	Representative	Present	Yes	No	Abstain
Coop					
Lower Colorado River Authority	Sandy Morris	Y	0.500		
Brazos Electric Power Cooperative, Inc.	Billy Helpert	Y	0.500		
	Segment Vote:	**2**	**1.000**	**0.000**	**0**
Municipal					
CPS Energy	David Detelich	Y	0.333		
Garland Power & Light	Dan Bailey	Y	0.333		
Austin Energy	Adrianne Brandt	y	0.333		
	Segment Vote:	**3**	**1.000**	**0.000**	**0**
Investor Owned Utilities					
Luminant	Henry Durrwachter	Y			a
CenterPoint Energy	DeAnn Walker	Y	1.000		
AEP Energy Partners	Jennifer Troutman	y			a
	Segment Vote:	**3**	**1.000**	**0.000**	**2**
Independent Generator					
Calpine	Randy Jones	Y	0.111		
NRG Texas	Adrian Pieniazek	Y			a
NextEra Energy Resources	Mark Bruce	y		0.111	
RES Americas	Matthew Burt	y		0.111	
Sweetwater Wind 2	Lane Robinson	y		0.111	
AES Corporation	Walter Reid	y		0.111	
Invenergy	Mark Soutter	y		0.111	
Horizon Wind Energy	Mike Grimes	y		0.111	
BP Alternative Energy	Carla Harrington	y		0.111	
E.ON C&R	Kevin Gresham	y			a
PSEG Texas	Marguerite Wagner	y	0.111		
	Segment Vote:	**11**	**0.222**	**0.778**	**2**
Consumers **Divide Subsegments?** y	**Consumer Vote Total**	1			
Occidental Chemical Corporation (Indu)	Scott Wardle	Y	0.500		
Office of Public Utility Counsel (Resi)	Gary Torrent	Y	0.500		
	Segment Vote:	**2**	**1.000**	**0.000**	**0**
Independent REP					
StarTex	Steve Madden	Y	0.500		
Stream Energy	Pam Carr	Y	0.500		
	Segment Vote:	**2**	**1.000**	**0.000**	**0**
Independent Power Marketers					
Sempra	Seth Cochran	Y			a
Exelon	Kristy Ashley	Y	0.333		
Morgan Stanley	Clayton Greer	y	0.333		
Iberdrola Renewables	Thresa Allen	y		0.333	
	Segment Vote:	**4**	**0.667**	**0.333**	**1**
All Sectors Voting Totals					**Total**
	Segment Vote:	**27**	**5.889**	**1.111**	**5**

830PRR-18
Impact Analysis
102609

ERCOT Impact Analysis Report

PRR Number	830	PRR Title	Reactive Power Capability Requirement
Impact Analysis Date		October 26, 2009	
Cost/Budgetary Impact		None.	
Estimated Project Time Requirements* *Unless otherwise indicated, project time requirements begin upon project initiation.		No project required. This Protocol Revision Request (PRR) can take effect upon ERCOT Board approval.	
ERCOT Staffing Impacts (across all areas)		No additional full time equivalents (FTEs) needed.	
ERCOT Computer System Impacts		Minor changes to ERCOT databases to incorporate additional SCADA points, which will be managed under the O&M budgets of affected departments.	
ERCOT Business Function Impacts		Existing business functions can accommodate this revision request.	
Grid Operations & Practices Impacts		No impact to ERCOT grid operations or practices.	

Alternatives for a More Efficient Implementation *(include explanation of impacts)*
None.

Evaluation of Interim Solutions *(e.g., manual workarounds)*
None.

Feasibility of Implementation
Impact on Resource Availability: None **Impact on Other Projects:** None

Comments
None.

830PRR-19
Calpine Comments
102809

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	10/28/2009

Submitter's Information	
Name	Randy Jones
E-mail Address	rajones@calpine.com
Company	Calpine
Phone Number	713.830.8846
Cell Number	832.385.3322
Market Segment	Independent Generators

Comments

NextEra's comments of October 22, 2009 propose that PRR830, Reactive Power Capability Requirement, be remanded to ROS for further study. Such a move would be inadvisable and would improperly redirect the stakeholders' focus away from the real issue of Reactive Power and voltage support – should stakeholders relieve Wind-powered Generation Resources (WGRs) of half of their obligation to support voltage and the reliability of the network. If the answer to that is "yes", then should the obligation simply be shifted to other technologies, or to the Loads in Transmission Cost of Service (TCOS), or both?

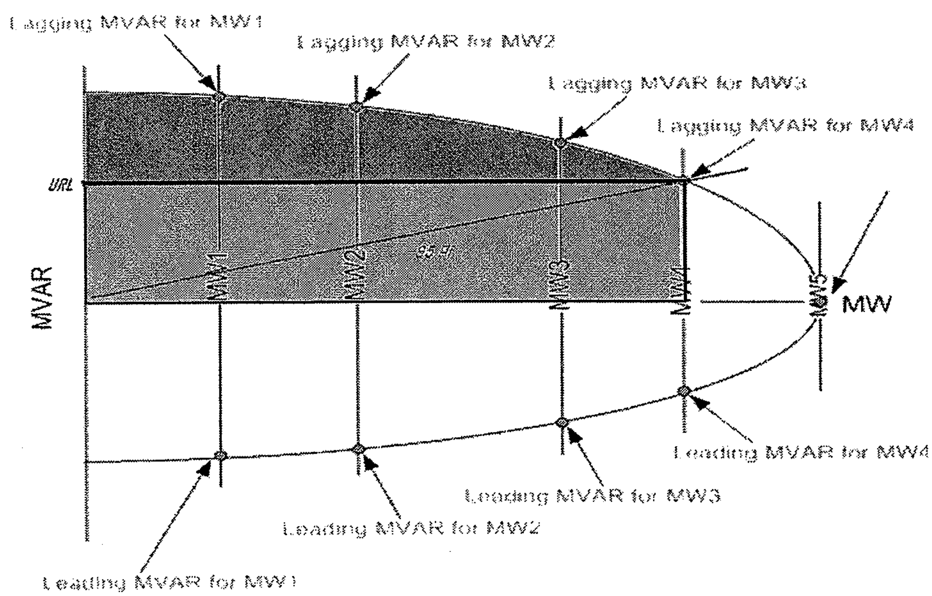
NextEra, obviously without consulting the Operating Guides, asserts that there are vast amounts of untapped Reactive Power capability on other units that cannot be accessed by the ISO and wants ROS to run off and find out where it is and how it's been made unavailable. They also go on to propose that PRR830 should mandate the availability of this reactive to the system. Operating Guides Section 2.10.4.2, Unit Dispatch Beyond the Unit Reactive Limit, (provided below), makes it clear that resources must respond to voltage Dispatch Instructions; including exceeding their Unit Reactive Limit (URL) (please note that **URL** is used in the singular, clearly indicating that it is the same value across the entire range of real power output).

2.10.4.2 Unit Dispatch Beyond the Unit Reactive Limit

Each generator shall respond to ERCOT instructed voltage control, including exceeding ***its URL****, as specified in Protocol Section 6.8.4, Capacity Payments for Voltage Support Provided to ERCOT. For multi-generator busses, ERCOT shall not instruct any single* *generator to operate beyond **<u>its URL</u>** until all generators on line and interconnected at the same transmission bus have been instructed to their respective URLs.*

Note in the diagram below the green range of reactive capability above the URL line that the ISO can dispatch if conditions warrant. We chose MW4 as the Net Demonstrated Capability to use in determining the resource's URL, since MW5 would yield a URL of 0 MVars and operation at the knee of the curve is never advisable under normal conditions for machine stability reasons. Please also note that the language sets as a goal the equalizing of reactive Dispatch of units connected to a common bus in an effort to ensure that all units are providing their fair share of the obligation to supply voltage support, an unpaid/community service.

The statement, "*If the PRR instead required all generators to simply make available whatever level of reactive power capability is inherently provided by their units....*" is an interesting one to be sure. Although reactive production, from a fuel standpoint, is relatively inexpensive, the long term wear and tear and initial capital costs are the components typically cited in Federal Energy Regulatory Commission (FERC) approved reactive tariffs in other jurisdictions where reactive is a paid service. NextEra's proposed solution would have them placing a free call option on other resource owners' capital and long term exciter and generator maintenance costs as a way of shifting wind's reactive obligation to the rest of the system. Even though this approach is entirely unacceptable, it is noteworthy that in it NextEra effectively admits that reactive obligations are not being met and searches for another party to carry that responsibility.



<u>Calpine strongly supports ERCOT's efforts to maintain system reliability and the fairness found in PRR830.</u> We ask that TAC members look to the overwhelming endorsement of PRR830 by ROS (**73.3% FOR and 26.7% AGAINST; of 5 NO votes, 4 came from wind-owning entities**), the subcommittee tasked with reliability matters, and significantly lopsided segment vote of PRS (**5.75 FOR, 1.25 AGAINST**), the subcommittee that listened to both reliability and commercial points, in passing the PRR on October 22, 2009.

Revised Proposed Protocol Language

None proposed.

830PRR-20
Oncor Comments
102909

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	October 29, 2009

Submitter's Information	
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Cell Number	
Market Segment	Investor Owned Utility (IOU)

Comments

For the bulk power system to operate reliably, it must be designed and operated based on the following principles:

- Total generation (MW & MVAR) at any moment must be kept equal to total electricity consumption and losses on the system
- Electricity is allowed to flow through the transmission system in accordance with physical laws and cannot be directed to flow through specific lines
- System must be designed with reserve capacity in generation (MW & MVAR) and transmission to allow for uninterrupted service when contingencies occur

Voltage, a pressure-like quantity, is a measure of the electromotive force necessary to maintain a flow of electricity on a transmission line. Voltage fluctuations can occur due to variations in electricity demand, lack of reactive reserve and to failures on transmission equipment. Constraints on the maximum voltage levels are set by the design of the transmission line and station equipment. If the maximum is exceeded, short circuits (faults), radio interference, and noise may occur. Also, transformers and other equipment at stations and/or customer facilities may be damaged or destroyed. Minimum voltage constraints also exist based on the power requirements of the customers and lack of reactive reserve. Low voltages cause inadequate operation of equipment and may damage motors.

Voltage on a transmission line tends to "drop" from the sending end to the receiving end and varies based upon the flow. The voltage drop along the AC line is almost directly proportional to Reactive Power flows and line reactance (impedance). The line reactance increases with the length of the line. Capacitors and inductive reactors are installed, as needed, on lines and in stations to, in part; control the amount of voltage drop or rise. This is important because voltage levels and current levels determine the power that can be delivered to the customers.

A variety of Reactive Power (MVAR) producing equipment exists. They can generally be broken down into two categories; "Dynamic Resources" and "Static Resources". The total production of Reactive Power must equal Customer demand plus losses under normal, fault and contingency conditions.

Small MVAR production shortages will result in degradation of grid voltage, while larger MVAR production shortages lead to severe low voltage or collapse. Over production MVAR results in high voltage with possible long term damage to grid facilities, generation equipment and customer facilities. Reactive Power must be constantly produced/absorbed locally and cannot be transported over long distances. Reactive energy (MVAR) cannot be transmitted as far as real energy (MW). This is primarily due to the bulk electric transmission line impedances which have a naturally large X to R ratio usually in the range of 5 to 25.

High voltage transmission lines are a local source of shunt reactive energy (line charging). This local reactive energy source is similar to a fixed static capacitor connected to each end of the line. However, reactive MVAR losses on heavily loaded transmission lines often exceed the local static reactive energy produced by line charging. Large X to R ratios produces significant difference in MW losses compared to MVAR losses. Due to this X to R ratio MVAR losses are typically 5 to 25 times higher than MW losses and are constantly varying.

Generators, Static VAR Compensators (SVCs), static compensators (STATCOMs), other Flexible AC Transmission Systems (FACTS) and synchronous condensers provide dynamic Reactive Power with various time responses to quickly changing system conditions.

Under low voltage conditions, static capacitors used in stations (and line charging) do not produce maximum Reactive Power as reliably as dynamic self excited power equipment because capacitor reactive power output depends on substation voltage. Capacitor Reactive Power output changes in proportion to the square of voltage magnitude. For example if substation voltage declines from 100% to 90% of nominal voltage, static Reactive Power output declines from 100% of capability to 81%. Low voltage also increases MVAR needed by motor loads further degrading the voltage.

Dynamic reactive resources are used to adapt to rapidly changing conditions on the transmission system, such as faults, sudden loss of generators or Transmission Facilities. In contrast switched static devices are typically used to adapt to slowly changing system conditions such as daily and seasonal Load cycles and changes to scheduled transactions.

PRR Comments

Static capacitor resources have lower capital cost than dynamic devices, and from a systems point of view, static capacitors are used to provide normal or intact-system voltage support. Locating static capacitors and dynamic reactive devices near to reactive load/losses, increases their effectiveness. Dynamic reactive resources are used to adapt to rapidly changing conditions on the transmission system, such as sudden loss of generators, faults or transmission facilities.

An appropriate combination of both static and dynamic resources is needed to ensure reliable operation of the transmission system under normal and changing conditions.

ROS, the subcommittee tasked with reliability matters, took a significant amount of time presenting the issues and ROS endorsed the PRR.

Oncor Electric Delivery Company LLC supports ERCOT's efforts to maintain system reliability with PRR830.

Revised Proposed Protocol Language

None proposed

830PRR-21
ERCOT Comments
102909

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	October 29, 2009

Submitter's Information	
Name	John Dumas
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Phone Number	(512) 248-3195
Cell Number	
Market Segment	N/A

Comments

ERCOT is providing these comments to support the need for the following Wind-powered Generation Resource (WGR) definition change. These comments also propose additional language changes which include revising the effective date to post-Protocol Revision Request (PRR) approval for when WGRs must have commenced operation or signed a Standard Generation Interconnection Agreement (SGIA) for purposes of meeting their Reactive Power requirements to December 1, 2009 in both the Revision Description and in paragraph (2) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, and providing administrative edits and clarification to proposed language revisions.

Revision Description	This Protocol Revision Request (PRR) clarifies the Reactive Power capability requirement for all Generation Resources, including existing Wind-powered Generation Resources (WGRs) who are not able to meet the 0.95 lead/lag requirement with the Generation Resource's Unit Reactive Limit (URL). WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before December 1, 2009 may meet the Reactive Power requirements through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices.

Deleted: November

PRR Comments

Proposed WGR definition in PRR830, Reactive Power Capability Requirement:

Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind. Wind turbines may be aggregated together to form a WGR if each turbine is the same model and size and located behind the same Generator Step Up (GSU) transformer.

Deleted: Generation
Deleted: T
Deleted: (GSU)
Inserted: T

WGRs currently aggregate turbines together in order to form a WGR. The WGR has the same telemetry requirements and Resource Plan scheduling requirements as conventional generation. These requirements do not change with PRR830. The proposed definition change may require some wind owners to form multiple WGRs instead of allowing only one depending on their equipment. It is common that a power plant with multiple units must represent each unit individually in their Resource Plan and provide individual unit telemetry. This telemetry is commonly provided from Remote Terminal Units (RTUs) at the site and may come from transducers or control system readings that are measured independent of the ERCOT-Polled Settlement (EPS) meter(s) at the location.

The definition change is needed in order to ensure that ERCOT has an accurate representation of each WGR's reactive capability. For example, a WGR under the current language may consist of 50 turbines from multiple vendors. If these turbines have very different Unit Reactive Limit (URL) capabilities, then it would be very difficult to develop a URL that represents this WGR accurately. If a number of these turbines were down for maintenance, it would be impossible to have an accurate representation of the WGR reactive capability.

AWS Truewind also provides a WGR forecast to the QSE based upon the number of turbines in the WGR and their power curves. If these turbines have different characteristics and some are down for maintenance, the assumption of the WGR forecasted output may be affected. ERCOT is working with AWS Truewind and QSEs toward requiring WGRs to enter Outage information in a tool provided by AWS Truewind. This tool only requires a de-rated capacity number for the WGR. It does not take Outage information of individual turbines.

ERCOT has performed a search of the Protocols to identify WGR references. This information is included below with ERCOT comments in blue. It is clear from the references that WGR and the definition change does not affect any of the requirements placed on WGRs. The change may require Qualified Scheduling Entities (QSEs) to update their Resource Plan, Resource Asset Registration Form (RARF) and telemetry to include additional WGRs instead of one. This is a similar approach to many power plants that have multiple units.

References to WGR in the Protocols:

Section 2: Definitions and Acronyms

Forced Derate
For a Generation Resource, a failure that requires immediate removal (either through controlled or un-controlled actions) of a portion of the capacity of the Resource from service through automated or manual means. The portion of the Resource removed from service must exceed two-percent (2%) of its prior High Sustainable Limit (HSL) for Generation Resources larger than 500 MW and ten-percent (10%) of its prior HSL for Generation Resources smaller than 500 MW. For Qualified Scheduling Entities (QSEs) representing Wind-powered Generation Resources (WGRs), the loss of a portion of the capacity shall be due to the unavailability of a portion of the equipment and shall not include capacity changes due to changes in the weather. For QSEs representing WGRs, the percentage calculation will be determined using the generating unit's maximum net power.

Short-Term Wind Power Forecast (STWPF)
An ERCOT produced, hourly, fifty percent (50%) probability of exceedence forecast of the generation in MWh per hour from each WGR that could be generated from all available units of that Resource.

Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind.

Wind-powered Generation Resource Production Potential (WGRPP)
The generation in MWh per hour from a WGR that could be generated from all available units of that Resource allocated from the eighty-percent (80%) probability of exceedance of the Total ERCOT Wind Power Forecast.

Section 4: Scheduling

4.4.15 QSE Resource Plans

ERCOT shall produce renewable production potential forecasts for Wind-powered Generation Resources (WGRs) to be used as the planned operating level in the Resource Plan during Replacement Reserve Service (RPRS) procurements. The WGR Production Potential (WGRPP) is an hourly eighty-percent (80%) probability of exceedance forecast of energy production for each WGR. ERCOT shall use a probabilistic Total ERCOT Wind Power Forecast (TEWPF) and select the forecast that the actual total ERCOT WGR production is expected to exceed eighty-percent (80%) of the time (eighty-percent (80%) probability of exceedance forecast). To produce the WGRPP, ERCOT will allocate the TEWPF eighty-percent (80%) probability of exceedance forecast to each WGR such that the sum of the individual WGRPP forecasts equal the TEWPF forecast. ERCOT shall produce these forecasts using information provided by WGRs to their QSEs including meteorological information or models, WGR power production curves and Supervisory Control and Data Acquisition (SCADA). ERCOT shall provide forecasts for each WGR to the QSEs representing WGRs and shall deliver the forecasts before RPRS procurements to allow the QSEs to update the WGR Resource Plans. QSEs shall use the ERCOT-provided forecasts for

WGRs as the planned operating level for the 1600 Resource Plan and prior to running an RPRS market in the Adjustment Period. The QSE may submit a lower operating level than the WGRPP forecast in the WGR Resource Plan if the WGR has communicated that it will be unavailable or operating at a reduced capability during an Operating Period which the forecast did not anticipate. QSEs representing only WGRs shall update their Resource Plans and schedules to reflect the expected wind-powered generation production after the close of the RPRS market. The energy schedules submitted by QSEs representing only WGRs should correspond with the Resource Plan scheduled energy output in order for Real Time balancing and the operator entered offset to perform properly. During Settlement Intervals in which QSEs representing only WGRs are using a Resource Plan modified due to insertion of the eighty-percent (80%) probability of exceedance forecast, ERCOT shall use the most recent available Resource Plan value prior to the ERCOT instruction to insert the eighty-percent (80%) probability of exceedance forecast.

⇨ If an aggregated wind farm consists of multiple types of wind turbines, then it will be difficult to apply the correct WGR power production curves for the wind forecast without knowing the unavailability of each type of turbines.

4.5.1 Receipt of Adjustment Period Schedule Changes

During the Adjustment Period (AP), Qualified Scheduling Entities (QSEs) that are not Wind-powered Generation Resource (WGR)-only QSEs may submit or change their energy schedules, and Ancillary Service (AS) schedules. WGR-only QSEs shall update their schedules every hour to correspond with their updated Resource Plans. Also during the Adjustment Period, QSEs may submit, change, or remove, Balancing Energy bids, or Replacement Reserve Service (RPRS) bids. Although a QSE is permitted to change an Ancillary Service schedule, it is not allowed to change the quantity of Ancillary Services awarded through the ERCOT procurement process. The QSE also may not change the amount of Self-Arranged AS from Day Ahead; however, the Resources supplying the Self-Arranged AS may be altered. If ERCOT calls on additional AS in the AP, the allocated portion of their additional AS may be Self-Arranged.

4.5.10 Updated Resource Plans

QSEs shall update their Resource Plans to ERCOT to reflect Resource status changes. QSEs representing only WGRs shall update their Resource Plans each hour using their best forecast of WGR output as specified in Section 4.5.12, Scheduling Requirements for a WGR-only QSE.

4.5.12 Scheduling Requirements for a WGR-only QSE

A WGR-only QSE shall update each WGR's Resource Plans and schedules each hour using their best forecast or the Short-Term Wind Power Forecast (STWPF) provided by ERCOT except as required by Section 4.4.15, QSE Resource Plans. The updated Resource Plan shall not change or update the very first hour of the Operating Period immediately following the time of the update. ERCOT may compare the actual average hourly WGR generation with the forecasted output for the Operating Hour of the Operating Period immediately following the time when the Resource Plan was updated. For this calculation, ERCOT shall use the last STWPF forecast that was available before the close of the Adjustment Period for the calculation of each hourly forecast error. A forecast error percentage shall be calculated using the WGR's maximum rated output as the base for each hour that the WGR does not have a unit specific curtailment. If the WGR-only QSE has received a Balancing Energy Service Down instruction, then all WGRs in the portfolio will be excluded from the error percentage calculation for that hour. If, for two (2) consecutive months, the WGR's monthly root mean square error of the forecasts for the hour specified above is greater than the monthly root mean square error for the STWPF for that same hour, the QSE will be required to use the STWPF adjusted for turbine outages when updating the Resource Plan, unless at some later date ERCOT approves the use of an alternative ERCOT-produced forecast. A WGR-only QSE may resume using its own forecast to update Resource Plans and schedules if for two (2) consecutive months the WGR's monthly root mean square error of the forecasts for the hour is less than the monthly root mean square error for the STWPF for that same hour.

4.10.4 Resource Low Sustainable Limit as a Percent of High Sustainable Limit Measure

The "Resource LSL as a percent of HSL Measure" compares the range between the Low Sustainable Limit (LSL) and High Sustainable Limit (HSL) submitted in the Resource Plan using the last Resource Plan submitted by the QSE before the start of or during the Operating Hour but after the end of the Adjustment Period. Only 15-minute intervals when the Resource Plan HSL of a Resource is greater than zero (0) MW and the Resource Plan status for the same Resource is On-line are included in the calculation of this measure. ERCOT-approved Aggregated Units are treated as single units for the purposes of calculating the score for this measure. LaaRs, Generation Resources undergoing required testing, and Generation Resources with a Resource Category Generic Fuel Cost of "Renewable" (excluding Wind-powered Generation Resources (WGRs)) or "Hydro" pursuant to item (1) of Section 6.8.2.1, Resource Category Generic Costs, are excluded from this measure.

To determine whether an Occurrence is recorded, the Resource Plan HSL is multiplied by the percentage corresponding to the Resource category as specified in item (1) of Section 6.8.2.1, for a particular Resource. The Resource Plan LSL should not exceed the percentage of the Resource Plan HSL in the table below for a given Generation Resource; such an exceedance shall be recorded as an Occurrence. The Resource category for each Resource is based on the Resource category designated by the Resource Entity for the Resource.

Resource Category Generic Fuel Cost	LSL Percent of HSL
Qualifying Facilities	As approved by ERCOT
Nuclear	70
Hydro	N/A
Coal and Lignite	60
Combined Cycle greater than 90 MW	85
Combined Cycle less than or equal to 90 MW	85
Gas Steam Supercritical Boiler	40
Gas Steam Reheat Boiler	40
Gas Steam Non-reheat or boiler without air-preheater	40
Simple Cycle greater than 90 MW	90
Simple Cycle less than or equal to 90 MW	90
Diesel (and all other diesel or gas-fired Resources)	90
Renewable (excluding WGR and Hydro renewable Resources)	N/A
WGR	As described in Section 4.10.4.1, LSL Requirement for WGRs
Block Load Transfer	N/A

If the Resource Plan LSL is greater than the resulting value, then an Occurrence is recorded for that Resource for that interval. Only one (1) Occurrence can be recorded per Resource per interval. To determine the QSE Measure Score for the Resource LSL as a percent of HSL measure, Occurrences are summed for all Resources for every interval in a given month, and divided by the total number of entries submitted in the Resource Plan by a QSE for all Resources where the HSL is greater than zero (0) MW and the Resource Plan Status is On-line for every interval in that month.

Generation Resources may request (with appropriate supporting documentation) an alternate percentage, subject to approval by ERCOT.

QSEs may request, with appropriate supporting documentation, an exclusion from this measure for any Generation Resource the QSE represents, subject to approval by ERCOT, where the LSL was increased or the HSL was decreased due to limiting technology or physical and/or mechanical issues with the Generation Resource for which the exclusion is being requested.

4.10.4.1 LSL Requirement for WGRs

For WGRs, the LSL for the "Resource LSL as a percent of HSL Measure" shall be ten-percent (10%) of the name plate rating, as registered with ERCOT. WGRs with in-service dates before January 1, 2003 are excluded from this measure.

4.10.5 Day Ahead Zonal Schedule Measure

The "Day Ahead Zonal Schedule Measure" compares each QSE's zonal energy schedule to the QSE's aggregated planned operating level for that Congestion Zone at the time a Day Ahead Schedule validation, as described in Section 4.7, Validation and Correction of Schedule Data, is run and approved. The QSE's zonal energy schedule and the aggregated planned operating level for that Congestion Zone for all twenty-four (24) hours of the next day are recorded at the time of the Day Ahead Schedule validation. The QSE's zonal energy schedules for each fifteen (15)-minute interval in an hour are averaged over the entire hour to create the QSE's average zonal energy schedule. The planned operating level for all Resources in a Congestion Zone are aggregated by QSE for each hour to create the QSE's aggregated planned operating level. If multiple Day Ahead Schedule validations are run on a particular day, only the first approved Day Ahead Schedule validation is used. Only hours when the zonal energy schedule is greater than zero (0) MW are considered in this measure.

An Occurrence is recorded for a Congestion Zone for a given hour if the QSE's zonal energy schedule and the aggregated planned operating level for that Congestion Zone differ by the greater of two percent (2%) of the zonal energy schedule or one (1) MW. Only one (1) Occurrence can be recorded per Congestion Zone per hour per QSE. To determine the QSE Measure Score for the Day Ahead Zonal Schedule Measure, Occurrences are summed for all Congestion Zones for every hour in a given month, and divided by the number of Congestion Zones multiplied by the total number of hours in that month where the QSE's zonal energy schedule in a Congestion Zone for a particular hour is greater than zero (0) MW.

This metric does not apply to WGR QSEs who submit ERCOT provided Resource Plans in compliance with Section 4.4.15, QSE Resource Plans.

[PRR800: Replace Section 4.10.5 above with the following upon system implementation.]

4.10.5 Day Ahead Schedule Measure

The "Day Ahead Schedule Measure" compares each QSE's energy schedule to the QSE's aggregated HSLs at the time a Day Ahead schedule validation, as described in Section 4.7, Validation and Correction of Schedule Data, is run and approved. The Resource Plan HSL is aggregated to include all On-line units, hydro units that have been tested hydro Responsive Reserve capability when synchronous condenser fast response mode, and active LaaRs for each QSE. The QSE's energy schedule and the aggregated HSLs for all twenty-four (24) hours of the next day are recorded at the time of the Day Ahead schedule validation. The highest value interval out of the four (4) fifteen (15)-minute Settlement Intervals in an Operating Hour is selected to represent the QSE's energy schedule. The HSLs for all Resources are aggregated by QSE for each Operating Hour to create the QSE's aggregated HSLs. If multiple Day Ahead schedule validations are run on a particular Operating Day, only the first approved Day Ahead schedule validation is used. Only Operating Hours when the energy schedule is greater than zero (0) MW are considered in this measure.

An Occurrence is recorded for a given Operating Hour if the QSE's energy schedule plus scheduled Ancillary Services are greater than the aggregated HSLs. The scheduled Ancillary Services include Regulation Service Up (RGSU) and response reserve schedules. Only one (1) Occurrence can be recorded per Operating Hour per QSE. To determine the QSE Measure Score for the Day Ahead Zonal Schedule Measure, Occurrences are summed for every Operating Hour in a given month, and divided by the total number of Operating Hours in that month where the QSE's energy schedule for a particular Operating Hour is greater than zero (0) MW.

4.10.6 Adjustment Period Zonal Schedule Measure

The "Adjustment Period Zonal Schedule Measure" compares each QSE's zonal energy schedule to the aggregated planned operating level for that Congestion Zone before the start of the Operating Hour. Each QSE's zonal energy schedule used to calculate this measure is taken at the end of the Adjustment Period. The last Resource Plan submitted before the start of the Operating Hour, but after the end of the Adjustment Period is used. The QSE's zonal energy schedules for each fifteen (15) minute interval in an hour are averaged over the entire hour to create the QSE's average zonal energy schedule. The planned operating level for all Resources in a Congestion Zone are aggregated by QSE for each hour to create the QSE's aggregated planned operating level. Only hours when the zonal energy schedule is greater than zero (0) MW are considered in this measure.

An Occurrence is recorded for a Congestion Zone for a given hour if the QSE's zonal energy schedule and the aggregated planned operating level for that Congestion Zone differ by the greater of two-percent (2%) of the zonal energy schedule or one (1) MW. Only one (1) Occurrence can be recorded per Congestion Zone per hour per QSE. To determine the QSE Measure Score for the Adjustment Period Zonal Schedule Measure, Occurrences are summed for all Congestion Zones for every hour in a given month, and divided by the number of Congestion Zones multiplied by the total number of hours in that month when the QSE's zonal energy schedule in a Congestion Zone for a particular hour is greater than zero (0) MW.

Any hour where a QSE that is not a WGR-only QSE updated its Resource Plan before the start of or during the Operating Hour, but after the end of the Adjustment Period and failed to pass this measure for that interval, will be excluded in the calculation of this measure. Any hour where a WGR-only QSE updated its Resource Plan for a Resource status change only and not changes in output due to changes in wind speed before the start of or during the Operating Hour, but after the end of the Adjustment Period, and failed to pass this measure for that interval will be excluded in the calculation of this measure.

Section 5: Dispatch

5.5.1 Changes in Resource Status

The Qualified Scheduling Entity (QSE) will notify ERCOT of an unplanned change in Resource status as soon as practicable following the change. The QSE representing the Resource will report any changes in Resource status to ERCOT in the Resource Plan by the beginning of the next hour following the change in status.

(1) When the operating mode of a Generation Resource required to provide Voltage Support Service (VSS) Automatic Voltage Regulator (AVR) or Power System Stabilizer (PSS) is changed while the unit is operating, the QSE shall promptly inform ERCOT. The QSE shall also supply AVR or PSS status logs to ERCOT upon request.

(2) Any short-term inability of a Generation Resource required to provide VSS to meet its reactive capability requirements shall be immediately reported to ERCOT and the Transmission Service Provider (TSP).

(3) A change in output of a Wind-powered Generation Resource (WGR) due to varying wind speed is not a Resource status change.

Section 6: Ancillary Services

6.5.1.1 Requirement for Operating Period Data for System Reliability and Ancillary Service Provision

Operating Period data will be used by ERCOT to monitor the reliability of the ERCOT System in Real Time, monitor compliance with Ancillary Service Obligations, perform historical analysis, and predict the short-term reliability of the ERCOT System using network analysis software. Each Transmission and/or Distribution Service Provider (TDSP), at its own expense, may obtain such Operating Period data from ERCOT or from Qualified Scheduling Entities (QSEs).

(1) A QSE representing a Generation Entity that has Generation Resources connected to a TDSP shall provide the following Real Time data to ERCOT for each individual generating unit at a Generation Resource plant location and ERCOT will make the data available to the Generation Resource's host TDSP (at TDSP expense):

(a) Gross and net real power, or

Gross real power at the generator terminal and unit auxiliary Load real power, or

Net real power at the ERCOT Polled Settlement (EPS) Meter and unit auxiliary Load real power.

(b) Gross reactive power at the generator terminal

(c) Status of switching devices in the plant switchyard not monitored by the TDSP affecting flows on the ERCOT System;

(d) Frequency Bias of Portfolio Generation Resources under QSE operation;

(e) Any data mutually agreed by ERCOT and the QSE to adequately manage system reliability and monitor Ancillary Service Obligations;

(f) Generator breaker status;

(g) High Operating Limit (HOL); and

(h) Low Operating Limit (LOL).

[PRR590: Add items (i) and (j) upon system implementation:]

(i) Automatic Generation Control (AGC) status; and

(j) Ramp rate.

[PRR307: Revise Section 6.5.1.1(1) and 6.5.1.1(1)(f) as follows when system change implemented.]

(1) A QSE representing a Generation Entity or a Competitive Retailer that has Resources connected to a TDSP shall provide the following Real Time data to ERCOT for each individual generating unit or Load acting as a Resource (LaaR) capable of controllably reducing or increasing consumption under Dispatch control (similar to AGC) and that immediately respond proportionally to frequency changes (similar to generator governor action) at a Resource plant location and ERCOT will make the data available to the Resource's host TDSP (at TDSP expense):

(f) Resource breaker status;

[PRR590: Add paragraph (2) and renumber subsequent paragraphs upon system implementation:]

(2) A QSE representing Uncontrollable Renewable Resources is exempt from the requirements of items (1) (i) and (j) above.

(2) Any QSE providing Responsive Reserve and/or Regulation must provide for communications equipment to receive ERCOT telemetered control deployments of service power.

(3) Any QSE providing Regulation Service must provide appropriate Real Time feedback signals to report the control actions allocated to the QSEs Resources.

(4) Any QSE that represents a provider of Responsive Reserve, Non-Spinning Reserve, or Replacement Reserve using interruptible LaaR shall provide separate telemetry of the real power consumption of each interruptible Load providing the above Ancillary Services, the LaaR response to Dispatch Instructions for each LaaR, and the status of the breaker controlling that interruptible Load. If interruptible Load is used as a Responsive Reserve Resource, the status of the high-set under frequency relay will also be telemetered.

(5) Any QSE that represents a qualified provider of Balancing Up Load (BUL) need not provide telemetry, but rather shall provide an estimate in Real Time representing the real power interrupted in response to the deployment of Balancing Up Load.

(6) Real Time data for reliability purposes must be accurate to within three-percent (3%). This telemetry may be provided from relaying accuracy instrumentation transformers.

(7) A Wind-powered Generation Resource (WGR) Entity shall provide the following site-specific meteorological information to ERCOT through its QSE selected for this purpose. The WGR shall be responsible for any associated compliance metrics. ERCOT shall establish procedures specifying the accuracy requirements of WGR meteorological information telemetry:

(a) Wind speed;

(b) Wind direction;

(c) Temperature; and

(d) Barometric pressure.

[PRR590: Insert paragraph (7) and renumber accordingly, upon system implementation]

(7) A QSE representing a combined cycle plant may aggregate the AGC and ramp rate Supervisory Control and Data Acquisition (SCADA) points for the individual units at a

plant location into two distinct SCADA points (AGC and ramp rate) if the plant is configured to operate as such, i.e. gas turbine(s) and steam turbine(s) are controlled in aggregate from an AGC perspective.

⇨ If an aggregated wind farm consist of multiple types of wind turbines, the met data in the same wind farm can still be applied to multiple turbines just like what is being done now for a wind farm with single type of turbine only. However, the power production curve still needs to be applied to the corresponding turbine type, which cannot be achieved without explicitly modeled wind farm based on the same type, same model. This also applied to reactive power capability curve calculation.

6.5.13 WGR Ramp Rate Limitations

(1) Each Wind-powered Generating Resource (WGR) that is part of an Interconnection Agreement signed on or after January 1, 2009 shall limit its ramp rate to ten-percent (10%) per minute of its nameplate rating (MWs) as registered with ERCOT when responding to or released from an ERCOT deployment.

(2) The requirement of pargraph (1) above does not apply during a Force Majeure Event or during intervals in which a decremental deployment instruction coincides with a demonstrated decrease in the available wind resource.

(3) Each WGR that is part of an Interconnection Agreement signed on or before December 31, 2008 and that controls power output by means other than turbine stoppage shall limit its ramp rate to ten percent (10%) per minute of its nameplate rating (MWs) as registered with ERCOT when responding to or released from an ERCOT deployment.

(4) The requirement of paragraph (3) above does not apply during a Force Majeure Event, during intervals in which a decremental deployment instruction coincides with a demonstrated decrease in the available wind resource, or during unit start up and shut down mode.

(5) WGRs that meet the technical specifications of paragraph (3) above and which do not comply with its ramp rate requirement shall submit a compliance plan to ERCOT on or before June 1, 2009 which details the technical limitations leading to non-compliance, a work plan to achieve compliance by a reasonable date, and a ramp rate mitigation plan describing the WGR's best efforts to adhere to the WGR ramp rate limitation during the applicable compliance transition period.

(6) WGRs that do not meet the technical specifications of paragraph (3) above must submit an operations plan to ERCOT on or before June 1, 2009 describing the WGR's best efforts to adhere to the WGR ramp rate limitation.

(7) WGRs subject to the ramp rate limitations of paragraphs (1) and (3) above are exempt from the requirements of the applicable section upon receipt of a valid Dispatch Instruction from ERCOT to exceed the applicable ramp rate limitation when necessary to protect system reliability.

(8) WGRs that operate under a Special Protection Scheme (SPS) are exempt from the ramp rate limitations of paragraphs (1) and (3) above when decreasing unit output to avoid SPS activation.

(9) WGRs that meet the requirements of paragraphs (1) and (3) above are compliant with ramp rate limitation requirements when the number of 10-minute averages of eligible intervals meeting ten percent (10%) of nameplate capacity per minute ramp rate limit is equal to or greater than ninety percent (90%) of eligible intervals per month. Intervals where paragraphs (2), (4), (7) or (8) above apply shall be excluded as eligible intervals for this performance metric. ERCOT shall initiate a review process with the WGR where the WGR's score is less than ninety percent (90%). Scores that remain below ninety percent (90%) for three consecutive months shall be considered to have failed the ramp rate limitation performance measure.

Revised Proposed Protocol Language

2.1 Definitions

Point of Interconnection (POI)
The location(s) where a Generation Entity's interconnection Facilities connect to the Transmission Facilities as reflected in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and a Transmission and/or Distribution Service Provider (TDSP).

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Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind. Wind turbines may be aggregated together to form a WGR if each turbine is the same model and size and located behind the same Generator Step Up (GSU) transformer.

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2.2 Acronyms

POI Point of Interconnection
GSU Generator Step UpSGIA Standard Generation Interconnection Agreement

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6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected at the same Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty

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(20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

6.5.7.1 Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS

(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT. Generation Resources shall comply with the following Reactive Power requirements: an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ERCOT Transmission Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the POI. The Reactive Power requirements shall be available at all MW output levels and may be met through a combination of the Generation Resource's Unit Reactive Limit (URL), which is the generating unit's dynamic leading and lagging operating capability, and/or dynamic VAR capable devices. For Wind-powered Generation Resources (WGRs), the Reactive Power requirements shall be available at all MW output levels at or above 10 percent (10%) of the WGR's nameplate capacity. When a WGR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT may require a WGR to disconnect from the ERCOT System. The Reactive Power requirements of this paragraph shall apply to all Generation Resources except as otherwise provided in paragraphs (2) through (4) below.

(2) WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before December 1, 2009, must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (1) above. However, the Reactive Power requirements may be met through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices. WGRs shall comply with the Reactive Power requirements of this paragraph by no later than December 31, 2010, unless it is known by July 31, 2010, that related retrofits are required by the Voltage Ride-Through study conducted in accordance with Operation Guide Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-powered Generation Resources, in which event ERCOT may in its discretion modify the deadline for an affected WGR. ERCOT, in its sole discretion, also may grant an extension of time for other reasons.

(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the qualified renewable

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Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(4) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(5) For purposes of meeting the Reactive Power requirements in paragraphs (1) and (2) above, multiple generation units including wind turbines shall, at a Generation Entity's option, be treated as a single Generation Resource or WGR if the units are connected to the same transmission bus.

(6) Generation Entities may submit to ERCOT specific proposals to meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices. ERCOT may, at its sole discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall provide the submitter an explanation of its decision.

(7) A Generation Resource and TDSP may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1).

(8) Unless specifically approved by ERCOT, no unit equipment replacement or modification at a Generation Resource shall reduce the capability of the unit below the Reactive Power requirements that applied prior to the replacement/modification.

(9) Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

(10) WGRs must provide a Real Time Supervisory Control and Data Acquisition (SCADA) point that communicates to ERCOT the number of wind turbines that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid. WGRs must also provide two (2) other Real Time SCADA points that communicate to ERCOT the following:

(a) The number of wind turbines that are not able to communicate and whose status is unknown; and

(b) The number of wind turbines out of service and not available for operation.

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WGRs must comply with the requirements of paragraph (10) by no later than June 1, 2010.

(11) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by automatically switchable static VAR capable devices.

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6.7.6 *Deployment of Voltage Support Service*

(1) ERCOT, or Transmission and/or Distribution Service Providers (TDSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional Megavolt Ampere Reactive (MVAR), nor will they be requested to operate on a voltage schedule outside the URL specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

(2) ERCOT and TDSPs shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, GSU transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

(3) The TDSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed Reactive Power capability requirements.

(4) All Generation Resources required to provide VSS shall support the transmission voltage at the POI to the ERCOT Transmission Grid, or at the transmission bus in accordance with paragraph (5) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

(5) The QSEs providing VSS shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

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An induction generator may elect to make a contribution in aide of construction in lieu of meeting the installed capacity VSS requirements contained herein. In order to comply with the VSS requirements under this paragraph (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to that used to collect payments for the direct assignment of interconnection Facilities under applicable Public Utility Commission of Texas (PUCT) rules. The level of payment shall reflect the cost to the TDSP of procuring, installing, operating, and maintaining any Reactive Power equipment required to replace the Reactive Power capability that otherwise would be necessary for the interconnection of the generator. In order for this paragraph (7) to be effective for VSS compliance, the TDSP shall certify to ERCOT that the induction generator has complied with these requirements.

830PRR-22
AEP Comments
103009

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	10/30/2009

Submitter's Information	
Name	Dennis Kunkel
E-mail Address	dkkunkel@aep.com
Company	American Electric Power
Phone Number	361 289 4003
Cell Number	361 813 4140
Market Segment	Investor Owned Utility (IOU)

Comments

AEP supports the passage of PRR830, Reactive Power Capability Requirement. Similar to MW reserve concerns with large wind generation shifts, large wind generation shifts across multiple farms within a short period of time can exhaust dynamic reactive reserves for the Transmission Operators (TOs) even though a large amount of dynamic reactive has been added in recent years.

Just as MW reserves are there to protect for more than just an N-1 event, reactive reserves are needed for these large generation swings across multiple wind units and farms. The dynamic language is specifically important since numerous events over the last few years can show large voltage swings when dynamic reserves were exhausted with the larger wind generation swings (that happen from time to time).

Revised Proposed Protocol Language

None proposed.

830PRR-23
Invenergy Comments
110209

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	November 2, 2009

Submitter's Information	
Name	Mark Soutter
E-mail Address	msoutter@invenergyllc.com
Company	Invenergy LLC
Phone Number	512-447-2005
Cell Number	512-466-4554
Market Segment	Independent Generator

Comments

The Reactive Power Protocol language does not currently address the fact that Wind-powered Generation Resources (WGRs) are collections of individual turbines, each with its own Reactive Power capabilities. Invenergy proposes the addition of paragraph (12) to 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability. The proposed language of 6.5.7.1(12) clarifies the requirements and approximates the treatment afforded to other types of Generation Resources that have multiple turbines behind the same Point of Interconnection (POI) such as combined cycle units. Turbines that are currently Off-line for whatever reason are not required to provide reactive support and wind turbines should be no exception.

Revised Proposed Protocol Language

2.1 Definitions

Point of Interconnection (POI)
The location(s) where a Generation Entity's interconnection Facilities connects to the Transmission Facilities as reflected in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and a Transmission and/or Distribution Service Provider (TDSP).

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Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind. Wind turbines may be aggregated together to form a WGR if each turbine is the same model and size and located behind the same Generation Step Up Transformer (GSU).

PRR Comments

2.2 Acronyms

POI	Point of Interconnection
GSU	Generation Step Up Transformer
SGIA	Standard Generation Interconnection Agreement

6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected at the same Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

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6.5.7.1 Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS

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(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT. Generation Resources shall comply with the following Reactive Power requirements: an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ERCOT Transmission Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the POI. The Reactive Power requirements shall be available at all MW output levels and may be met through a combination of the Generation Resource's Unit Reactive Limit (URL), which is the generating unit's dynamic leading and lagging operating capability, and/or dynamic VAR capable devices. For Wind-powered Generation Resources (WGRs), the Reactive Power requirements shall be available at all MW output levels at or above 10% of the WGR's nameplate capacity. When a WGR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT may require a WGR to disconnect from the ERCOT System. The Reactive Power requirements of this paragraph shall apply to all Generation Resources except as otherwise provided in paragraphs (2) through (4) below.

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(2) WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before November 1, 2009, must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (1) above. However, the Reactive Power requirements may be met through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices. WGRs shall comply with the Reactive Power requirements of this paragraph by no later than December 31, 2010, unless it is known by July 31, 2010, that related retrofits are required by the Voltage Ride-Through study conducted in accordance with Operation Guide Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-

powered Generation Resources, in which event ERCOT may in its discretion modify the deadline for an affected WGR. ERCOT, in its sole discretion, also may grant an extension of time for other reasons.

(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the qualified renewable Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(4) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(5) For purposes of meeting the Reactive Power requirements in paragraphs (1) and (2) above, multiple generation units including wind turbines shall, at a Generation Entity's option, be treated as a single Generation Resource or WGR if the units are connected to the same transmission bus.

(6) Generation Entities may submit to ERCOT specific proposals to meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices. ERCOT may, at its sole discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall provide the submitter an explanation of its decision.

(7) A Generation Resource and TDSP may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1).

(8) Unless specifically approved by ERCOT, no unit equipment replacement or modification at a Generation Resource shall reduce the capability of the unit below the Reactive Power requirements that applied prior to the replacement/modification.

(9) Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

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(10) WGRs must provide a Real Time SCADA point that communicates to ERCOT the number of wind turbines that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid. WGRs must also provide two other Real Time SCADA points that communicate to ERCOT the following:

(a) The number of wind turbines that are not able to communicate and whose status is unknown; and

(b) The number of wind turbines out of service and not available for operation. WGRs must comply with these requirements by no later than six months after the effective date of this paragraph.

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(11) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by automatically switchable static VAR capable devices.

(12) The Reactive Power requirements for a WGR under this Section shall be reduced proportionally to the nameplate capacity of the WGR's wind-powered turbines that are out of service and not available for operation. Any wind-powered turbine not able to produce more than ten percent (10%) of its nameplate capacity shall be considered to be out of service and not available for operation for the purposes of the Reactive Power requirements under this Section.

6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or Transmission Service Providers (TSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional Megavolt Ampere Reactive (MVAR), nor will they be requested to operate on a voltage schedule outside the URL specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

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(2) ERCOT and Transmission and/or Distribution Service Providers (TDSPs) shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, step-up transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

(3) The TSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed Reactive Power capability requirements.

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(4) All Generation Resources required to provide VSS shall support the transmission voltage at the POI to the ERCOT Transmission Grid, or at the transmission bus in accordance with paragraph (5) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

(5) The QSEs providing VSS shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

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An induction generator may elect to make a contribution in aide of construction in lieu of meeting the installed capacity VSS requirements contained herein. In order to comply with the VSS requirements under this paragraph (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to that used to collect payments for the direct assignment of interconnection Facilities under applicable Public Utility Commission of Texas (PUCT) rules. The level of payment shall reflect the cost to the TDSP of procuring, installing, operating, and maintaining any Reactive Power equipment required to replace the Reactive Power capability that otherwise would be necessary for the interconnection of the generator. In order for this paragraph (7) to be effective for VSS compliance, the TDSP shall certify to ERCOT that the induction generator has complied with these requirements.

830PRR-24
NextEra Comments
110309

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	November 3, 2009

Submitter's Information	
Name	Todd Kimbrough
E-mail Address	todd.kimbrough@fpl.com
Company	NextEra Energy Resources
Phone Number	512.466.3190
Cell Number	512.466.3190
Market Segment	Independent Generator

Comments

NextEra Energy Resources submits the following comments regarding PRR 830, Reactive Power Capability Requirement, for consideration by the TAC. The redline language proposed below is based upon the PRS Recommendation Report of October 22, 2009 and incorporates concepts and specific amendments proposed in comments submitted by LCRA (10/08/09), The Wind Coalition (10/21/09), ERCOT (10/29/09), and Invenergy (11/02).

NextEra's new compromise proposal below does not insert the PRR 835 approach, which was not endorsed by the ROS and which was rejected by the PRS on Oct. 22. Although NextEra still believes ERCOT's proposed Reactive Power capability standard as set forth in PRR 830 is potentially inefficient and wasteful, NextEra nonetheless respects the opinion of the ROS and the PRS regarding the minimum standards for the ERCOT System going forward. NextEra's proposal, therefore, utilizes the "rectangle" requirement for all technologies as proposed by ERCOT.

Summary of NextEra's proposal

1. Prospectively, the compromise proposal applies the exact Reactive Power capability requirement proposed by ERCOT, endorsed by the ROS, and recommended by the PRS.

2. It provides a means to accomplish ERCOT's Reactive Power capability modeling needs without the unintended consequences of ERCOT's proposed change to the definition of Wind-powered Generation Resource (WGR) in Sec. 2, which

would apply throughout the Protocols for many purposes other than that intended by ERCOT.

3. It sets aside the legacy issues applicable to existing units for resolution following a PUCT decision in the related contested case (Docket No. 36482) and/or through Alternative Dispute Resolution (ADR) processes pursuant to Commission order or pursuant to existing Protocols regarding ADR.

Explanation of each of NextEra's proposed amendments

1. Section 2.1: NextEra strikes ERCOT's proposed re-definition of Wind-powered Generation Resource (WGR) and inserts alternate language which comports with the way WGRs are interconnected to the ERCOT Transmission Grid. As discussed in more detail below, NextEra believes ERCOT's stated desire to more easily model the Reactive Power capability of Resources with multiple units can be achieved with amendments applicable only to Section 6.5.7.1(10) rather than inviting the unintended consequences of re-defining WGRs for all purposes throughout the Protocols.

2. Section 2.2: NextEra includes ERCOT's 10/29 correction to the acronym "GSU" and adopts The Wind Coalition's 10/21 proposed addition of the "WTG" acronym, which is used in the proposed amendment to Section 6.5.7.1(10) to address the Resource Reactive Power capability modeling concerns.

3. Section 6.5.7.1(1): NextEra incorporates ERCOT's 10/29 correction to "10 percent." NextEra also adds clarifying language that the requirement that WGRs disconnect from the grid when unable to support voltage at the POI is a "temporary" disconnection at ERCOT's instruction to address a Real Time condition and that the WGR is allowed to re-connect at ERCOT's instruction. NextEra further incorporates the concept advocated by the 10/08 LCRA comments that execution of ERCOT's instruction to disconnect from the ERCOT System to address a Real Time voltage event precludes a finding that the WGR violated Section 6.5.7.

4. Section 6.5.7.1(2): NextEra incorporates ERCOT's 10/29 correction striking "November" and inserting "December" to reflect the revised expected effective date of PRR 830. NextEra also strikes "February 17, 2004" and inserts "July 1, 2010" for the reasons identified below.

   a) Paragraph (2) specifically requires WGRs to meet the "rectangle" standard for Reactive Power capability. As drafted by ERCOT, this paragraph creates several problems. Despite ERCOT's claims to be only a clarification of existing language and a prospective application of the clarified standard, ERCOT's proposed paragraph (2) clearly requires retrofitting existing units with new equipment. The interpretation of the existing Protocol language and whether it historically required a "rectangle" is before the Public Utility Commission of Texas and is the subject of ADR processes that are ongoing. Therefore, these forums should be allowed to continue to address the issue rather than muddying the process with a Protocol revision that may be reversed by existing proceedings. NextEra's proposal does not eliminate the possibility that retrofitting existing units could be required in the future. However, it does reserve this issue for the appropriate jurisdictional entity, the PUCT. The prudent course of action is to address prospective standards and implement the terms of the PUCT final order on the legacy issues, whatever the PUCT determines, once a final order is issued.

b) Paragraph (2) as drafted by ERCOT also fails to meet the ERCOT Board's policy direction set with the adoption of Operating Guide Revision Request 208, Voltage Ride Through Requirement. In that decision, the Board made a sound policy decision that retroactive application of technical standards can be applied only when a body of evidence indicates such application is required to maintain system reliability. While ERCOT and the ROS have presented sufficient argumentation to support the refinement of the Reactive Power capability standard on a prospective basis, the lack of evidence demonstrating historical deficiencies and the lack of any study at all which would support spending tens of millions of dollars for unit retrofits is seriously troubling and invites scrutiny by policymakers.

c) NextEra's amendment to paragraph (2) keeps ERCOT's proposed effective date (as revised by its 10/29 comments) for signed Interconnection Agreements but proposes July 1, 2010 as the effective date for new units. The date is drawn from the historical record in which the ERCOT Board last approved substantive changes to this section of the Protocols. With the approval of PRR 473, Reactive Standards, the Board provided 15 months for new units to comply with the revised standard in order to not force immediate retrofit for units which had already been designed and for which equipment had already been procured. NextEra proposes less than half that amount of time – 7 months from the effective date of PRR 830.

d) Finally, NextEra strikes the ERCOT-proposed sentence establishing a Dec. 2010 deadline for retrofit for the same reasons outlined above. NextEra is unaware of a single PRR in the history of ERCOT which imposed tens of millions of dollars of equipment costs on any Market Participant or group of Market Participants without demonstration that the benefit would clearly outweigh the cost. PRR 830 should not be the first PRR to broach this slippery slope.

5. <u>Section 6.5.7.1(3)</u>: NextEra strikes "February 17, 2004" and replaces it with "December 1, 2009" which is the anticipated effective date of PRR 830. This

change is recommended for the reasons described above. Because paragraph (3) clearly references the revised standards set forth in paragraph (1), existing units should be held only to the existing Protocols requirement and their URLs submitted to ERCOT in accordance with the Operating Guides absent some compelling evidence to abandon previous policy on the retrofit issue. This change sets aside the legacy issues likely to delay implementation of PRR 830 and allows the PUCT to address the issues duly before it.

6. Section 6.5.7.1(4): NextEra proposes changing the two dates in accordance with the reasons set forth above.

7. Section 6.5.7.1(10) and (12): NextEra endorses the 10/21 comments of The Wind Coalition which provides ERCOT with the Real Time Reactive Power capability modeling information requested from WGRs but without the unintended consequences of changing the definition of WGR throughout the Protocols in Sec. 2. NextEra adopts The Wind Coalition's proposed language with minor modifications for clarity and to avoid redundancy. NextEra's revisions to paragraphs (10) and (12) are also consistent with ERCOT's 10/29 technical corrections.

8. Section 6.5.7.1(11): Delete the word "automatically".

9. Section 6.5.7.1(13): NextEra adopts Invenergy's 11/02 proposal in a new paragraph (13) to approximate the treatment of the Reactive Power obligation for other Resources which have multiple turbines located behind the POI.

10. Section 6.7.6(1)-(3): NextEra incorporates the technical corrections proposed in 10/29 ERCOT comments.

11. Section 6.7.6(5): NextEra rejects ERCOT's strikethrough of the existing paragraph(5), returning the blackline language of existing Protocols and offers an amendment to clarify this language only applies to existing units, as it does not comport with the new requirement established in ERCOT's proposed Section 6.5.7.1(1). The reinstated Sections are highlighted in yellow.

12. Section 6.7.6(6): NextEra renumbers due to reinsertion of deleted paragraph (5).

Response to ERCOT Comments of October 29 and request for new CEO Review and Impact Analysis

NextEra appreciates ERCOT's attempt to address the concerns of wind generators regarding the proposed change to the definition of WGR in its 10/29 comments. However, NextEra notes that while ERCOT addressed the uses of "WGR" in the Protocols, ERCOT did not address the more complex issue that WGRs are simply referred to as "Resources" and "generation units" throughout the Protocols and Guides when there is not a specific need to separately address WGRs and they are treated like all other Resources. It is precisely in this area where NextEra believes the unintended consequences of ERCOT's proposal will reveal themselves. The rapid timeline on which PRR 830 has advanced through the process has not afforded NextEra the opportunity to evaluate the hundreds of such references throughout ERCOT's controlling documents and so requests stakeholders re-evaluate the wisdom the WGR definition change and adopt NextEra's proposed methodology below to deliver the same results in a Section-specific way.

Additionally, NextEra points to ERCOT's 10/29 comments which state on page 2, "The proposed definition change may require some wind owners to form multiple WGRs instead of allowing only one depending on their equipment." NextEra agrees with this comment but questions whether the CEO Review and Impact Analysis consider the resource impacts of handling new RARF submissions in both zonal and nodal, whether new sub-QSEs would also need to be created, tested, and certified, or any other impacts on ERCOT Staff to process the changes associated with implementation of this change.

Finally, NextEra notes that the unnecessary WGR definition change would effectively preclude many activities which would benefit the ERCOT System and Texas consumers. NextEra often uses wind turbines in Texas as test models for various hardware and software enhancements to provide better unit control, power uprating, ramp rate control, etc. If each new technological application requires forming a new WGR and submitting RARF data, etc., then such activity becomes overly burdensome and may not be undertaken. A more beneficial approach would be to ensure that the section of the Protocols addressing Reactive Power requirements clearly places the burden on the generator to telemeter the Reactive Power capability to ERCOT, as proposed by NextEra, rather than forcing some definition on units which does not reflect the realities of their configuration in the field.

Conclusion

NextEra's proposal below delivers the full range of Reactive Power capability for all generation units sought by ERCOT and endorsed by ROS in a manner consistent with the application of ERCOT Protocols from the beginning of this market in 2001. NextEra strongly encourages TAC to weigh the policy and market implications of deviating from the market rules philosophy which has served Texas consumers well by continually encouraging major investment in new, more efficient, cleaner generation Resources across a variety of technology types for the past several years. NextEra does not believe the proposed language below in any way precludes addressing the legacy issues now under dispute at the PUCT. However, NextEra predicts serious harm to individual Market Participants, an entire segment of the electric power industry, overall faith in the stability of the ERCOT market rules, and efforts to fulfill state policy on renewable resources should PRR 830 be adopted in its current form.

PRR Comments

Revised Proposed Protocol Language

2.1 Definitions

Point of Interconnection (POI)
The location(s) where a Generation Entity's interconnection Facilities connects to the Transmission Facilities as reflected in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and a Transmission and/or Distribution Service Provider (TDSP).

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Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind~~, which may consist of an aggregation of wind turbines connected to the ERCOT Transmission Grid through one Point of Interconnection (POI)~~.

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Inserted: Wind turbines may be aggregated together to form a WGR if each turbine is the same model and size and located behind the same Generation Step Up Transformer (GSU).

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2.2 Acronyms

POI	Point of Interconnection
GSU	~~Generator~~ Step Up Transformer
SGIA	Standard Generation Interconnection Agreement
~~WTG~~	~~Wind-powered Turbine Generator~~

6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected at the same Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

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6.5.7.1 Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS

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(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT. Generation Resources shall comply with the following Reactive Power requirements: an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ERCOT Transmission Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the POI. The Reactive Power requirements shall be available at all MW output levels and may be met through a combination of the Generation Resource's Unit Reactive Limit (URL), which is the generating unit's

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dynamic leading and lagging operating capability, and/or dynamic VAR capable devices. For Wind-powered Generation Resources (WGRs), the Reactive Power requirements shall be available at all MW output levels at or above 10 percent (10%) of the WGR's nameplate capacity. When a WGR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT may require a WGR to temporarily disconnect from the ERCOT System. WGRs which comply with instructions to temporarily disconnect from the ERCOT System in accordance with this Section will not be found in violation of Section 6.5.7 Voltage Support Service. The Reactive Power requirements of this paragraph shall apply to all Generation Resources except as otherwise provided in paragraphs (2) through (4) below.

(2) WGRs that commenced operation on or after July 1, 2010, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before December 1, 2009, must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (1) above. However, the Reactive Power requirements may be met through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices.

(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before December 1, 2009, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(4) New generating units connected before July 1, 2010, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to December 1, 2009, based upon previous standards, whose design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(5) For purposes of meeting the Reactive Power requirements in paragraphs (1) and (2) above, multiple generation units including wind turbines shall, at a Generation Entity's option, be treated as a single Generation Resource or WGR if the units are connected to the same transmission bus.

(6) Generation Entities may submit to ERCOT specific proposals to meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices. ERCOT may, at its sole discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall provide the submitter an explanation of its decision.

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(7) A Generation Resource and Transmission and/or Distribution Service Provider (TDSP) may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1) above.

(8) Unless specifically approved by ERCOT, no unit equipment replacement or modification at a Generation Resource shall reduce the capability of the unit below the Reactive Power requirements that applied prior to the replacement/modification.

(9) Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

(10) Wind-powered Turbine Generators (WTGs) of the same model and size located behind the same Generator Step Up Transformer (GSU) must be aggregated to form a WTG aggregation. Effective June 1, 2010, the following Real Time Supervisory Control and Data Acquisition (SCADA) points must be communicated to ERCOT for each WTG aggregation by the WGR's QSE, selected for this purpose:

(a) The number of WTGs that are not able to communicate and whose status is unknown; and

(b) The number of WTGs out of service and not available for operation; and

(c) The number of WTGs that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid.

(11) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by switchable static VAR capable devices.

(12) ERCOT and the TSPs shall, at a minimum, represent WGRs in the ERCOT and TSP Real Time control systems and their off-line studies to include: GSUs, substation reactive devices, and the equivalent of the WTG aggregation connected to each GSU.

(13) The reactive power requirements for a WGR under this Section shall be reduced proportionally to the nameplate capacity of the WGR's WTGs that are out of service and not available for operation. Any WTG not able to produce more than 10% of its nameplate capacity shall be considered to be out of service and not available for operation for the purpose of the Reactive Power requirements under this Section.

6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or Transmission and/or Distribution Service Providers (TDSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL)

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capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional Megavolt Ampere Reactive (MVAR), nor will they be requested to operate on a voltage schedule outside the URL specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

(2) ERCOT and TDSPs shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, GSU tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

(3) The TDSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed Reactive Power capability requirements.

(4) All Generation Resources required to provide VSS shall support the transmission voltage at the POI to the ERCOT Transmission Grid, or at the transmission bus in accordance with paragraph (5) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

(5) At all times a Generation Resource unit which commenced operation before July 31, 2010, has a signed SGIA before December 1, 2009, and which is required to provide VSS is On-line, the URL must be available for utilization at the generating unit's continuous rated active power output, and Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any Reactive Power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP.

(6) The QSEs providing VSS shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

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Upon request to, and with the approval of ERCOT, multiple generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these URL requirements only.

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such alternative requirements or

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Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements.

830PRR-25
Horizon Wind Energy LLC Comments
110309

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	November 03, 2009

Submitter's Information	
Name	Matt Daniel
E-mail Address	Matthew.Daniel@horizonwind.com
Company	Horizon Wind Energy LLC
Phone Number	713-265-0350
Cell Number	
Market Segment	Independent Generator

Comments

Horizon Wind Energy appreciates this opportunity to comment on PRR 830, Reactive Power Capability Requirement. Horizon supports reliability and efforts to increase reliability on the ERCOT System, but PRR 830 will not provide additional reliability benefits. No study has been done to determine that any existing generation needs to retrofit to accommodate a reliability situation on the grid and neither ERCOT, nor any other party providing comments, has demonstrated that any reliability problem exists with the Wind-powered Generation Resources (WGRs) now connected to the grid. Despite this, existing WGRs are being asked to install retrofits on operating generation at significant expense. For Horizon alone, the costs are estimated to be tens of millions of dollars.

WGRs have sited thousands of megawatts of capacity in the ERCOT market. That capacity has Reactive Power capability consistent with the existing ERCOT Protocols and other guidance. That capability has been reported in asset registration forms. When interconnection studies showed the need, WGRs have installed additional reactive equipment.

Some commenters argue that WGRs shift costs because they only provide half of the "rectangle." This is simply not true. First, the requirement in the Protocols is to comply with a Reactive Power standard of the triangle. Many generators, in fact all built before 1999 (conventional generators), avoid the rectangle requirement because they are exempted. The argument that WGRs are shifting costs is made by the same generators who are largely exempt from these requirements for the bulk of their generation fleet. Yet WGRs are the only Market Participants asked to undergo retrofits. In actuality, instead of shifting costs to other Market Participants, WGRs have paid more to support system reliability by going above the Protocol requirements when the TDSP stated that additional reactive capability was necessary.

PRR Comments

Wind power has lowered the price of power in ERCOT, to the benefit of most Market Participants, particularly Load Serving Entities (LSEs) and ultimately to the consumers. PRR 830 would increase system costs without any real justification. WGRs would be required to increase investment in projects that have been operating for years, which costs would need to be recovered through higher prices. Further, it is possible that WGRs that provide power to the system will need to be taken off-line for these retrofits to be done. Removing wind generation or making wind generation more expensive will serve to benefit only the generators that would not otherwise be dispatched if the wind generation were running—gas-fired generators. A policy of requiring retrofits also increases costs by increasing investor uncertainty about additional costs that may be imposed on existing assets and even more so on new projects.

If the target is to get to the "rectangle" ERCOT-wide, all exemptions should be removed from the rectangle requirement. However, in the instant situation, there is no demonstrated need for the rectangle. PRR 830 also attempts to insert into the Protocols the requirement that Reactive Power capability be provided using more expensive dynamic equipment, instead of static devices that many WGRs now use. No study supports such action by ERCOT or such investment of potentially hundreds of millions of dollars by one segment of the generation market.

ERCOT has known the capability of WGRs in the ERCOT market for years. WGRs have supplied Generation Asset Registration Forms ("GARFs"), and Resource Asset Registration Forms ("RARFs") that clearly demonstrate the capability in the shape of a triangle and not the rectangle. Until recently, the Resource Asset Registration Guide even demonstrated by pictorial that the minimum requirement is the triangle, not the rectangle.

Despite claims to the contrary, ERCOT's current interpretation of the Reactive Power requirements in the Protocols remains in dispute. It is the subject of an appeal active at the Public Utility Commission of Texas (PUCT). PUCT Docket 36482, Appeal of Competitive Wind Generators Regarding the Electric Reliability Council of Texas' Interpretation of the Reactive Power Protocols, demonstrates that a serious controversy remains about required Reactive Power capability. The docket was initiated when a group of WGR owners (the Competitive Wind Generators) appealed ERCOT's November 2008 Legal Interpretation that the Protocols require all Generation Resources that are not otherwise exempt to provide the same amount of Reactive Power that they are capable of at their rated output at any level of output. This puts Generation Resources that had been approved for interconnection without that capability (except those exempted or grandfathered by the Protocols already) at risk of penalties for not complying with Protocol standards. For some Resources, the exposure would be three years of penalties, potentially levied on every wind turbine in WGR.

Throughout the appeal, ERCOT steadfastly maintained that the requirement had always been clear, and that WGRs should retrofit even without some demonstration of need. However, every Standard Generation Interconnection Agreement (SGIA), by contract in the form approved by the PUCT, requires that "unless exempt, the TSP shall timely request **ISO** and all regulatory approvals necessary to carry out its responsibilities." Moreover, before each of these WGRs, that had submitted GARFs or RARFs, depending on the timing, was energized, ERCOT specifically approved interconnection checklists, which include demonstration of Reactive Power capabilities prior to energization. As a System Operator, ERCOT knew exactly what the requirements were and exactly what the WGRs were connecting to the grid. To now state years later that the standard applicable to these WGRs, that have invested billions in the ERCOT market based on the rules in place at the time, is somehow different and that these WGRs are causing system reliability issues can mean only one of two things. Either 1) ERCOT did not pay attention to its own requirements in the Protocols and what it was connecting to the grid; or 2) ERCOT knew the standards were right and the WGRs were compliant, hence the compliance letters that WGRs met the standards.

What has changed between now and then? As discussed at the PRS meeting in response to the question by the Independent Market Monitor, the modeling for Competitive Renewable Energy Zone (CREZ) transmission evidently assumed that all WGRs were meeting a different standard than that in the Protocols—the full dynamic rectangle standard that ERCOT now claims all WGRs must meet. There is still no evidence that this standard is required to accommodate CREZ generation. However, ERCOT's response has not been to change the model, but to change the requirements so that ERCOT itself can state that it has complied with North American Electric Reliability Corporation (NERC_ requirements relating to planning.

ERCOT's description of PRR 830 says, in part: "This PRR clarifies the Reactive Power capability requirement for all Generation Resources, including existing WGRs". If ERCOT's interpretation of Reactive Power capability requirementsin the Protocols is indeed accurate, there should be no need to clarify the Protocols that ERCOT says are already clear. Leaving that aside, the reality on the ground proves that the Protocols have not been interpreted in practice by WGRs, ERCOT or Transmission and/or Distribution Service Providers (TDSPs) in the way ERCOT reads them now and is attempting to change them through PRR 830. Thousands of megawatts of wind resource capacity have interconnected with the ERCOT Transmission Grid without the capability that is supposedly clearly required by Protocols.

Paragraphs (3) and (4) of Protocol Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, are explicit about which Generation Resources are exempt from completely meeting the Reactive Power capability requirement. Since the end date of that exemption, over 40 WGRs with approximately 7,000 MW of capacity have interconnected with the ERCOT Transmission Grid. The vast majority of these WGRs do not meet ERCOT's interpretation of the required Reactive Power capability. This fact can be verified by reviewing the asset registration forms that ERCOT accepted from these WGRs, and from the results of an informal survey ERCOT undertook in the last half of 2008 of WGR capabilities and procedures. It is hard to comprehend how so many projects could be interconnected in derogation of ERCOT's interpretation of the Reactive Power requirements, particularly if such interconnections would create reliability problems—which has not been shown in actuality, only discussed hypothetically in the comments of ERCOT and Calpine.

As attendees of the October 22nd PRS meeting were reminded, Reactive Power is a local service; it does not travel well. Requiring all WGRs to install more equipment simply because the requirements are re-interpreted would only increase costs—long after the investment in the Texas market has been financed. There is no demonstrated nexus between the imposition of these extra costs and the improvement in system safety or reliability.

PRR Comments

A broader concern is that PRR 830 continues efforts to require retrofits without justification. The retrofit provisions in PRR 830 obviously hurt WGRs that have located in the ERCOT market—particularly given that the ERCOT interpretation of dynamic rectangle was not feasible by any wind turbine on the market at the time the Protocol language was drafted. Attempts to substantively change standards on a going-forward basis, as has always been the case in ERCOT, should be based on actual studies demonstrating need and/or benefits for the market. However, requiring retrofits from WGRs that met the ERCOT standards in effect at the time, and singling out one new generation technology on which the standards have been changed, while continuing to exempt older technologies, raises fairness issues and frustrates the investment-backed expectation of those generators that answered the call to invest in the ERCOT market.

The impact of WGRs on the ERCOT Transmission Grid has been to lower power prices. This result is not unique to ERCOT. Other regions with significant wind capacity are saving money, too. The impacts may be greater in ERCOT, however, given the installed generation fleet. Those impacts have been widely reported. Results of analysis by Bernstein Research showing that increased wind capacity in ERCOT has reduced power prices have appeared in a variety of publications, including a Wall Street Journal Blog[1] and Coal Power magazine[2]. The following excerpt summarizes the expected impact of lower power costs in general terms. For 2008 wind generation is calculated to have reduced the annual average price per MWh by $2.00.

> *"In ERCOT, the growth in wind generation is expected to push gas off the margin during certain off-peak hours and, during the hours when gas plants are operating, to reduce the marginal cost of supply by curtailing the hours run by higher cost combustion turbines."*[3]

It goes without saying that consumers benefit from lower prices. It's equally clear that this benefit comes by displacing high cost generation. As more wind capacity is installed, consumers will benefit while competing generators will see lower revenue. PRR 830 would shift this equation by imposing additional costs on both future and existing WGRs. The true impact analysis of PRR 830 is that it will raise prices in the ERCOT market, diminishing the benefits of wind generation the Texas Legislature and the PUCT have worked to achieve.

PRR 830 should be rejected.

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[1] "Will Wind Power Blow Texas Generators Away?" posted on Wall Street Journal's Environmental Capital Blog, August 10, 2009. http://blogs.wsj.com/environmentalcapital/2009/08/10/blown-away-wind-power-makes-electricity-cheaper-in-texas/

[2] "Texas Wind Boom Cutting into Fossil Generator Profits" in Coal Power magazine, October 8, 2009 http://www.coalpowermag.com/ops_and_maintenance/223.html

[3] P. 4, Bernstein Commodities & Power: The Impact of Wind on Power Prices and Coal and Gas Consumption, September 4, 2009

PRR Comments

Revised Proposed Protocol Language

None.

830PRR-26
Vestas Comments
110409

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	11/04/2009

Submitter's Information	
Name	Steven W. Saylors, P.E.
E-mail Address	sayl@vestas.com
Company	Vestas-American Wind Technology, Inc
Phone Number	(503) 327-2111
Cell Number	(503) 830-4085
Market Segment	n/a

Comments

Vestas Americas submits the following comments on PRR 830, Reactive Power Capability Requirement.

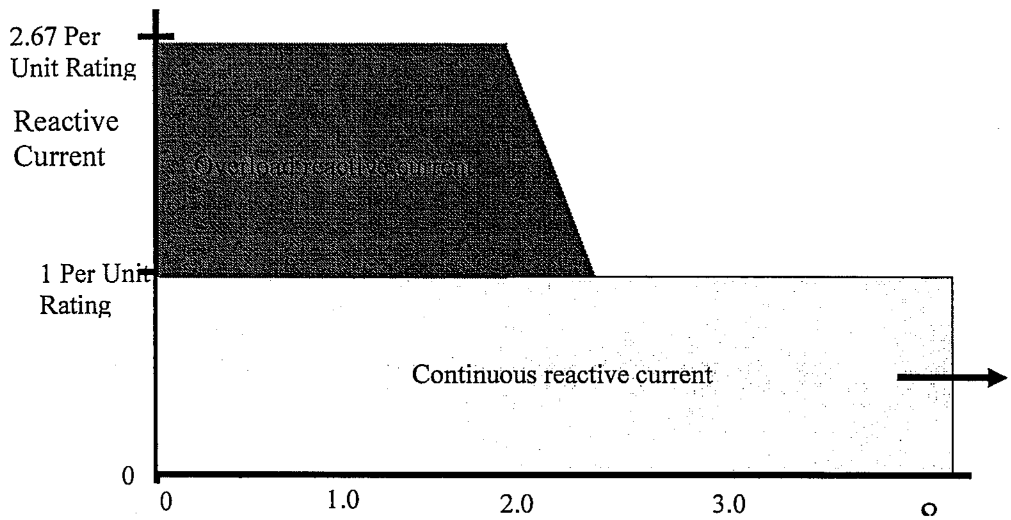
If adopted as proposed, PRR 830 may unnecessarily increase the costs of certain Wind-powered Generation Resources (WGRs) while providing ERCOT with no improvements in reliability and causing an unfair market to ERCOT Customers by limiting their selection of manufacturers.

PRR 830 would require WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) after December 1, 2009, be only able to meet the Reactive Power requirements through a combination of the WGR's Unit Reactive Limit (URL) and/or dynamic VAR capable devices. Vestas would like to make it understood that a properly designed integrated Reactive Power solution utilizing a combination of the WGRs and URL and/or automatically switchable static VAR capable devices [shunt reactive elements, i.e. capacitors and/or reactors] in combination with dynamic VAR capable devices [i.e. Static Compensators, commonly referred to as Statcoms] have the same effective dynamic performance as a combination of the WGR's URL and/or dynamic VAR capable devices. Thus such integrated solutions should be allowed as an acceptable alternative to meet ERCOT's Reactive Power interconnection requirement.

Only a very small number of wind turbine manufacturers currently provide a full dynamic solution to Reactive Power requirements within the turbine alone.

Moreover, other regional authorities have allowed manufacturers the option to employ a "hybrid" solution incorporating a combination of a Statcom and automatically switched capacitors and/or reactors to meet the Reactive Power requirements of numerous Transmission Operators, both nationally and internationally.

These hybrid systems rely upon the inherent overload capability of a Statcom device (approximately 2 to 3 times Continuous Rating, depending on device supplier) to operate at multiples of their continuous duty rating for 2-4 seconds. An example of the overload response is shown below.



VAR output is smooth and linear with voltage. After an initial dynamic response from the Statcom (within one electrical cycle), fast-switched static reactive elements are then switched in by the Statcom's master controller allowing the Statcom to return to operation within its Continuous Rating range; complete Reactive Power response can be accomplished within one second or less. Vestas has employed the hybrid solution on numerous projects in North America as well as projects in Europe and Australia. This hybrid solution meets all reliability requirements of these Transmission Operators and is the full functional equivalent of a dynamic solution that employs only full-sized SVCs or Statcoms. Hybrid systems provide excellent steady-state voltage control, as well as extremely fast response to rapid changes in voltage.

Vestas has been provided an indicative-pricing budgetary quotation indicating that the cost of installing a dynamic solution with only dynamic capable devices to meet the same Reactive Power requirements will increase installed costs approximately four times over using the hybrid solution. These additional project costs would not be accompanied by any increase in reliability and will provide an unfair market advantage to certain turbine manufacturers.

Additional comments provided from American Superconductor:

"AMSC has 35 "hybrid" reactive compensation systems comprising of D-VAR STATCOM and shunt capacitor and reactor banks at wind farm throughout the world, configured to provide a fully dynamic reactive compensation for wind farms. The STATCOM and shunt devices have been sized to allow these wind farms to meet the local wind interconnection requirements which have specified dynamic performance requirements. These installations are in Canada (AESO, IESO, Prince Edward Island, Sask Power, New Brunswick), South Australia, New Zealand, United Kingdom and the United States. Over half of these installations are in North America alone.

The hybrid system controls switch shunt banks installed as part of the system, leveraging the STATCOM's dynamic capability, to effectively provide an expanded dynamic compensation range. The D-VAR STATCOMs also have short term overload capability to address short term voltage sags and swells in the system allowing added reliability of the facility. The hybrid STATCOM approach has proven to be a technically sound and cost effective approach to allowing large amounts of wind generation to be interconnected to systems worldwide."

Further additional comments provided by S&C Electric:

S&C and other Statcom suppliers have "hybrid" systems operating in the following areas.

ISO / RTO	**Hybrid Systems Accepted as Dynamic VARS**
United States	
WECC	Yes
BPA	Yes (inverters 50% of VARs)
CAISO	Yes
New Mexico	Yes
PacifiCorp	Yes
SPP	Yes
Kansas	Yes
MISO	Yes
Wisconsin	Yes
ERCOT	Yes
AEP	Yes

NYISO	Yes
ISO-NE	Yes

International

Canada	Yes
Quebec (HQ)	Yes
Ontario (IESO)	Yes
Alberta (AESO)	Yes
Prince Edward Island (NB)	Yes
United Kingdom	Yes (Full inductive down to 50% MW)
England (NGET)	Yes (Ditto)
Wales (NGET)	Yes (Ditto)
Scotland (NGET / SP / SSE)	Yes (Ditto)
Ireland	Yes
Eirgrid (ESB)	Yes

Revised Proposed Protocol Language

PRR Comments

2.1 Definitions

Point of Interconnection (POI)
The location(s) where a Generation Entity's interconnection Facilities connects to the Transmission Facilities as reflected in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and a Transmission and/or Distribution Service Provider (TDSP).

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Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind. Wind turbines may be aggregated together to form a WGR if each turbine is the same model and size and located behind the same Generation Step Up Transformer (GSU).

2.2 Acronyms

POI	Point of Interconnection
GSU	Generation Step Up Transformer
SGIA	Standard Generation Interconnection Agreement

6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected at the same Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

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6.5.7.1 Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS

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(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT. Generation Resources shall comply with the following Reactive Power requirements: an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ERCOT Transmission Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the POI. The Reactive Power requirements shall be available at all MW output levels and may be met through a combination of the Generation Resource's Unit Reactive Limit (URL), which is the generating unit's dynamic leading and lagging operating capability, and/or dynamic VAR capable devices. Dynamic VAR capable devices include Hybrid devices composed of dynamic devices temporarily operated above their nameplate rating in combination with switched static devices. For Wind-powered Generation Resources (WGRs), the Reactive Power requirements shall be available at all MW output levels at or above 10% of the WGR's nameplate capacity. When a WGR is operating below 10% of its nameplate capacity and

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is unable to support voltage at the POI, ERCOT may require a WGR to disconnect from the ERCOT System. The Reactive Power requirements of this paragraph shall apply to all Generation Resources except as otherwise provided in paragraphs (2) through (4) below.

(2) WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before November 1, 2009, must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (1) above. However, the Reactive Power requirements may be met through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices. WGRs shall comply with the Reactive Power requirements of this paragraph by no later than December 31, 2010, unless it is known by July 31, 2010, that related retrofits are required by the Voltage Ride-Through study conducted in accordance with Operation Guide Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-powered Generation Resources, in which event ERCOT may in its discretion modify the deadline for an affected WGR. ERCOT, in its sole discretion, also may grant an extension of time for other reasons.

(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the qualified renewable Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(4) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

(5) For purposes of meeting the Reactive Power requirements in paragraphs (1) and (2) above, multiple generation units including wind turbines shall, at a Generation Entity's option, be treated as a single Generation Resource or WGR if the units are connected to the same transmission bus.

(6) Generation Entities may submit to ERCOT specific proposals to meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices. ERCOT may, at its sole

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discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall provide the submitter an explanation of its decision.

(7) A Generation Resource and TDSP may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1).

(8) Unless specifically approved by ERCOT, no unit equipment replacement or modification at a Generation Resource shall reduce the capability of the unit below the Reactive Power requirements that applied prior to the replacement/modification.

(9) Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

(10) WGRs must provide a Real Time SCADA point that communicates to ERCOT the number of wind turbines that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid. WGRs must also provide two other Real Time SCADA points that communicate to ERCOT the following:

(a) The number of wind turbines that are not able to communicate and whose status is unknown; and

(b) The number of wind turbines out of service and not available for operation. WGRs must comply with these requirements by no later than six months after the effective date of this paragraph.

(11) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by automatically switchable static VAR capable devices.

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6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or Transmission Service Providers (TSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional Megavolt Ampere Reactive (MVAR), nor will they be requested to operate on a voltage schedule outside the URL specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

(2) ERCOT and Transmission and/or Distribution Service Providers (TDSPs) shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For

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Generation Resources required to provide VSS, step-up transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

(3) The TSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed Reactive Power capability requirements.

(4) All Generation Resources required to provide VSS shall support the transmission voltage at the POI to the ERCOT Transmission Grid, or at the transmission bus in accordance with paragraph (5) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

(5) The QSEs providing VSS shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

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Deleted: (5) At all times a Generation Resource unit required to provide VSS is On-line, the URL must be available for utilization at the generating unit's continuous rated active power output, and Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any Reactive Power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP.¶

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830PRR-27
TAC Recommendation Report
110509

TAC Recommendation Report

PRR Number	830	PRR Title	Reactive Power Capability Requirement
Timeline	Urgent	Recommended Action	Approval
Date of Decision	November 5, 2009		
Proposed Effective Date	December 1, 2009		
Priority and Rank Assigned	Not applicable.		
Protocol Section(s) Requiring Revision	2.1, Definitions 2.2, Acronyms 6.5.7, Voltage Support Service 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability 6.7.6, Deployment of Voltage Support Service		
Revision Description	This Protocol Revision Request (PRR) clarifies the Reactive Power capability requirement for all Generation Resources, including existing Wind-powered Generation Resources (WGRs) who are not able to meet the 0.95 lead/lag requirement with the Generation Resource's Unit Reactive Limit (URL). WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before December 1, 2009 may meet the Reactive Power requirements through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices.		
Reason for Revision	Clarification of Reactive Power capability requirements on a going-forward basis and path to compliance for certain WGRs that are not able to meet the 0.95 lead/lag requirement at the Point of Interconnection (POI) based on the Generation Resource's URL.		
Overall Market Benefit	Provides additional clarity to the reactive requirements for wind generation.		
Overall Market Impact	Unknown.		
Consumer Impact	None.		
Credit Impacts	ERCOT Credit Staff and the Credit Work Group (Credit WG) have reviewed PRR830 and do not believe that it requires changes to credit monitoring activity or the calculation of liability.		
Relevance to Nodal Market	Yes. The Reactive Power capability requirements exist in Nodal as well.		

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Nodal Protocol Sections Requiring Revision	2.1, Definitions 2.2, Acronyms and Abbreviations 3.15, Voltage Support 6.5.7.7, Voltage Support Service
Procedural History	➢ On 9/08/09, PRR830, a preliminary Impact Analysis, and CEO Revision Request Review were posted. ➢ On 9/10/09, PRR830 was granted Urgent status via a PRS e-mail vote. ➢ On 9/15/09, Horizon Wind Energy LLC comments were posted. ➢ On 9/17/09, PRS considered PRR830. ➢ On 9/28/09, Calpine comments were posted. ➢ On 10/7/09, Iberdrola Renewables comments were posted. ➢ On 10/8/09, a second set of Horizon Wind Energy LLC comments were posted. ➢ On 10/8/09, LCRA comments were posted. ➢ On 10/19/09, ROS comments were posted. ➢ On 10/21/09, Wind Coalition comments were posted. ➢ On 10/22/09, Vestas comments were posted. ➢ On 10/22/09, PRS again considered PRR830. ➢ On 10/22/09, NextEra Energy Resources comments were posted. ➢ On 10/26/09, the Impact Analysis was posted. ➢ On 10/28/09, a second set of Calpine comments were posted. ➢ On 10/29/09, Oncor comments were posted. ➢ On 10/29/09, ERCOT comments were posted. ➢ On 10/30/09, AEP comments were posted. ➢ On 11/2/09, Invenergy comments were posted. ➢ On 11/3/09, a second set NextEra Energy Resources comments were posted. ➢ On 11/3/09, a third set of Horizon Wind Energy LLC comments were posted. ➢ On 11/4/09, a second set of Vestas comments were posted. ➢ On 11/5/09, TAC considered PRR830.
PRS Decision	On 9/17/09, PRS unanimously voted to table PRR830 for one month and to encourage ROS to provide comments on PRR830. All Market Segments were present for the vote. On 10/22/09, PRS voted to recommend approval of PRR830 as endorsed by ROS. The motion passed via roll call vote. All Market Segments were present for the vote.
Summary of PRS Discussion	On 9/17/09, there was discussion regarding the appeal currently at the Public Utility Commission of Texas (PUCT) which stemmed from an ERCOT interpretation of the current Protocols regarding Reactive Power. It was debated whether or not the proposed content of PRR830 was being addressed in the contested case.

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TAC Recommendation Report

	On 10/22/09, ERCOT Staff explained that PRR830 is not intended to change the philosophy of the Protocols. ERCOT Staff also provided clarification of the proposed change to the WGR definition, and noted that dynamic devices will be required going forward, but that existing WGRs can meet the requirement with static devices. There was also discussion regarding the use of the "cone" versus the "rectangle" for Reactive Power capability and that having differing requirements makes planning difficult and may pose fairness and grid stability issues. Some Market Participants expressed concerns that requirements of PRR830 would impose costs to retrofit existing units and that studies should be performed to demonstrate need.
TAC Decision	On 11/5/09, TAC voted to recommend approval of PRR830 as recommended by PRS in the 10/22/09 PRS Recommendation Report and as amended by the 10/29/09 ERCOT comments. All Market Segments were present for the vote.
Summary of TAC Discussion	On 11/5/09, TAC reviewed PRR830 comments. A Market Participant proposed including language that allowed a hybrid solution to meet Reactive Power capability requirements. ERCOT Staff explained that paragraph (6) of Section 6.5.7.1 allows Market Participants to submit alternative proposals to ERCOT for meeting the requirement, which could include a hybrid solution. Some Market Participants opined that changing the definition of WGR would have repercussions not only where "WGR" is used in the Protocols or market guides, but could also create complications in instances where the terms "generator," "Resource," or "unit" are used. ERCOT Staff contended that the definition change is needed in order to ensure that ERCOT has an accurate representation of each WGR's Reactive Power capability. Questions were raised regarding ERCOT's acceptance of the "triangle" that was provided in the Resource Asset Registration Forms (RARFs). ERCOT Staff explained that the RARFs should provide an accurate representation of what a unit is physically capable of doing and should not be taken as a substitute for the requirements in the Protocols, which require the "rectangle". Some Market Participants expressed concern regarding retrofits to existing units. It was stated that in the past, most rules that would impose cost on existing units were implemented on a prospective basis unless there was a demonstrated need, and it was argued that at this point, there has been no evidence provided indicating that there is a need to retrofit. Others countered that if generators are not operating in the "rectangle" as the current system was designed that it is a reliability issue versus a cost issue since the risk of a voltage

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	collapse increases as you increase capacity not operating within the "rectangle."

Quantitative Impacts and Benefits			
Assumptions	1		
	2		
	3		
	4		
Market Cost		**Impact Area**	**Monetary Impact**
	1		
	2		
	3		
	4		
Market Benefit		**Impact Area**	**Monetary Impact**
	1	*Clarifies the reactive requirements for wind generation.*	
	2		
	3		
	4		
Additional Qualitative Information	1		
	2		
	3		
	4		
Other Comments	1		
	2		
	3		
	4		

Sponsor	
Name	John Dumas
E-mail Address	jdumas@ercot.com
Company	ERCOT
Phone Number	(512) 248-3195
Cell Number	
Market Segment	N/A

Market Rules Staff Contact	
Name	Sandra Tindall
E-Mail Address	stindall@ercot.com
Phone Number	512-248-3867

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Comments Received	
Comment Author	**Comment Summary**
Horizon Wind Energy LLC 091509	Recommended that PRR830 be rejected as submitted.
Calpine 092809	Supported approval of PRR830.
Iberdrola Renewables 100709	Suggested existing Protocol language is clear. Proposed additional revisions only as an alternative to the ERCOT proposed changes.
Horizon Wind Energy LLC 100809	Opined that PRR830 is contrary to existing Protocols, and is proposed without demonstration of need. Commented that PRR830 re-defines Reactive Power capability requirements for Generation Resources interconnected with the ERCOT Transmission Grid, imposing new requirements on WGRs and requiring retrofits to the majority of operating WGRs.
LCRA 100809	Proposed clarifying language which would allow Resources to start at lower voltage levels. Also proposed changes related to establishing Reactive Power requirements.
ROS 101909	Endorsed PRR830 as submitted.
Wind Coalition 102109	Provided alternative language to the definition of a WGR and the subsequent changes that are intended to improve the modeling of wind-powered generation reactive capabilities.
Vestas 102209	Stated that if PRR830 is adopted as proposed, it may unnecessarily increase the costs of WGRs in Texas with no improvements in reliability. Suggested that hybrid systems that have the effective performance of a fully dynamic system should be allowed.
NextEra Energy Resources102209	Recommended that PRS reject PRR830 and instead recommended that PRR835 be approved.
Calpine 102809	Responded to NextEra's 10/22/09 comments and supported ERCOT's efforts to maintain system reliability and the fairness found in PRR830.
Oncor 102909	Supported ERCOT's efforts to maintain system reliability with PRR830.
ERCOT 102909	Provided comments to support the need for the WGR definition change. Also proposed additional language changes which revised the effective date in both the Revision Description and in paragraph (2) of Section 6.5.7.1 to December 1, 2009 and provided administrative edits and clarification to proposed language revisions.
AEP 103009	Supported the passage of PRR830.
Invenergy 110209	Proposed the addition of paragraph (12) to Section 6.5.7.1 to clarify the requirements and approximated the treatment afforded to other types of Generation Resources that have multiple turbines behind the same POI such as combined cycle units
NextEra Energy Resources 110309	Incorporated concepts and specific amendments proposed in comments submitted by LCRA (10/08/09), The Wind Coalition (10/21/09), ERCOT (10/29/09), and Invenergy (11/02/09). Also

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	proposed additional language changes that utilized the "rectangle" requirement for all technologies as proposed by ERCOT.
Horizon Wind Energy 110309	Recommended that PRR830 be rejected.
Vestas 110409	Provided additional language changes so that dynamic VAR capable devices would include hybrid devices and would be considered as an acceptable alternative to meet ERCOT's Reactive Power interconnection requirement.

Revised Proposed Protocol Language

2.1 Definitions

Point of Interconnection (POI)
The location(s) where a Generation Entity's interconnection Facilities connect to the Transmission Facilities as reflected in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and a Transmission and/or Distribution Service Provider (TDSP).

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Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind. Wind turbines may be aggregated together to form a WGR if each turbine is the same model and size and located behind the same Generator Step Up (GSU) transformer.

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2.2 Acronyms

POI Point of Interconnection
GSU Generator Step UpSGIA Standard Generation Interconnection Agreement

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6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected at the same Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

6.5.7.1 Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS

(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT. Generation Resources shall comply with the following Reactive Power requirements: an over-

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excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ERCOT Transmission Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the POI. The Reactive Power requirements shall be available at all MW output levels and may be met through a combination of the Generation Resource's Unit Reactive Limit (URL), which is the generating unit's dynamic leading and lagging operating capability, and/or dynamic VAR capable devices. For Wind-powered Generation Resources (WGRs), the Reactive Power requirements shall be available at all MW output levels at or above 10 percent (10%) of the WGR's nameplate capacity. When a WGR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT may require a WGR to disconnect from the ERCOT System. The Reactive Power requirements of this paragraph shall apply to all Generation Resources except as otherwise provided in paragraphs (2) through (4) below.

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(2) WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before December 1, 2009, must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (1) above. However, the Reactive Power requirements may be met through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices. WGRs shall comply with the Reactive Power requirements of this paragraph by no later than December 31, 2010, unless it is known by July 31, 2010, that related retrofits are required by the Voltage Ride-Through study conducted in accordance with Operation Guide Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-powered Generation Resources, in which event ERCOT may in its discretion modify the deadline for an affected WGR. ERCOT, in its sole discretion, also may grant an extension of time for other reasons.

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(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the qualified renewable Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

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(4) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

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(5) For purposes of meeting the Reactive Power requirements in paragraphs (1) and (2) above, multiple generation units including wind turbines shall, at a Generation Entity's option, be treated as a single Generation Resource or WGR if the units are connected to the same transmission bus.

(6) Generation Entities may submit to ERCOT specific proposals to meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices. ERCOT may, at its sole discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall provide the submitter an explanation of its decision.

(7) A Generation Resource and TDSP may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1).

(8) Unless specifically approved by ERCOT, no unit equipment replacement or modification at a Generation Resource shall reduce the capability of the unit below the Reactive Power requirements that applied prior to the replacement/modification.

(9) Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

(10) WGRs must provide a Real Time Supervisory Control and Data Acquisition (SCADA) point that communicates to ERCOT the number of wind turbines that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid. WGRs must also provide two (2) other Real Time SCADA points that communicate to ERCOT the following:

(a) The number of wind turbines that are not able to communicate and whose status is unknown; and

(b) The number of wind turbines out of service and not available for operation.

WGRs must comply with the requirements of paragraph (10) by no later than June 1, 2010.

(11) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by automatically switchable static VAR capable devices.

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6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or Transmission and/or Distribution Service Providers (TDSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional Megavolt Ampere Reactive (MVAR), nor will they be requested to operate on a voltage schedule outside the URL specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

(2) ERCOT and TDSPs shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, GSU transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

(3) The TDSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed Reactive Power capability requirements.

(4) All Generation Resources required to provide VSS shall support the transmission voltage at the POI to the ERCOT Transmission Grid, or at the transmission bus in accordance with paragraph (5) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

(5) The QSEs providing VSS shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

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An induction generator may elect to make a contribution in aide of construction in lieu of meeting the installed capacity VSS requirements contained herein. In order to comply with the VSS requirements under this paragraph (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to that used to collect payments for the direct assignment of interconnection Facilities under applicable Public Utility Commission of Texas (PUCT) rules. The level of payment shall reflect the cost to the TDSP of procuring, installing, operating, and maintaining any Reactive Power equipment required to replace the Reactive Power capability that otherwise would be necessary for the interconnection of the generator. In order for this paragraph (7) to be effective for VSS compliance, the TDSP shall certify to ERCOT that the induction generator has complied with these requirements.

830PRR-28
TAC Roll Call Vote
110509

Version 2.0

2009 TAC MOTION: H

To recommend approval of PRR830 as recommended by PRS with ERCOT comments.

Tally Votes

Date: November 5, 2009

Clear

Prepared by: B. Albracht

TALLY TOTAL

Voting Structure	Motion Passes		Total Abstentions
TAC	67% of non-abst TAC Votes = 17		
TAC Vote:	23	1	6

Sector / Entity		Representative	Present	Yes	No	Abstain
Cooperatives						
Lower Colorado River Authority		Brad Belk (Sandy Morris)	y	1		
Brazos Electric Power Cooperative, Inc.		Hugh Lenox	y	1		
Nueces Electric Cooperative		John L. Sims (Clif Lange)	y	1		
South Texas Electric Cooperative, Inc.		Henry Wood (Clif Lange)	y	1		
		Segment Vote:	4	4	0	0
Municipals						
CPS Energy		Les Barrow	y	1		
Austin Energy		Mark Dreyfus	y	1		
Brownsville Public Utilities Board		Fernando Saenz (James McCann)	y	1		
GEUS		David McCalla (Gary Singleton)	y	1		
		Segment Vote:	4	4	0	0
Investor Owned Utilities						
Luminant Energy		Brad Jones	y			a
CenterPoint Energy		John Houston	y	1		
First Choice Power, Inc.		Steven Moss	y	1		
AEP Corporation		Richard Ross (Kip Fox)	y	1		
		Segment Vote:	4	3	0	1
Indepent Generators						
FPL Energy		Mark Bruce	y		1	
Calpine Corporation		Randy Jones	y	1		
NRG Texas		Adrian Pieniazek	y			a
PSEG TX		Marguerite Wagner	y	1		
		Segment Vote:	4	2	1	1
Consumers **Divide Subsegments?**	n	**Consumer Vote Total**	1			
Residential Consumer	Resi	Shannon McClendon	y			a
Office of Public Utility Counsel	Resi	Danny Bivens	y	1		
City of Lewisville	Comm	Phillip Boyd	y	1		
City of Eastland	Comm	Chris Brewster	y	1		
Austin White Lime Company	Indu	Oscar Robinson (Mark Smith)	y			a
Air Liquide	Indu	Bill Smith	y	1		
		Segment Vote:	6	4	0	2
Independent Retail Electric Providers						
Strategic Energy, LLC		Read Comstock	y	1		
TriEagle Energy		Martin Downey	y	1		
Cirro Group		William Lewis (Marcie Zlotnic)	y	1		
Star Electricity dba StarTex Power		Marcie Zlotnik	y	1		
		Segment Vote:	4	4	0	0
Independent Power Marketers						
Exelon Generation Company, LLC		Kristy Ashley	y	1		
Sempra Energy Trading		Seth Cochran	y	1		
BP Energy		Eric Schubert (Judy Briscoe)	y			a
DB Energy Trading		Brandon Whittle	y			a
		Segment Vote:	4	2	0	2
All Sectors Voting Totals						**Total**
		Segment Vote:	30	23	1	6

830PRR-29
NextEra Energy Resources Appeal
110609

PRR Appeal of Decision

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	November 6, 2009

Decision Being Appealed	Technical Advisory Committee Recommendation Report
Date of Decision	November 5, 2009

Submitter's Information	
Name	Todd Kimbrough
E-mail Address	todd.kimbrough@fpl.com
Company	NextEra Energy Resources
Phone Number	512-466-3190
Cell Number	512-466-3190
Market Segment	Independent Generator

Comments

NextEra Energy Resources ("NextEra") respectfully appeals the November 5, 2009 decision of the Technical Advisory Committee ("TAC") to recommend approval of PRR 830 Reactive Power Capability Requirement to the ERCOT Board of Directors ("Board").

NextEra believes the TAC erred in its decision with respect to a number of technical concerns which were raised during deliberations on the PRR but which are not resolved in the TAC-recommended language. NextEra also believes the TAC-recommended language of PRR 830 contradicts previously adopted Board policy regarding the imposition of new technical capabilities on existing Resources in ERCOT.

PRR 830 has been granted Urgent Status and is, therefore, scheduled for decision by the Board at its November 17, 2009 regular meeting. In accordance with Section 8.4 of the Board Policies and Procedures, NextEra's appeal is timely filed and NextEra requests the Board hear this appeal on November 17, 2009. NextEra commits to filing documentation in support of this appeal sufficiently in advance of the November Board meeting to allow timely review of the material by Directors prior to hearing the appeal at the meeting.

NextEra Energy Appeal of PRR 830 Regarding Reactive Power

NextEra Energy Resources (NextEra) respectfully requests the ERCOT Board of Directors remand PRR 830 to TAC with instructions to address material defects in the PRR as discussed below or, in the alternative, approve the PRR as set forth in Attachment A.

Proper levels of reactive power in the ERCOT system are essential for the reliable delivery of electricity service to customers throughout the state. No one disputes this fact. However, there is significant dispute regarding: (a) the appropriate reactive power capability needs in various locations on the ERCOT transmission system; (b) whether multi-million dollar retrofits of some wind farms are either technically necessary or economically efficient; and (c) whether the ERCOT Protocol revision process can be used to interfere with pending Alternative Dispute Resolution (ADR) and Public Utility Commission of Texas (Commission or PUCT) contested case processes which address the same issue as the proposed Protocol revision.

No matter one's position on the core issues above, PRR 830 as recommended by TAC lacks clarity in key respects and risks unintended consequences from the inclusion of insufficiently vetted new concepts. The PRR would clearly benefit from further refinement.

NextEra strongly recommends the Board decline to approve PRR 830 in its current form because it conflicts with prudent ERCOT policy precedent and lacks sufficient technical support. NextEra remains committed to working through the stakeholder process to improve the PRR if the Board chooses to remand it to TAC. However, NextEra also recognizes the urgent need for resolution of this issue and, therefore, offers amendments for Board consideration which would sufficiently improve the PRR to enable immediate adoption, while reserving remaining issues for subsequent resolution in accordance with the applicable procedures.

I. Background

Well before submitting PRR 830, ERCOT Staff sent letters to wind generators asking them to demonstrate compliance with the existing Protocol language requiring generators to provide reactive power capability. Wind generators, including NextEra, submitted responses to ERCOT's request and consistently presented evidence that showed compliance by providing what is commonly called a "triangle," *i.e.*, increasing reactive power as the amount of available wind increases. Similar evidence had in many cases been presented to ERCOT Staff and Transmission Service Providers (TSPs) through the generation interconnection and asset registration processes as these units were developed and certified for operation. Nonetheless, ERCOT Staff in November 2008 announced an interpretation of the existing Protocol language to require what is commonly called a "rectangle," *i.e.*, the same amount of reactive power would be expected from wind turbines regardless of whether or how strong the wind blows.

As a result of the conflict between ERCOT Staff's interpretation and that of multiple owners of wind resources installed over a four-year period, several ADRs and a contested case have resulted. NextEra is currently in the final stages of an ADR process which preceded the contested case at the Commission and the proposal of PRR 830. It was in the midst of these activities, which are defined by Section 21 of the Protocols and by the PUCT Procedural Rules that, ERCOT Staff on September 8 submitted PRR 830 which was described as a "clarification" of existing Protocol language even though it proposed substantive new language, introduced new compliance deadlines, and contained substantive deletions of many key elements of the current reactive power capability standard language.

In response to the clear deficiencies of PRR 830 and in the desire to find a mutually agreeable compromise, NextEra filed PRR 835, included as Attachment B, on September 30. PRR 835 would have required application of the "rectangle" requirement where generation interconnection studies or other studies demonstrated the need for it, but maintained the previously used "triangle" as the minimum reactive power capability requirement. In support of PRR 835, NextEra presented preliminary results of engineering studies to ROS on October 15. The NextEra presentation to the ROS is included as Attachment C. ERCOT Staff sought to dismiss the engineering studies offered by NextEra as insufficient in scope, but did not offer, and has still yet to offer, any alternative studies or data to support the PRR 830 requirement. The ROS, TAC's subcommittee of technical experts in the area of system reliability, endorsed PRR 830 as filed based upon a "fairness" argument and an assumption that "more is better," rather than on any technical analysis of system conditions or likely future scenarios. NextEra notes with some concern that the ROS filed only 24 words in its technical endorsement of the PRR, none of them providing technical guidance on any of the fundamental issues. Similarly, both PRS and TAC subsequently endorsed PRR 830 as filed, despite acknowledgement by several parties, including ERCOT Staff, that some issues remained unresolved and that the amendments proposed by multiple parties might improve the clarity and workability of the PRR.

On November 3, prior to the TAC deliberation, NextEra submitted the alternative language included in Attachment A which cured the original language's interference with the ADR process; preserved the Commission's jurisdiction over the subject matter in contested case proceedings; provided the exact "rectangle" requirement sought by ERCOT Staff for all new generation; and proposed solutions for identified technical concerns with the PRR – all without closing the door on requiring retrofits of existing units where needed to address system security needs. NextEra's proposal also incorporated a number of suggestions offered by other parties which the ROS, PRS, and TAC either completely ignored or only briefly considered. NextEra notes that at no point in the Protocol revision process has PRR 830 been studied by the kinds of working groups or task forces where thorough, substantive, detailed discussion by specialized subject matter experts typically occurs in the stakeholder process. NextEra requests the Board remedy these procedural and substantive defects by remanding or amending the PRR.

II. <u>PRR 830 as recommended by TAC does not meet the ERCOT policy standard for retroactive application of technical capabilities.</u>

Implementation of PRR 830 as recommended by TAC is estimated to cost wind generators approximately $100 million, yet no evidence has been presented to suggest such an investment would yield a commensurate benefit to system reliability. Indeed, the first mention of known reliability concerns related to existing units did not appear until the discussion at TAC, when ERCOT Staff referenced "two recent incidents" where grid operator actions were required to address reactive power capability deficiencies. No details about these incidents were provided and there was no analysis or discussion whether the reactive power capability retrofits required by PRR 830 would have sufficiently addressed the referenced incidents. There was also no analysis or discussion about whether ERCOT's actions to support voltage in the referenced incidents provided a more economically beneficial solution to the challenge than imposition of retrofit requirements. In fact, the only thing clear from the brief discussion of known "incidents" is that multiple solutions other than the PRR 830 approach are available to ERCOT and TSPs to resolve voltage support and reactive power issues. In each instance where anecdotal support for PRR 830 has been offered it has been in the form of extemporaneous oral argument – no studies, data, or written comments have been provided.

As the Board is aware, NextEra and other wind generators in ERCOT have spent millions of dollars in the past 18 months to implement numerous PRRs which required new or upgraded capabilities and processes for existing units to support operational reliability. Examples include upgrading generation control systems to implement ramp rate limitations (PRR 778); installing additional data-gathering equipment and telemetry to support development of the ERCOT system-wide wind forecast and accelerated implementation of Texas Nodal Market requirements deemed to have immediate benefit (PRR 794); as well as changes to key operational processes to support ERCOT's ability to manage wind variability-related issues (PRRs 763, 773, and 793). Indeed, all of these new requirements on existing units were supported, even authored, by wind generators. NextEra has not and will not argue that existing units cannot be required to provide new or upgraded technical capabilities when technically feasible to do so. However, NextEra notes that when such new requirements necessarily involve substantial unit outages and/or dedication of significant technical and financial resources, wind generators have never opposed retrofits out of hand but rather have requested those proposing the major modifications provide reasonable justification for the retrofits and some analysis to support the value of the proposed requirements. PRR 830 noticeably lacks such evidentiary support.

On previous occasions, most notably in the Appeal of OGRR 208, the Board has required a meaningful analysis to support major retrofits on existing investments. In OGRR 208, TAC approved universal application of a voltage ride-through standard which would have forced a number of generators to extensively retrofit existing units. The recommendation was based on a general sense that more capability would be better for the system but there was no study or evidence to support the contention that the benefit would meet or exceed the costs to retroactively apply the new standard. The Board noted the lack of adequate evidence to demonstrate the need for such a significant investment and appropriately approved the new VRT standard on a prospective basis, while directing that a study be performed to identify system needs and recommend solutions. Moreover, the Board recognized the danger of sending a signal to investors and developers that no project *pro forma* was safe from arbitrary *ex post facto* action and that all investment decisions in ERCOT should be made with the understanding that future financial and capital risk could be boundless. NextEra requests the Board remain committed to the reasonable policy precedent that evolving technical requirements be implemented prospectively unless compelling evidence supporting retroactive application is presented.

III. PRR 830 merits refinement of important secondary issues independent of any decision on the issue of retroactive application of the "rectangle" standard.

Even if the Board chooses to ignore the procedural and policy concerns raised in this appeal, it is important to note the TAC-recommended language should be improved to provide additional clarity and to avoid unintended consequences. In so doing, the Board could also minimize the risk that vague or confusing language would prompt additional needs for ADR sessions and contested cases at the Commission. Specifically, NextEra directs the Board to proposed amendments Nos. 1, 2, 3, 7, and 9 in Attachment A. Each proposed amendment addresses issues unrelated to the retrofit question such as whether an ERCOT-ordered disconnection from the grid to support voltage is temporary or permanent and how to best provide ERCOT the information needed for Real Time reactive power capability modeling, among others.

NextEra is disappointed that as late in the process as the November 5, 2009 TAC deliberation, several parties who ultimately supported PRR 830 as filed, including ERCOT Staff, acknowledged some of the concerns and potential solutions raised by NextEra, Invenergy, Vestas, and the Wind Coalition, yet declined to dedicate the time necessary to vet the identified issues. NextEra is concerned that the push to do something has morphed into a willingness to do anything, whether or not fully considered. Such a rush to judgment on critical issues of system reliability and economics does not reflect well on the stakeholder process.

IV. PRR 830 merits further examination of key technical issues.

Sources of reactive power typically provide more benefit to the system by being nearer to load. Wind resources, with almost no exception, are located in remote areas that are far from load. Therefore, even if wind resources were able to provide significant amounts of reactive power, there would likely be no benefit to loads that are hundreds of miles away since reactive power does not travel well. NextEra's study and presentation to ROS showed this fact. The need for additional reactive power near wind farms typically occurs when the amount of energy generated by the turbines increases. The "triangle" provides this by definition, *i.e.*, the amount of reactive power produced increases as the amount of energy is produced. ERCOT Staff has offered no data or studies to quantify the system benefits which might result from burdensome reactive power requirements in regions with low load levels.

Moreover, NextEra is concerned that adding superfluous amounts of reactive power in remote generation pockets can actually harm reliability and can compel expensive equipment additions by TSPs. Where there is too much reactive power in a region, TSPs will be compelled to add equipment on their lines in order to remove these excesses. Although the PUCT approved a plan more than one year ago to add more than 10,000 MW of new wind generation to the western portion of the ERCOT network, a study of the reactive power needs associated with that build out is only now under development. The fact that such a study is under development, and that such a study is similar to the OGRR 208 VRT Study currently underway begs the question: why should anyone, including the Board, feel compelled to make major changes now based on speculation and conjecture when quantifiable data and analysis is under development and expected within a reasonable time frame? NextEra recommends the Board correct PRR 830's procedural and technical deficiencies by setting aside the legacy issues and directing ERCOT Staff to move forward with an appropriate reactive power requirements study which takes into account the impact of thousands of additional megawatts of new wind capacity in the West Zone generation pocket which must comply with the new "rectangle" requirement of a prospectively applied PRR 830.

V. PRR 830 does not maximize consumer benefit.

Although it has been argued that the reactive power capability from generation units is insufficient for system needs and some, albeit scant and anecdotal, evidence has been offered that ERCOT has taken various actions to address voltage support issues in the west, no meaningful discussion or analysis has occurred to address which approach to the reactive power issue provides the best solution for Texas consumers. If it costs generators more than it would cost TSPs, then consumers will benefit from TSPs providing the solution because the costs of implementation must be recovered regardless of whether they are borne by a generator or a TSP. There is absolutely no evidence that the single option included in PRR 830 is the most cost-effective way to address reactive power. This tunnel vision could cost Texas consumers millions of dollars and burden them with a less efficient system design in the process. NextEra recommends the Board recognize the deficiency of analysis from the consumer viewpoint and refrain from prematurely adopting a policy which may ultimately require significant wasteful spending which would trickle down into customer impacts.

VI. The ERCOT Protocols cannot be "clarified," they can only be "revised."

The ERCOT Staff has described PRR 830 as a "clarification" of existing Protocol language. NextEra is concerned, as many other entities have been over time, with the idea that the Protocols can be "clarified." Section 21.1 of the Protocols clearly states any, "request to make additions, edits, deletions, revisions, or clarifications to these Protocols, including any attachments and exhibits to these Protocols, is called a 'Protocol Revision Request.'" There is no "clarification" which is separate and distinct from a "revision."

ERCOT and all Market Participants are bound by the requirements of the Protocols. When there is a lack of clarity regarding those requirements, parties may proceed at their own risk of an adverse interpretation by a jurisdictional entity or may seek to revise the Protocols to provide new language which makes the Protocols requirement at issue clearer upon the effective date of approved clarifying language. But such revisions never resolve what the language meant in the past, they can only attempt to make clear what the language means once that language is an effective part of the Protocols. All disputes regarding Protocols requirements belong under the jurisdiction of the PUCT. No matter what ERCOT Staff or a particular Market Participant thinks any particular requirement of the Protocols meant at any particular point in time, only the PUCT can actually interpret the language of the Protocols when an irresolvable dispute is raised, as is the case regarding the reactive power capability requirements of Section 6.5.7.

Even to the casual reader, PRR 830 clearly stretches the boundaries of what could reasonably be considered a clarification. In Section 2.1, PRR 830 proposes a new definition which has never appeared in the Protocols and makes a fundamental distinction in another which had previously never been contemplated. PRR 830 strikes entire existing paragraphs, inserts entirely new paragraphs, complete with new technical standards, compliance deadlines, and ERCOT authority to review and approve various plans and actions. In many respects, one could argue PRR 830 is less clear on some issues than the existing Protocols language, such as the Section 6.5.7.1(7) allowance for generators to pay TSPs to install reactive capability equipment. The section currently contains precise language approved by the Board in PRR 493 to ensure consumers did not bear unwarranted costs through transmission rates. That specificity would be stripped by PRR 830 and replaced with vague language allowing generators and TSPs to "enter into an agreement."

NextEra recommends the Board reject on principle the notion that backward-looking "clarifications" of the Protocols are even possible and amend PRR 830 to comport with the long-held standard that Protocol revisions are only prospectively effective and retroactive application of new standards requiring major financial commitment is permissible only when supported by a demonstration of need and/or cost-effectiveness.

VII. Circumvention of the ADR process and the Commission's jurisdiction by PRR 830 is inappropriate.

PRR 830 is unique in that, to NextEra's knowledge, it marks the first time ERCOT Staff has submitted a "clarifying" PRR which seeks to impose the viewpoint of one party in an active ADR process conducted under Section 21 of the Protocols. Typically, as one of the terms to a successful conclusion of ADR, ERCOT requires the Market Participant to file a PRR which provides the clarification in the Protocols needed to avoid another ADR for the same issue in the future. Never before has NextEra known ERCOT to abandon the ADR process and attempt to apply a retroactive interpretation of the Protocols in an effort to render the ongoing ADR proceeding moot. Not only is such an approach unique, it is also quite disturbing because it seems designed to prevent an affected entity from relying on the due processes described in the Protocols and the PUCT rules.

PRR 830 was submitted while a contested case was pending at the PUCT and while multiple companies were engaged in ADR with ERCOT Staff. Each of the ADRs and the contested case focused on the proper interpretation of the existing Protocol language related to reactive power. The contested case has since been dismissed, purely on procedural grounds; however the ADR processes continue and appear to be on track for multiple appeals to the Commission. By actively pushing PRR 830 through the revision process, ERCOT Staff has effectively forum-shopped in a manner that seeks to neuter the ADR process and to end run the Commission's contested case processes. As a matter of procedural principle, it is inappropriate for any participant, including ERCOT Staff, to ignore the proper tools of ADR and contested cases for interpretation and clarification of existing Protocol language. For this reason, NextEra recommends PRR 830 be designed solely for prospective application at this time. The existing wind farms can and will be addressed in the pending ADRs and likely in contested cases that relate to them.

VIII. <u>NextEra's proposal addresses key deficiencies in PRR 830 while delivering the full "rectangle" solution and keeps the door open on the retrofiting issue by respecting the PUCT's authority to interpret the Protocols and by proposing technical analysis to develop the right solution.</u>

For the reasons described above, NextEra firmly believes successful resolution of the issues addressed by PRR 830 requires the adoption of revised Protocol language which clearly defines the reactive power capability requirements for generation Resources on a going forward basis. NextEra further believes that such revised language should avoid unnecessary, unclear, or unvetted changes which might produce unintended consequences. Finally, NextEra believes such revised language should avoid an arbitrary retroactive application of major technology changes or language intended to meddle with legal processes outside the PRR process which invite litigation and threaten implementation of a clear standard for market participants. PRR 830 as recommended by TAC fails each of these tests.

The proposal offered by NextEra in Attachment A meets each of these important considerations. It clearly offers the same "rectangle" requirement proposed by ERCOT and endorsed by ROS, PRS, and TAC while setting aside the legacy issues which threaten implementation of the clarified reactive power standard. NextEra's proposal comports with long-standing ERCOT practice for Protocol revisions and with previously adopted Board policy regarding major changes to technical standards for existing infrastructure.

Importantly, NextEra's proposal does not preclude the adoption of a subsequent PRR to require retrofits to existing units. Clearly, if the PUCT decides that multiple wind developers over the last four years somehow all misunderstood the requirements of Section 6.5.7, then those asset owners will obviously be obligated to meet the requirements of the Protocols in effect at that time as interpreted by the PUCT decision. If a PRR is needed to effectuate that change, then such a PRR consistent with a Commission order will be filed and approved. Even if the PUCT decides, as wind generators anticipate, that the existing Protocols language allows the provision of a "triangle"-shaped reactive power capability, there is no reason a new PRR cannot be filed in the future to require generators currently incapable of providing the "rectangle" to make the upgrades necessary to achieve such a standard, provided such a change is sufficiently supported by compelling evidence of necessity.

In short, the NextEra proposal does not preclude the possibility that the ultimate resolution of the reactive power capability issue may eventually include all the elements of PRR 830. However, the NextEra proposal ensures that the most reliable and economically efficient solution has a chance to emerge from the deliberative stakeholder process; preserves the integrity of the stakeholder process and PUCT rules; and follows previous Board policy on fundamental issues of market design and market rules implementation. NextEra strongly recommends the Board do what TAC and its subcommittees failed to do – seriously consider a methodical approach which breaks this issue into achievable pieces leading to the best long-term result for the ERCOT market and the ERCOT system.

IX. Recommendation of NextEra Energy Resources.

Consistent with ERCOT precedent and sound market policy principles, NextEra recommends the Board decline to approve PRR 830 as recommended by TAC. Rather, NextEra recommends the Board adopt one of the two draft motions below, listed in order of preference.

1. Remand PRR 830 to TAC with instructions to redesign the PRR solely for prospective application and reconsider the need for changing the definition of WGR throughout the Protocols solely for purposes related to Section 6.5.7.; or

2. Adopt PRR 830 with NextEra's November 3, 2009 comments.

830PRR-30
NextEra Energy Resources Appeal
Supporting Documents 1

Attachment A

November 3, 2009 Comments of NextEra Energy Resources Regarding PRR 830

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	November 3, 2009

Submitter's Information	
Name	Todd Kimbrough
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Company	NextEra Energy Resources
Phone Number	512.466.3190
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Market Segment	Independent Generator

Comments

NextEra Energy Resources submits the following comments regarding PRR 830, Reactive Power Capability Requirement, for consideration by the TAC. The redline language proposed below is based upon the PRS Recommendation Report of October 22, 2009 and incorporates concepts and specific amendments proposed in comments submitted by LCRA (10/08/09), The Wind Coalition (10/21/09), ERCOT (10/29/09), and Invenergy (11/02).

NextEra's new compromise proposal below does not insert the PRR 835 approach, which was not endorsed by the ROS and which was rejected by the PRS on Oct. 22. Although NextEra still believes ERCOT's proposed Reactive Power capability standard as set forth in PRR 830 is potentially inefficient and wasteful, NextEra nonetheless respects the opinion of the ROS and the PRS regarding the minimum standards for the ERCOT System going forward. NextEra's proposal, therefore, utilizes the "rectangle" requirement for all technologies as proposed by ERCOT.

Summary of NextEra's proposal

1. Prospectively, the compromise proposal applies the exact Reactive Power capability requirement proposed by ERCOT, endorsed by the ROS, and recommended by the PRS.

2. It provides a means to accomplish ERCOT's Reactive Power capability modeling needs without the unintended consequences of ERCOT's proposed change to the definition of Wind-powered Generation Resource (WGR) in Sec. 2, which

would apply throughout the Protocols for many purposes other than that intended by ERCOT.

3. It sets aside the legacy issues applicable to existing units for resolution following a PUCT decision in the related contested case (Docket No. 36482) and/or through Alternative Dispute Resolution (ADR) processes pursuant to Commission order or pursuant to existing Protocols regarding ADR.

Explanation of each of NextEra's proposed amendments

1. Section 2.1: NextEra strikes ERCOT's proposed re-definition of Wind-powered Generation Resource (WGR) and inserts alternate language which comports with the way WGRs are interconnected to the ERCOT Transmission Grid. As discussed in more detail below, NextEra believes ERCOT's stated desire to more easily model the Reactive Power capability of Resources with multiple units can be achieved with amendments applicable only to Section 6.5.7.1(10) rather than inviting the unintended consequences of re-defining WGRs for all purposes throughout the Protocols.

2. Section 2.2: NextEra includes ERCOT's 10/29 correction to the acronym "GSU" and adopts The Wind Coalition's 10/21 proposed addition of the "WTG" acronym, which is used in the proposed amendment to Section 6.5.7.1(10) to address the Resource Reactive Power capability modeling concerns.

3. Section 6.5.7.1(1): NextEra incorporates ERCOT's 10/29 correction to "10 percent." NextEra also adds clarifying language that the requirement that WGRs disconnect from the grid when unable to support voltage at the POI is a "temporary" disconnection at ERCOT's instruction to address a Real Time condition and that the WGR is allowed to re-connect at ERCOT's instruction. NextEra further incorporates the concept advocated by the 10/08 LCRA comments that execution of ERCOT's instruction to disconnect from the ERCOT System to address a Real Time voltage event precludes a finding that the WGR violated Section 6.5.7.

4. Section 6.5.7.1(2): NextEra incorporates ERCOT's 10/29 correction striking "November" and inserting "December" to reflect the revised expected effective date of PRR 830. NextEra also strikes "February 17, 2004" and inserts "July 1, 2010" for the reasons identified below.

    a) Paragraph (2) specifically requires WGRs to meet the "rectangle" standard for Reactive Power capability. As drafted by ERCOT, this paragraph creates several problems. Despite ERCOT's claims to be only a clarification of existing language and a prospective application of the clarified standard, ERCOT's proposed paragraph (2) clearly requires retrofitting existing units with new equipment. The interpretation of the existing Protocol language and whether it historically required a "rectangle" is before the Public Utility Commission of Texas and is the subject of ADR processes that are ongoing. Therefore, these forums should be allowed to continue to address the issue rather than muddying the process with a Protocol revision that may be reversed by existing proceedings. NextEra's proposal does not eliminate the possibility that retrofitting existing units could be required in the future. However, it does reserve this issue for the appropriate jurisdictional entity, the PUCT. The prudent course of action is to address prospective standards and implement the terms of the PUCT final order on the legacy issues, whatever the PUCT determines, once a final order is issued.

b) Paragraph (2) as drafted by ERCOT also fails to meet the ERCOT Board's policy direction set with the adoption of Operating Guide Revision Request 208, Voltage Ride Through Requirement. In that decision, the Board made a sound policy decision that retroactive application of technical standards can be applied only when a body of evidence indicates such application is required to maintain system reliability. While ERCOT and the ROS have presented sufficient argumentation to support the refinement of the Reactive Power capability standard on a prospective basis, the lack of evidence demonstrating historical deficiencies and the lack of any study at all which would support spending tens of millions of dollars for unit retrofits is seriously troubling and invites scrutiny by policymakers.

c) NextEra's amendment to paragraph (2) keeps ERCOT's proposed effective date (as revised by its 10/29 comments) for signed Interconnection Agreements but proposes July 1, 2010 as the effective date for new units. The date is drawn from the historical record in which the ERCOT Board last approved substantive changes to this section of the Protocols. With the approval of PRR 473, Reactive Standards, the Board provided 15 months for new units to comply with the revised standard in order to not force immediate retrofit for units which had already been designed and for which equipment had already been procured. NextEra proposes less than half that amount of time – 7 months from the effective date of PRR 830.

d) Finally, NextEra strikes the ERCOT-proposed sentence establishing a Dec. 2010 deadline for retrofit for the same reasons outlined above. NextEra is unaware of a single PRR in the history of ERCOT which imposed tens of millions of dollars of equipment costs on any Market Participant or group of Market Participants without demonstration that the benefit would clearly outweigh the cost. PRR 830 should not be the first PRR to broach this slippery slope.

5. <u>Section 6.5.7.1(3)</u>: NextEra strikes "February 17, 2004" and replaces it with "December 1, 2009" which is the anticipated effective date of PRR 830. This

change is recommended for the reasons described above. Because paragraph (3) clearly references the revised standards set forth in paragraph (1), existing units should be held only to the existing Protocols requirement and their URLs submitted to ERCOT in accordance with the Operating Guides absent some compelling evidence to abandon previous policy on the retrofit issue. This change sets aside the legacy issues likely to delay implementation of PRR 830 and allows the PUCT to address the issues duly before it.

6. Section 6.5.7.1(4): NextEra proposes changing the two dates in accordance with the reasons set forth above.

7. Section 6.5.7.1(10) and (12): NextEra endorses the 10/21 comments of The Wind Coalition which provides ERCOT with the Real Time Reactive Power capability modeling information requested from WGRs but without the unintended consequences of changing the definition of WGR throughout the Protocols in Sec. 2. NextEra adopts The Wind Coalition's proposed language with minor modifications for clarity and to avoid redundancy. NextEra's revisions to paragraphs (10) and (12) are also consistent with ERCOT's 10/29 technical corrections.

8. Section 6.5.7.1(11): Delete the word "automatically".

9. Section 6.5.7.1(13): NextEra adopts Invenergy's 11/02 proposal in a new paragraph (13) to approximate the treatment of the Reactive Power obligation for other Resources which have multiple turbines located behind the POI.

10. Section 6.7.6(1)-(3): NextEra incorporates the technical corrections proposed in 10/29 ERCOT comments.

11. Section 6.7.6(5): NextEra rejects ERCOT's strikethrough of the existing paragraph(5), returning the blackline language of existing Protocols and offers an amendment to clarify this language only applies to existing units, as it does not comport with the new requirement established in ERCOT's proposed Section 6.5.7.1(1). The reinstated Sections are highlighted in yellow.

12. Section 6.7.6(6): NextEra renumbers due to reinsertion of deleted paragraph (5).

Response to ERCOT Comments of October 29 and request for new CEO Review and Impact Analysis

NextEra appreciates ERCOT's attempt to address the concerns of wind generators regarding the proposed change to the definition of WGR in its 10/29 comments. However, NextEra notes that while ERCOT addressed the uses of "WGR" in the Protocols, ERCOT did not address the more complex issue that WGRs are simply referred to as "Resources" and "generation units" throughout the Protocols and Guides when there is not a specific need to separately address WGRs and they are treated like all other Resources. It is precisely in this area where NextEra believes the unintended consequences of ERCOT's proposal will reveal themselves. The rapid timeline on which PRR 830 has advanced through the process has not afforded NextEra the opportunity to evaluate the hundreds of such references throughout ERCOT's controlling documents and so requests stakeholders re-evaluate the wisdom the WGR definition change and adopt NextEra's proposed methodology below to deliver the same results in a Section-specific way.

Additionally, NextEra points to ERCOT's 10/29 comments which state on page 2, "The proposed definition change may require some wind owners to form multiple WGRs instead of allowing only one depending on their equipment." NextEra agrees with this comment but questions whether the CEO Review and Impact Analysis consider the resource impacts of handling new RARF submissions in both zonal and nodal, whether new sub-QSEs would also need to be created, tested, and certified, or any other impacts on ERCOT Staff to process the changes associated with implementation of this change.

Finally, NextEra notes that the unnecessary WGR definition change would effectively preclude many activities which would benefit the ERCOT System and Texas consumers. NextEra often uses wind turbines in Texas as test models for various hardware and software enhancements to provide better unit control, power uprating, ramp rate control, etc. If each new technological application requires forming a new WGR and submitting RARF data, etc., then such activity becomes overly burdensome and may not be undertaken. A more beneficial approach would be to ensure that the section of the Protocols addressing Reactive Power requirements clearly places the burden on the generator to telemeter the Reactive Power capability to ERCOT, as proposed by NextEra, rather than forcing some definition on units which does not reflect the realities of their configuration in the field.

Conclusion

NextEra's proposal below delivers the full range of Reactive Power capability for all generation units sought by ERCOT and endorsed by ROS in a manner consistent with the application of ERCOT Protocols from the beginning of this market in 2001. NextEra strongly encourages TAC to weigh the policy and market implications of deviating from the market rules philosophy which has served Texas consumers well by continually encouraging major investment in new, more efficient, cleaner generation Resources across a variety of technology types for the past several years. NextEra does not believe the proposed language below in any way precludes addressing the legacy issues now under dispute at the PUCT. However, NextEra predicts serious harm to individual Market Participants, an entire segment of the electric power industry, overall faith in the stability of the ERCOT market rules, and efforts to fulfill state policy on renewable resources should PRR 830 be adopted in its current form.

Revised Proposed Protocol Language

2.1 Definitions

Point of Interconnection (POI)
The location(s) where a Generation Entity's interconnection Facilities connects to the Transmission Facilities as reflected in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and a Transmission and/or Distribution Service Provider (TDSP).

Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind, which may consist of an aggregation of wind turbines connected to the ERCOT Transmission Grid through one Point of Interconnection (POI).~~. Wind turbines may be aggregated together to form a WGR if each turbine is the same model and size and located behind the same Generation Step Up Transformer (GSU).~~

2.2 Acronyms

POI	Point of Interconnection
GSU	~~Generation~~Generator Step Up Transformer
SGIA	Standard Generation Interconnection Agreement
WTG	Wind-powered Turbine Generator

6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected ~~to~~ at the same ~~transmission bus~~Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

6.5.7.1 Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS ~~Installed Reactive Capability~~

(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power ~~at rated capability (MW)~~ to maintain a Voltage Profile established by ERCOT. ~~This quantity of Reactive Power is the Unit Reactive Limit (URL).~~

~~(2)~~ Generation Resources ~~required to provide VSS except as noted below in items (3) or (4),~~ shall ~~have and maintain a URL which~~ comply with the following Reactive Power requirements: ~~has~~ an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ERCOT ~~t~~Transmission ~~g~~Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the ~~point of interconnection~~POI~~ to the TDSP~~. The Reactive Power requirements shall be available at all MW output levels and may be met through a combination of the Generation Resource's Unit Reactive Limit (URL), which is the generating unit's dynamic leading and lagging operating capability, and/or dynamic VAR capable devices. For Wind-powered Generation Resources (WGRs), the Reactive Power requirements shall be available at all MW output levels at or above 10 percent (10%) of the WGR's nameplate capacity. When a WGR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT may require a WGR to temporarily disconnect from the ERCOT System. WGRs which comply with instructions to temporarily disconnect from the ERCOT System in accordance with this Section will not be found in violation of Section 6.5.7 Voltage Support Service. The Reactive Power requirements of this paragraph shall apply to all Generation Resources except as otherwise provided in paragraphs (2) through (4) below.

(2) WGRs that commenced operation on or after ~~February 17, 2004~~July 1, 2010, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before ~~November~~December 1, 2009, must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (1) above. However, the Reactive Power requirements may be met through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices.~~ WGRs shall comply with the Reactive Power requirements of this paragraph by no later than December 31, 2010, unless it is known by July 31, 2010, that related retrofits are required by the Voltage Ride-Through study conducted in accordance with Operation Guide Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-powered Generation Resources, in which event ERCOT may in its discretion modify the deadline for an affected WGR. ERCOT, in its sole discretion, also may grant an extension of time for other reasons.~~

(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before ~~February 17, 2004~~December 1, 2009, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the ~~URL as stated above~~Reactive Power requirements established in paragraph (1) above, will be required to maintain a ~~URL~~ Reactive Power requirement as defined by the~~ qualified renewable~~ Generation Resource's URL that was submitted to ERCOT and established per the ~~is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and~~ criteria ~~as described~~ in the Operating Guides.

(4) New generating units connected before ~~May 17, 2005~~July 1, 2010, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to ~~February 17, 2004~~December 1, 2009, based upon previous standards, whose design does not allow them to meet the ~~URL as stated above~~Reactive Power requirements established in paragraph (1) above, will be required to maintain a ~~URL~~ Reactive Power requirement as defined by the Generation Resource's URL that was

submitted to ERCOT and established per the ~~is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and~~ criteria ~~described~~ in the Operating Guides.

(5) ~~Upon request to, and with the approval of ERCOT, multiple generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these URL requirements only.~~For purposes of meeting the Reactive Power requirements in paragraphs (1) and (2) above, multiple generation units including wind turbines shall, at a Generation Entity's option, be treated as a single Generation Resource or WGR if the units are connected to the same transmission bus.

(6) ~~Upon submission by a~~ Generation ~~Resource~~ Entities ~~required to provide VSS~~may submit to ERCOT ~~of a~~ specific proposals ~~for requirements~~ to ~~substitute for these URL~~meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices.~~,~~ ERCOT ~~shall~~ may, at its sole discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall ~~such alternative requirements or~~ provide the submitter an explanation of its ~~objections to the proposal~~decision. ~~Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements.~~

(7) ~~An induction generator may elect to make a contribution in aide of construction in lieu of meeting the installed capacity VSS requirements contained herein. In order to comply with the VSS requirements under this paragraph (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to that used to collect payments for the direct assignment of interconnection Facilities under applicable Public Utility Commission of Texas (PUCT) rules. The level of payment shall reflect the cost to the TDSP of procuring, installing, operating, and maintaining any Reactive Power equipment required to replace the Reactive Power capability that otherwise would be necessary for the interconnection of the generator. In order for this paragraph (7) to be effective for VSS compliance, the TDSP shall certify to ERCOT that the induction generator has complied with these requirements.~~ A Generation Resource and Transmission and/or Distribution Service Provider (TDSP) may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1) above.

(8) ~~For Generation Resources required to provide VSS~~Unless specifically approved by ERCOT, no unit equipment replacement or modification at a Generation Resource shall reduce the capability of the unit below the Reactive Power requirements ~~to be met by~~ that ~~unit~~ applied prior to the replacement/modification~~, unless specifically approved by ERCOT~~.

(9) Generation Resources ~~required to provide VSS~~ shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

(10) ~~WGRs must provide a Real Time SCADA point that communicates to ERCOT the number of wind turbines that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid.~~ Wind-powered Turbine Generators (WTGs) of the same model and size located behind the same Generator Step Up Transformer (GSU) must be aggregated to form a WTG aggregation. Effective June 1, 2010, ~~WGRs must also provide two other~~the following Real Time Supervisory Control and Data Acquisition (SCADA) points ~~that communicate~~must be communicated to ERCOT ~~the following~~for each WTG aggregation by the WGR's QSE, selected for this purpose:

(a) The number of ~~wind turbine~~WTGs that are not able to communicate and whose status is unknown; and

(b) The number of ~~wind turbine~~WTGs out of service and not available for operation; and

(c) The number of WTGs that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid. ~~WGRs must comply with these requirements by no later than six months after the effective date of this paragraph.~~

(11) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by ~~automatically~~ switchable static VAR capable devices.

(12) ERCOT and the TSPs shall, at a minimum, represent WGRs in the ERCOT and TSP Real Time control systems and their off-line studies to include: GSUs, substation reactive devices, and the equivalent of the WTG aggregation connected to each GSU.

(13) The reactive power requirements for a WGR under this Section shall be reduced proportionally to the nameplate capacity of the WGR's WTGs that are out of service and not available for operation. Any WTG not able to produce more than 10% of its nameplate capacity shall be considered to be out of service and not available for operation for the purpose of the Reactive Power requirements under this Section.

6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or Transmission and/or Distribution Service Providers (TDSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional M~~m~~egavolt-A~~a~~mperes R~~r~~eactive (MVAR), nor will they be requested to operate on a voltage schedule outside the ~~Unit Reactive Limits (~~URL~~)~~ specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

(2) ERCOT and ~~Transmission and/or Distribution Service Providers (~~TDSPs~~)~~ shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, ~~step-up transformer~~GSU tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

(3) The TDSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed ~~r~~Reactive Power capability requirements.

(4) All Generation Resources required to provide VSS shall ~~maintain~~support the transmission voltage at the ~~point of interconnection~~POI to the ERCOT ~~t~~Transmission ~~g~~Grid, or at the transmission bus in accordance with paragraph (5) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

(5) At all times a Generation Resource unit which commenced operation before July 31, 2010, has a signed SGIA before December 1, 2009, and which is required to provide VSS is On-line, the URL must be available for utilization at the generating unit's continuous rated active power output, and Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any Reactive Power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP.

(6) The QSEs providing V~~oltage Support Servic~~SS~~e~~ shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

Attachment B

PRR 835

PRR Number	835	PRR Title	Reactive Capability Requirement
Date Posted		September 30, 2009	

Protocol Section(s) Requiring Revision **(Include Section No. and Title)**	2.1, Definitions 2.2, Acronyms 6.5.7, Voltage Support Service 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability 6.5.7.4, Wind-powered Generation Resources Required to Provide VSS Installed Reactive Capability (new) 6.7.6, Deployment of Voltage Support Service
Requested Resolution **(Normal or Urgent, and justification for Urgent status)**	Urgent. Due to conflicting interpretations of Protocol Sections 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability and 6.7.6, Deployment of Voltage Support Service, ambiguity exists as to what the requirements are for existing and future Wind-powered Generation Resources (WGRs) in providing Reactive Power and Voltage Support Service (VSS). This Protocol Revision Request (PRR) clarifies the Reactive Power and VSS requirements for WGRs, and provides a means for maintaining and ensuring reliability without unnecessarily burdening existing and future WGRs with the cost of installing supplemental reactive capability in locations where it will have little or no value. This PRR requires existing WGRs interconnected after May 17, 2005 to provide +/- .95 power factor at the Point of Interconnection (POI) over the full output range of the Resource which is consistent with the interpretation and criteria applied by the Transmission Service Providers (TSPs) at the time these Resources were interconnected. This PRR differentiates Reactive Power and VSS requirements for WGRs from other non-wind types of Resources primarily because of the unique characteristics of the ERCOT Transmission Grid where the majority of the wind Resources currently are, and will be, interconnected. The Western zone of ERCOT has very little Load as compared to the magnitude of installed and planned WGRs and therefore has very different Reactive Power requirements from other regions of ERCOT. The imposition of a "one size for all" approach, as proposed in PRR830, Reactive Power Capability Requirement, to all generating Resources for ensuring reliability is not economically efficient in that it will necessitate the installation of reactive Resources at locations where, as a practical matter, grid reliability benefits will not be realized or ensured. This PRR also provides for the imposition of additional Reactive

	Power capability to support VSS by WGRs if the TSP shows, through the System Impact Study, that such capability is required to ensure grid safety or reliability.
Revision Description	This PRR clarifies the Reactive Power capability requirement for WGRs by specifying +/- 0.95 power factor criteria as the minimum requirement, and the Generation Resources Unit Reactive Limit (URL) criteria as the maximum requirement contingent upon a System Impact Study by the TSP.
Reason for Revision	Clarification of requirements for Resources.
Overall Market Benefit	This PRR provides additional clarity to the reactive requirements for wind generation to ensure grid safety and reliability while avoiding the cost of additional equipment where it is not justified.
Overall Market Impact	None.
Consumer Impact	This PRR may cause the cost of energy generation to increase for WGRs, however, it provides a responsible, economically efficient and technically justified option for consumers should Market Participants find that WGRs should provide additional Reactive Power.
Credit Implications **(Yes or No, and summary of impact)**	Unknown.
Relevance to Nodal Market **(Yes or No, and summary of impact)**	Yes.
Nodal Protocol Section(s) Requiring Revision **(Include Section No. and Title, and submit NPRR if applicable)**	To be determined based upon final resolution of this issue in the Zonal Protocols.

Quantitative Impacts and Benefits			
Assumptions	1	***Additional 10,000 MW of wind generation in Competitive Renewable Energy Zones (CREZs) and unknown amount of existing affected wind Resources under the proposed PRR830.***	
	2	***Avoidance of unnecessary cost impacts to existing wind generators assumed to be $10k/MW installed.***	
	3	***Avoids installation of additional reactive capability not justified for reliability.***	
	4		
Market Cost		**Impact Area**	**Monetary Impact**
	1	*WGRs.*	*Potentially $100M.*
	2		
	3		
	4		
Market Benefit		**Impact Area**	**Monetary Impact**

	1	*System reliability*	*Potentially none*
	2		
	3		
	4		
Additional Qualitative Information	1	*Avoidance of the imposition of additional reactive requirements under the presumption of reliability without technical justification is economically inefficient.*	
	2		
	3		
	4		
Other Comments	1		
	2		
	3		
	4		

Sponsor	
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Company	NextEra Energy Resources
Phone Number	561-304-5356
Cell Number	
Market Segment	Independent Generator

Market Rules Staff Contact	
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Proposed Protocol Language Revision

2.1 Definitions

Point of Interconnection (POI)

The location(s) where a Generation Entity's interconnection Facilities connect to the Facilities of the Transmission and/or Distribution Service Provider (TDSP) as specified in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and the TDSP.

Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind, which may consist of an aggregation of wind turbines connected to the ERCOT Transmission Grid through one Point of Interconnection (POI).

P_{max}
A wind power generation facility's revised maximum output submitted in Real Time via SCADA based on the number of wind turbine generators that our out of service.

2.2 Acronyms

POI Point of Interconnection

SGIA Standard Generation Interconnection Agreement

6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected ~~to~~ at the same ~~transmission bus~~Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

6.5.7.1 Generation Resources, Other Than Wind-powered Generation Resources, Required to Provide VSS Installed Reactive Capability

(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power at rated capability (MW) to maintain a Voltage Profile established by ERCOT. This quantity of Reactive Power is the Unit Reactive Limit (URL).

(2) Generation Resources required to provide VSS ~~except as noted below in items (3) or (4),~~ shall have and maintain a URL which has an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ~~transmission grid~~ERCOT Transmission Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the ~~point of interconnection~~POI to the TDSP.

~~(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the URL as stated above, will be required to maintain a URL that is limited to the~~

~~quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and criteria as described in the Operating Guides.~~

~~(4) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the URL as stated above, will be required to maintain a URL that is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and criteria described in the Operating Guides.~~

(~~5~~3) Upon request to, and with the approval of ERCOT, multiple generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these URL requirements only.

(~~6~~4) Upon submission by a Generation Resource required to provide VSS to ERCOT of a specific proposal for requirements to substitute for these URL requirements, ERCOT shall either approve such alternative requirements or provide the submitter an explanation of its objections to the proposal. Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements.

~~(7) An induction generator may elect to make a contribution in aide of construction in lieu of meeting the installed capacity VSS requirements contained herein. In order to comply with the VSS requirements under this paragraph (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to that used to collect payments for the direct assignment of interconnection Facilities under applicable Public Utility Commission of Texas (PUCT) rules. The level of payment shall reflect the cost to the TDSP of procuring, installing, operating, and maintaining any Reactive Power equipment required to replace the Reactive Power capability that otherwise would be necessary for the interconnection of the generator. In order for this paragraph (7) to be effective for VSS compliance, the TDSP shall certify to ERCOT that the induction generator has complied with these requirements.~~

(~~8~~5) For Generation Resources required to provide VSS, no unit equipment replacement or modification shall reduce the capability of the unit below the requirements to be met by that unit prior to the replacement/modification, unless specifically approved by ERCOT.

(~~9~~6) Generation Resources required to provide VSS shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

6.5.7.4 Wind-powered Generation Resources Required to Provide VSS Installed Reactive Capability

(1) WGRs are required to provide VSS and must be capable of operating at a power factor of +/- .95 or less over the full (MW) net power output range of the Resource, supplied to the ERCOT Transmission Grid, and measured at the POI to the TDSP in order to maintain a Voltage Profile established by ERCOT. This requirement is graphically depicted in Figure 1. The quantity of Reactive Power measured at the full rated capability of the Resource is the URL.

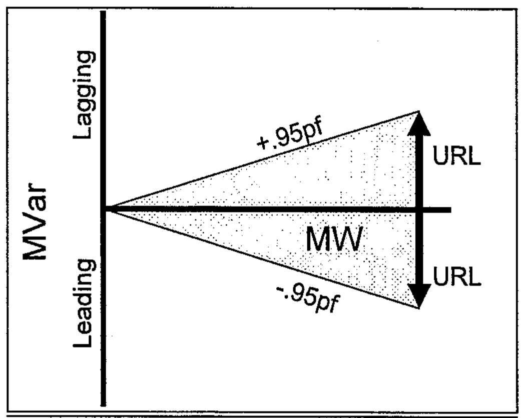

Figure 1. +/- .95 Power Factor Criteria

(2) WGRs may be required to provide VSS beyond what is required in paragraph (1) above only if the TSP or ERCOT shows, through a System Impact Study, that such capability is required to ensure grid safety or reliability. The amount of additional reactive capability required to be provided by the Resource shall not exceed the URL specified in paragraph (1) above and be available at all MW output levels over the full output range of the Resource. This requirement is graphically depicted in Figure 2. This additional reactive capability may be provided through any combination of automatically switchable static reactive devices (i.e. switched shunts) and/or dynamic reactive devices (i.e. SVC, Statcom, etc.) so long as the requirement to ensure safety and reliability is met.

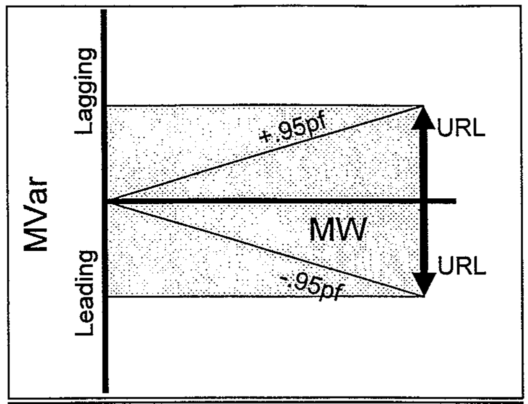

Figure 2. Fixed URL Criteria (based on +/- .95 Power Factor)

(3) Demonstration and measurement of reactive capability will be based on system Voltage Profile criteria specified by ERCOT. This Voltage Profile criteria will consist of a low system voltage V_{sys-l}, where the wind Resource will be operating in a lagging power mode to produce the required amount of Reactive Power to support system voltage, and V_{sys-h}, where the wind Resource will be operating in a leading mode to absorb the required amount of Reactive Power to suppress system voltage. The scheduled system voltage under normal conditions should fall somewhere in between V_{sys-l} and V_{sys-h}.

(4) WGRs capable of remaining On-line at low output levels considered outside of their net power output range where VSS can not be provided at the POI shall be capable of operating such that they appear "VAR Neutral" at the POI. The amount of allowable deviation from unity (1.0) power factor will be specified by the TDSP. WGRs that cannot meet the "VAR neutrality" requirement may be required to disconnect from the ERCOT System.

(5) Qualified renewable WGRs (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS, and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the URL as stated above, will be required to maintain a URL that is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and criteria as described in the Operating Guides.

(6) WGRs connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the URL as stated above, will be required to maintain a URL that is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and criteria described in the Operating Guides.

(7) WGRs connected after May 17, 2005 are required to provide VSS as described in paragraph (1) above.

(8) Upon request to, and with the approval of ERCOT, multiple wind generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these URL requirements only.

(9) Upon submission by a WGR required to provide VSS to ERCOT of a specific proposal for requirements to substitute for these URL requirements, ERCOT shall either approve such alternative requirements or provide the submitter an explanation of its objections to the proposal. Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements.

(10) A wind induction generator may elect to make a contribution in aid of construction in lieu of meeting the installed capacity VSS requirements contained herein. In order to comply with the VSS requirements under paragraph (7) above, the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to that used to collect payments for the direct assignment of interconnection Facilities under applicable Public Utility Commission of Texas (PUCT) rules. The level of payment shall reflect the cost to the TDSP of procuring, installing, operating, and maintaining any Reactive Power equipment required to replace the Reactive Power capability that otherwise would be necessary for the interconnection of the generator. In order for paragraph (7) above to be effective for VSS compliance, the TDSP shall certify to ERCOT that the induction generator has complied with these requirements.

(11) For WGRs required to provide VSS, no unit equipment replacement or modification shall reduce the capability of the unit below the requirements to be met by that unit prior to the replacement/modification, unless specifically approved by ERCOT.

(12) WGRs required to provide VSS shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

(13) WGRs must provide Real Time Supervisory Control And Data Acquisition (SCADA) points that communicate to ERCOT the Facility's available P_{max} and revised URL values reflecting the amount of installed turbine capacity that is out of service.

6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or Transmission Service Providers (TSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional ~~megavolt~~Megavolt ~~amperes~~ Ampere ~~reactive~~Reactive (MVAR), nor will they be requested to operate on a

voltage schedule outside the ~~Unit Reactive Limits (~~URL~~)~~ specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

(2) ERCOT and Transmission and/or Distribution Service Providers (TDSPs) shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, step-up transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

(3) The TSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed reactive capability requirements.

(4) All Generation Resources required to provide VSS shall ~~maintain~~ support the transmission voltage at the ~~point~~ Point of ~~interconnection~~ Interconnection (POI) to the ERCOT ~~transmission~~ Transmission ~~grid~~ Grid as directed by ERCOT within the operating Reactive Power capability of the unit(s).

~~(5) At all times a Generation Resource unit required to provide VSS is On-line, the URL must be available for utilization at the generating unit's continuous rated active power output, and Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any Reactive Power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP.~~

(~~6~~5) The QSEs providing ~~Voltage Support Service~~VSS shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

Attachment C

PRR 835 presentation to ROS

NEXTera ENERGY RESOURCES

PRR835 – Reactive Power Capability Requirement

Peter Wybierala

Regional Director of Transmission & Interconnects

Presentation to the ERCOT Reliability and Operations Subcommittee (ROS)

October 15, 2009

The current ERCOT Protocol on reactive power capability requirements is obsolete

Ancillary Services Section 6.5.7 needs to be revised

- **All generators are not the same**
  - Synchronous generators have their own inherent reactive power characteristics
  - The reactive capability of wind generators is evolving
    - -- Early machines were Type 1and 2 induction generators with no reactive capabilty
    - -- Type 3 machines consist of a Doubly Fed Induction Generator (DFIG)
    - -- Type 4 machines employ a full bridge converter design coupled to either an induction or synchronous machine
- **Other technologies such as solar and energy storage will have their own unique characteristics**
- **The imposition of a "one size fits all" approach to reactive power capability requirements will result in economic inefficiency and create barriers to entry for the adoption of new technologies**

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Not only is the current ERCOT Protocol obsolete...it's also ambiguous

Ancillary Services Section 6.5.7 needs to be revised

- **Protocol 6.5.7.1 (2) states that...**

  "Generation Resources required to provide VSS....shall have and maintain a URL which has an over-excited (lagging) power factor capabilty of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capabilty of ninety five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the transmission grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the point of interconnection to the TDSP."

- **Does "shall have and maintain" mean going forward in time or does it mean over the output range of the unit?**
- **PRR830, if adopted, would require a wind generator interconnected after February 17, 2004 to maintain a URL over the output range of the unit.**

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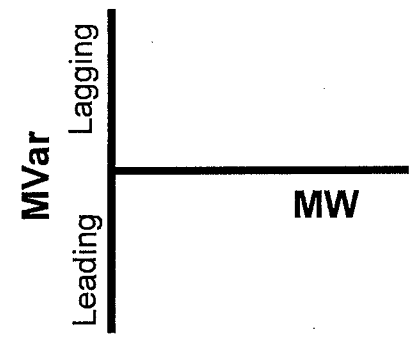
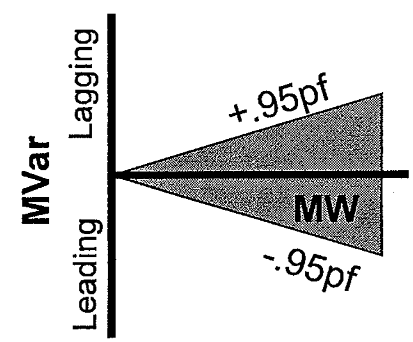
Wind turbine generator technology continues to evolve

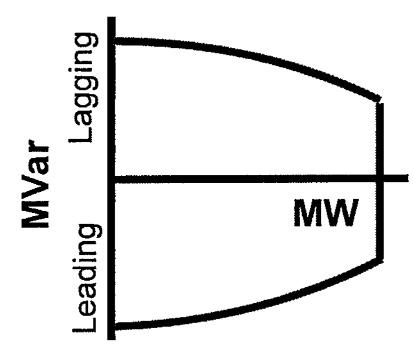
- Type 1 and 2 induction generators – no inherent reactive production capability



- Type 3 doubly fed induction generators - +/- 0.95 pf (typical of GE 1.5 MW machines)



- Type 4 machines – reactive capability comparable to synchronous generators (typical of Siemens 2.3 MW machines and comparable to conventional synchronous units)



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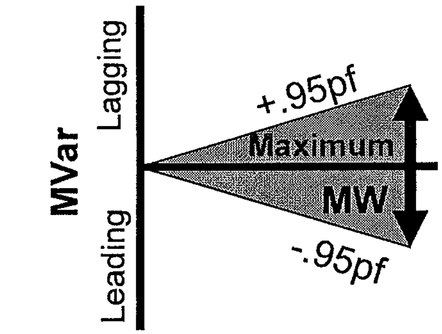
PRR835 does several things...

- It carves out a separate section for the reactive power requirements of Wind Generating Resources and requires a +/- 0.95 power factor range as the minimum requirement
- It provides for the imposition of additional reactive requirements consistent with PRR830 where it can be demonstrated through a system impact study that such capability is required to ensure safety and reliability
- PRR835 avoids requiring generators already interconnected to make costly investment in additional reactive capability where it is not justified
- PRR 835 exceeds FERC Order 661-A requirements

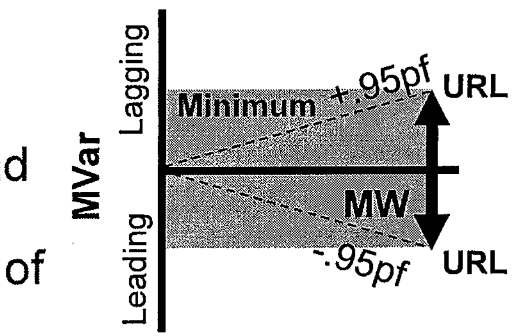
NEXTera ENERGY RESOURCES

Comparision of PRR835 to PRR830 and FERC Order 661-A

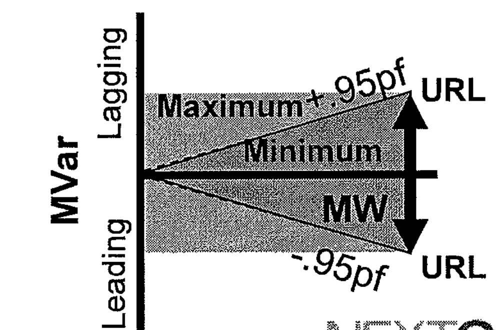
- FERC Order 661-A
  - Adopts +/- 0.95PF range as the maximum requirement
  - Requires wind plants to maintain the required power factor range only if the Transmission Provider shows, through the System Impact Study, that such capability is required of the plant to ensure safety and reliability



- PRR830
  - Adopts the URL measured at +/-0.95 PF and maximum net MW output
  - Requires URL over the full operating range of the plant



- PRR835
  - Adopts +/-0.95PF as the minimum reactive capability
  - May require URL over the full operating range of the plant only if the Transmission Provider demonstrates it is needed to ensure safety and reliability through a System Impact Study



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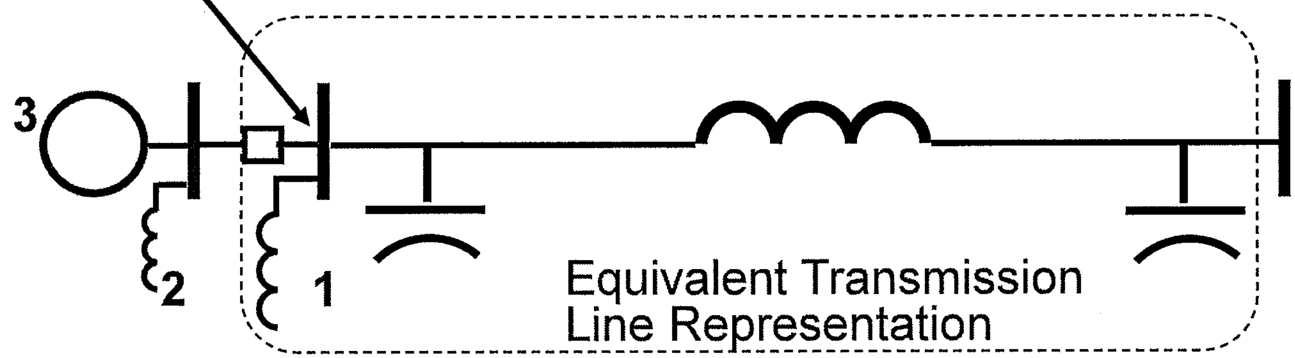
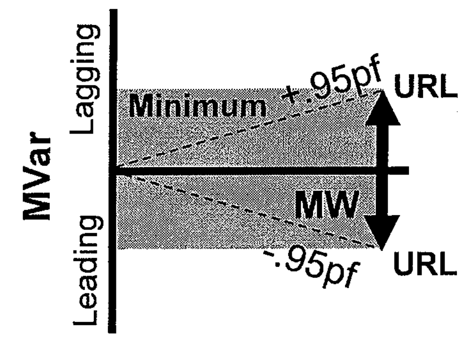
PRR830 will result in redundant and excessive reactive capability where it is not needed

Transmission Line Example



1. Transmission Owner must provide shunt reactors to offset line charging when wind is calm and generator is not generating
2. PRR830 would have the Generator install an additional shunt reactor to meet its URL requirement for leading reactive capability over its range of output
3. Inherent Generator reactive capability



PRR830 will result in the wasteful installation of redundant reactive resources.

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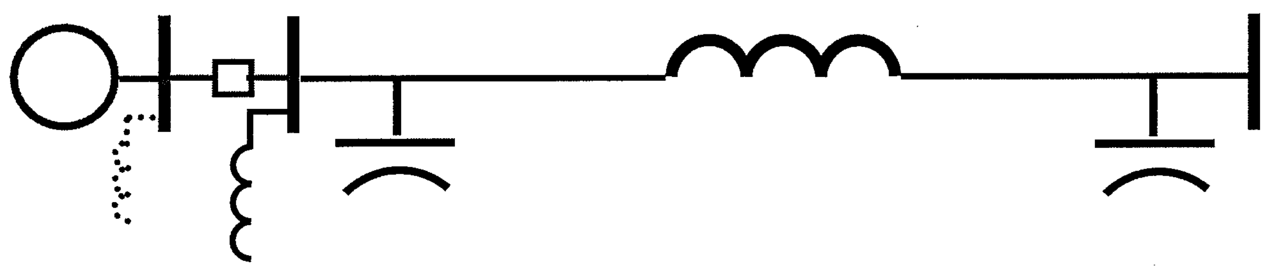
PRR835 ensures system safety and reliability without mandating investment in reactive capability for providing VSS where it is not needed

Transmission Line Example



Generator shunt reactor (or capacitor) would not be required to meet its URL requirement for leading (or lagging) reactive capability over its range of output unless shown to be required by the System Impact Study

NEXTera ENERGY RESOURCES

NextEra has engaged the services of Siemens-PTI to assess the current need for additional reactive resources in Western ERCOT

Study Assumptions

- **Reference case from ERCOT**
  - 2010/2011 Winter off-Peak (09/17/2009 update)
  - 39,569 MW total generation; 3,719 MW wind generation (9.4%)
- **Wind farms represented per ERCOT's modeling**
  - Reactive power capability expressed by Q_{min} and Q_{max} as given in the reference case (rectangular reactive power capability)
  - Wind farms represented by equivalent (aggregated) models
- **Sensitivity cases**
  - Different reactive power capability (triangular capability)
  - Different levels of wind generation

Scenarios based on ERCOT case, from no wind to high wind penetration. Limited reactive power capability in the wind farms (conservative).

Wind Farm Generation Re-Dispatch was performed to model the following sensitivity scenarios

Sensitivity Scenarios

- **No-Wind scenarios**
  - Constant load (conventional generation increased by 3,719 MW)
  - Constant conventional generation (system load scaled down by 3,719 MW)
- **Increased wind generation scenarios**
  - Scenario 3 (5,849 MW of wind generation, 14.7% of total)
    - -- Maximum wind generation in the Gulf Coast and Horse Hollow gen-tie
    - -- West Texas wind generation increased by 1,040 MW
  - Scenario 4 (6,369 MW of wind generation, 16% of total)
    - -- Scenario 3 with an additional 520 MW of wind in West Texas
  - Scenario 5 (same as scenario 4 but with additional wind in west Texas dispatched against local generation)

Preliminary results indicate that voltage violations are not the issue for the current Western ERCOT system

Results

- **AC contingency analysis**
  - ERCOT contingency file (9,000+ cat. B and cat. C contingencies)
- **Few post-contingency voltage violations**
  - Generally unrelated to the wind generation dispatch
  - Also unrelated to reactive power capability at the wind farms
- **Thermal violations**
  - Existing system configuration → restrictions to dispatch of West Texas wind generation
  - Significant overloads already identified before reaching full power output of wind generation in West Texas

Thermal overloads are the limiting factors. No condition has been identified that shows the need for additional reactive power capability from wind farms

NEXTera ENERGY RESOURCES

Generator reactive capability requirements are driven by system topology and the imbalance between generation and load in Western ERCOT. This trend will become further exaggerated with CREZ implementation

- **Current ERCOT System**
  - West Zone load – approximately 4,000 MW
  - West Zone Generation – approximately 8,000 MW
- **ERCOT System post CREZ**
  - West Zone load – approximate 4,400 MW
  - West Zone Generation – 18,000 MW
- **WGR lagging reactive capability will need to increase with MW output to compensate for transmission line reactive losses.**
- **WGR leading reactive capability will have little value since shunt reactors will be required to offset transmission line charging anyway when the wind is calm.**

CREZ doesn't make things worse but amplifies the consequences of adopting PRR830!

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Highlights of PRR835

- Sets minimum requirement of +/-0.95 Power Factor at the Point of Interconnection
- May require additional reactive requirements when supported by a System Impact Study
- Addresses the "Cone" versus "Rectangle" debate
- Wind generator reactive requirements and VSS are distinguished from non-wind generators
- Requires wind generators to provide real-time reactive capability through SCADA
- Does not unnecessarily limit aggregation of wind turbine generators based on size and type as does PRR830
- Grandfathers WGRs interconnected after May 17, 2005 and before the adoption of PRR835 in meeting the +/- 0.95 PF requirement

What differentiates PRR835 from PRR830 is that it provides superior economies while ensuring system safety and reliability where justified and needed!

NEXTera ENERGY RESOURCES

830PRR-31
AEP Comments
111009

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	11/10/2009

Submitter's Information	
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Market Segment	Investor Owned Utility (IOU)

Comments

AEP supports the TAC Approved language of PRR830, Reactive Power Capability Requirement and requests the Board deny the appeal. Similar to MW (real power) concerns created with large wind generation shifts, large wind generation shifts within a short period of time can create significant MVAR (Reactive Power) concerns. While the Transmission Owners have installed a large amount of dynamic reactive devices in recent years, the large swings on the system can quickly exhaust dynamic reactive capability. The proper amount of reactive capability, including capability from Generation Resources, is necessary to maintain the reliability of the grid. Unlike thermal limits that can be exceeded for short periods of time, violating the reactive needs of the system can have immediate and severe consequences.

While AEP is supportive of the development of the vast wind Resources in the region, those Resources must provide the reactive capabilities necessary to support their power injections on the grid. There is clear evidence that the ERCOT System has significant Reactive Power deficiency that is directly correlated to wind generation including:

1. AEP can get large voltage swings because of significant changes in wind in a short period of time and we do not have time to adjust. We are also taking a large number of circuits out because of overloads to maximize wind output. We believe lack of dynamic Reactive Power support from wind

farms is a primary root cause for large voltage swings for large wind changes. This problem will be exacerbated with events such as a "carbon tax" where base load coal plants are likely to reduce their output during these high wind periods. There is a growing, significant possibility of voltage collapse that AEP believes is beyond the risk tolerance for ERCOT's reliable operations.

2. The primary purpose of the Transmission System is to reliably deliver power and energy to Load. Historically, transmission maintenance is scheduled in spring and fall to prepare for the summer Load. Maintenance in these periods coincides with periods of high wind production. Transmission Service Providers (TSPs) continue to see ERCOT move planned Maintenance Outages and lines taken out of service for upgrades which over time will have significant reliability impact on the transmission system and the ability of the transmission system to meet its primary purpose. AEP believes that PRR 830 as written will improve this condition by having a better dispersion of Reactive Power in the network around wind.
3. Operating Guides and local controls are being used more frequently and to less effect than in years past during high wind conditions. AEP operates transmission in Southwest Power Pool (SPP), PJM and ERCOT. Operating issues during high wind events take place significantly more in ERCOT than the rest of the AEP system nationwide. AEP believes that PRR 830 as written will improve this condition.
4. Just as MW reserves are made available to protect for more than just an N-1 event, reactive reserves are needed for such large generation swings across multiple wind units and farms. The dynamic language is specifically important since numerous events over the last few years can show large voltage swings when dynamic reserves were exhausted with the larger wind generation swings, which happen frequently.

The ROS subcommittee, tasked with reliability matters, took a significant amount of time to address the dynamic VAR requirement issues and endorsed PRR 830. These issues have been debated and reviewed among the stakeholders since February 2004. In 2004, a compromise was reached among the stakeholders that "grandfathered" wind generators installed before February 2004. It was understood that future wind farms would meet the reactive and static requirements of all generators in compliance with ERCOT requirements as we moved forward. AEP does commend those wind farms that are meeting their obligation under this compromise and request the ERCOT Board approve the TAC recommendation in order to continue to honor this compromise. Even prior to this proposed change, the requirements are clear. Providing any further exemption to wind farms outside the current grandfathered language would amount to a retroactive relaxation/change in the protocol requirements. While a waiver of such provisions of the Protocols might be considered reasonable in a situation where the reactive needs of the system are stable, it should not be considered in this case given the reactive needs in the area.

The consequences if the Board grants the language proposed by Nextera would be for TSP's to submit reactive element upgrades for the transmission system such as Static VAR Compensators (SVCs), static compensators (STATCOMs), other Flexible AC Transmission Systems (FACTS) and synchronous condensers which provide dynamic Reactive Power with various time responses to quickly changing system conditions. The costs of these upgrades should be borne by those that are charged with meeting the requirements outlined in the Protocols and their choice is clear. Install the equipment to meet the standards outlined in the Protocols or make contributions in aide of construction in lieu of meeting the standard as outlined in paragraph (7) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability.

Revised Proposed Protocol Language

None proposed.

830PRR-32
AES Comments
111009

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	11/10/2009

Submitter's Information	
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Cell Number	(619) 992-8381
Market Segment	Independent Generator

Comments

PRR 830 should not be implemented in the present form for a number of reasons. The following are 3 issues important to the AES Corporation.

1) PRR 830 requires voltage and power factor capabilities higher than the requirements of FERC 661A "Interconnection Requirements for Wind Energy implemented in December of 2005. ERCOT has not demonstrated the need for voltage and power factor support capabilities higher than the accepted National standard.

Many existing wind projects, and particularly those that use type 3 and 4 turbines from General Electric and Siemens can provide substantial voltage support now without retrofits. The systems in these turbines have been designed to conform to the voltage and power factor requirements mandated by FERC in order 661A and by many other regulatory bodies around the world. These regulatory requirements and turbine capabilities are based on numerous system studies performed specific to wind turbine interaction and integration with utility power systems.

ERCOT has arbitrarily required a higher level of voltage and power factor support than what is required under FERC 661A. No studies have been conducted and no justification has been provided by ERCOT as to why this higher level of voltage support is needed, or if it can even be utilized by the ERCOT System.

Technical studies conducted by AES indicate that wind projects will hit their over and under voltage limits and trigger protective relaying at the levels of voltage support required under PRR 830. AES suggests that existing and future wind generators will be required to spend millions of dollars to enhance the voltage and power factor capabilities and these systems will never be utilized.

ERCOT should be required to demonstrate the *need* and *ability* of the ERCOT transmission system to utilize voltage and power factor support at levels above those required under the accepted national standard of FERC 661A.

2) PRR 830 is incomplete and a piecemeal approach to providing the ERCOT System with additional reliability and support from wind turbines. ERCOT should take a comprehensive approach to studying and specifying the need for voltage and power factor support along with Low Voltage Ride Through (LVRT) for wind turbines.

ERCOT is presently studying the need for LVRT capability for wind turbines as directed by the ERCOT Board under OGRR 208, Voltage Ride-Through (VRT) Requirement. Should this study result in additional requirements for wind turbines it would involve the same voltage and power factor systems within the turbines and wind projects that may require modification under PRR 830. This very well may result in a situation where existing projects spend substantial capital to retrofit existing turbines to conform to PRR 830 only to find that additional or different retrofits may be required to conform to new LVRT requirements. A comprehensive analysis of what is ***needed*** and can be ***utilized*** by the ERCOT system from the installed fleet of wind turbines is recommended.

3) PRR 830 retroactively changes the interconnection requirements for thousands of megawatts of operating wind projects with no technical basis, no system studies, and no documented need.

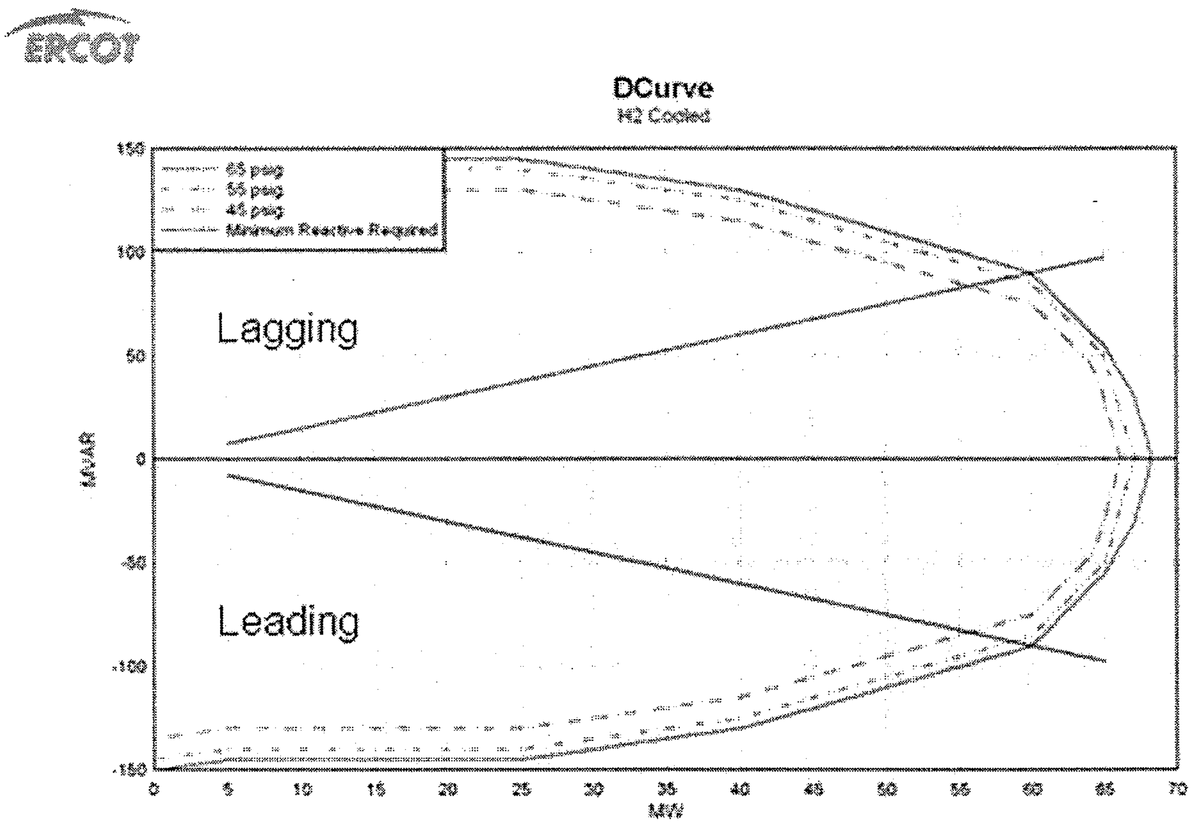
Prior to PRR 830, the "cone" reactive requirement was clearly defined in the Protocols and related ERCOT documents and has been accepted by ERCOT as detailed in the individual generator registrations (RARF).

a) The current ERCOT Protocols state the reactive "cone" requirement in paragraph (5) of Section 6.7.6, Deployment of Voltage Support Service (below). PRR 830 deletes this paragraph entirely and effectively changes the reactive requirement retroactively for operating projects.

> *(5) At all times a Generation Resource unit required to provide VSS is On-line, the URL must be available for utilization at the generating unit's continuous rated active power output, and Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the Reactive Power available be less than the required installed <u>reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output</u>, and any Reactive Power*

available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP

b) The ERCOT Resource Registration Guide as recently as June 2009 illustrated the "cone" requirement in section 7.4. As noted in the diagram from page # 30 below the purple line illustrates the "Minimum Reactive Required" as the "cone"



c) Virtually all wind projects installed in ERCOT prepared and submitted Resource Asset Registration Forms (RARFs) that clearly stated their reactive capability as the "cone". These detailed official registration documents convey the operating parameters and capabilities of the generation projects to ERCOT. The RARF forms were reviewed and accepted by ERCOT with the "cone" parameters as each generator connected to the ERCOT system.

As stated above, ERCOT should be required to demonstrate the _need_ and _ability_ of the ERCOT transmission system to utilize voltage and power factor support at levels above those required under the accepted national standard of FERC 661A. These needs should be studied along with LVRT requirements also defined in FERC 661A to provide a comprehensive and technically sound set of requirements for Wind Generators.

PRR Comments

830PRR-33
Horizon Statement of Position
111009

Brief in Support of the NextEra Appeal of the Technical Advisory Committee Recommendation Report Relating to PRR 830

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	November 10, 2009

Decision Being Appealed	Technical Advisory Committee Recommendation Report
Date of Decision	November 5, 2009

Submitter's Information	
Name	Brian Hayes
E-mail Address	Brian.Hayes@horizonwind.com
Company	Horizon Wind Energy LLC
Phone Number	(713) 265-0245
Cell Number	
Market Segment	Independent Generator

Comments

Horizon submits this, its *Brief in Support of the NextEra Appeal of the Technical Advisory Committee Recommendation Report Relating to PRR 830,* styled as comments, and incorporates by reference the earlier Horizon comments made throughout the committee process including to the Technical Advisory Committee ("TAC")[1] in opposition to PRR 830 and in support of the NextEra Energy Resources Appeal of the TAC Recommendation Report with regard to PRR 830.

Horizon incorporates NextEra's briefing in support of its appeal by reference herein and focuses its brief on demonstrating that PRR 830 is neither "clarification" of existing Protocols, nor in anyway consistent with the current Protocols and will create hardships on a single segment of the generation market that answered the call to make Texas the wind capital of the United States.

[1] Each set of comments is attached at the end of this, Horizon's Brief in Support of the NextEra Appeal of the TAC Recommendation Report relating to PRR 830, as Exhibits F, G, and H.

Brief in Support of the NextEra Appeal of the Technical Advisory Committee Recommendation Report Relating to PRR 830

PRR 830 submitted by the Electric Reliability Council of Texas ("ERCOT") purports to clarify what ERCOT has previously stated is already the clear standard set forth in the ERCOT Protocols relating to reactive power. This position has been the ERCOT position since it submitted its November 13, 2008 Interpretation of Reactive Power Protocols §§6.5.7.1(2) and 6.7.6(5), which was later withdrawn for procedural defects following an appeal to the Public Utility Commission of Texas ("PUCT" or "Commission"), and that ERCOT has stated it will still enforce. ERCOT is now attempting to modify the ERCOT Protocols to retroactively require retrofits to wind generation resources that have been operating in the ERCOT market for years, and at great expense—tens of millions of dollars for Horizon alone.

This is a sea change in the way the market has operated and is in direct conflict with the plain language of the ERCOT Protocols—it is not a clarification or consistent with the market rules that have been in place since 2004. The best way to explain the intent of the Protocols is to use ERCOT's own presentation to the market—conventional generators and wind generation resources alike, noting which generation is exempt from these requirements, and what the requirement is for generation that is not exempt. That presentation is dated August of 2008 and is the first attachment hereto (Exhibit A). The second slide of ERCOT's PowerPoint discusses the lead and lag requirement in the Protocols. Anyone listening to the discussions in the earlier ERCOT Committees would notice that this standard is referred to by ERCOT or Calpine as the "rectangle". However, as clearly discussed on slide 2, and demonstrated pictorially on slide 3, the .95 lead and lag requirement means that the MVAR or reactive power requirement starts at 0 and increases gradually under a .95 lead and lag standard as generation increases. Note also that the minimum requirement is clearly triangle or cone-shaped and noted plainly in ERCOT's presentation—intended to demonstrate what ERCOT's interpretation of these requirements was until just before the ERCOT Official Interpretation was issued in November of 2008 (see Exhibit B).

Wind-powered generation resources ("WGRs") have entered the Texas market and invested billions of dollars in this market under the existing rules. It is those WGRs that have made the investment under the rules in effect at the time, and today, that will be penalized by PRR 830. The reason is that PRR 830 is meant to require massive retrofits for WGRs that have long since financed their generation and for generation that has been operating in accordance with the Protocols for years.

WGRs have made their capabilities clear to ERCOT and ERCOT has allowed them to interconnect, sent them notices that they meet the ERCOT checklist, and ERCOT has had before it each time a Generation Asset Registration Form ("GARF") (now termed a Resource Asset Registration Form ("RARF")) that depicts the reactive power capability of WGRs—and that reflects the triangle. ERCOT has consistently accepted these GARFs and RARFs. For years and until very recently in the Resource Asset Registration Guide (Exhibit C), the minimum requirement for reactive power for WGRs has been depicted, clearly, as the triangle—increasing with the output of the wind project. It is unclear how changes were made to the Resource Asset Registration Guide to remove the pictorial, but it was apparently removed in a July 2009 revision.

In addition to all of the above, ERCOT has permitted WGRs clearly providing the "cone" or "triangle" to interconnect using the Public Utility Commission of Texas ("PUCT" or "Commission") Standard Generation Interconnection Agreement ("SGIA") with the relevant transmission service provider ("TSP"). The SGIA requires that the TSP request ISO approval necessary to carry out its responsibilities. Further, ERCOT has the obligation not to interconnect generation in violation of the ERCOT Protocols or the Commission's Rules. In practice, ERCOT gets on the phone with the WGR and the TSP to discuss the project before allowing it to interconnect—including in its checklist the RARF or GARF demonstrating that it meets the ERCOT cone/triangle requirement and then sends a notice to the WGR that it complies with all of the requirements—which include reactive power requirements. WGRs go farther than the standards in the Protocols require though and implement any additional reactive equipment the TSP deems necessary at the time after the TSP has run its studies. All of this is the expectation of cost, value, market expectation and a clear sense of what the rules are—prior to interconnection and has resulted in all GARF and RARF forms striving to meet the cone/triangle in accordance with the Resource Asset Registration Guide. In addition, ERCOT required all WGRs to meet the New Generator Interconnection Check list, attached as Exhibit D. Had WGRs not met the Checklist requirements, including for reactive power, and in accordance with the Operating Guides implementing these Protocols, ERCOT could not have interconnected these WGRs. See also RARF Approval attached as Exhibit E.

As further demonstration that the standards under PRR 830 seek to modify the rules and impose retrofits on WGRs without any basis or study, ERCOT takes the position that not only is the "rectangle" required to be provided, but that that response must now be dynamic, under ERCOT's current inaccurate interpretation of the Protocols and its language in PRR 830. The current Protocols make no mention of any dynamic power requirement and such a requirement multiples the retrofit investment by a factor of four. ERCOT is incorrect in stating that PRR 830 is not a change from the current Protocols. ERCOT's 2008 survey of WGR equipment confirmed that many have installed static reactive equipment. The "dynamic requirement" is not in the Protocols today. Only two manufacturers arguably can meet that requirement with their turbines, but those manufacturers are not comfortable warranting that their turbines have that capability. Similarly, there were no turbines on the market that could meet a rectangle standard at the time the Protocol language at issue was instituted.

Despite arguments largely from Calpine and PSEG in ERCOT committee meetings that WGRs are not "providing their fair share", it is important to note that PRR 830 only requires retrofits of WGRs, leaving all of the other conventional generation in service before 1999 exempt. To the extent retrofits are being required, which is what PRR 830 does only to WGRs, Calpine argues that generators in the market need to "step up" and "pay their fair share" for reliability. Horizon suggests that if the language requires retrofits to existing generation to meet a new standard, that same standard should be applied across the board such that WGRs that complied with the Protocols as drafted and now are being asked to retrofit should be joined by conventional generators such as Calpine that should be treated in the same manner.

The singling out of one category of generation for retrofits is inappropriate, particularly when, as here, ERCOT has done no study or analysis to determine what is actually needed for reliability. As was stated by Mr. Dumas in the TAC meeting, ERCOT has modeled the transmission system as if WGRs met its "interpretation" (and the PRR 830 requirements) even though ERCOT knew from its own presentations, the language of the Protocols and the RARFs and GARFs submitted by WGRs, exactly what was on the system—WGRs providing the cone/triangle. ERCOT modeled a system different from what currently exists, and now seeks to force WGRs to make retrofits to make the system look like the model, rather than changing ERCOT's modeling and determining if the expense would provide any value or just be gold-plating that will not support reliability, as the only study done on the subject by NextEra demonstrates.

Looking at the language of the current Protocols, it can be easily demonstrated that PRR 830 is a shift intended to require retrofits from WGRs alone.

> § 6.5.7.1 Generation Resources Required to Provide VSS Installed Reactive Capability
>
> (2) Generation Resources required to provide VSS except as noted below in items (3) or (4), shall have and maintain a URL which has an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the transmission grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the point of interconnection to the TDSP.
>
> § 6.7.6 Deployment of Voltage Support Service
>
> (5) At all times a Generation Resource unit required to provide VSS is On-line, the URL must be available for utilization at the generating unit's continuous rated active power output, and Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any Reactive Power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP.

The operating capability is the level at which a WGR is running. The Protocols require that reactive power **up to the operating capability** and at lower levels must be available. Reactive power is not to be less that the installed reactive capability (which is the total possible reactive capability) **multiplied by the ratio of lower active power output to the continuous rated output** (the ratio of the amount the WGR is providing in output compared to the total it could provide). Thus, the reactive power will always be a percentage based on the output—increasing when output increases and decreasing when output decreases—as demonstrated in Exhibit A, ERCOT's presentation on reactive power.

Paragraphs (3) and (4) of Protocol Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability explicitly state which Generation Resources are exempt from meeting the Reactive Power capability requirement and which Resources are not required to retrofit in PRR 830 as would WGRs. Since the end date of that exemption, over 40 WGRs with approximately 7,000 MW of capacity have interconnected with the ERCOT Transmission Grid. Horizon is not aware of a single WGR that meets ERCOT's interpretation of the required Reactive Power capability. This can be verified by reviewing the asset registration forms that ERCOT accepted from these WGRs, and from the results of an informal survey ERCOT undertook in the last half of 2008 of WGR capabilities and procedures. It is hard to comprehend how so many projects could be interconnected in a manner contrary to ERCOT's interpretation of the Reactive Power requirements, particularly if such interconnections would create reliability problems.

More than 40 wind resources that have interconnected with ERCOT since the Reactive Power capability requirement in the Protocols were instituted. At the time of such interconnections, WGRs interpreted the minimum Reactive Power requirement as the "triangle". This is borne out by ERCOT's survey of wind resources conducted in the summer and fall of 2008. The survey shows that WGRs have Reactive Power capability in the triangle, unless they have installed additional equipment. Thirty of the 49 WGRs surveyed have installed additional equipment. In every case where that additional equipment was specified, WGRs had installed capacitors. Horizon's projects are included in this number. Based on the studies conducted as part of the interconnection process, those projects installed sufficient capacitance to provide Reactive Power as described in the top half of the rectangle (lagging). The projects' leading Reactive Power capability as described by the triangle. While the minimum Reactive Power capability was agreed by all parties involved in the interconnection of these projects to be the triangle, Horizon, among others, installed additional equipment determined by the TSP to be necessary for system reliability. This equipment has been reported to ERCOT in several rounds of asset registration forms, which were accepted and approved by ERCOT prior to the issuance of its "compliance letters" in June of 2009 shortly after it withdrew its Official Protocol Interpretation and sought to remove the issue from Commission review in seeking dismissal of PUCT Docket 36482. The letter states that, based on the Reactive Power curves in the asset registration forms Horizon had submitted, Horizon's projects appear unable to comply with ERCOT's interpretation of the protocol requirements.

ERCOT has never discussed or mentioned how WGRs supplying a good deal of energy to the ERCOT market will operate if this PRR passes. If WGRs do not comply with the Protocols, will they be allowed to continue to provide service and how would retrofits be accomplished with virtually all existing WGRs requiring retrofits and units having to be shut down? What would such a result do to increase market prices as conventional units are dispatched in place of WGRs that are down for retrofits? How will this benefit reliability if at all?

Horizon can answer some of the above questions—some WGRs may not be able to afford the retrofits and those that can will have to recover those investments from the market, raising the price for power in the ERCOT market, and benefiting conventional generation that would otherwise not be dispatched, such as Calpine's units. ERCOT states that the current system can be run reliably and has no studies or analyses of any kind to demonstrate that retrofits are needed. If this is true, then there is no reason not to implement this new standard on a forward-looking basis as NextEra's PRR compromise amendments to PRR 830 at the TAC would have done, and which Horizon supports.

Horizon believes that ERCOT got it right the first time, from 2004 through at least August of 2008, when it explained that the ERCOT requirement meant the cone/triangle as demonstrated on Exhibit A, rather than three months later when ERCOT changed its interpretation following its discovery that it had modeled the transmission system incorrectly. Market certainty in the requirements applicable to WGRs is extremely important. Investors depend upon stable rules to invest in the ERCOT market. In the case of PRR 830 where there is no demonstrated reliability need for retrofits and the only study that has been done shows that such changes do not provide reliability benefits, there is no reason to require a single WGR to spend tens of millions of dollars or the collective WGR market to spend what may well be hundreds of millions of dollars, without basis. PRR 830 should not be implemented such that one segment of the generation market is burdened with retrofits (WGRs), while other generation resources (exempt conventional generation) with which WGRs compete are benefited as market prices rise and are passed on to consumers. Horizon agrees with the NextEra comments provided at TAC to implement these new standards only on a forward-looking basis and not to penalize existing generation that has invested in the Texas market, resulting in overall lower market costs to consumers and cleaner power. Horizon incorporates the comments of NextEra in support of its appeal.

EXHIBIT A

ERCOT

Voltage Control Requirement

ERCOT Operations Planning

August 22, 2008

Voltage Control Protocols that apply to WGRs

- **Protocol 6.5.7.1-**

  Generation Resources Required to Provide VSS Installed Reactive Capability

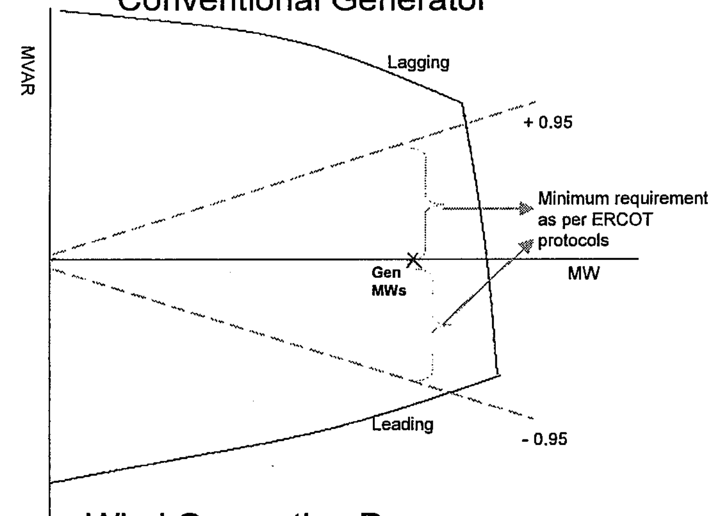
  - (2) Generation Resources required to provide VSS except as noted below in items (3) or (4), shall have and maintain a Unit Reactive Limit (URL) which has an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the transmission grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the point of interconnection to the TDSP.

  - (3) Qualified renewable Generation Resources (as described in Section 14, Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the URL as stated above, will be required to maintain a URL that is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and criteria as described in the Operating Guides.

0.95 PF requirement for generators

- Shown to the right are the reactive capability curves for a conventional generator and a WGR
- As seen from the figures, each generator is required to provide a + 0.95 to -0.95 pf voltage support
- Example:
  - **Wind generation output equals 100 MW; MVAR requirement = +/- 33 MVAR at Point of Interconnect**
  - **Wind generation output equals 0 MW; MVAR requirement = 0 MVAR at Point of Interconnect**

Conventional Generator



Wind Generation Resource

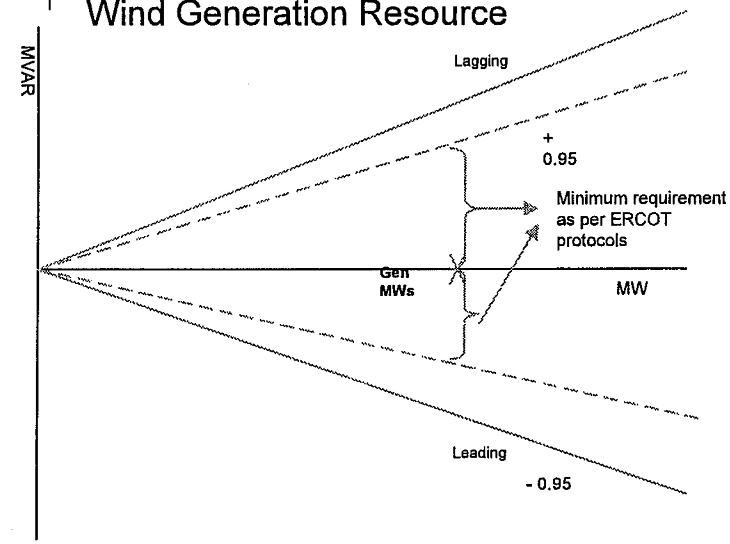


EXHIBIT B

NOTICE DATE: November 13, 2008

NOTICE TYPE: M-D111308-01 Legal

SHORT DESCRIPTION: Protocol Interpretation Request on Reactive Power Capability Requirements

INTENDED AUDIENCE: All ERCOT Market Participants

LONG DESCRIPTION: An Entity has submitted to ERCOT a Protocol Clarification/Interpretation Request (PIR) regarding subsection (2) in Protocol Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, and subsection (5) in Protocol Section 6.7.6, Deployment of Voltage Support Service. Specifically, the PIR seeks clarification on issues surrounding Reactive Power capability requirements.

ERCOT provides the following guidance to the questions submitted by the Entity.

1. **Clarify if the power factor capability of +/- 0.95 is required at all levels of generation.**

Yes. Protocol Section 6.5.7.1(2) sets the Reactive Power capability requirement for all Generation Resources that provide Voltage Support Service (VSS). The section states that a Generation Resource is required to have and maintain an Unit Reactive Limit (URL) with a power factor capability of +/- 0.95, determined at its net max output to the transmission system, and that this capability must be maintained – no exceptions are provided.

2. **Clarify the minimum reactive capability requirements at lower levels of generation and exactly how this is calculated.**

There is no minimum Reactive Power capability requirement. The Reactive Power requirement is set forth in Protocol Section 6.5.7.1, *Generation Resources Required to Provide VSS Installed Reactive Capability*. Specifically, subsection (2) states:

> Generation Resources required to provide VSS except as noted below in items (3) or (4), **shall have and maintain a URL which has an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less**, both determined at the generating unit's maximum net power to be supplied to the transmission grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the point of interconnection to the TDSP.

As described in the response to Question 1, Protocol Section 6.5.7.1(2) states that a Generation Resource must provide the MVAR requirement (+/- 0.95 power factor) calculated at the maximum net output to the ERCOT Transmission Grid, and that level must be available at all MW output levels.

ERCOT, or TSPs designated by ERCOT, have the right to instruct Generation Resources to make adjustments for voltage support within the URL capacity limits. However, dispatching a Generation Resource within a URL range is the right of the system operator, and is unrelated to, and does not affect a Generation Resource's obligation to maintain a power factor capability of +/- 0.95 when dispatched by ERCOT or TSPs.

Protocol Section 6.7.6(5) confirms the power factor capability requirement in Protocol Section 6.5.7.1(2). Specifically, the first sentence reads:

> At all times a Generation Resource unit required to provide VSS is On-Line, the URL must be available for utilization at the generating unit's continuous rated active power output, and **<u>Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels</u>**.

Therefore, under this Protocol as well, the power factor capability requirement does **<u>not</u>** decrease with decreasing generation output. A Generation Resource must be able to maintain the MVAR capability requirement as described in Protocol Section 6.5.7.1(2) even with decreasing power output.

The second sentence in Protocol Section 6.7.6(5) states:

> In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any Reactive Power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP.

This sentence does not conflict with the power factor capability requirement in the first sentence or Protocol Section 6.5.7.1(2) by establishing a minimum reactive capability requirement. In fact, as described above, the requirement in 6.5.7.1(2) is confirmed in the first sentence of this section. The language in the second sentence of this section merely accounts for situations in which a Generation Resource encounters equipment-related issues or other unforeseen circumstances that may cause the Reactive Power capability to be less than the requirement in Protocol Section 6.5.7.1(2). If the Reactive Power is less than the calculation described in the second sentence, then the Generation Resource's ability to support system voltage may jeopardize the reliability of the ERCOT Transmission Grid.

3. **Clarify the definitions for "generating unit's maximum net power" as indicated in Protocol Section 6.5.7.1(2) and "the generating unit's continuous rated active power output" as indicated in Protocol Section 6.7.6(5).**

Both references above refer to the Net High Capability Limit provided by the Generation Resource to ERCOT through resource registration. Net High Capability Limit is the net high MW generation output based on the rating of plant equipment minus plant Load.

CONTACT: If you have any questions, please contact your ERCOT Account Manager. You may also call the general ERCOT Client Services phone number at (512) 248-3900 or contact ERCOT Client Services via e-mail at ClientRelations@ercot.com.

sg

EXHIBIT C

Resource Asset Registration Guide
v4.03

Revision History

Date	Version	Description	Author
10/10/2007	0.03	Draft for Internal Review	D. Showalter
10/10/2007	0.04	Second draft for Internal Review	D. Showalter
10/10/2007	0.05	Draft for Posting	D. Showalter
10/11/2007	0.06	Revised Draft for Posting	D. Showalter
10/16/2007	0.07	Revised with Market Comments	D. Showalter
12/13/2007	0.08	Revised for Planning Submittal	D. Showalter
4/01/2008	3.99	Draft -Reorganized and reformatted for RARF Ver 4	D. Showalter
4/08/2008	4.00	Released with RARF Ver 4 (Official RARF)	D. Showalter
12/16/08	4.01	Updated RARF Guide V4.01	A. Moy
2/4/2009	4.02	Updated and re-wrote transmission and load data tabs	S. Middleton
3/10/2009	4.03	Corrected / Modified business rules for transformer tab	S. Middleton

Table of Contents

1.0 Summary of Resource Registration Guide

This document is a guide to completing Resource Asset Registration with ERCOT in accordance with Section 16 of the ERCOT Nodal Protocols. Historically, the GARF, along with other documents, has been used for Resource Entities (RE) to provide information necessary to setup a Resource within ERCOT's systems, including registration, market operations, power operations, and commercial operations.

Upon obtaining the forms from Resource Entities, ERCOT will keep the RARFs in a central repository hub so the files can be tracked and easily accessed by all ERCOT systems, as well as communicated back to the Resource Entity through audits (Figure 1 below illustrates the process flow of receiving and loading RARF data).

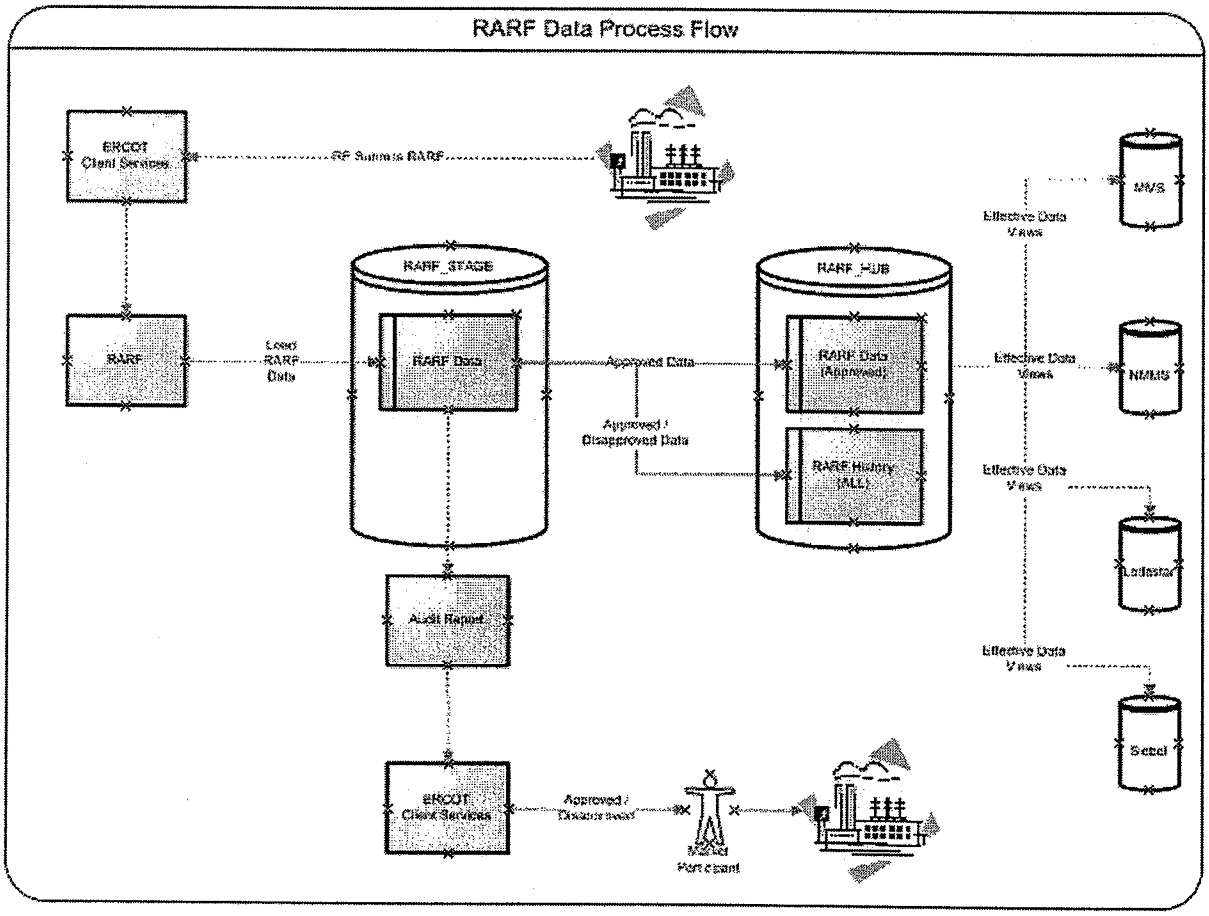


Figure 1

1.1 Tabs

The RARF uses the worksheet tabs to focus on areas. The goal is to get this as close to web-interface entry as possible. The list of tabs is as follows:

- Instructions
- Spreadsheet Map
- General Information - ALL
- Site Information - All GEN RES
- Unit Info - GEN
- Unit Info - CC
- Unit Info - WIND
- Resource Parameters - GEN
- Resource Parameters - CC
- Resource Parameters - CC CFG
- Resource Parameters - WIND
- Operational Resource Parameters - GEN
- Operational Resource Parameters - CC CFG
- Operational Resource Parameters - WIND
- Reactive Capability - GEN
- Reactive Capability - CC
- Reactive Capability - WIND
- Ownership - GEN
- Ownership - CC
- Ownership - WIND
- Configurations - CC1
- Transitions - CC1
- Configurations - CC2
- Transitions - CC2
- Configurations - CC3
- Transitions - CC3
- Planning - GEN
- Planning - CC
- Planning - WIND
- Protection - GEN
- Protection - CC
- Protection - WIND
- SubSync Resonance - GEN
- SubSync Resonance - CC
- Private Network
- GEN Owned Transmission Assets
- Line Data
- Breaker Switch Data
- Capacitor and Reactor Data

- Transformer Data

1.2 Colors

The new form for the official RARFs will primarily use colors to identify sections of the workbook. However, a pale yellow cell indicates any cell that is blank or set to zero.

ERCOT Confidential

RETURN TO MAP

Unit Information

This worksheet tab applies only to Wind generation resources. This tab is UNIT specific for all Wind.
Please complete this section and select RETURN TO MAP

WIND GENERATION RESOURCES

Unit Details	Labels	Unit 1	Unit 2
Unit Name		UNIT1	
Resource Name (Unit Code/Mnemonic)		TEST_UNIT1	
PUC Registration Number (Docket Number)			
ERCOT Interconnection Project Number - only new units			
NERC Number (NERC ID#)			
Unit Start Date	mm/dd/yyyy	12/12/2007	
Unit End Date	mm/dd/yyyy		
Physical Unit Type		WT	
Renewable	Y/N	Y	
Renewable/Offset		RN	
Resource Category		Renewable	
Qualifying facility	Y/N	N	
Eligible for McCamey Flowgate Rights (MCFRIs)?	Y/N	Y	
Name Plate Rating	MVA	200.00	
Real Power Rating	MW	180.00	
Reactive Power Rating	MVAR	100.00	
Unit Generating Voltage (collection voltage?)	kV	13.80	
Latitude of center of Wind Farm	decimal degrees (N)	200.00	
Longitude of center of Wind Farm	decimal degrees (W)	100.00	
Average Height above ground of Turbine Hub	meters	50.00	
Latitude of Meteorological Tower	decimal degrees (N)	200.00	
Longitude of Meteorological Tower	decimal degrees (W)	100.00	
Height of Meteorological Tower Instrumentation	meters	75.00	
Turbine Details - Turbine Information by Model			
Group 1 - Type of Turbine (Manufacturer/Model)		GE 1.5 SLE	
Group 1 - MW Rating for this model of Turbine	MW	180.00	
Group 1 - Number of this type of Turbine		10.000	

- If a cell is hatched, the cell is not ready to be filled out, and should be left blank. Upon completing the Resource Names and defining all basic site and unit information, all cells that need to be completed should be hatch-free. Do not enter data behind hatched cells.

- If a field has a Label, the data for the corresponding cell must show only the applicable data value, not the label itself,.

- N/A values or other descriptive information is not allowed in cells unless otherwise provided in the pull-down menu selection.

1.3 RARF - Hyperlinks and Mapping

In an attempt to ease accessibility to this document, hyperlinks and a mapping page have been used. Each worksheet has a "RETURN TO MAP" link at the top, in or near cell C1.

C	D	E
	RETURN TO MAP	

The Map page is categorized by generation type – CC, WIND and GEN where GEN is all non-wind, non-CC Generation Resources. The example below is for wind. In addition, the map shows a reference to this guide.

WIND	RARF Guide / Protocol Reference	Worksheets included in this form:
Instructions	RARF Guide: Section 3.0	Instructions
Map (this page)	RARF Guide: Section 3.0	Spreadsheet Map (this page)
General Information - ALL	RARF Guide: Section 4.0	General Information
Site Information - GEN CC WIND	RARF Guide: Section 4.0	Site Information
Unit Info - WIND	RARF Guide: Section 5.3	Unit Information
Resource Parameters - WIND	RARF Guide: Section 6.3	Resource Parameters
Operational Resource Parameters - WIND	RARF Guide: Section 7.3	Operational Resource Parameters
Reactive Capability - WIND	RARF Guide: Section 8.3	Reactive Capability
GSU Transformer - ALL	RARF Guide: Section 9.1	GSU Transformer
Ownership - WIND	RARF Guide: Section 10.3	Ownership
Planning - WIND	RARF Guide: Section 12.1	Planning
Protection - WIND	RARF Guide: Section 12.3	Planning
Private Network - PUN	RARF Guide: Section 13.0	Private Use Network
Generation Owned Transmission Assets - ALL	RARF Guide: Section 14.0	Generation Owned Transmission Assets

1.4 Glossary

A glossary has been created and is being provided as a separate document to this form. The glossary is the source for the definition of each field requested in the RARF.

162					**Reactive Capability**
163	Reactive Capability	GEN, CC, WIND	MW	MW1	Reactive Capability curve - point on curve of MW output for this unit, MW1
164	Reactive Capability		MVAR	Lagging MVAR limit associated with MW1 output	Unit's Lagging reactive power output capability associated with its MW1 out
165	Reactive Capability		MVAR	Leading MVAR limit associated with MW1 output	Unit's Leading reactive power output capability associated with its MW1 out negative number
166	Reactive Capability		MW	MW2	Reactive Capability curve - point on curve of MW output for this unit, MW2
167	Reactive Capability		MVAR	Lagging MVAR limit associated with MW2 output	Unit's Lagging reactive power output capability associated with its MW2 out
168	Reactive Capability		MVAR	Leading MVAR limit associated with MW2 output	Unit's Leading reactive power output capability associated with its MW2 out negative number
169	Reactive Capability		MW	MW3	Reactive Capability curve - point on curve of MW output for this unit, MW3
170	Reactive Capability		MVAR	Lagging MVAR limit associated with MW3 output	Unit's Lagging reactive power output capability associated with its MW3 out
171	Reactive Capability		MVAR	Leading MVAR limit associated with MW3 output	Unit's Leading reactive power output capability associated with its MW3 out negative number
172	Reactive Capability		MW	MW4	Reactive Capability curve - point on curve of MW output for this unit, MW4
173	Reactive Capability		MVAR	Lagging MVAR limit associated with MW4 output	Unit's Lagging reactive power output capability associated with its MW4 out
174	Reactive Capability		MVAR	Leading MVAR limit associated with MW4 output	Unit's Leading reactive power output capability associated with its MW4 out negative number
175	Reactive Capability		MW	MW5 - Unity Power Factor	From the Reactive Capability curve - the MW output at Unity Power Factor (ze
176	Reactive Capability	GEN, CC	PSI	If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT studies	From manufacturer Reactive Capability Curve or data sheet.
177	Reactive Capability	GEN, CC, WIND	MVAR	Net Maximum Leading Operating Capability (MVAR)	Enter the maximum lagging MVARs that can be produced. Obtained from m Capability Curve or data sheet; input as negative number
178	Reactive Capability		MVAR	Net Maximum Lagging Operating Capability (MVAR)	From manufacturer Reactive Capability Curve or data sheet.
179	Reactive Capability		Y/N	Manufacturer's Capability Curve submitted?	Has a recent curve been submitted to ERCOT? If not, please submit.
180	Reactive Capability	WIND	Y/N	Reactive Standard?	Does the Wind unit meet the reactive standard?

2.0 Instructions and Map

A RARF should be submitted for each generation resource site that contains data for all generation at the site. A separate RARF should also be submitted for each Resource Entity covering all load resources represented by that entity. A RARF is to be completed for all active and mothballed generation resources inside ERCOT. Organizations must submit a market participant application as a Resource Entity prior to submission of this form, if not eligible for Federal Hydro waiver (Section 16.5). If questions arise related to the completion of this form, please contact your designated ERCOT Account Manager or email Wholesale Client Services at NodalMarketTransition@ercot.com with the subject "Resource/Asset Registration Form".

Please bear in mind the following for the completion of this form:

- A single RARF must be submitted for each generation resource site. This form will accommodate generation Resources located at a common site as well as generation load splitting.

- A single RARF must be submitted for load resources represented by a common Resource Entity.

2.1 Process for Official Submittal

There are two methods of submitting the RARF, as follows:

PRIMARY: RARFs are to be submitted through the Texas Market Link (TML) located at https://tml.ercot.com. Submission through the TML link requires a valid Authorized Representative's digital certificate.

ALTERNATIVE: An alternate email signature document is available upon request from your ERCOT Account Manager for those who have technical problems submitting via the TML portal. The RARF must be emailed in both portable document format (pdf) and Microsoft Excel spreadsheet (xls) format, along with the signature document to: MPAPPL@ERCOT.COM and NodalMarketTransition@ercot.com.

The following are instructions for submitting the RARF through TML:

- Access to ERCOT TML requires a user digital certificate with a minimal role that allows access to "Create Service Request" on the "Market Activities" page. The "user digital certificate" is authorized by the Market Participant's User Security Administrator.

- Upon accessing TML, go to the "*Market Activities*" page and select "*Create Service Request*". Be advised that the Service Request will display in a new window as a pop-up, which may be restricted by browser settings.

- Complete the required fields on the "*Service Request*" screen annotated by red asterisks.

- The following Request Type and Sub-Type are essential to a proper submittal:
  - *Request Type:* Select "**MP Registration**" from the drop-down list
  - *Request Sub-Type:* Select "**Resource/Asset Registration**" from the drop-down list

Please note that if the Type and Sub-Type values above are not used, the RARF will not be received or processed by ERCOT Client Services.

- Click "*Submit*" (you will add the RARF file on the next screen)
- From the "*Activities and Attachments*" screen, under the Attachments heading of the Service Request click the 'Add' button.
- Select "*Browse*" icon and find the completed RARF file on your computer
- Click "*Submit*" (comments are optional)

ERCOT will verify the RARF is sent from the Authorized Representative of the registered Resource Entity via digital certificate. ERCOT may request additional authentication as deemed necessary.

2.2 Map

ERCOT Confidential **Map of the ERCOT Resource Asset Registration Form** *This worksheet tab identifies the necessary worksheets and provides links to the pages.*		
WIND	**RARF Guide / Protocol Reference**	**Worksheets included in this form:**
Instructions	RARF Guide: Section 3.0	Instructions
Map (this page)	RARF Guide: Section 3.0	Spreadsheet Map (this page)
General Information - ALL	RARF Guide: Section 4.0	General Information
Site Information - GEN CC WIND	RARF Guide: Section 4.0	Site Information
Unit Info - WIND	RARF Guide: Section 5.3	Unit Information
Resource Parameters - WIND	RARF Guide: Section 6.3	Resource Parameters
Operational Resource Parameters - WIND	RARF Guide: Section 7.3	Operational Resource Parameters
Reactive Capability - WIND	RARF Guide: Section 8.3	Reactive Capability
GSU Transformer - ALL	RARF Guide: Section 9.1	GSU Transformer
Ownership - WIND	RARF Guide: Section 10.3	Ownership
Planning - WIND	RARF Guide: Section 12.1	Planning
Protection - WIND	RARF Guide: Section 12.3	Planning
Private Network - PUN	RARF Guide: Section 13.0	Private Use Network
Generation Owned Transmission Assets - ALL	RARF Guide: Section 14.0	Generation Owned Transmission Assets
GEN		
Instructions	RARF Guide: Section 3.0	Instructions
Map (this page)	RARF Guide: Section 3.0	Spreadsheet Map (this page)
General Information - ALL	RARF Guide: Section 4.0	General Information
Site Information - GEN CC WIND	RARF Guide: Section 4.0	Site Information
Unit Info - GEN	RARF Guide: Section 5.1	Unit Information
Resource Parameters - GEN	RARF Guide: Section 6.1	Resource Parameters
Operational Resource Parameters - GEN	RARF Guide: Section 7.3	Operational Resource Parameters
Reactive Capability - GEN	RARF Guide: Section 8.1	Reactive Capability
GSU Transformer - ALL	RARF Guide: Section 9.1	GSU Transformer
Ownership - GEN	RARF Guide: Section 10.1	Ownership
Planning - GEN	RARF Guide: Section 12.1	Planning
Protection - GEN	RARF Guide: Section 12.2	Planning
Subsynchronous Resonance - GEN	RARF Guide: Section 12.3	Planning
Private Network - PUN	RARF Guide: Section 13.0	Private Use Network
Generation Owned Transmission Assets - ALL	RARF Guide: Section 14.0	Generation Owned Transmission Assets
COMBINED CYCLE		
Instructions	RARF Guide: Section 3.0	Instructions
Map (this page)	RARF Guide: Section 3.0	Spreadsheet Map (this page)
General Information - ALL	RARF Guide: Section 4.0	General Information
Site Information - GEN CC WIND	RARF Guide: Section 4.0	Site Information
Unit Info - CC	RARF Guide: Section 5.2	Unit Information
Resource Parameters - CC	RARF Guide: Section 6.2	Resource Parameters
Resource Parameters - CC CFG *(ensure configurations are entered first)*	RARF Guide: Section 6.2	Resource Parameters
Operational Resource Parameters - CC CFG *(ensure configurations are entered first)*	RARF Guide: Section 7.3	Operational Resource Parameters
Reactive Capability - CC	RARF Guide: Section 8.2	Reactive Capability
GSU Transformer - ALL	RARF Guide: Section 9.1	GSU Transformer
Ownership - CC	RARF Guide: Section 10.2	Ownership
Configurations - CC1	RARF Guide: Section 11.2	Combined Cycle Configuration Details
Configurations - CC2	RARF Guide: Section 11.2	Combined Cycle Configuration Details
Configurations - CC3	RARF Guide: Section 11.2	Combined Cycle Configuration Details
Transitions - CC1	RARF Guide: Section 11.3	Combined Cycle Configuration Details
Transitions - CC2	RARF Guide: Section 11.3	Combined Cycle Configuration Details
Transitions - CC3	RARF Guide: Section 11.3	Combined Cycle Configuration Details
Planning - CC	RARF Guide: Section 12.1	Planning

3.0 General Information and Site Information

These sections contain information that applies to the RARF submittal and/or the site.

3.1 General Information

The General Information tab should be updated with every submittal for load and generation resources. The submittal information, such as date completed, should be updated with every submission, while the remainder of the fields should be verified. Primary contact information is essential, as it provides ERCOT with an additional contact in case of questions regarding the RARF.

ERCOT Confidential	RETURN TO MAP
General Information - All Resource Entities	
This worksheet tab contains information on the Resource Entity responsible for submitting this form.	
Please complete this section and select RETURN TO MAP	
This submittal is for:	
** Deletions are accepted as intentions. This form does not supersede the Notice of Suspension of Operations requirements.*	
Submittal Information	
Date Form Completed:	
Resource Entity Submitting Form:	
Resource Entity DUNS #:	
Primary Contact (name of person ERCOT can contact with questions regarding this form)	
Printed Name:	
Title:	
Phone Number:	
E-mail Address:	
Fax Number:	
Secondary Contact (if available)	
Printed Name:	
Title:	
Phone Number:	
E-mail Address:	
Fax Number:	
Instructions for Revisions	
Tab name (Use Drop-Down List):	Describe revision and whether revision is to be applied in Zonal Market. All revisions will be applied to Nodal as default.

3.2 Site Information

The Site Information tab identifies information for the generation resource site, such as address and ERCOT Polled Settlement metering information. The Resource Site Code is determined jointly with ERCOT, and typically aligns with the substation name at the point of interconnection.

All fields in this section must be completed with the exception of Site Stop Service Date. For assistance in identifying the 2003 Congestion Management Zone or the Resource ID (RID), please contact NodalMarketTransition@ercot.com.

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Please verify the transmission provider, as some names may have changed over time.

This section does not apply to load resources.

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Site Information

This worksheet tab contains site-specific information.
Please complete this section and select RETURN TO MAP

RETURN TO MAP

All Generation Resources

Site Info for Generation Resources (Load Resources and Block Load Transfers should skip this section)	
Resource Site Name:	
Resource Site Code:	
Street Address:	
City:	
State & Zip:	
County:	
Site In-Service Date:	
Site Stop Service Date:	
Congestion Management Zone for 2003:	
Resource owned by NOIE?	
Is Resource behind a NOIE Settlement Meter Point?	
Number of EPS Primary meters:	
Generation Load Split?	
ESI ID:	
ERCOT Read Meter?	
TDSP Providing Service To Resource:	
TDSP DUNS Number:	

If the facility has the Gen Site Load split among multiple competitive retailers or among multiple TDSPs, the second part of the Site Information tab should be filled out as applicable (not the top ESI ID & TDSP fields). Otherwise this section should be left blank.

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Site Information

This worksheet tab contains site-specific information.
Please complete this section and select RETURN TO MAP

RETURN TO MAP

Site Load Split

Complete this section if the Gen Site Load is split among multiple ESI IDs.	
ESI ID 1:	
Fixed Load Splitting %	
Competitive Retailer	
Competitive Retailer DUNS #	
TDSP Providing Service To Resource:	
TDSP DUNS Number:	
ESI ID 2:	
Fixed Load Splitting %	
Competitive Retailer	
Competitive Retailer DUNS #	
TDSP Providing Service To Resource:	
TDSP DUNS Number:	
ESI ID 3:	
Fixed Load Splitting %	
Competitive Retailer	
Competitive Retailer DUNS #	
TDSP Providing Service To Resource:	
TDSP DUNS Number:	
ESI ID 4:	
Fixed Load Splitting %	
Competitive Retailer	
Competitive Retailer DUNS #	
TDSP Providing Service To Resource:	
TDSP DUNS Number:	
ESI ID 5:	
Fixed Load Splitting %	
Competitive Retailer	
Competitive Retailer DUNS #	
TDSP Providing Service To Resource:	
TDSP DUNS Number:	
ESI ID 6:	
Fixed Load Splitting %	
Competitive Retailer	
Competitive Retailer DUNS #	

4.0 Unit Information

The Unit Information section is required for all generation resources. This tab is split into the different sections based on generation resource type: Wind, CC, or other non-Wind, non-CC Generation.

Please enter the PUC Registration number and the NERC Registration number for tracking purposes. The ERCOT Interconnection Project number is only needed for NEW units to aid with tying the interconnection process and the commercial operation process together.

All fields in this section should be completed. Also, the ERCOT Interconnection Project Number is not needed for units already in commercial operation.

4.1 Unit Info – non-Wind, non-CC Generation Units

The Resource Name (also known as the Unit Code/Mnemonic) is the unique identifier that propagates through ERCOT systems. This is determined jointly between ERCOT and the resource, but is already established for existing units. The Resource Name consists of "SITECODE_UNITNAME". This field will populate the remainder of the spreadsheet, identifying additional fields that must be completed.

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RETURN TO MAP

Unit Information

*This worksheet tab provides generator unit information for generation resources. This tab is UNIT specific for **all non-Wind and non-CC**.*
Please complete this section and select RETURN TO MAP

GENERATION RESOURCES (non-WIND, non-CC)

Unit Details	Labels	Unit 1	Unit 2	Unit 3
Unit Name				
Resource Name (Unit Code/Mnemonic)		TEST_A	TEST_B	
PUC Registration Number				
ERCOT Interconnection Project Number - only new units				
NERC Number				
Unit Start Date	mm/dd/yyyy			
Unit End Date	mm/dd/yyyy			
Physical Unit Type				
Primary Fuel Type				
Secondary Fuel Type				
Fuel Transportation Type				
Renewable	Y/N			
Renewable/Offset				
Resource Category				
Qualifying facility	Y/N			
Name Plate Rating	MVA			
Real Power Rating	MW			
Reactive Power Rating	MVAR			
Turbine Rating	MW			
Unit Generating Voltage	KV			

4.2 Unit Info – Combined-Cycle Units

This tab contains three parts – for registering up to three trains at one site.

The Mnemonic of Combined Cycle Train is the unique identifier that will propagate through ERCOT systems to identify the Train. This is determined by ERCOT by simply using "SITECODE_CCx" where x is 1, 2, or 3.

The Resource Name (also known as the Unit Code/Mnemonic) is the unique identifier that propagates through ERCOT systems. This is determined jointly between ERCOT and the resource, but is already established for existing units. The Resource Name consists of "SITECODE_UNITNAME". This field will populate the remainder of the spreadsheet, identifying additional fields that must be completed.

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RETURN TO MAP

Unit Information

This worksheet tab applies to all combined cycle generation resources. This information is UNIT and TRAIN specific. Please complete this sections (one for each train at the facility) and select RETURN TO MAP

COMBINED-CYCLE GENERATION RESOURCES-CC1

Train Details	Labels	Train 1
Name of Combined Cycle Train		
Mnemonic for Combined Cycle Train		TEST_CC1
PUC Registration Number		
NERC Number		
Unit Start Date	mm/dd/yyyy	
Unit End Date	mm/dd/yyyy	
Fuel Transportation Type		
Resource Category		
Qualifying Facility (Y/N)?	Y/N	
Is train augmented with Duct Burner(s)?	Y/N	
Is train augmented with Evap Cooler(s)?	Y/N	
Is train augmented with Chiller(s)?	Y/N	
Other augmentation?	Y/N	

Unit Details	Labels	Unit 1	Unit 2	Unit 3
Unit Name				
Resource Name (Unit Code/Mnemonic)		TEST_A	TEST_B	TEST_C
ERCOT Interconnection Project Number - only new units				
Unit Start Date	mm/dd/yyyy			
Unit End Date	mm/dd/yyyy			
Physical Unit Type				
Primary Fuel Type				
Secondary Fuel Type				
Name Plate Rating	MVA			
Real Power Rating	MW			
Reactive Power Rating	MVAR			
Turbine Rating	MW			
Unit Generating Voltage	KV			

4.3 Unit Info – Wind Units

The Resource Name (also known as the Unit Code/Mnemonic) is the unique identifier that propagates through ERCOT systems. This is determined jointly between ERCOT and the resource, but is already established for existing units. The Resource Name consists of "SITECODE_UNITNAME". This field will populate the remainder of the spreadsheet, identifying additional fields that must be completed.

The Wind Unit Information tab contains information on the turbine groups. Each Wind Unit may identify up to 5 groups of turbine types, or 5 different models, within a particular unit. This section asks for the model, quantity, and rating of each.

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RETURN TO MAP

Unit Information

This worksheet tab applies only to Wind generation resources. This tab is UNIT specific for all Wind.
Please complete this section and select RETURN TO MAP

WIND GENERATION RESOURCES

Unit Details	Labels	Unit 1	Unit 2	Unit 3
Unit Name				
Resource Name (Unit Code/Mnemonic)		TEST_A		
PUC Registration Number (Docket Number)				
ERCOT Interconnection Project Number - only new units				
NERC Number (NERC ID#)				
Unit Start Date	mm/dd/yyyy			
Unit End Date	mm/dd/yyyy			
Physical Unit Type				
Renewable	Y/N			
Renewable/Offset				
Resource Category				
Qualifying facility	Y/N			
Eligible for McCamey Flowgate Rights (MCFRIs)?	Y/N			
Name Plate Rating	MVA			
Real Power Rating	MW			
Reactive Power Rating	MVAR			
Unit Generating Voltage	kV			
Latitude of center of Wind Farm	decimal degrees (N)			
Longitude of center of Wind Farm	decimal degrees (W)			
Average Height above ground of Turbine Hub	meters			
Latitude of Meteorological Tower	decimal degrees (N)			
Longitude of Meteorological Tower	decimal degrees (W)			
Height of Meteorological Tower Instrumentation	meters			
Turbine Details - Turbine Information by Model				
Group 1 - Type of Turbine (Manufacturer/Model)		GROUP1		
Group 1 - MW Rating for this model of Turbine	MW			
Group 1 - Number of this type of Turbine				
Group 2 - Type of Turbine (Manufacturer/Model)				
Group 2 - MW Rating for this model of Turbine	MW			
Group 2 - Number of this type of Turbine				
Group 3 - Type of Turbine (Manufacturer/Model)				
Group 3 - MW Rating for this model of Turbine	MW			
Group 3 - Number of this type of Turbine				
Group 4 - Type of Turbine (Manufacturer/Model)				
Group 4 - MW Rating for this model of Turbine	MW			
Group 4 - Number of this type of Turbine				
Group 5 - Type of Turbine (Manufacturer/Model)				
Group 5 - MW Rating for this model of Turbine	MW			
Group 5 - Number of this type of Turbine				
Total number of turbines		0	0	0

5.0 Resource Parameters

The Resource Parameters tab allows generation resources to establish operational limits and long term planning information. The Seasonal Net Max Sustainable ratings for each season will also be used for the Mitigated Offer Cap.

All fields on this tab should be completed.

5.1 Generation Resources – non-Wind, non-CC Generation Units

ERCOT Confidential — RETURN TO MAP

Resource Parameters

This worksheet tab provides resource parameters for generation resources. This tab is UNIT specific for all non-Wind and non-CC.
Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section and select RETURN TO

GENERATION RESOURCES (non-WIND, non-CC)

Reasonability Limits	Labels	TEST A	TEST B	
High Reasonability Limit	MW			
Low Reasonability Limit	MW			
High Reasonability Ramp Rate Limit	MW/min			
Low Reasonability Ramp Rate Limit	MW/min			
Seasonal Ratings	**Labels**	**TEST A**	**TEST B**	
Seasonal Net Max Sustainable Rating - Spring	MW			
Seasonal Net Min Sustainable Rating - Spring	MW			
Seasonal Net Max Emergency Rating - Spring	MW			
Seasonal Net Min Emergency Rating - Spring	MW			
Seasonal Net Max Sustainable Rating - Summer	MW			
Seasonal Net Min Sustainable Rating - Summer	MW			
Seasonal Net Max Emergency Rating - Summer	MW			
Seasonal Net Min Emergency Rating - Summer	MW			
Seasonal Net Max Sustainable Rating - Fall	MW			
Seasonal Net Min Sustainable Rating - Fall	MW			
Seasonal Net Max Emergency Rating - Fall	MW			
Seasonal Net Min Emergency Rating - Fall	MW			
Seasonal Net Max Sustainable Rating - Winter	MW			
Seasonal Net Min Sustainable Rating - Winter	MW			
Seasonal Net Max Emergency Rating - Winter	MW			
Seasonal Net Min Emergency Rating - Winter	MW			

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5.2 Generation Resources – Combined-Cycle Units and Configurations

This tab contains three parts – for registering up to three trains at one site. This information is required for Units and Configurations.

Units:

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RETURN TO MAP

Resource Parameters

*This worksheet tab provides resource parameters for **Combined Cycle** generation resources. This tab is UNIT specific for **all CC**.*

Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section and select RETURN TO

CC GENERATION RESOURCES CC1

Reasonability Limits	Labels	TEST_A	TEST_B	TEST_C
High Reasonability Limit	MW			
Low Reasonability Limit	MW			
High Reasonability Ramp Rate Limit	MW/min			
Low Reasonability Ramp Rate Limit	MW/min			
Seasonal Ratings	**Labels**	**TEST_A**	**TEST_B**	**TEST_C**
Seasonal Net Max Sustainable Rating - Spring	MW			
Seasonal Net Min Sustainable Rating - Spring	MW			
Seasonal Net Max Emergency Rating - Spring	MW			
Seasonal Net Min Emergency Rating - Spring	MW			
Seasonal Net Max Sustainable Rating - Summer	MW			
Seasonal Net Min Sustainable Rating - Summer	MW			
Seasonal Net Max Emergency Rating - Summer	MW			
Seasonal Net Min Emergency Rating - Summer	MW			
Seasonal Net Max Sustainable Rating - Fall	MW			
Seasonal Net Min Sustainable Rating - Fall	MW			
Seasonal Net Max Emergency Rating - Fall	MW			
Seasonal Net Min Emergency Rating - Fall	MW			
Seasonal Net Max Sustainable Rating - Winter	MW			
Seasonal Net Min Sustainable Rating - Winter	MW			
Seasonal Net Max Emergency Rating - Winter	MW			
Seasonal Net Min Emergency Rating - Winter	MW			

Configurations:

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RETURN TO MAP

Resource Parameters

*This worksheet tab provides resource parameters for **Combined Cycle** generation resources. This tab is specific to all **CC configurations**.*

The cells for the resource parameters will become un-hatched for data entry, after a configuration is entered on the corresponding Configurations Tab.

CC GENERATION RESOURCES CC1 CONFIGURATIONS

Reasonability Limits	Labels	TEST_CC1_1	TEST_CC1_2	TEST_CC1_3
High Reasonability Limit	MW			
Low Reasonability Limit	MW			
High Reasonability Ramp Rate Limit	MW/min			
Low Reasonability Ramp Rate Limit	MW/min			
Seasonal Ratings	**Labels**	**TEST_CC1_1**	**TEST_CC1_2**	**TEST_CC1_3**
Seasonal Net Max Sustainable Rating - Spring	MW			
Seasonal Net Min Sustainable Rating - Spring	MW			
Seasonal Net Max Emergency Rating - Spring	MW			
Seasonal Net Min Emergency Rating - Spring	MW			
Seasonal Net Max Sustainable Rating - Summer	MW			
Seasonal Net Min Sustainable Rating - Summer	MW			
Seasonal Net Max Emergency Rating - Summer	MW			
Seasonal Net Min Emergency Rating - Summer	MW			
Seasonal Net Max Sustainable Rating - Fall	MW			
Seasonal Net Min Sustainable Rating - Fall	MW			
Seasonal Net Max Emergency Rating - Fall	MW			
Seasonal Net Min Emergency Rating - Fall	MW			
Seasonal Net Max Sustainable Rating - Winter	MW			
Seasonal Net Min Sustainable Rating - Winter	MW			
Seasonal Net Max Emergency Rating - Winter	MW			
Seasonal Net Min Emergency Rating - Winter	MW			

5.3 Generation Resource – Wind Units

ERCOT Confidential

RETURN TO MAP

Resource Parameters

*This worksheet tab provides resource parameters for **Wind** generation resources. This tab is UNIT specific for **all Wind**.*
Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete this se

WIND GENERATION RESOURCES

Reasonability Limits	Labels	TEST_A	
High Reasonability Limit	MW		
Low Reasonability Limit	MW		
High Reasonability Ramp Rate Limit	MW/min		
Low Reasonability Ramp Rate Limit	MW/min		

Seasonal Ratings	Labels	TEST_A	
Seasonal Net Max Sustainable Rating - Spring	MW		
Seasonal Net Min Sustainable Rating - Spring	MW		
Seasonal Net Max Emergency Rating - Spring	MW		
Seasonal Net Min Emergency Rating - Spring	MW		
Seasonal Net Max Sustainable Rating - Summer	MW		
Seasonal Net Min Sustainable Rating - Summer	MW		
Seasonal Net Max Emergency Rating - Summer	MW		
Seasonal Net Min Emergency Rating - Summer	MW		
Seasonal Net Max Sustainable Rating - Fall	MW		
Seasonal Net Min Sustainable Rating - Fall	MW		
Seasonal Net Max Emergency Rating - Fall	MW		
Seasonal Net Min Emergency Rating - Fall	MW		
Seasonal Net Max Sustainable Rating - Winter	MW		
Seasonal Net Min Sustainable Rating - Winter	MW		
Seasonal Net Max Emergency Rating - Winter	MW		
Seasonal Net Min Emergency Rating - Winter	MW		

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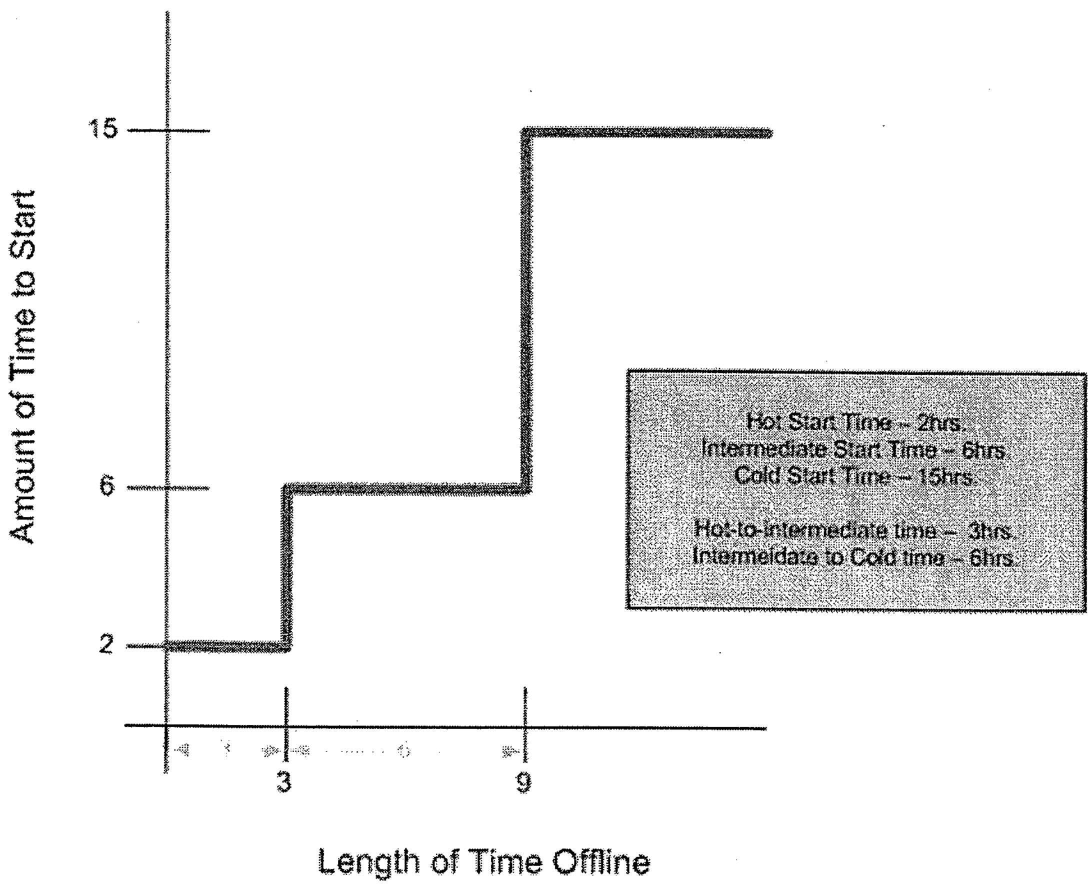
6.0 Operational Resource Parameters

The Operational Resource Parameters section of the RARF provides base values for start-up. The QSE will be able to update these values through the MMS.

These values are required. The only permissible blanks will be the unused portion of the ramp rate curves. (e.g. A minimum of one megawatt value is required, so the MW1 Value and the Upward & Downward Ramps for that MW value.)

The start times for hot, intermediate, and cold apply only to units and trains that are off-line. The Hot-Intermediate and Intermediate-Cold times define which start time to use by seeing how long the unit/train has been off-line. An example is shown below:



ERCOT

6.1 Operational Resource Parameters – non-Wind, non-CC Generation Units

ERCOT Confidential

RETURN TO MAP

Operational Resource Parameters

Resource Entity authorizes QSE representing this Generation Resource to submit Resource Parameters on this page for operational purposes in accordance with Section 3.7.1 on behalf of Resource Entity.

*This worksheet tab provides resource parameters for **generation** resources. This tab is UNIT specific for **all non-Wind and non-CC***

Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section and selec

GENERATION RESOURCES (non-WIND, non-CC)

Resource Parameters	Labels	TEST_A	TEST_B	
Minimum On Line Time	hours			
Minimum Off Line Time	hours			
Hot Start Time	hours			
Intermediate Start Time	hours			
Cold Start Time	hours			
Max Weekly Starts				
Max On Line Time	hours			
Max Daily Starts				
Max Weekly Energy	MWh			
Hot-to-Intermediate Time	hours			
Intermediate-to-Cold Time	hours			

Normal Ramp Rate Curve	Labels	TEST_A	TEST_B	
MW1	MW			
Upward RampRate1	MW/min			
Downward RampRate1	MW/min			
MW2	MW			
Upward RampRate2	MW/min			
Downward RampRate2	MW/min			
MW3	MW			
Upward RampRate3	MW/min			
Downward RampRate3	MW/min			
MW4	MW			
Upward RampRate4	MW/min			
Downward RampRate4	MW/min			
MW5	MW			
Upward RampRate5	MW/min			
Downward RampRate5	MW/min			
MW6	MW			
Upward RampRate6	MW/min			
Downward RampRate6	MW/min			
MW7	MW			
Upward RampRate7	MW/min			
Downward RampRate7	MW/min			
MW8	MW			
Upward RampRate8	MW/min			
Downward RampRate8	MW/min			
MW9	MW			
Upward RampRate9	MW/min			
Downward RampRate9	MW/min			
MW10	MW			
Upward RampRate10	MW/min			
Downward RampRate10	MW/min			

Emergency Ramp Rate Curve	Labels	TEST_A	TEST_B	
MW1	MW			
Upward RampRate1	MW/min			
Downward RampRate1	MW/min			
MW2	MW			
Upward RampRate2	MW/min			
Downward RampRate2	MW/min			
MW3	MW			
Upward RampRate3	MW/min			
Downward RampRate3	MW/min			
MW4	MW			
Upward RampRate4	MW/min			
Downward RampRate4	MW/min			
MW5	MW			
Upward RampRate5	MW/min			
Downward RampRate5	MW/min			
MW6	MW			
Upward RampRate6	MW/min			
Downward RampRate6	MW/min			

ERCOT

6.2 Operational Resource Parameters – Combined-Cycle Configurations

This tab contains three parts – for registering up to three trains at one site. This information is required for Configurations.

ERCOT Confidential RETURN TO MAP

Operational Resource Parameters

Resource Entity authorizes QSE representing this Generation Resource to submit Resource Parameters on this page for operational purposes in accordance with Section 3.7.1 on behalf of Resource Entity.

This worksheet tab provides resource parameters for ***Combined Cycle*** *generation resources. This tab is* ***Configuration*** *specific.*

The cells for the operational resource parameters will become un-hatched for data entry, after a configuration is entered on the corresponding

CC GENERATION RESOURCES CC1 CONFIGURATIONS

Resource Parameters	s	TEST_CC1_1	TEST_CC1_2	TEST_CC1_3
Minimum On Line Time	hours			
Minimum Off Line Time	hours			
Hot Start Time	hours			
Intermediate Start Time	hours			
Cold Start Time	hours			
Max Weekly Starts				
Max On Line Time	hours			
Max Daily Starts				
Max Weekly Energy	MWh			
Hot-to-Intermediate Time	hours			
Intermediate-to-Cold Time	hours			

Normal Ramp Rate Curve	s	TEST_CC1_1	TEST_CC1_2	TEST_CC1_3
MW1	MW			
Upward RampRate1	MW/min			
Downward RampRate1	MW/min			
MW2	MW			
Upward RampRate2	MW/min			
Downward RampRate2	MW/min			
MW3	MW			
Upward RampRate3	MW/min			
Downward RampRate3	MW/min			
MW4	MW			
Upward RampRate4	MW/min			
Downward RampRate4	MW/min			
MW5	MW			
Upward RampRate5	MW/min			
Downward RampRate5	MW/min			
MW6	MW			
Upward RampRate6	MW/min			
Downward RampRate6	MW/min			
MW7	MW			
Upward RampRate7	MW/min			
Downward RampRate7	MW/min			
MW8	MW			
Upward RampRate8	MW/min			
Downward RampRate8	MW/min			
MW9	MW			
Upward RampRate9	MW/min			
Downward RampRate9	MW/min			
MW10	MW			
Upward RampRate10	MW/min			
Downward RampRate10	MW/min			

Emergency Ramp Rate Curve	s	TEST_CC1_1	TEST_CC1_2	TEST_CC1_3
MW1	MW			
Upward RampRate1	MW/min			
Downward RampRate1	MW/min			
MW2	MW			
Upward RampRate2	MW/min			
Downward RampRate2	MW/min			
MW3	MW			
Upward RampRate3	MW/min			
Downward RampRate3	MW/min			
MW4	MW			
Upward RampRate4	MW/min			
Downward RampRate4	MW/min			
MW5	MW			
Upward RampRate5	MW/min			
Downward RampRate5	MW/min			
MW6	MW			
Upward RampRate6	MW/min			
Downward RampRate6	MW/min			
MW7	MW			

ERCOT

6.3 Operational Resource Parameters – Wind Units

ERCOT Confidential

RETURN TO MAP

Operational Resource Parameters

Resource Entity authorizes QSE representing this Generation Resource to submit Resource Parameters on this page for operational purposes in accordance with Section 3.7.1 on behalf of Resource Entity.

*This worksheet tab provides resource parameters for **Wind** generation resources. This tab is UNIT specific for all W*

Complete the Unit Information Tab first, then the corresponding cells will become un-hatched on this tab. Then complet

WIND GENERATION RESOURCES

Resource Parameters	Labels	TEST_A	
Minimum On Line Time	hours		
Minimum Off Line Time	hours		
Hot Start Time	hours		
Intermediate Start Time	hours		
Cold Start Time	hours		
Max Weekly Starts			
Max On Line Time	hours		
Max Daily Starts			
Max Weekly Energy	MWh		
Hot-to-Intermediate Time	hours		
Intermediate-to-Cold Time	hours		

Normal Ramp Rate Curve	Labels	TEST_A	
MW1	MW		
Upward RampRate1	MW/min		
Downward RampRate1	MW/min		
MW2	MW		
Upward RampRate2	MW/min		
Downward RampRate2	MW/min		
MW3	MW		
Upward RampRate3	MW/min		
Downward RampRate3	MW/min		
MW4	MW		
Upward RampRate4	MW/min		
Downward RampRate4	MW/min		
MW5	MW		
Upward RampRate5	MW/min		
Downward RampRate5	MW/min		
MW6	MW		
Upward RampRate6	MW/min		
Downward RampRate6	MW/min		
MW7	MW		
Upward RampRate7	MW/min		
Downward RampRate7	MW/min		
MW8	MW		
Upward RampRate8	MW/min		
Downward RampRate8	MW/min		
MW9	MW		
Upward RampRate9	MW/min		
Downward RampRate9	MW/min		
MW10	MW		
Upward RampRate10	MW/min		
Downward RampRate10	MW/min		

Emergency Ramp Rate Curve	Labels	TEST_A	
MW1	MW		
Upward RampRate1	MW/min		
Downward RampRate1	MW/min		
MW2	MW		
Upward RampRate2	MW/min		

6.4 Ramp Rates

The Ramp Rate Curve data must be entered for both Normal and Emergency Operations. The ramp rates are initially submitted in the RARF, however the QSE will be able to update the ramp rates in Market Management System (MMS).

Ramp rate curves are step functions in the up and down directions at ten MW break points. All ramp rate values, including downward rates, should be entered in the RARF as non-zero positive values. The ramp rates and curves are critical and must be provided for every unit or, in the case of Combined Cycle facilities, ramp rates curves are needed for every configuration

The values submitted in the RARF are used to build the ramp rate step curves, and should not be used as tools to restrain the operating range of the unit or configuration. The curves are limited to LRL and HRL. Further operating restrictions exist as part of the COP and telemetry.

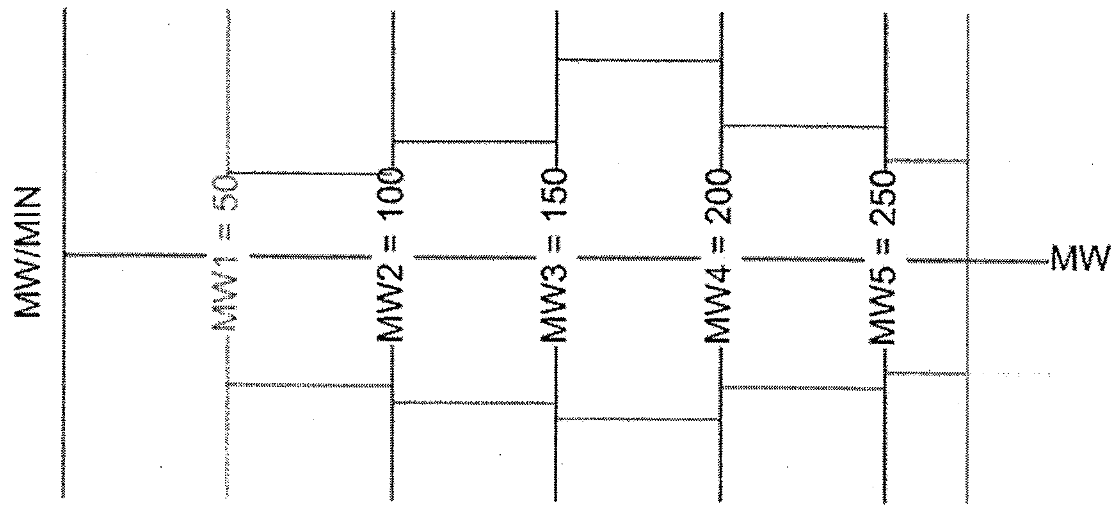
For ranges where the resource must be manually ramped, the up and down ramp rate should be a MW rate at which, if requested, the resource can be manually ramped to within a 5 minute period.

Only one ramp rate is required for the Normal curve and the Emergency curve.

The following picture is an example of a Ramp Rate curve using only five MW break points.

Normal Ramp Rate Curve	Labels	TEST_UNIT1
MW1	MW	50.00
Upward RampRate1	MW/min	5.00
Downward RampRate1	MW/min	8.00
MW2	MW	100.00
Upward RampRate2	MW/min	7.00
Downward RampRate2	MW/min	9.00
MW3	MW	150.00
Upward RampRate3	MW/min	12.00
Downward RampRate3	MW/min	10.00
MW4	MW	200.00
Upward RampRate4	MW/min	8.00
Downward RampRate4	MW/min	8.00
MW5	MW	250.00
Upward RampRate5	MW/min	6.00
Downward RampRate5	MW/min	7.00
MW6	MW	
Upward RampRate6	MW/min	
Downward RampRate6	MW/min	
MW7	MW	
Upward RampRate7	MW/min	
Downward RampRate7	MW/min	
MW8	MW	
Upward RampRate8	MW/min	
Downward RampRate8	MW/min	
MW9	MW	
Upward RampRate9	MW/min	
Downward RampRate9	MW/min	
MW10	MW	
Upward RampRate10	MW/min	
Downward RampRate10	MW/min	

The curve below is shown to help visualize how the reasonability and sustainable limits act as operational limiters as entered on the COP:



LRL = 50MW, HRL = 275MW

ERCOT

7.0 Reactive Capability

The Reactive Capability section requires the submittal of the manufacturer's capability curve as well as the 9-point curve values in the RARF. This information will be used to validate test data and should be the best design information available – including all reactive limitations. ERCOT will continue to require bi-annual testing, and this data will be used operationally.

With the exception of Wind, all values on this tab should be filled in.

7.1 Reactive Capability – non-Wind, non-CC Generation Units

ERCOT Confidential — RETURN TO MAP

Reactive Capability

*This worksheet tab provides reactive capability for **generation** resources. This tab is UNIT specific for **all non-Wind and non-CC**. Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section*

GENERATION RESOURCES non-WIND non-CC

Reactive Capability Curve	Labels	TEST_A	TEST_B
MW1	MW		
Lagging MVAR limit associated with MW1 output	MVAR		
Leading MVAR limit associated with MW1 output	MVAR		
MW2	MW		
Lagging MVAR limit associated with MW2 output	MVAR		
Leading MVAR limit associated with MW2 output	MVAR		
MW3	MW		
Lagging MVAR limit associated with MW3 output	MVAR		
Leading MVAR limit associated with MW3 output	MVAR		
MW4	MW		
Lagging MVAR limit associated with MW4 output	MVAR		
Leading MVAR limit associated with MW4 output	MVAR		
MW5 - Unity Power Factor	MW		
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT	PSI		
Maximum Leading Operating Capability (MVAR)	MVAR		
Maximum Lagging Operating Capability (MVAR)	MVAR		
Manufacturer's Capability Curve submitted?	Y/N		

ERCOT

7.2 Reactive Capability – Combined-Cycle Units

This tab contains three parts – for registering up to three trains at one site. This information is required for Units.

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RETURN TO MAP

Reactive Capability

This worksheet tab provides reactive capability for ***Combined Cycle*** *generation resources. This tab is UNIT specific for* ***all CC****.*
Please complete this section and select RETURN TO MAP

CC GENERATION RESOURCES CC1

Reactive Capability Curve	Labels	TEST_A	TEST_B	TEST_C
MW1	MW			
Lagging MVAR limit associated with MW1 output	MVAR			
Leading MVAR limit associated with MW1 output	MVAR			
MW2	MW			
Lagging MVAR limit associated with MW2 output	MVAR			
Leading MVAR limit associated with MW2 output	MVAR			
MW3	MW			
Lagging MVAR limit associated with MW3 output	MVAR			
Leading MVAR limit associated with MW3 output	MVAR			
MW4	MW			
Lagging MVAR limit associated with MW4 output	MVAR			
Leading MVAR limit associated with MW4 output	MVAR			
MW5 - Unity Power Factor	MW			
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT	PSI			
Maximum Leading Operating Capability (MVAR)	MVAR			
Maximum Lagging Operating Capability (MVAR)	MVAR			
Manufacturer's Capability Curve submitted?	Y/N			

SOURCES CC2

Reactive Capability Curve	Labels			
MW1	MW			
Lagging MVAR limit associated with MW1 output	MVAR			
Leading MVAR limit associated with MW1 output	MVAR			
MW2	MW			
Lagging MVAR limit associated with MW2 output	MVAR			
Leading MVAR limit associated with MW2 output	MVAR			
MW3	MW			

7.3 Reactive Capability – Wind Units

The 9 point reactive curve data points must be submitted for each unit, as well as the manufacturer's capability curve. The units are listed in the vertical columns – the RARF allows up to five. The groups are horizontal.

Reactive capability must be completed for each group of each unit.

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RETURN TO MAP

Reactive Capability

This worksheet tab provides reactive capability for Wind generation resources. This tab is UNIT specific for all WIND.

Complete the Unit Information Tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section and select RETURN TO

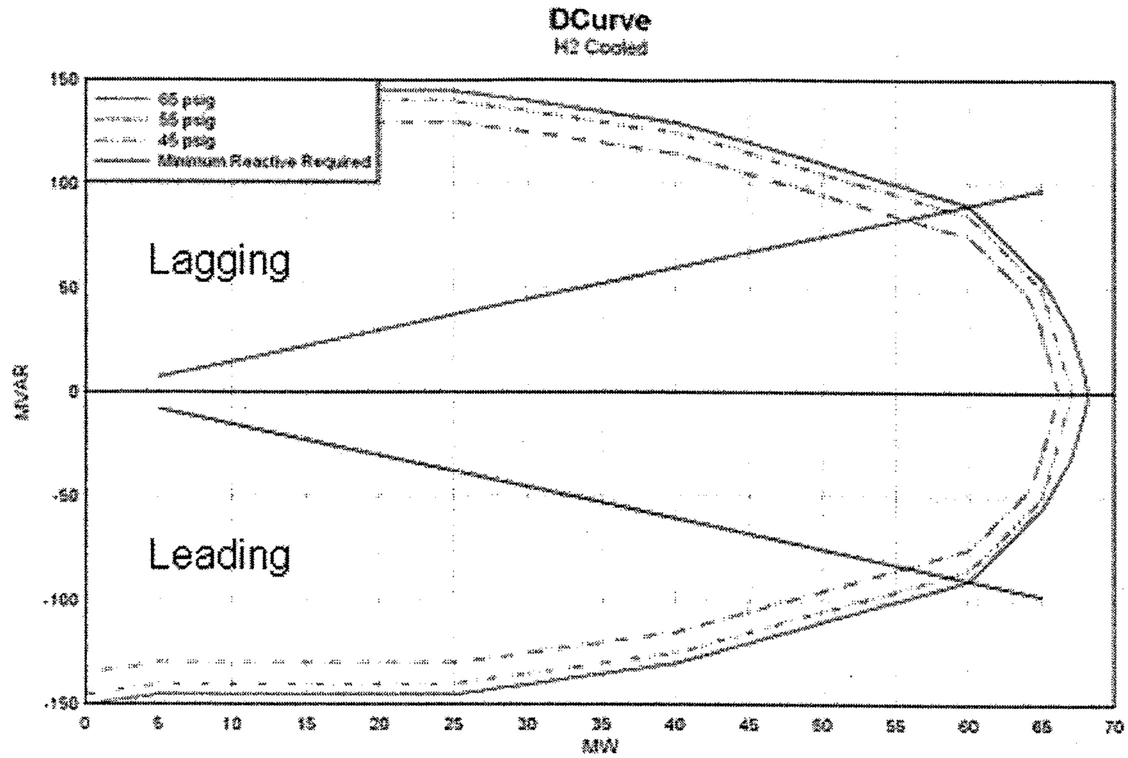
WIND GENERATION RESOURCES UNIT 1

Reactive Capability Curves - TEST_A	Labels	Group 1	Group 2	Group 3	Group 4
Does this unit meet the ERCOT Reactive Standard?					
MW1	MW				
Lagging MVAR limit associated with MW1 output	MVAR				
Leading MVAR limit associated with MW1 output	MVAR				
MW2	MW				
Lagging MVAR limit associated with MW2 output	MVAR				
Leading MVAR limit associated with MW2 output	MVAR				
MW3	MW				
Lagging MVAR limit associated with MW3 output	MVAR				
Leading MVAR limit associated with MW3 output	MVAR				
MW4	MW				
Lagging MVAR limit associated with MW4 output	MVAR				
Leading MVAR limit associated with MW4 output	MVAR				
MW5 - Unity Power Factor	MW				
Maximum Leading Operating Capability	MVAR				
Maximum Lagging Operating Capability	MVAR				
Has the Manufacturer's Capability Curve submitted?	Y/N				

7.4 D-Curve / REACTIVE CAPABILITY CURVES

Reactive capability is the ability of a generator unit to supply/absorb reactive power (MVAR) to the grid continuously for a given MW operating value without damaging the unit. Reactive power is required to control voltage under normal and emergency situations in order to prevent voltage collapse of the grid. Reactive capability qualification testing is required by ERCOT for verification of maximum leading and lagging capability of all generation resources required to provide voltage support service.

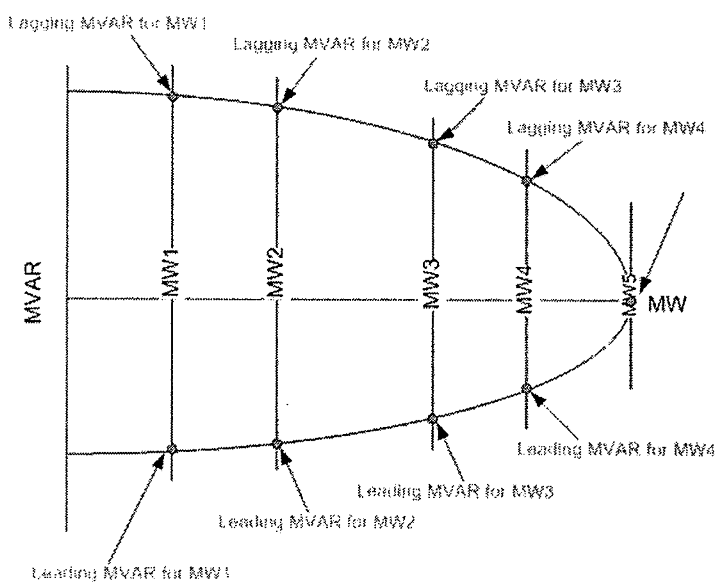
The Reactive Capability Curve, also known as the D-curve, represents the operating limits of the generator. The example Reactive Capability Curve pictured below shows the Reactive Capability Curve or D-Curve of a generator unit where the X-axis is MW and the Y-axis is MVAR, and is intended for illustrative purposes only. Values above the x-axis (positive VARs) are "LAGGING" MVARs and values below the x-axis (negative VARs) are "LEADING" MVARs.


DCurve
H2 Cooled
65 psig
55 psig
45 psig
Minimum Reactive Required
Lagging
Leading
MVAR
MW
150
100
50
0
-50
-100
-150
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70

To establish the curve in the RARF, ERCOT requests nine points of data. When entering data on the RARF, use POSITIVE values to represent the lagging MVARs and NEGATIVE values to represent leading MVARs. If the unit is hydrogen cooled, indicate pressure of hydrogen in psi; otherwise leave the cell blank. Supply 5 increasing MW values of operating real power - MW1 at the lowest operation MW through MW 5 at unity power factor. An example of this entry is shown below.

Reactive Capability Curve	Labels	TEST_UNIT1
MW1	MW	50.00
Lagging MVAR limit associated with MW1 output	MVAR	10.00
Leading MVAR limit associated with MW1 output	MVAR	-12.00
MW2	MW	100.00
Lagging MVAR limit associated with MW2 output	MVAR	15.00
Leading MVAR limit associated with MW2 output	MVAR	-25.00
MW3	MW	150.00
Lagging MVAR limit associated with MW3 output	MVAR	20.00
Leading MVAR limit associated with MW3 output	MVAR	-35.00
MW4	MW	200.00
Lagging MVAR limit associated with MW4 output	MVAR	30.00
Leading MVAR limit associated with MW4 output	MVAR	-50.00
MW5 - Unity Power Factor	MW	250.00
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT studies	PSI	65.0
Maximum Lagging Operating Capability (MVAR)	MVAR	40.00
Maximum Leading Operating Capability (MVAR)	MVAR	-55.00
Manufacturer's Capability Curve submitted?	Y/N	Y

The following is an example of a D-curve and the selection of points. The graph below shows five MW points and corresponding MVARs. After entering these values in the form, the end curve is shown. This implies that the MW selection points should move closer to the unity end to more accurately depict the curve and reactive capability of the resource.



8.0 Split Generation Resources

The responsibility for ensuring proper resource registration belongs to the Resource Entity that represents or controls the output of the unit(s). Joint-ownership is not formally defined in ERCOT. These resources are referred to as Split Generation.

If the entire output of all units at a facility/site is controlled by one Resource Entity only, then the top section should be completed. However, if multiple Resource Entities share ownership, even if the split is by entire units, then the Split Generation Resource section must be completed. This will allow the unit to be properly aligned with the Resource Entity in the ERCOT registration system.

8.1 Ownership – non-Wind, non-CC Generation Units

Complete this section ONLY if a single Resource Entity (RE) represents 100% of all units.		
Resource Owner Data	Owner 1	
Resource Entity Name		
Resource Duns Number		
Complete the following sections if units at the same site are represented by different Resource Entites (RE) or represented ;		
TEST A	Owner 1	Owner 2
Market Participant (Resource) Name	RESOURCEOWNER1	RESOURCEOWNER2
Market Participant (Resource) Duns Numb	123456789	3216549872000
Fixed Ownership % (must equal 100%)	60.00%	40.00%
Master Owner (Y or N)	Y	N
	Owner 1	Owner 2
Market Participant (Resource) Name		
Market Participant (Resource) Duns Number		
Fixed Ownership % (must equal 100%)		
Master Owner (Y or N)		

8.2 Split Resource Generation – Combined-Cycle Units

This tab contains three parts, for registering up to three trains at one site. The information is required for each train. ERCOT does not allow Combined-Cycle Resources to register as Split Generation.

CC1		
	Complete this section if a single Resource Entity (RE) represents 100% of all units	
	Resource Owner Data - TEST_CC1	Owner
	Resource Entity Name	RESOURCEOWNER1
	Resource Duns Number	123456789

CC2		
	Complete this section if a single Resource Entity (RE) represents 100% of all units	
	Resource Owner Data -	Owner
	Resource Entity Name	RESOURCEOWNER1
	Resource Duns Number	3216549872000

CC3		
	Complete this section if a single Resource Entity (RE) represents 100% of all units	
	Resource Owner Data -	Owner
	Resource Entity Name	
	Resource Duns Number	

8.3 Split Resource Generation – Wind Units

ERCOT Confidential — ***RETURN TO MAP***

Representation of Facility Output

This worksheet tab applies to all WIND Generation Resources. This tab identifies the Resource
Please complete either the single Resource Owner section or the Split-Generation Owners sectio

IND GENERATION RESOURCES		
	Complete this section ONLY if a single Resource Entity (RE) represents 100% of all units.	
	Resource Owner Data	Owner 1
	Resource Entity Name	
	Resource Duns Number	
	Complete the following sections if units at the same site are represented by different Reso	
	TEST_A	Owner 1
	Market Participant (Resource) Name	RESOURCEOWNER1
	Market Participant (Resource) Duns Number	123456789
	Fixed Ownership % (must equal 100%)	100.00%
	Master Owner (Y or N)	Y
	TEST_B	Owner 1
	Market Participant (Resource) Name	RESOURCEOWNER2
	Market Participant (Resource) Duns Number	3216549872000
	Fixed Ownership % (must equal 100%)	100.00%
	Master Owner (Y or N)	Y
		Owner 1
	Market Participant (Resource) Name	
	Market Participant (Resource) Duns Number	
	Fixed Ownership % (must equal 100%)	
	Master Owner (Y or N)	

9.0 Combined-Cycle Configurations and Transitions

Before the details such as ramp rates can be entered for a configuration, the configurations must be established.

9.1 Configurations

This section is pre-populated with the unit mnemonic, the unit type, and the nameplate MVA rating for reference. CCx refers to a combined cycle train, e.g. CC1 or CC2 or CC3.

Previously, ERCOT limited registration of configurations to no more than the number of units in the train. In this registration, resources are allowed to register all operationally unique configurations. When registering additional configurations, bear in mind the configurations should represent logical configurations (1-0, 2-0, 1-1, etc.), and should NOT represent uniqueness for individual units. In the example below, whether running Unit1&Steamer or Unit2&Steamer, the resource would represent only one unique configuration of 1-on-1.

Enter the unique configurations for each train. Assistance with developing all unique configurations can be found later in this document. The keys to properly identifying the configurations include defining the configurations to increase in MW and in units from left to right (configuration 1 through xx).

As a configuration is entered, the cells for all the resource parameters for that configuration will become available for data entry. The resource parameters must be filled, as this will overwrite any RARF submittals for all configurations.

ERCOT CONFIDENTIAL | *RETURN TO MAP*

Combined Cycle Configurations

This worksheet tab applies to ***all Combined Cycle*** *Generation Resources. Please complete this section and select RETURN TO MAP*

As a configuration is entered into the CCx Config tab, the hatched cells will open up in the corresponding CCx Transition tab.

	Resource Name (Unit Code)	Unit Type	TEST_CC1_1	TEST_CC1_2	TEST_CC1_3
CC1	TEST_A	0	x	x	x
	TEST_B	0	a	x	x
	TEST_C	0			x
	Number of units and MW increase from left to right.				

9.2 Transitions

As a configuration is entered into the CCx Config tab, the hatched cells will open up in the corresponding CCx Transition tab. This table is a map that, for each operating state/configuration, identifies what states/configurations are next available – e.g. adding a unit or removing a unit. This map is critical to properly transition the ERCOT systems.

ERCOT CONFIDENTIAL | RETURN TO MAP

Combined Cycle Transitions

*This worksheet tab applies to **all Combined Cycle** Generation Resources. This tab defines the operating transitions.*

Transition cells will open as a configuration is entered into the corresponding CCx Config tab. After completing this section, select RETURN TO MAP

To / From	Offline	TEST_CC1_1	TEST_CC1_2	TEST_CC1_3	TEST_CC1_4	TEST_CC1_5
Offline		x				
TEST_CC1_1	x		x			
TEST_CC1_2	x	x		x		
TEST_CC1_3	x	x	x			
TEST_CC1_4						

9.3 Establishing Configurations and Transitions

The following are steps intended to aid in developing configurations and transitions. These steps are not required.

An example is included for illustrative purposes only. For the example, assume a three unit train named ABC_CC1, consisting of two 100MW combustion turbines (CT) and one 100MW steam turbine (CA). When one CT is on, assume the CA can operate at 50% output.

Step 1:

Establish and register all operationally unique configurations with ERCOT. When registering additional configurations, bear in mind the configurations represent logical configurations (1-0, 2-0, 1-1, etc), and should NOT represent uniqueness for individual units. In the example below, whether running Unit1&Steamer or Unit2&Steamer, the resource would only represent one unique configuration of 1-on-1. Additional background to assist with this step can be obtained from the combined cycle whitepaper found at http://www.ercot.com/calendar/2008/01/20080121-TPTF.html, item 31.

This step should also establish a configuration order, 1 through xx (where xx represents, at a maximum, the number of unique configurations for the train). The sort order for the configurations should be from lowest to highest MW. A secondary sort order, if needed, would be to assign the lower configuration number to the configuration with fewer units operating.

Step 1 Example:

CC1 can operate in four unique configurations – 1x0, 2x0, 1x1, and 2x1. Each configuration has a different MW output. These configurations and the output have been identified in the table to the right. Applying the configuration order requirement, the yellow cells identify the order that they should be entered into the CCx Config table.

CC1		MW	1x0	2x0	1x1	2x1
Unit 1	CT	100	x	x	x	x
Unit 2	CT	100	a	x	a	x
Unit 3	CA	100			x	x
		300	100	200	150	300
			1	*3*	*2*	*4*

Step 2:

Enter the configurations into the CCx Config tab of Addendum 2.

Step 2 Example:

Unit Code / Mnemonic	Unit Type, MVA	ABC_CC1_1	ABC_CC1_2	ABC_CC1_3	ABC_CC1_4
ABC_Unit1	CT, 120MVA	X	X	X	X
ABC_Unit2	CT, 120MVA	A	A	X	X
ABC_Unit3	CA, 120MVA		X		X

Step 3:

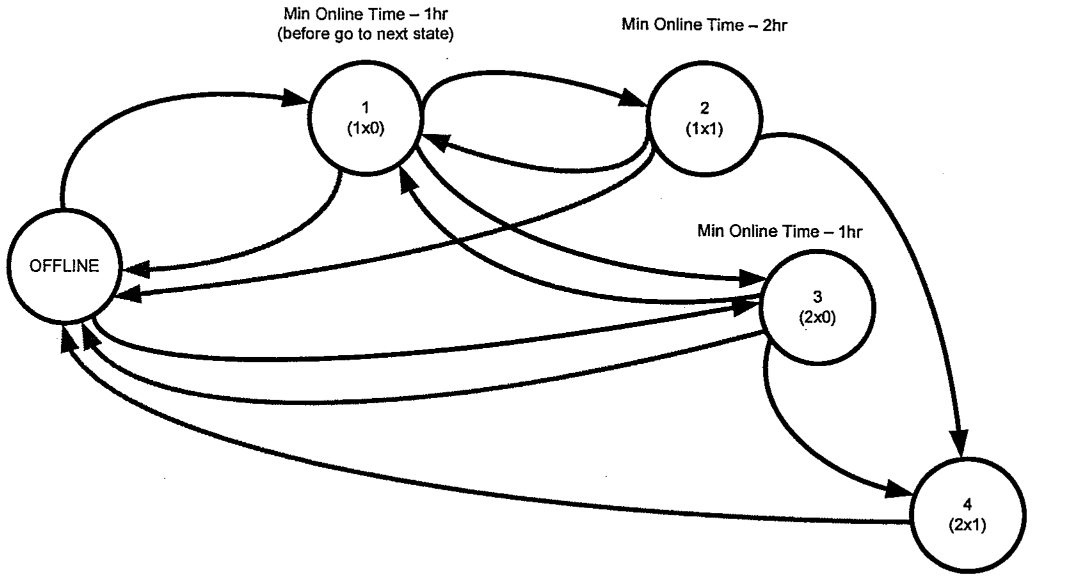
Enter resource parameter information for the configurations. Use the hyperlinks and the map to return to these sections.

Step 4:

Construct a state diagram, where each configuration is a "state" represented by a circle. Then arrows are drawn from each configuration to any other that can be reached **within the minimum online time.**

The state diagram should be laid out from left to right, where OFFLINE is furthest to the left, and the highest configuration number is furthest to the right. Draw arrows between states/configurations to indicate where the train could operate next. If the configurations were assigned correctly, arrows to the right should add a unit and increase MW. Arrows to the left should indicate decreasing MW and units. This diagram will help you build an accurate matrix for the Nodal systems.

Step 4 Example:



Step 5:

Go to the transition tab to complete the transition matrix.

Referring to the state diagram constructed in Step 4, each arrow should be an X in the matrix. With this layout, an arrow from left to right will be entered as an X in the transition matrix *above* the black diagonal, and any arrow from right to left will be entered as an X in the transition matrix *below* the black diagonal.

Please keep in mind that the unit will stay in any one state/configuration for the duration of the minimum online time.

Step 5 Example:

From Offline, this train can go to ABC_CC1_1 or ABC_CC1_2. This could be any state that could be reached in one hour from offline. The unit will stay in the initial state for the duration of the minimum online time.

To / From	Offline	ABC_CC1_1	ABC_CC1_2	ABC_CC1_3	ABC_CC1_4
Offline		X		X	
ABC_CC1_1	X		X	X	
ABC_CC1_2	X	X			X
ABC_CC1_3	X	X			X
ABC_CC1_4	X				

In this example, the train could reach Configuration 4 after 1 hour by going from Offline to Configuration 3 (ABC_CC1_3), wait the minimum online time of 1 hour, then transition to Configuration 4 (ABC_CC1_4). If the steamer cannot be ready in 1 hour, then the minimum online time should be increased for Configuration 3.

Alternatively, the train could reach Configuration 4 in 3 hours by going from ABC_CC1_1, wait 1 hour, go to ABC_CC1_2, wait 2 hours, then go to ABC_CC1_4. Again, if the steamer cannot be ready in 1 hour, then the minimum online time for Configuration 1 should be increased.

Complete these steps for each CC train.

10.0 Planning

The Planning Information section of the RARF, along with the PSSE Model datasheets, provides ERCOT with the information needed to properly complete studies. The planning section of the RARF has been separated into three sections.

10.1 Planning Information

This section provides details to ERCOT regarding generator details, auxiliary load information, acknowledgement of PSSE model submittals, as well as transient and subtransient reactances.

Machine Impedance is equivalent to Zeq, which consists of the armature, rotor, and mutual coupling impedances. In addition, the System Protection Working Group needs the Positive, Negative, and Zero sequence impedances.

The Auxiliary Load should be defined by identifying the amount of load in MW and MVAR for each unit. The Load Characteristics should be completed to allocate 100% of the MW and MVAR (separately) across the types of load the facility may have. Please include any motor connected to 2400V/4160V and above with the large motor percentage and lower voltage motors as small.

New Resources should request the PSSE model direct from the manufacturer, especially if the standard models do not exist.

If there are questions related to the PSSE models, please contact your designated ERCOT Account Manager or email Wholesale Client Services at NodalMarketTransition@ercot.com.

All fields in this section should be completed.

ERCOT

10.1.1 Planning – non-Wind, non-CC Generation Units

ERCOT Confidential | RETURN TO MAP

Planning Information

*This worksheet tab provides planning information for **generation** resources. This tab is UNIT specific for **all non-Wind and non-CC**.*
Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section and select RE

GEU (non-wind, non-CC)

Generator Details	Labels	TEST_A	TEST_B
What is the MVA base that the following data is based on?	MVA		
What is the kV base that the following data is based on?	kV		
Machine Impedance Zeq (R+jX)	R in p.u.		
	X in p.u.		
Armature Z	R in p.u.		
	X in p.u.		
Rotor Z	R in p.u.		
	X in p.u.		
Mutual coupling Armature-Rotor Z	R in p.u.		
	X in p.u.		
Positive Sequence Z	R in p.u.		
	X in p.u.		
Negative Sequence Z	R in p.u.		
	X in p.u.		
Zero Sequence Z	R in p.u.		
	X in p.u.		
Generator Auxiliary Load	**Labels**	**TEST_A**	**TEST_B**
Average Amount of Auxiliary Real Power	MW		
Average Amount of Auxiliary Reactive Power	MVAR		
Generation Auxiliary Load Characteristics for MW Load			
Large Motor, percent of total MW load	%		
Small Motor, percent of total MW load	%		
Resistive (Heating) Load, percent of total MW load	%		
Discharge Lighting, percent of total MW load	%		
Other, percent of total MW load	%		
Generation Auxiliary Load Characteristics for MVAR Load			
Large Motor, percent of total MVAR load	%		
Small Motor, percent of total MVAR load	%		
Discharge Lighting, percent of total MVAR load	%		
Other, percent of total MVAR load	%		
PSSE Model		**TEST_A**	**TEST_B**
Generator Form on file with ERCOT?	Y/N		
Turbine-Governor Form on file with ERCOT?	Y/N		
Excitation Form on file with ERCOT?	Y/N		
Do you have a Power System Stabilizer?	Y/N		
If so, is Stabilizer Form on file with ERCOT?	Y/N		
Do you have a Compensator?	Y/N		
If so, is Compensator Form on file with ERCOT?	Y/N		
Do you have a Over Excitation Limiter?	Y/N		
If so, is Over Excitation Limiter Form on file with ERCOT?	Y/N		
Do you have a Under Excitation Limiter?	Y/N		
If so, is Under Excitation Limiter Form on file with ERCOT?	Y/N		

10.1.2 Planning – Combined Cycle

This tab contains three parts, for registering up to three trains at one site. This information should be completed for each unit of the trains.

ERCOT Confidential

RETURN TO MAP

Planning Information

This worksheet tab provides planning information for ***Combined Cycle*** *generation resources. This tab is UNIT specific for* ***all CC*** *units.*
Please complete this section and select RETURN TO MAP

CC1				
Generator Details		TEST_A	TEST_B	TEST_C
What is the MVA base that the following data is based on?	MVA			
What is the kV base that the following data is based on?	kV			
Machine Impedance Zeq (R+jX)	R in p.u.			
	X in p.u.			
Armature Z	R in p.u.			
	X in p.u.			
Rotor Z	R in p.u.			
	X in p.u.			
Mutual coupling Armature-Rotor Z	R in p.u.			
	X in p.u.			
Positive Sequence Z	R in p.u.			
	X in p.u.			
Negative Sequence Z	R in p.u.			
	X in p.u.			
Zero Sequence Z	R in p.u.			
	X in p.u.			
Generator Auxiliary Load		TEST_A	TEST_B	TEST_C
Average Amount of Auxiliary Real Power	MW			
Average Amount of Auxiliary Reactive Power	MVAR			
Generation Auxiliary Load Characteristics for MW Load				
Large Motor, percent of total MW load	%			
Small Motor, percent of total MW load	%			
Resistive (Heating) Load, percent of total MW load	%			
Discharge Lighting, percent of total MW load	%			
Other, percent of total MW load	%			
Generation Auxiliary Load Characteristics for MVAR Load				
Large Motor, percent of total MVAR load	%			
Small Motor, percent of total MVAR load	%			
Discharge Lighting, percent of total MVAR load	%			
Other, percent of total MVAR load	%			
PSSE Model		TEST_A	TEST_B	TEST_C
Generator Form on file with ERCOT?	Y/N			
Turbine-Governor Form on file with ERCOT?	Y/N			
Excitation Form on file with ERCOT?	Y/N			
Do you have a Power System Stabilizer?	Y/N			
If so, is Stabilizer Form on file with ERCOT?	Y/N			
Do you have a Compensator?	Y/N			
If so, is Compensator Form on file with ERCOT?	Y/N			
Do you have a Over Excitation Limiter?	Y/N			
If so, is Over Excitation Limiter Form on file with ERCOT?	Y/N			
Do you have a Under Excitation Limiter?	Y/N			
If so, is Under Excitation Limiter Form on file with ERCOT?	Y/N			
Reactances		TEST_A	TEST_B	TEST_C
Direct Axis Subtransient reactance, X"di				
Direct Axis Transient reactance, X'di				

ERCOT

10.1.3 Planning – Wind Units

For non-Wind Generation Resources, the Over/Under Excitation Limiter form is new and must be submitted to ERCOT as soon as possible.

All fields in this section should be completed.

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RETURN TO MAP

Planning Information

This worksheet tab provides planning information for WIND generation resources. This tab is UNIT specific for all Wind units.
Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section and select RETURN

	Field Description	Labels	TEST_A	TEST_B
Wind	What is the MVA base that the following data is based on?	MVA		
	What is the kV base that the following data is based on?	kV		
	Machine Impedance Zeq (R+jX)	R in p.u.		
		X in p.u.		
	Armature Z	R in p.u.		
		X in p.u.		
	Rotor Z	R in p.u.		
		X in p.u.		
	Mutual coupling Armature-Rotor Z	R in p.u.		
		X in p.u.		
	Positive Sequence Z	R in p.u.		
		X in p.u.		
	Negative Sequence Z	R in p.u.		
		X in p.u.		
	Zero Sequence Z	R in p.u.		
		X in p.u.		
	PSSE MODEL		TEST_A	TEST_B
	PSSE Compatible Wind Generator Models submitted to ERCOT?	Y/N		
	Do you have a Dynamic Reactive Device?	Y/N		
	If so, is corresponding Dynamic Reactive Device Form on file with ERCOT?	Y/N		
	Transient and Subtransient Reactances		TEST_A	TEST_B
	Direct Axis Subtransient reactance, X"di			
	Direct Axis Transient reactance, X'di			

ERCOT

10.2 Protection

The protection section of the Planning tabs covers the breaker interruption time as well as the voltage and frequency protection of the unit.

Protection information must be provided as applicable. Please ensure that the generator protection is defined.

10.2.1 Protection – non-Wind, non-CC Generation Units

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Planning Information

RETURN TO MAP

*This worksheet tab provides protection information for **generation** resources. This tab is UNIT specific for*
Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. The

GEN (non-wind, non-CC)

Plant Voltage Protection	Label	TEST_A	TEST_B
Instantaneous Undervoltage Trip	KV		
Time 1	sec		
Undervoltage 1	KV		
Time 2	sec		
Undervoltage 2	KV		
Time 3	sec		
Undervoltage 3	KV		
Instantaneous Overvoltage Trip	KV		
Time 1	sec		
Overvoltage 1	KV		
Time 2	sec		
Overvoltage 2	KV		
Time 3	sec		
Overvoltage 3	KV		
Plant Frequency Protection	**Label**	**TEST_A**	**TEST_B**
Instantaneous Underfrequency Trip	Hz		
Time 1	sec		
Underfrequency 1	Hz		
Time 2	sec		
Underfrequency 2	Hz		
Time 3	sec		
Underfrequency 3	Hz		
Instantaneous Overfrequency Trip	Hz		
Time 1	sec		
Overfrequency 1	Hz		
Time 2	sec		
Overfrequency 2	Hz		
Time 3	sec		
Overfrequency 3	Hz		
Breaker Interruption Time	**Label**	**TEST_A**	**TEST_B**
Breaker Interruption Time	cycles		

ERCOT

10.2.2 Protection – Combined Cycle

This tab contains three parts – for registering up to three trains at one site. This information is required for each unit of the train.

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RETURN TO MAP

Planning Information

*This worksheet tab provides protection information for **Combined Cycle** generation resources. This tab is UNIT specific for **all CC**. Please complete this section and select RETURN TO MAP*

CC1

Plant Voltage Protection	Label	TEST_A	TEST_B	TEST_C
Instantaneous Undervoltage Trip	kV			
Time 1	sec			
Undervoltage 1	kV			
Time 2	sec			
Undervoltage 2	kV			
Time 3	sec			
Undervoltage 3	kV			
Instantaneous Overvoltage Trip	kV			
Time 1	sec			
Overvoltage 1	kV			
Time 2	sec			
Overvoltage 2	kV			
Time 3	sec			
Overvoltage 3	kV			
Plant Frequency Protection	**Label**	**TEST_A**	**TEST_B**	**TEST_C**
Instantaneous Underfrequency Trip	Hz			
Time 1	sec			
Underfrequency 1	Hz			
Time 2	sec			
Underfrequency 2	Hz			
Time 3	sec			
Underfrequency 3	Hz			
Instaneous Overfrequency Trip	Hz			
Time 1	sec			
Overfrequency 1	Hz			
Time 2	sec			
Overfrequency 2	Hz			
Time 3	sec			
Overfrequency 3	Hz			
Breaker Interruption Time	**Label**	**TEST_A**	**TEST_B**	**TEST_C**
Breaker Interruption Time	cycles			

ERCOT

10.2.3 Protection – Wind Units

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RETURN TO MAP

Planning Information

This worksheet tab provides protection information for WIND generation resources. This tab is UNIT specific for all Wind
Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete th

	Plant Voltage Protection	Label	TEST_A	TEST_B	
WIND	Instantaneous Undervoltage Trip	kV			
	Time 1	sec			
	Undervoltage 1	kV			
	Time 2	sec			
	Undervoltage 2	kV			
	Time 3	sec			
	Undervoltage 3	kV			
	Instantaneous Overvoltage Trip	kV			
	Time 1	sec			
	Overvoltage 1	kV			
	Time 2	sec			
	Overvoltage 2	kV			
	Time 3	sec			
	Overvoltage 3	kV			
	Plant Frequency Protection	**Label**	**TEST_A**	**TEST_B**	
	Instantaneous Underfrequency Trip	Hz			
	Time 1	sec			
	Underfrequency 1	Hz			
	Time 2	sec			
	Underfrequency 2	Hz			
	Time 3	sec			
	Underfrequency 3	Hz			
	Instantaneous Overfrequency Trip	Hz			
	Time 1	sec			
	Overfrequency 1	Hz			
	Time 2	sec			
	Overfrequency 2	Hz			
	Time 3	sec			
	Overfrequency 3	Hz			
	Breaker Interruption Time	**Label**	**TEST_A**	**TEST_B**	
	Breaker Interruption Time	cycles			

10.3 Sub-synchronous Resonance

Sub-synchronous Resonance information has been difficult for many Resources to provide. At this time, the studies that need this information are not completed often, but will become more common as capacitor compensation is used in series on long transmission lines.

The studies focus on the units at either end of the lines compensated with the series capacitors to ensure the resonance from these lines will not excite critical frequencies in the machines in the areas at the ends of these lines.

In the future, these studies will be useful to Resource owners interested in equipment damage prevention.

Due to the infrequent nature of these studies, ERCOT accepts minimal information in these fields at this time. However, as series compensation is installed on our grid, this information will become necessary and critical to system performance

10.3.1 Sub-synchronous Resonance – non-Wind, non-CC Generation Units

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RETURN TO MAP

Planning Information

*This worksheet tab provides subsynchronous resonance planning information for **generation** resources. This tab is UNIT specific for **all non-Win***

Please complete this section and select RETURN TO MAP

GEII (non-wind, non-CC)				
	Subsynchronous Resonance - Mass 1	**TEST_A**	**TEST_B**	
	Name of Mass 1			
	Mass Inertia			
	Inertia units			
	Associated damping			
	Damping units			
	Subsynchronous Resonance - Mass 2	**TEST_A**	**TEST_B**	
	Name of Mass 2			
	Mass Inertia			
	Inertia units			
	Associated damping			
	Damping units			
	Stiffness between Masses 1 and 2			
	Stiffness units			
	Subsynchronous Resonance - Mass 3	**TEST_A**	**TEST_B**	
	Name of Mass 3			
	Mass Inertia			
	Inertia units			
	Associated damping			
	Damping units			
	Stiffness between Masses 2 and 3			
	Stiffness units			
	Subsynchronous Resonance - Mass 4	**TEST_A**	**TEST_B**	
	Name of Mass 4			
	Mass Inertia			
	Inertia units			
	Associated damping			
	Damping units			
	Stiffness between Masses 3 and 4			
	Stiffness units			
	Subsynchronous Resonance - Mass 5	**TEST_A**	**TEST_B**	
	Name of Mass 5			
	Mass Inertia			
	Inertia units			
	Associated damping			
	Damping units			
	Stiffness between Masses 4 and 5			
	Stiffness units			

10.3.2 Sub-synchronous Resonance – Combined Cycle

This tab contains three parts, for registering up to three trains at one site. This information is required for each unit of the train.

ERCOT Confidential | RETURN TO MAP

Planning Information

*This worksheet tab provides subsynchronous resonance planning information for **Combined Cycle** generation resources. This tab is UNIT specific f*
Please complete this section and select RETURN TO MAP

	Subsynchronous Resonance - Mass 1	TEST_A	TEST_B	TEST_C
CC1	Name of Mass 1			
	Mass Inertia			
	Inertia units			
	Associated damping			
	Damping units			
	Subsynchronous Resonance - Mass 2	**TEST_A**	**TEST_B**	**TEST_C**
	Name of Mass 2			
	Mass Inertia			
	Inertia units			
	Associated damping			
	Damping units			
	Stiffness between Masses 1 and 2			
	Stiffness units			
	Subsynchronous Resonance - Mass 3	**TEST_A**	**TEST_B**	**TEST_C**
	Name of Mass 3			
	Mass Inertia			
	Inertia units			
	Associated damping			
	Damping units			
	Stiffness between Masses 2 and 3			
	Stiffness units			
	Subsynchronous Resonance - Mass 4	**TEST_A**	**TEST_B**	**TEST_C**
	Name of Mass 4			
	Mass Inertia			
	Inertia units			
	Associated damping			
	Damping units			
	Stiffness between Masses 3 and 4			
	Stiffness units			
	Subsynchronous Resonance - Mass 5	**TEST_A**	**TEST_B**	**TEST_C**
	Name of Mass 5			
	Mass Inertia			
	Inertia units			
	Associated damping			
	Damping units			
	Stiffness between Masses 4 and 5			
	Stiffness units			

ERCOT

11.0 Private Use Networks

Private Use Networks require information at both the site and unit level. If the facility is a Private Use Network – load other than auxiliary load behind the EPS meter – then enter Y for the response to "Private Network?" This will open the rest of the hatched cells on the page that must be completed.

11.1 Site Information

Each private network should provide the MW and MVAR that can be generated, that which is typically used by the facility, and that which is net to the grid. ERCOT is aware this net value can swing widely, and telemetry will provide details. If possible, provide an average over the past year.

Similar to the auxiliary load, load characteristics must be provided for the planning studies. Each of the % for MW Load and for MVAR Load areas must add to 100%.

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RETURN TO MAP

Private Network - Site and Unit Information

This worksheet tab applies to all Private Use Networks. Complete this section then select RETURN TO MAP

Complete the Unit Information tab then answer whether the site is Private Network and the appropriate cells will become un-hatched on this tab.

	PRIVATE NETWORK - SITE INFORMATION	Labels	
SITE	Private Network?	Y/N	Y
	Average Amount of Self-Serve private load	MW	
	Average Amount of Self-Serve private reactive load	MVAR	
	Expected Typical Private Network Net Interchange	MW	
	Expected Typical Private Network Net Reactive Interchange	MVAR	
	Private Network Gross Unit Capability	MW	
	Private Network Gross Unit Reactive Capability	MVAR	
	Load Characteristics:		
	Load Characteristics for MW Load (must equal 100%)		
	Large Motor, percent of total MW load	%	
	Small Motor, percent of total MW load	%	
	Resistive (Heating) Load, percent of total MW load	%	
	Discharge Lighting, percent of total MW load	%	
	Other, percent of total MW load	%	
	Load Characteristics for MVAR Load (must equal 100%)		
	Large Motor, percent of total MVAR load	%	
	Small Motor, percent of total MVAR load	%	
	Discharge Lighting, percent of total MVAR load	%	
	Other, percent of total MVAR load	%	

11.2 Unit Information

After completing the site details, the generation and load must be allocated across the units. Please identify the amount of load allocated to each unit, as well as the percentage of load that will trip if the unit trips. Some facilities become a large load to ERCOT if the generation trips, which can create issues with the reliability studies if the load cannot trip within a minute of the generation unit trip.

PRIVATE NETWORK - Unit Information	Label	TEST_A	TEST_B	TEST_C
Average Amount of Self-Serve private load	MW			
Average Amount of Self-Serve private reactive load	MVAR			
Expected Typical Private Network Net Interchange	MW			
Expected Typical Private Network Net Reactive Interchange	MVAR			
Private Network Gross Unit Capability	MW			
Private Network Gross Unit Reactive Capability	MVAR			
If Unit trips, does Load trip?	Y/N			
If yes, approximate percentage of Load that will trip?	%			

PRIVATE NETWORK - Unit Information	Label			
Average Amount of Self-Serve private load	MW			
Average Amount of Self-Serve private reactive load	MVAR			
Expected Typical Private Network Net Interchange	MW			
Expected Typical Private Network Net Reactive Interchange	MVAR			
Private Network Gross Unit Capability	MW			
Private Network Gross Unit Reactive Capability	MVAR			
If Unit trips, does Load trip?	Y/N			
If yes, approximate percentage of Load that will trip?	%			

PRIVATE NETWORK - Unit Information	Label			
Average Amount of Self-Serve private load	MW			
Average Amount of Self-Serve private reactive load	MVAR			
Expected Typical Private Network Net Interchange	MW			
Expected Typical Private Network Net Reactive Interchange	MVAR			
Private Network Gross Unit Capability	MW			
Private Network Gross Unit Reactive Capability	MVAR			
If Unit trips, does Load trip?	Y/N			
If yes, approximate percentage of Load that will trip?	%			

12.0 Line Data

The Line Data tab is used for registering both, internal lines and lines which go outside of the generation site, but are owned by the resource entity. All lines registered here are those owned by the Resource Entity.

Each line registered must use the Line names as they appear in the ERCOT model.

For connected devices, ERCOT requires at least 1 device, but no more than 10.

Line Data Business Rules / Basic Validations
Use this section to pre-validate the information entered in the RARF.

RARF DATA FIELD	Business Rules/Basic UI validations	Datatype
Description of Change	1) This field is conditionally Required - If there is a change to a tab, the change must be described.	Alpha
ERCOT Line Name	1) This field is required 2) Warn if > 14 characters 3) This field may not have any special characters, except an underscore "_" and a dash "-"	Alpha
Line Voltage Level	1) This field is required. 2) If the value >= 69kv it must be 69,138, or 345 3) The value must be < 345 4) The value must be > 1	Float
TO STATION - ERCOT Station Code Mnemonic	1) This field is Optional 2) Warn if left blank 3) This field must match ERCOT records (unless new)	Alpha
TO STATION - TSP Name	1) This field is conditionally required if TO STATION - Internal Line - 'N' 2) This field must match ERCOT records (drop down in RARF)	Alpha
TO STATION - Connected Device Name(s) (multiple)	1) This field is required 2) May not be >= than 17 characters 3) May not have duplicates within the TO or FROM Station 4) May not contain special characters except for an underscore "_" and a dash "-"	Alpha
TO STATION - Bus Number (PTI Bus Number)	1) This field is optional 2) This field must be between 1 - 99,999	Integer
TO STATION - Weather Zone / Weather Station (used for Dynamic Ratings)	1) This field is conditionally required if "Line Rating (Static or Dynamic)" = 'DYNAMIC' 2) Value must be from the following list: COAST, EAST, FAR_WEST, NORTH, NORTH_C, SOUTH_C, SOUTHERN, WEST, KABI, KAUS, KBRO, KCRP, KDFW, KGLS, KIAH, KJCT, KLRD, KLFK, KMAF, KMWL, KSJT, KSAT, KTYR, KVCT, KACT, KSPS, KINK, KPRX	Alpha
FROM STATION - ERCOT Station Code Mnemonic	1) This field is required 2) Must match ERCOT records (unless new) 3) Value must be <= 8 characters	Alpha
FROM STATION - Connected Device Name(s) (multiple)	1) This field is required 2) May not be > than 17 characters	Alpha

	3) May not have duplicates within the TO or FROM Station 4) May not contain special characters except for an underscore "_" and a dash "-"	
FROM STATION - Bus Number (PTI Bus Number)	1) This field is optional 2) This field must be between 1 - 99,999 3) Warn if left blank	Integer
FROM STATION - Weather Zone / Weather Station (used for Dynamic Ratings)	1) This field is conditionally required if "Line Rating (Static or Dynamic)" = 'DYNAMIC' 2) Value must be from the following list: COAST, EAST, FAR_WEST, NORTH, NORTH_C, SOUTH_C, SOUTHERN, WEST, KABI, KAUS, KBRO, KCRP, KDFW, KGLS, KIAH, KJCT, KLRD, KLFK, KMAF, KMWL, KSJT, KSAT, KTYR, KVCT, KACT, KSPS, KINK, KPRX	Alpha
Resistance in P.U. (100 MVA Base)	1) Field is required 2) Value must be >= 0.0001 3) If Line Data - Line Voltage Level = 69kV, value must be <= 1.5 If Line Data - Line Voltage Level = 138kV or 345kV, value must be <= 0.5 WARN if value is outside of these conditions	Float
Reactance in P.U. (100 MVA Base)	1) Field is required 2) Value must be >= 0.0001 If Line Data - Line Voltage Level = 69kV, value must be <=1.0 If Line Data - Line Voltage Level = 138kV, value must be <=0.1 If Line Data - Line Voltage Level = 345kV, value must be <=.05 WARN if value is outside of these conditions	Float
Charging Susceptance in PU (100 MVA Base)	1) Field is required 2) Value must be >= 0 If Line Data - Line Voltage Level = 69kV, value must be <=0.3 If Line Data - Line Voltage Level = 138kV, value must be <=0.5 If Line Data - Line Voltage Level = 345kV, value must be <=1.75	Float
Type (overhead / underground)	1) Field is required 2) Value must be at from the following list: OVERHEAD, UNDERGROUND, BOTH	Alpha
Segment Length	1) Field is required 2) Value must > 0 3) Formula on Line Data - Segment Length: The formula to determine the length of a line based on the Reactance (X) and the Charging Susceptance (Chg) is 486 * SQRT(X_pu * Chg_pu). 25% variation This is a warning	Float
Line Rating (Static or Dynamic)	1) Field is required 2) Field must be from the following list: STATIC, DYNAMIC	Alpha
Nominal (Static) - Continuous Rating	1) This field is required regardless of STATIC or DYNAMIC 2) Value must be <= Nominal (Static) - 2-hr Emergency Rating	Integer

	3) Value must be <= Nominal (Static) - 15-min Rating 4) Conditional Rule (if Line Rating (Static or Dynamic) = Dynamic): Value must be <= 20 °F - Continuous Rating AND value must be >= 115 °F Continuous Rating	
Nominal (Static) - 2-hr Emergency Rating	1) This field is required regardless of STATIC or DYNAMIC 2) Value must be >= Nominal (Static) - Continuous Rating 3) Value must be <= Nominal (Static) - 15-min Rating 4) Conditional Rule (if Line Rating (Static or Dynamic) = Dynamic): Value must be <= 20 °F - 2-hr Emergency Rating AND value must be >= 115 °F 2-hr Emergency Rating	Integer
Nominal (Static) - 15-min Rating	1) This field is required regardless of STATIC or DYNAMIC 2) Value must be >= Nominal (Static) - Continuous Rating 3) Value must be >= Nominal (Static) - 2-hr Emergency Rating 4) Conditional Rule (if Line Rating (Static or Dynamic) = Dynamic): Value must be <= 20 °F - 15-min Rating AND value must be >= 115 °F 15-min Rating	Integer
20 °F - Continuous Rating - 115 °F Continuous Rating	1) These field are conditionally required. If Line Rating (Static or Dynamic) = Dynamic this field is required 2) Line Rating (Static or Dynamic) = Static, this field must be blank 3) If required, these values must be <= the subsequent dynamic rating. For example: 20 °F - Continuous Rating >= 25 °F - Continuous Rating 25 °F - Continuous Rating >= 30 °F - Continuous Rating 4) If required, within each temp rating, the following must apply Continuous Rating <= 2-hr Emergency Rating <= 15-min rating	Integer
20 °F - 2-hr Emergency Rating - 115 °F 2-hr Emergency Rating	1) These field are conditionally required. If Line Rating (Static or Dynamic) = Dynamic this field is required 2) Line Rating (Static or Dynamic) = Static, this field must be blank 3) If required, these values must be >= the subsequent dynamic rating. For example: 20 °F - 2-hr Emergency Rating >= 25 °F - 2-hr Emergency Rating 25 °F - 2-hr Emergency Rating >= 30 °F - 2-hr Emergency Rating 4) If required, within each temp rating, the following must apply Continuous Rating <= 2-hr Emergency Rating <= 15-min rating	Integer
20 °F - 15-min Rating - 115 °F 15-min Rating	1) These field are conditionally required. If Line Rating (Static or Dynamic) = Dynamic this field is required 2) Line Rating (Static or Dynamic) = Static, this	Integer

	field must be blank 3) If required, these values must be >= the subsequent dynamic rating. For example: 20 °F - 2-hr 15-min Rating >= 25 °F - 15-min Rating 25 °F - 2-hr 15-min Rating >= 30 °F - 15-min Rating 4) If required, within each temp rating, the following must apply Continuous Rating <= 2-hr Emergency Rating <= 15-min rating	
General	This tab is conditionally required if Private Network - Private Network? = 'Y'	N/A

13.0 Breaker / Switch Data

The Breaker and Switch Data tab is used for registering all breakers and switches. All Breakers and Switches registered here are those owned by the Resource Entity.

Each Breakers and Switches registered must use the name as it appears in the ERCOT model.

For directly connected devices, ERCOT requires at least 1 device, but no more than 10.

Breaker and Switch Business Rules / Basic Validations
Use this section to pre-validate the information entered into the RARF.

RARF DATA FIELD	Business Rules/Basic UI validations	Datatype
Description of Change	1) This field is conditionally Required - If there is a change to a tab, the change must be described.	Alpha
ERCOT Station Code Mnemonic	1) This field is required 2) Must match ERCOT records (unless new) 3) Must be <= 8 characters	Alpha
Is this a Fault Isolating Device (e.g. Circuit Breaker)	1) This is a required field 2) Values must from the following list: 'Y', 'N'	Alpha
Switch Name	1) This field is required 2) Value may contain no special characters except an underscore "_". and a dash "-" 3) Must be <=14 characters	Alpha
Normal Operating Status (when in-service)	1) This field is required 2) Value must be from the following list: 'OPEN', 'CLOSED'	Alpha
Voltage Level	1) This field is required. 2) If the value >= 69kv it must be 69,138, or 345 3) The value may not exceed 345 4) The value must be > 0	Float
Side 1 / Side 2 - Directly connected device name(s)	1) This field is required 2) Value may contain no special characters except an underscore "_" and a dash "-" 3) Must be <=17 characters	Alpha

General	This tab is required	N/A

14.0 Capacitor Reactor Data

The Capacitors Reactor Data tab is used for registering all capacitors and reactors. All Capacitor and Reactors registered here are those owned by the Resource Entity.

Each Capacitors Reactor registered must use the name as it appears in the ERCOT model.

Capacitors and Reactors Business Rules / Basic Validations
Use this section to pre-validate the information entered in the RARF.

RARF DATA FIELD	**Business Rules/Basic UI validations**	**Datatype**
Description of Change	1) This field is conditionally Required - If there is a change to a tab, the change must be described.	Alpha
ERCOT Station Code Mnemonic	1) This field is required 2) Must match ERCOT records (unless new) 3) Value must be <= 8 characters	Alpha
Capacitor or Reactor	1) This field is required 2) Value must be from the following list: 'C', 'R'	Alpha
Device Name	1) This field is required 2) Value may contain no special characters except an underscore "_" and a dash "-" 3) Must be <=14 characters	Alpha
Nominal MVAR	1) This field is required 2) Value must be > 0	Float
Voltage Level kV	1) This field is required. 2) If the value >= 69kv it must be 69,138, or 345 3) The value may not exceed 345 4) The value must be > 0	Float

PTI Bus Number	1) This field is optional 2) This field must be between 1 - 99,999	Float
Device Name(s) - that this reactive device is directly connected to	1) This field is optional 2) May not be > than 17 characters 3) May not contain special characters except for an underscore "_" and a dash "-"	Alpha
Automatic Voltage Regulation	1) This field is required 2) Value must be from the following list: 'Y', 'N'	Alpha
Voltage Level of Busbar being regulated	1) This field is conditionally required if Automatic Voltage Regulation = 'Y' 2) If the value >= 69kv it must be 69,138, or 345 3) The value may not exceed 345 4) The value must be > 0	Float
Desired Regulating voltage	1) This field is conditionally required if Automatic Voltage Regulation = 'Y' 2) The value may not exceed 345 3) The value must be > 0 4) The value must >= Minimum Regulating Voltage 5) The value must <=Maximum Regulating Voltage	Float
Minimum Regulating Voltage	1) This field is conditionally required if Automatic Voltage Regulation = 'Y' 2) The value may not exceed 345 3) The value must be > 0 4) The value must be <= Maximum Regulating Voltage 5) Warning if value exceeds 50% from Maximum Regulating Voltage	Float
Maximum Regulating Voltage	1) This field is conditionally required if Automatic Voltage Regulation = 'Y' 2) The value may not exceed 345 3) The value must be > 0 4) The value must be >= Minimum Regulating Voltage 5) Warning if value exceeds 50% from Minimum Regulating Voltage	Float

15.0 Transformers

GSU Transformers

Note that for associated units, this field is only for the GSU (Generator Step-Up) Transformer.

Some resources use multiple transformers for one unit and some have one transformer for multiple units. In order to accommodate this, the GSU section has been developed independent of units.

Ensure the proper unit(s) is(are) assigned to the transformer. A dropdown list is provided to supply the previously supplied unit name as identified on the General Information tab.

All Transformers

The Transformer Data tab is used for registering all transformers. All Transformer registered here are those owned by the Resource Entity.

There is only one Transformer data tab for all resource types.

Each Transformer registered must use the name as it appears in the ERCOT model.

Transformer Business Rules / Basic Validations
Use this section to pre-validate the information entered in the RARF.

RARF DATA FIELD	Business Rules/Basic UI validations	Datatype
Description of Change	1) This field is conditionally Required - If there is a change to a tab, the change must be described.	Alpha
ERCOT Station Name (Station Code or Station Mnemonic)	1) This field is required 2) Must match ERCOT records 3) Must be <= 8 characters	Alpha
Transformer Name	1) This field is required 2) Warn if >= 14 characters. First 14 characters must be unique 3) May not contain special characters except for an underscore "_" and a dash "-"	Alpha
Is this transformer in Master / Follower of Current Balancing configuration?	1) This field is required 2) Value must be in the following list: 'Y', 'N'	Alpha
Master Name (can be same as this transformer)	1) This field is conditionally required if Transformer Data - Is this transformer in Master / Follower of Current Balancing configuration? = 'Y' 2) Warn if >= 14 characters. First 14 characters must be unique 3) May not contain special characters except for an underscore "_" and a dash "-" 4) Either the Master Name or the Follower Name MUST = Transformer Data - Transformer Name	Alpha
Follower Name (can be same as this transformer)	1) This field is conditionally required if Transformer Data - Is this transformer in Master / Follower of Current Balancing configuration? = 'Y' 2) Warn if >= 14 characters. First 14 characters must be unique 3) May not contain special characters except for an underscore "_" and a dash "-" 4) Either the Master Name or the Follower Name MUST = Transformer Data - Transformer Name	Alpha

Generation Step-Up Transformer?	1) This field is required 2) Value must be in the following list: 'Y', 'N'	Alpha
Unit(s) associated with this transformer	1) This field is conditionally required - if Generation Step-up = 'Y', this is required 2) Value(s) must be <=17 characters 3) Warn if the unit name is not in the Unit Info - GEN or Unit Info - CC or Unit Info - Wind	Alpha
High Side Voltage Level (no-load)	1) This field is required 2) If the value >= 69kv it must be 69,138, or 345 3) The value may not exceed 345 4) The value must be > 0 5) The value must be >= Low Voltage Level (no-load)	Float
High Side Voltage Level (PTI)	1) This field is optional 2) This field must be between 1 - 99,999	Integer
High Side Voltage Connection - Wye or Delta	1) This field is required 2) Value must be of the following: 'Wye', 'Delta'	Alpha
High Side Voltage Connected devices (list on separate lines)	1) This field is required a) Error: if High Side Voltage >= 60kV and Low Side Voltage >1kV b) Warn: if High Side Voltage < 60kV and Low Side Voltage = 1kV 2) Warn if >= 17 characters 3) No special characters except an underscore or a dash	Alpha
High Side Manufactured Nominal Voltage	1) This field is required 2) If value > 60kV **Accepted** if value (using 5%) Deviates < |3.45| kV from 69 Deviates < |6.9| kV from 138 Deviates < |17.25| kV from 345 **Warn** if value (using >= 5% and <10%) Deviates > = |3.45| but deviates < |6.9| from 69 Deviates >= |6.9| but deviates < 13.8 from 138 Deviates >= |17.25| but deviates < 34.5 from 345 **Error** if value (using > =10%) Deviates >= |6.9| kV from 69 Deviates >= |13.8|kV from 138 Deviates >= |34.5|kV from 345 3) Warn if value > 345 4) The value must be > 0 5) High Side Manufactured Nominal Voltage >= Low Side Manufactured Nominal Voltage	Float
Low Side Voltage Level (no-load)	1) This field is required 2) If the value >= 69kv it must be 69,138, or 345 3) The value may not exceed 345 4) The value must be > 0 5) The value must be <= High Voltage Level (no-load) 6) If Generator Step-up Transformer = 'Y' AND Low Side Voltage Level (no-load) > 1kV AND Then the Low Side Voltage Level (no-load) must be equal to Unit Info - GEN / CC / WIND - Unit Generating Voltage	Float

Low Side Voltage Level (PTI)	1) This field is optional 2) This field must be between 1 - 99,999	Integer
Low Side Voltage Connected device(s) (list on separate lines)	1) This field is required a) Error: if High Side Voltage >= 60kV and Low Side Voltage >1kV b) Warn: if High Side Voltage < 60kV and Low Side Voltage = 1kV 2) Warn if >= 17 characters. 3) No special characters except an underscore "_" or a dash "-"	Alpha
Low Side Manufactured Nominal Voltage	1) This field is required 2) If the value >= 69kv: **Accepted** if value (using 5%) Deviates < |3.45| kV from 69 Deviates < |6.9| kV from 138 Deviates < |17.25| kV from 345 **Warn** if value (using >= 5% and <10%) Deviates > = |3.45| but deviates < |6.9| from 69 Deviates >= |6.9| but deviates < 13.8 from 138 Deviates >= |17.25| but deviates < 34.5 from 345 **Error** if value (using > =10%) Deviates >= |6.9| kV from 69 Deviates >= |13.8|kV from 138 Deviates >= |34.5|kV from 345 3) Warn if value > 345 4) The value must be > 0 5) High Side Manufactured Nominal Voltage >= Low Side Manufactured Nominal Voltage	Float
Series Resistance (100 MVA Base)	1) This field is required 2) Value must be >=0	Float
Series Reactance (100 MVA Base)	1) This field is required 2) Warn if value > 1. Error! Reactance (value) > 1.0. Reactance should be expressed in terms of per unit (e.g. not percentage).	Float
Continuous Rating	1) This field is required 2) Value must be <= 2-hr Emergency Rating 3) Value must be <= 15-min Rating	Integer
2-hr Emergency Rating	1) This field is required 2) Value must be >= Continuous Rating 3) Value must be <= 15-min Rating	Integer
15-min Rating	1) This field is required 2) Value must be >= Continuous Rating 3) Value must be >= 2-hr Emergency Rating	Integer
Automatic Voltage Regulation	1) This field is required 2) Value must be from the following list: 'Y', 'N'	Alpha
Does Transformer have a Load Tap Changer?	1) This field is conditionally required if Automatic Voltage Regulation = 'Y' 2) Value must be from the following list: 'Y', 'N'	Alpha
Location of Tap Changer	1) This field is required 2) Value must be of the following: 'HIGH', 'LOW'	Alpha
Base kV of Regulated Side	1) This field is conditionally required if Automatic Voltage Regulation = 'Y' 2) If the value >= 69kv it must be 69,138, or 345	Float

	3) The value may not exceed 345 4) The value must be > 0 5) The value must be >= Low Voltage Level (no-load)	
Target kV of Regulated Side	1) This field is conditionally required if Automatic Voltage Regulation = 'Y' 2) Value must be > 0	Float
Acceptable Deviation of Target Voltage in Percent	1) This field is conditionally required if Automatic Voltage Regulation = 'Y' 2) Value must not exceed 50%	Percentage
Low Tap Settings - Tap position at Manufactured Nominal Voltage	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap Second Condition: This field must be left blank if Low Voltage Level = 1 2) Note: this value may be negative	Integer
Low Tap Settings - Total Number of Tap Positions	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap Second Condition: This field must be left blank if Low Voltage Level = 1 2) Value must be >= 2 3) Warn if value < 16 and "Automatic Voltage Regulation" = 'Y'	Integer
Low Tap Settings - Normal Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out. Note that it is valid for both, Low and High Tap settings to be filled out. Second Condition: This field must be left blank if Low Voltage Level = 1 2) Value must be >= Low Tap Settings - Lowest Tap Position 3) Value must be <= Low Tap Settings - Highest Tap Position 4) Note: this value may be negative	Integer
Low Tap Settings - Lowest Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both,	Integer

	Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap Second Condition: This field must be left blank if Low Voltage Level = 1 2) Value must be <= Low Tap Settings - Highest Tap Position 3) Note: this value may be negative	
Low Tap Settings - Voltage at Lowest Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap Second Condition: This field must be left blank if Low Voltage Level = 1 2) Value must be <= Low Tap Settings - Voltage at Highest Tap Position 3) Value must be < High Tap Settings - Voltage at Lowest Tap Position 4) Value must be >= 0	Float
Low Tap Settings - Highest Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out. Note that it is valid for both, Low and High Tap settings to be filled out. Second Condition: This field must be left blank if Low Voltage Level = 1 2) Value must be >= Low Tap Settings - Low Tap Position 3) Note: this value may be negative	Integer
Low Tap Settings - Voltage at Highest Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out. Note that it is valid for both, Low and High Tap settings to be filled out. Second Condition: This field may be left blank if Low Voltage Level = 1 2) Value must be >= Low Tap Settings - Voltage at Lowest Tap Position 3) Value must be <= High Tap Settings - Voltage at Highest Tap Position 4) Value must be >= 0	Float
Low Tap Settings – Size of each Voltage Step	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of	Float

	the Load Tap Second Condition: This field may be left blank if Low Voltage Level = 1 2) Value must > 0 3) Warn if < 0.002 * Low Side Voltage Level (no-load) 4) Warn if > 0.05 * Low Side Voltage Level (no-load)	
High Tap Settings - Tap position at Manufactured Nominal Voltage	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap 2) Note: this value may be negative	Integer
High Tap Settings - Total Number of Tap Positions	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap 2) Value must be >= 2 3) Warn if value < 16 and "Automatic Voltage Regulation" = 'Y'	Integer
High Tap Settings - Normal Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap 2) Value must be >= High Tap Settings - LowestTap Position 3) Value must be <= High Tap Settings - Highest Tap Position 4) Note: this value may be negative	Integer
High Tap Settings - Lowest Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap	Integer

	2) Value must be <= High Tap Settings - Highest Tap Position 3) Note: this value may be negative	
High Tap Settings – Voltage at Lowest Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap 2) Value must be <= High Tap Settings - Voltage at Highest Tap Position 3) Value must be > Low Tap Settings - Voltage at Lowest Tap Position 4) Value must be >= 0	Float
High Tap Settings - Highest Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap 2) Value must be >= Low Tap Position 3) Note: this value may be negative	Integer
High Tap Settings - Voltage at Highest Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap 2) Value must be >= High Tap Settings - Voltage at Lowest Tap Position 3) Value must be > Low Tap Settings - Voltage at Highest Tap Position 4) Value must be > 0	Float
High Tap Settings – Size of each Voltage Step	1)This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap 2) Value must > 0 3) Warn if < 0.002 * High Side Voltage Level	Float

	(no-load) 4) Warn if > 0.05 * High Side Voltage Level (no-load)	
General	This tab is conditionally required if Private Network - Private Network? = 'Y'	N/A

16.0 Static Var Compensator

The Static Var Compensator Data tab is used for registering all Static Var Compensator. All Static Var Compensator registered here are those owned by the Resource Entity.

Each Static Var Compensator registered must use the name as it appears in the ERCOT model.

Static Var Compensator Business Rules / Basic Validations
Use this section to pre-validate the information entered in the RARF.

RARF DATA FIELD	Business Rules/Basic UI validations	Datatype
Description of Change	1) This field is conditionally Required - If there is a change to a tab, the change must be described.	Alpha
ERCOT Station Name (Station Code or Station Mnemonic)	1) This field is required 2) Must match ERCOT records (unless new) 3) Must be <= 8 characters	Alpha
SVC Name	1) This field is required 2) May not be > than 14 characters 3) May not contain special characters except for an underscore "_" and a dash "-"	Alpha
Device Name(s) - that this reactive device is directly connected to	1) This field is optional 2) May not be > than 17 characters 3) May not contain special characters except for an underscore "_" and a dash "-"	Alpha

SVC Base Voltage Level	1) This field is required 2) If the value >= 69kv it must be 69,138, or 345 3) The value may not exceed 345 4) The value must be > 0	Float
Fixed MVAR (VAR injection at nominal voltage)	1) This field is required 2) Value must be > 0	Float
Minimum Admittance Limits (100 MVA Base)	1) This field is required 2) Value must be <= Maximum Admittance	Float
Maximum Admittance Limits (100 MVA Base)	1) This field is required 2) Value must be >= Minimum Admittance	Float
Minimum Steady State Reactive Power Limits	1) This field is required 2) Value must be >= Maximum Steady State Reactive Power Limits	Float
Maximum Steady State Reactive Power Limits	1) This field is required 2) Value must be >= Minimum Steady State Reactive Power Limits	Float
Minimum Threshold (post contingency) Reactive Power Limits	1) This field is required 2) Value must be <= Maximum Threshold (post contingency) Reactive Power Limits	Float
Maximum Threshold (post contingency) Reactive Power Limits	1) This field is required 2) Value must be >= Minimum Threshold (post contingency) Reactive Power Limits	Float

Minimum Voltage Threshold (100 MVA Base)	1) This field is required 2) Value must be <= Maximum Voltage Threshold (100 MVA Base) 3) The value may not exceed 345 3) The value must be > 0 4) Warn if Max / Min exceed 50% of one another	Float
Maximum Voltage Threshold (100 MVA Base)	1) This field is required 2) Value must be >= Minimum Voltage Threshold (100 MVA Base) 3) The value may not exceed 345 4) The value must be > 0 5) Warn if Max / Min exceed 50% of one another	Float

17.0 Series Device Data

The Series Device Data tab is used for registering all Series Devices. All Series Devices registered here are those owned by the Resource Entity.

Each Series Device registered must use the name as it appears in the ERCOT model.

Series Device Business Rules / Basic Validations
Use this section to pre-validate the information entered in the RARF.

RARF DATA FIELD	Business Rules/Basic UI validations	Datatype
Description of Change	1) This field is conditionally Required - If there is a change to a tab, the change must be described.	Alpha
Series Device Name	1) This field is required 2) Warn if >= 14 characters. First 14 characters must be unique 3) No special characters except and underscore	Alpha
ERCOT Station Name (Station Code or Station Mnemonic)	1) This field is required 2) Must match ERCOT records (unless new) 3) Must be <= 8 characters	Alpha
Voltage Level	1) This field is required 2) If the value >= 69kv it must be 69,138, or 345 3) The value may not exceed 345 4) The value must be > 0	Float
Side 1 - Connected Switching Device Name(s)	1) This field is required 2) May not be > than 17 characters 3) May not have duplicates within the TO or FROM Station 4) May not contain special characters except for an underscore "_" and a dash "-"	Alpha
Side 1 - Bus Number (PTI Bus Number)	1) This field is optional 2) This field must be between 1 - 99,999	Integer
Side 2 - Connected Switching Device Name(s)	1) This field is required 2) May not be > than 17 characters 3) May not have duplicates within the TO or FROM Station 4) May not contain special characters except for an underscore "_" and a dash "-"	Alpha

Side 2 - Bus Number (PTI Bus Number)	1) This field is optional 2) This field must be between 1 - 99,999	Integer
Resistance	1) This value is required 2) Value must be > 0	Float
Reactance	1) This value is required 2) Value must be > 0	Float
Continuous Rating	1) This field is required 2) Value must be <= 2-hr Emergency Rating 3) Value must be <= 15-min Rating	Float
2-hr Emergency Rating	1) This field is required 2) Value must be >= Continuous Rating 3) Value must be <=15-min Rating	Float
15-min Rating	1) This field is required 2) Value must be >= Continuous Rating 3) Value must be >= 2-hr Emergency Rating	Float

18.0 Load Data

The Load Data tab is used for registering Load as it defined in this section. All Load registered here are those owned by the Resource Entity.

Each Load registered must use the name as it appears in the ERCOT model. For equivalent Loads, it may be necessary to work with ERCOT to determine the naming.

Loads which are connected on a Bus greater than or equal to 60kV need to be modeled individually

Loads connected at less than 60kV may be aggregated into an "equivalent load" at the 69kV Bus

Auxiliary and Site Service Load may be combined
Note: Auxiliary load is defined as that which is only present when the generator is running

Load Business Rules / Basic Validations
Use this section to pre-validate the information entered in the RARF.

RARF DATA FIELD	Business Rules/Basic UI validations	Datatype
Load Voltage Level	1) This field is required 2) Value must be >= 0 3) If the value >= 69kv it must be 69,138, or 345	Float
PTI Bus Number	1) This field is optional 2) This field must be between 1 - 99,999	Integer
Device Name(s) - that this load is physically connected to	1) This field is required 2) Warn if >= 17 characters. First 14 characters must be unique 3) No special characters except an underscore or a dash	Alpha
Average MW Load Under Normal Operations	1) This field is required 2) Value must be > 0	Float
Average MVAR Under Normal Operations	1) This field is required	Float

	2) Value must be > 0	
General	This tab is conditionally required if Private Network - Private Network? = 'Y'	N/A

19.0 Load Resources

Load Resources must complete the General Information tab as well as the two tabs discussed here.

19.1 Load Resource Information

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Load Resource Information Tab

*This worksheet tab provides information for **Load Resources**.*
Please complete this section and select RETURN TO MAP

RETURN TO MAP

LOAD RESOURCES

Unit Details	Labels	Load Point #1	Load Point #2
Name of End Use Customer			
Common Name for Load Resource			
Physical Street Address for point of Delivery (POD)			
Name of City for Point of Delivery (POD)			
Is Load Netted From Generation at ERCOT Read Gensite?	Y/N		
Is Load Behind a NOIE Settlement Meter Point?	Y/N		
Load Resource Type (CLR/UFR/Interruptible)			
If CLR, will CLR be Dynamically Scheduling?	Y/N		
Dispatch Asset Code (provided by ERCOT)			
Load Resource Effective Date			
Load Resource Expiration Date			
Substation Name for POD			
Substation Code for POD			
ESIID Station Name			
ESIID Station Code			
Transmission Bus POD (PTI Bus No)			
Voltage Level of Telemetered load(s)	KV		
Meter Reading Entity (TDSP)			
Meter Reading Entity Duns Number			
QSE Name			
QSE Duns Number			
ESI-ID assigned to meter			
Wholesale Delivery Point?	Y/N		
Notice Requirements to Interrupt			
High Set Under-frequency Relay (UFR) Setting	Hz		
Load Resource Control Device			
If CLR, ability to operate as a UFR type Resource?	Y/N		
ERCOT Load Zone			
Maximum POD Total Load	MW		
Summer Interruptible MW	MW		
Winter Interruptible MW	MW		
High Reasonability Limit	MW		
Low Reasonability Limit	MW		
CLR High Reasonability Ramp Rate Limit	MW/min		
CLR Low Reasonability Ramp Rate Limit	MW/min		
Private Use Network?	Y/N		

19.2 Load Resource Parameters

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RETURN TO MAP

Load Resource Parameters

Resource Entity authorizes OSE representing this Generation Resource to submit Resource Parameters on this page for operational purposes in accordance with Section 3.7.1 on behalf of Resource Entity.

This worksheet tab provides information for ***Load Resources*** *. Resource Parameters - Initial submittal by RE, updat*
Please complete this section and select RETURN TO MAP

Non-CLR Resource Parameters	Labels	TEST_LD1	
Minimum Interruption Time	hours		
Minimum Restoration Time	hours		
Max WEEKLY Deployments	hours		
Max Interruption Time	hours		
Max DAILY Deployments	hours		
Max Weekly Energy	MWh		
Minimum Notice Time	minutes		
CLR Resource Parameters	**Labels**	**TEST_LD1**	
Max Deployment Time	hours		
Max Weekly Energy	MW		

19.3 CLR Ramp Rates

CLRs must provide Ramp Rate Curves. For information on building the curves, see section 7.4.

LOAD RESOURCES

CLR - Normal Ramp Rate Curve		TEST_LD1	
MW1	MW		
Upward RampRate1	MW/min		
Downward RampRate1	MW/min		
MW2	MW		
Upward RampRate2	MW/min		
Downward RampRate2	MW/min		
MW3	MW		
Upward RampRate3	MW/min		
Downward RampRate3	MW/min		
MW4	MW		
Upward RampRate4	MW/min		
Downward RampRate4	MW/min		
MW5	MW		
Upward RampRate5	MW/min		
Downward RampRate5	MW/min		
MW6	MW		
Upward RampRate6	MW/min		
Downward RampRate6	MW/min		
MW7	MW		
Upward RampRate7	MW/min		
Downward RampRate7	MW/min		
MW8	MW		
Upward RampRate8	MW/min		
Downward RampRate8	MW/min		
MW9	MW		
Upward RampRate9	MW/min		
Downward RampRate9	MW/min		
MW10	MW		
Upward RampRate10	MW/min		
Downward RampRate10	MW/min		
CLR - Emergency Ramp Rate Curve	**Labels**	**TEST_LD1**	
MW1	MW		
Upward RampRate1	MW/min		
Downward RampRate1	MW/min		
MW2	MW		
Upward RampRate2	MW/min		
Downward RampRate2	MW/min		
MW3	MW		
Upward RampRate3	MW/min		
Downward RampRate3	MW/min		

20.0 Additional Information

A Resource Entity and its assets must be registered separately, using the forms provided on the ERCOT Resource Entities Registration and Qualification webpage.
http://www.ercot.com/services/rq/re/

Each RE must also be represented by a Qualified Scheduling Entity (QSE), which establishes a control interface with ERCOT. If questions arise related to the completion of this or any other registration form, please contact your designated ERCOT Account Manager or email Wholesale Client Services at NodalMarketTransition@ercot.com.

EXHIBIT D

Version			
No.	**ERCOT Department**	**Revision Description**	**Date**
1.1	Manager of Operations Support Engineering	Revision	11/06/2008
1.2	Wholesale Client Services	Added emphasis to initial energizing of interconnection	12/05/2008
1.3	Wholesale Client Services	Added field for QSE Agent	01/06/2009
1.4	Wholesale Client Services	Update telemetry requirement table	03/09/2009
1.5	Manager of Operations Support Engineering	Distinguish telemetry minimum for energizing interconnect	04/07/2009

Purpose/Scope

This checklist shall be performed in accordance with ERCOT Operating Guides 2.2.5, 3.1.3.1, 3.1.4., 3.1.4.1, 3.1.4.5 and 3.1.4.6 of the and ERCOT Protocols.6.5.7.

- The QSE and Resource Entity shall complete and submit the New Generator Commissioning Checklist for requesting to commission station power serving new Resource and for requesting approval for initial synchronization of the new Resource and Start-up Testing. Request to Commission Station Checklist (Attachment 1) is to be submitted by Resource Entity to ERCOT Wholesale Client Services at least 7 business days prior to effective date of request to energize station. Request for Initial Synchronization Checklist (Attachment 2) is to be submitted by QSE at least 7 business days prior to effective date of initial synchronization for new generating unit(s).
- Wholesale Client Services will distribute copies of the completed form to the ERCOT Operations Planning Staff (Attn: Administrative Assistant), Operations Engineering.
- The Operations Planning Staff will create a file for the generator and assign an Operations Engineer to confirm that all required information has been provided. (Any discrepancies or omissions will be reported via e-mail to the QSE's Client Services Representative for follow-up, correction and subsequent re-distribution.)

Procedure

The process of reaching approval for initial synchronization of new generation occurs in two steps. Attachment 1 and Attachment 2 checklists may be submitted complete together or separately.

STEP 1 (Request to Commission Station Checklist, Attachment 1): If no outstanding issues with SCADA data for station power or other issues pending ERCOT Operations Engineering sends "Approval of Initial Energize Date of New Generation

Interconnection" (via e-mail) to the Operations Administrative Assistant, the Client Services Representative, the Shift Supervisors and the Chief System Operator. This notification shall include the planned date the station will be energized. Client Services Representative notifies Resource Entity, TSP, and QSE of approval to energize interconnect.

STEP 2 (Request for Initial Synchronization Checklist, Attachment 2): If there are no outstanding issues with SCADA data or other issues pending for the entire generation station at the time approval is issued to energize interconnect (Attachment 1) then the QSE is cleared to coordinate first synchronization with ERCOT Control Room as per procedure. Otherwise, ERCOT Operations Engineering will send notification separate from Step 1 notification to Client Services Representative if outstanding issues have been satisfactorily addressed and approval to synchronize. Client Services Representative notifies QSE that the initial synchronization date is approved and reminds the QSE of day-ahead notice to ERCOT Shift Supervisor of first day the new generation will synchronize.

If outstanding issues remain and/or the QSE Checklist is not submitted at the time approval for station power is requested then approval for initial synchronization will remain pending. The QSE Checklist in Attachment 2 may then be submitted, or resubmitted with outstanding items resolved for ERCOT to issue approval to proceed with initial synchronization.

After approval of the initial synchronization date has been received from the Operations Engineer for the new unit start-up testing, the following procedures will be used to facilitate the process.

Day Ahead

- The QSE representing the new generating unit to be start-up tested by 1100 on the business day prior to the initial synchronization. The QSE must identify this unit as "testing".
- The QSE will enter the projected output of the new unit into their resource plan.
- The ERCOT Shift Supervisor will notify the Day Ahead Operator and the Transmission and Security Desk Operator.
- The ERCOT Day Ahead Desk Operator will notify the respective TO.

Operating Day

- On the day of the planned initial synchronization, the QSE will re-confirm, via telephone with the Shift Supervisor, plans for unit synchronization. New unit start ups are done in the "Test" mode.
- After the unit has been successfully synchronized to the ERCOT grid, all future unit start-up testing will be communicated by way of QSE resource schedules. If the QSE fails to schedule the output of the unit, then the QSE must notify the Shift Supervisor via the telephone of plans to continue start-up testing. The Shift Supervisor or his/her designee will write an "Information Only" VDI stating that

ERCOT has been notified by the QSE of the planned unit start-up testing for the Operating Day.

- Maximum capability and MVAR testing for the new unit will be planned in accordance with ERCOT procedures.

Attachment 1: Request to Commission Station Checklist

[RESOURCE ENTITY submits checklist to commission station]

RE Name:

Agent (optional):

Date form completed:

Proposed Station Energize Date:

* Actual date contingent on completion of requirements and approval from ERCOT.

Primary contact for Station Commissioning (Contacts may be RE's Agent):

Primary Contact Name:

Primary Contact Telephone Number:

Primary Contact E-mail Address:

Gen Site Name:	TDSP:	ESI ID:

Congestion Zone: Transmission Voltage:

Special Protection Scheme (SPS) Yes ☐ No ☐

Can unit synchronously connect to another grid? Yes ☐ No ☐

Identify the QSE/TDSP responsible for sending ERCOT station telemetry:

QSE primary contact (may be QSE's Agent):	TDSP primary telemetry contact:
Name:	Name:
Telephone Number:	Telephone Number:
E-mail Address:	E-mail Address:

By signing below I attest that information provided on this form (Attachment 1) is true, correct and complete, and that any substantial changes in such information will be provided to the Electric Reliability Council of Texas (ERCOT) in a timely manner.

Signature: ______________________

(RE Authorized Representative)

Printed Name: ______________________

(RE Authorized Representative)

Date Signed: ______________________

The QSE and Resource Entity are required to remain in compliance with ERCOT Protocol and Operating Guide upon initial day the interconnect becomes operational. The QSE will comply with telemetry requirements and procedures for operation of station to new Resource.

☐ Generation facility is in an ERCOT Control Area and is being reported by that RE's QSE to the ERCOT ISO in the manner as specified in Section 3 of the ERCOT Operating Guides, or any applicable ERCOT agreement requiring information on generation.

☐ Unit is greater than 10MW per ERCOT Operating Guide No. 3.1.4.

☐ Station telemetry from the facility's interconnecting station is in place and operational as of _____ (date) to QSE and TDSP (Optional) required under ERCOT Operating Guide No. 3.1.3.1 and ERCOT Operating Guide Attachment 8a. Enter specific comments about status of station telemetry in comment box on telemetry checklist below.

☐ RE's QSE has reliable voice communications for station operations to new Generating Facility, ERCOT Control Area, and TDSP (Optional) ERCOT Operating Guide No. 3.1.3.1.

☐ Resource Entity has provided ERCOT the technical equipment data to be used in modeling studies per ERCOT Operating Guide No. 3.1.4. **Comments:** _____

Station Telemetry

	Data	Frequency	Mode	Reference/Comments
☐	Station Switching Device status	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. (High side Typical TSP telemetry point; Low side typical QSE telemetry point) **RE Comment:**
☐	Station Breaker status	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision.(Typical QSE telemetry point) **RE Comment:**
☐	Generating Unit High Side bus voltage	10 sec	RTU/ICCP	Protocol Section 6.5.7, Voltage Support Service, May be supplied by the TDSP. (Typical TDSP telemetry point) or Low Side voltage with appropriate transformer model may be substituted.(Typical QSE telemetry point) **RE Comment:**
☐	Station Static Reactive Device(s) status	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision.(Typical QSE telemetry point) **RE Comment:**

	Data	Frequency	Mode	Reference/Comments
☐	Transmission Line Flow	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. (RE has confirmed that TSP is providing required points). **RE Comment:**

Attachment 2: Request for Initial Synchronization Checklist

[QSE submits checklist to request initial start-up]

QSE Name: ______

Agent (optional): ______

Date form completed: ______

* Proposed Initial Synchronization Date : ______

* Actual date contingent on completion of requirements and approval from ERCOT.

Primary and back-up contact personnel for Initial Synchronization (may be QSE's Agent):

Primary for Initial Synchronization Contact Name: ______

Primary Contact Telephone Number: ______

Primary Contact E-mail Address: ______

Back-Up Contact Name: ______

Back-Up Contact Telephone Number: ______

Back-Up Contact E-mail Address: ______

*If the unit is Split Metered:

Identify the QSE responsible for coordinating the start-up testing: ______

Identify all of the QSE's that are sharing this unit: ______

Identify all of the ESI ID's that are related to this unit: ______

Projected Commercial Date (unit available for market and/or reliability commitment): ______

By signing below I attest that information provided on this form (Attachment 2) is true, correct and complete, and that any substantial changes in such information will be provided to the Electric Reliability Council of Texas (ERCOT) in a timely manner.

Signature: ______

(QSE Authorized Representative)

Printed Name: ______

(QSE Authorized Representative)

Date Signed: ______

The QSE and Resource Entity are required to remain in compliance with ERCOT Protocol and Operating Guide upon initial day the interconnect becomes operational. The QSE will comply with procedures for new unit start-up testing, with initial synchronization schedule communicated to ERCOT Shift Supervisor.

If the new unit does not successfully synchronize to the ERCOT Transmission System within 30 days, as per **Procedure Step 2** above, the QSE will notify its ERCOT Client Representative of corrective measures and expected timelines for successful unit synchronization and unit testing.

- ☐ Generation facility is in an ERCOT Control Area and is being reported by that QSE to the ERCOT ISO in the manner as specified in Section 3 of the ERCOT Operating Guides, or any applicable ERCOT agreement requiring information on generation.

- ☐ Telemetry from the facility (station and generation) is in place and operational as of _____ (date) to QSE and TDSP (Optional). Enter specific comments about status of telemetry in QSE comment box on telemetry checklist on next page.

- ☐ QSE telemetry is being provided to ERCOT ISO (This information is summarized in Attachment 2 QSE New Generator Telemetry Checklist and is provided to assist Market Participants in identifying the telemetry required under ERCOT Operating Guide No. 3.1.3.1 and ERCOT Operating Guide Attachment 8a).

- ☐ QSE has reliable voice communications with the Generating Facility, ERCOT Control Area, and TDSP (Optional) ERCOT Operating Guide No. 3.1.3.1.

- ☐ Generation facility has automatic voltage regulators (in Voltage Control Mode) (AVR) and power system stabilizers (PSS) in service as of _____ (date) per ERCOT Operating Guide No. 3.1.4.5. AVR and PSS performance tests will be reported ERCOT within 30-days after start of commercial operations. **Comments:** _____

- ☐ The QSE is able to dispatch the reactive output (VARS) of this generation facility to maintain adequate transmission voltage at the point of Interconnection. (ERCOT Operating Guide 2.10.4.1 and 2.10.4.2). **Describe process for VAR dispatch:** _____

- ☐ QSE has submitted generation facility machine characteristics and plant design to incorporate the under frequency load shedding philosophy and criteria of ERCOT Operating Guide No. 3.1.4.6.

- ☐ Generation facility protective relaying is in place and operational, necessary to protect equipment from abnormal conditions consistent with the Control Area protective relaying criteria as described in ERCOT Operating Guide No. 3.1.4.6. **Comments:** _____

New Generator Telemetry Checklist

	Data	Frequency	Mode	Reference/Comments
☐	Real Time data accuracy			Real Time data for reliability purposes must be accurate to within three percent (3%). This telemetry may be provided from relaying accuracy instrumentation transformers. **QSE Comment:**
☐	Generating Unit gross and net MW output	2 sec	RTU	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. Net Generation is preferred. Otherwise, aux load should also be provided. **QSE Comment:**
☐	Generating Unit gross and net MVar output	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. Net Generation is preferred. Otherwise, aux load should also be provided. **QSE Comment:**
☐	Switching Device status other than reported in Attachment 1	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. **QSE Comment:**
☐	Breaker status other than reported in Attachment 1	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. **QSE Comment:**
☐	Generating Unit High Operating Limit	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. **QSE Comment:**
☐	Generating Unit Low Operating Limit	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. **QSE Comment:**
☐	Generating Unit Automatic Voltage Regulator status	10 sec	RTU/ICCP	Protocol Section 6.5.7.2 QSE Responsibilities. Applies to units required to provide VSS. **QSE Comment:**
☐	Generating Unit Power System Stabilizer status			Protocol Section 6.5.7.2 QSE Responsibilities. Applies to units required to provide VSS. **QSE Comment:**

Wind-Generation Resource Only

	Additional Wind Resource Data	Frequency (sec)	Protocol Reference
☐	Wind Speed (Miles per Hour)	10	6.5.11 (7)
☐	Wind Direction (Degrees)	10	6.5.11 (7)
☐	Temperature (Celsius)	10	6.5.11 (7)
☐	Barometric Pressure (Millibars)	10	6.5.11 (7)

QSE Comment: _____

EXHIBIT E

From: Nodal Market Transition [mailto:NodalMarketTransition@ercot.com]
Sent: Friday, November 21, 2008 3:22 PM
To: Hayes, Brian; Freiman, Leslie
Cc: Daniel, Matthew; Hayes, Brian; Carmen, Travis; Nodal Market Transition; Middleton, Scott
Subject: Resource RARF Approval Notice - POST OAK WIND LLC- DUNS# 791082162

Resource Entities:

Your RARF submittal has passed all iterations of Nodal CIM business rules for Resource MMS and EMS parameters and is approved for loading into the Nodal CIM data base in December. We congratulate your staff for meeting and exceeding the time line in helping ERCOT reach the target for production quality data in time for the Critical Path CIM project.

Changes to Resource parameters you may need going forward are to be made using your last approved version and submitted on a TML Service Request as before by the Authorized Representative's digital certificate so ERCOT may properly document the change request.

For a revision initiated by the Resource Entity ERCOT will run an audit report upon receiving the updated RARF data to ensure that it is reviewed and validated against applicable business rules.

The next stage of RARF data submittals and validations ERCOT will initiate is planned for 2009 when the market will be transitioning to the single entry model.

For any assistance with resource registration please call or email your ERCOT Account Manager or email NodalMarketTransition@ercot.com.

Sincerely,

ERCOT Wholesale Client Services

Classification: ERCOT Confidential

EXHIBIT F

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	November 03, 2009

Submitter's Information	
Name	Matt Daniel
E-mail Address	Matthew.Daniel@horizonwind.com
Company	Horizon Wind Energy LLC
Phone Number	713-265-0350
Cell Number	
Market Segment	Independent Generator

Comments

Horizon Wind Energy appreciates this opportunity to comment on PRR 830, Reactive Power Capability Requirement. Horizon supports reliability and efforts to increase reliability on the ERCOT System, but PRR 830 will not provide additional reliability benefits. No study has been done to determine that any existing generation needs to retrofit to accommodate a reliability situation on the grid and neither ERCOT, nor any other party providing comments, has demonstrated that any reliability problem exists with the Wind-powered Generation Resources (WGRs) now connected to the grid. Despite this, existing WGRs are being asked to install retrofits on operating generation at significant expense. For Horizon alone, the costs are estimated to be tens of millions of dollars.

WGRs have sited thousands of megawatts of capacity in the ERCOT market. That capacity has Reactive Power capability consistent with the existing ERCOT Protocols and other guidance. That capability has been reported in asset registration forms. When interconnection studies showed the need, WGRs have installed additional reactive equipment.

Some commenters argue that WGRs shift costs because they only provide half of the "rectangle." This is simply not true. First, the requirement in the Protocols is to comply with a Reactive Power standard of the triangle. Many generators, in fact all built before 1999 (conventional generators), avoid the rectangle requirement because they are exempted. The argument that WGRs are shifting costs is made by the same generators who are largely exempt from these requirements for the bulk of their generation fleet. Yet WGRs are the only Market Participants asked to undergo retrofits. In actuality, instead of shifting costs to other Market Participants, WGRs have paid more to support system reliability by going above the Protocol requirements when the TDSP stated that additional reactive capability was necessary.

PRR Comments

Wind power has lowered the price of power in ERCOT, to the benefit of most Market Participants, particularly Load Serving Entities (LSEs) and ultimately to the consumers. PRR 830 would increase system costs without any real justification. WGRs would be required to increase investment in projects that have been operating for years, which costs would need to be recovered through higher prices. Further, it is possible that WGRs that provide power to the system will need to be taken off-line for these retrofits to be done. Removing wind generation or making wind generation more expensive will serve to benefit only the generators that would not otherwise be dispatched if the wind generation were running—gas-fired generators. A policy of requiring retrofits also increases costs by increasing investor uncertainty about additional costs that may be imposed on existing assets and even more so on new projects.

If the target is to get to the "rectangle" ERCOT-wide, all exemptions should be removed from the rectangle requirement. However, in the instant situation, there is no demonstrated need for the rectangle. PRR 830 also attempts to insert into the Protocols the requirement that Reactive Power capability be provided using more expensive dynamic equipment, instead of static devices that many WGRs now use. No study supports such action by ERCOT or such investment of potentially hundreds of millions of dollars by one segment of the generation market.

ERCOT has known the capability of WGRs in the ERCOT market for years. WGRs have supplied Generation Asset Registration Forms ("GARFs"), and Resource Asset Registration Forms ("RARFs") that clearly demonstrate the capability in the shape of a triangle and not the rectangle. Until recently, the Resource Asset Registration Guide even demonstrated by pictorial that the minimum requirement is the triangle, not the rectangle.

Despite claims to the contrary, ERCOT's current interpretation of the Reactive Power requirements in the Protocols remains in dispute. It is the subject of an appeal active at the Public Utility Commission of Texas (PUCT). PUCT Docket 36482, Appeal of Competitive Wind Generators Regarding the Electric Reliability Council of Texas' Interpretation of the Reactive Power Protocols, demonstrates that a serious controversy remains about required Reactive Power capability. The docket was initiated when a group of WGR owners (the Competitive Wind Generators) appealed ERCOT's November 2008 Legal Interpretation that the Protocols require all Generation Resources that are not otherwise exempt to provide the same amount of Reactive Power that they are capable of at their rated output at any level of output. This puts Generation Resources that had been approved for interconnection without that capability (except those exempted or grandfathered by the Protocols already) at risk of penalties for not complying with Protocol standards. For some Resources, the exposure would be three years of penalties, potentially levied on every wind turbine in WGR.

Throughout the appeal, ERCOT steadfastly maintained that the requirement had always been clear, and that WGRs should retrofit even without some demonstration of need. However, every Standard Generation Interconnection Agreement (SGIA), by contract in the form approved by the PUCT, requires that "unless exempt, the TSP shall timely request **ISO** and all regulatory approvals necessary to carry out its responsibilities." Moreover, before each of these WGRs, that had submitted GARFs or RARFs, depending on the timing, was energized, ERCOT specifically approved interconnection checklists, which include demonstration of Reactive Power capabilities prior to energization. As a System Operator, ERCOT knew exactly what the requirements were and exactly what the WGRs were connecting to the grid. To now state years later that the standard applicable to these WGRs, that have invested billions in the ERCOT market based on the rules in place at the time, is somehow different and that these WGRs are causing system reliability issues can mean only one of two things. Either 1) ERCOT did not pay attention to its own requirements in the Protocols and what it was connecting to the grid; or 2) ERCOT knew the standards were right and the WGRs were compliant, hence the compliance letters that WGRs met the standards.

What has changed between now and then? As discussed at the PRS meeting in response to the question by the Independent Market Monitor, the modeling for Competitive Renewable Energy Zone (CREZ) transmission evidently assumed that all WGRs were meeting a different standard than that in the Protocols—the full dynamic rectangle standard that ERCOT now claims all WGRs must meet. There is still no evidence that this standard is required to accommodate CREZ generation. However, ERCOT's response has not been to change the model, but to change the requirements so that ERCOT itself can state that it has complied with North American Electric Reliability Corporation (NERC_ requirements relating to planning.

ERCOT's description of PRR 830 says, in part: "This PRR clarifies the Reactive Power capability requirement for all Generation Resources, including existing WGRs". If ERCOT's interpretation of Reactive Power capability requirementsin the Protocols is indeed accurate, there should be no need to clarify the Protocols that ERCOT says are already clear. Leaving that aside, the reality on the ground proves that the Protocols have not been interpreted in practice by WGRs, ERCOT or Transmission and/or Distribution Service Providers (TDSPs) in the way ERCOT reads them now and is attempting to change them through PRR 830. Thousands of megawatts of wind resource capacity have interconnected with the ERCOT Transmission Grid without the capability that is supposedly clearly required by Protocols.

Paragraphs (3) and (4) of Protocol Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, are explicit about which Generation Resources are exempt from completely meeting the Reactive Power capability requirement. Since the end date of that exemption, over 40 WGRs with approximately 7,000 MW of capacity have interconnected with the ERCOT Transmission Grid. The vast majority of these WGRs do not meet ERCOT's interpretation of the required Reactive Power capability. This fact can be verified by reviewing the asset registration forms that ERCOT accepted from these WGRs, and from the results of an informal survey ERCOT undertook in the last half of 2008 of WGR capabilities and procedures. It is hard to comprehend how so many projects could be interconnected in derogation of ERCOT's interpretation of the Reactive Power requirements, particularly if such interconnections would create reliability problems—which has not been shown in actuality, only discussed hypothetically in the comments of ERCOT and Calpine.

As attendees of the October 22nd PRS meeting were reminded, Reactive Power is a local service; it does not travel well. Requiring all WGRs to install more equipment simply because the requirements are re-interpreted would only increase costs—long after the investment in the Texas market has been financed. There is no demonstrated nexus between the imposition of these extra costs and the improvement in system safety or reliability.

PRR Comments

A broader concern is that PRR 830 continues efforts to require retrofits without justification. The retrofit provisions in PRR 830 obviously hurt WGRs that have located in the ERCOT market—particularly given that the ERCOT interpretation of dynamic rectangle was not feasible by any wind turbine on the market at the time the Protocol language was drafted. Attempts to substantively change standards on a going-forward basis, as has always been the case in ERCOT, should be based on actual studies demonstrating need and/or benefits for the market. However, requiring retrofits from WGRs that met the ERCOT standards in effect at the time, and singling out one new generation technology on which the standards have been changed, while continuing to exempt older technologies, raises fairness issues and frustrates the investment-backed expectation of those generators that answered the call to invest in the ERCOT market.

The impact of WGRs on the ERCOT Transmission Grid has been to lower power prices. This result is not unique to ERCOT. Other regions with significant wind capacity are saving money, too. The impacts may be greater in ERCOT, however, given the installed generation fleet. Those impacts have been widely reported. Results of analysis by Bernstein Research showing that increased wind capacity in ERCOT has reduced power prices have appeared in a variety of publications, including a Wall Street Journal Blog[1] and Coal Power magazine[2]. The following excerpt summarizes the expected impact of lower power costs in general terms. For 2008 wind generation is calculated to have reduced the annual average price per MWh by $2.00.

> *"In ERCOT, the growth in wind generation is expected to push gas off the margin during certain off-peak hours and, during the hours when gas plants are operating, to reduce the marginal cost of supply by curtailing the hours run by higher cost combustion turbines."*[3]

It goes without saying that consumers benefit from lower prices. It's equally clear that this benefit comes by displacing high cost generation. As more wind capacity is installed, consumers will benefit while competing generators will see lower revenue. PRR 830 would shift this equation by imposing additional costs on both future and existing WGRs. The true impact analysis of PRR 830 is that it will raise prices in the ERCOT market, diminishing the benefits of wind generation the Texas Legislature and the PUCT have worked to achieve.

PRR 830 should be rejected.

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[1] "Will Wind Power Blow Texas Generators Away?" posted on Wall Street Journal's Environmental Capital Blog, August 10, 2009. http://blogs.wsj.com/environmentalcapital/2009/08/10/blown-away-wind-power-makes-electricity-cheaper-in-texas/

[2] "Texas Wind Boom Cutting into Fossil Generator Profits" in Coal Power magazine, October 8, 2009 http://www.coalpowermag.com/ops_and_maintenance/223.html

[3] P. 4, Bernstein Commodities & Power: The Impact of Wind on Power Prices and Coal and Gas Consumption, September 4, 2009

PRR Comments

Revised Proposed Protocol Language

None.

EXHIBIT G

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	October 8, 2009

Submitter's Information	
Name	Matt Daniel
E-mail Address	Matthew.Daniel@horizonwind.com
Company	Horizon Wind Energy LLC
Phone Number	713-265-0350
Cell Number	
Market Segment	Independent Generator

Comments

Horizon Wind Energy LLC appreciates the opportunity to offer comments on PRR830, Reactive Power Capability Requirement. Horizon believes that Market Participants have the responsibility to provide capabilities required by the market rules, and has ensured that our Wind-powered Generation Resources (WGRs) fulfill that responsibility.

The introductory comments for PRR830 say it is a clarification of Reactive Power requirements and is intended to be prospective, even a cursory review shows that it goes far beyond clarification. In addition to redefining the terms for Reactive Power service and adding new definitions for existing terms, it imposes new requirements on existing generation that can only be accomplished through significant capital investment in retrofits. This re-write of Reactive Power capability requirements occurs at the same time that the Public Utility Commission of Texas (PUCT) is hearing an appeal of an ERCOT Protocol Interpretation regarding the requirements for Reactive Power capability.

PRR830 broadly re-defines Reactive Power capability requirements for Generation Resources interconnected with the ERCOT Transmission Grid. For example, it changes the concept of Unit Reactive Limit (URL) and adds the requirement that all Reactive Power capability be dynamic. By doing so, it imposes new requirements on WGRs and requires retrofits to the majority of operating WGRs. These new requirements are contrary to existing Protocols and practice, and are proposed without any demonstration of need.

At the time the current Protocols were adopted, the technology for WGRs to perform as ERCOT interprets them did not exist. Only one vendor had even announced that their turbines could do so, as was pointed out in the discussions around their adoption. Clearly imposing a requirement now to reach back will penalize existing WGRs that invested in the market based on the market rules at the time. They will have to make substantial investments to implement these new Reactive Power requirements, without any study showing that doing so will improve system reliability.

If the true intent is to level the playing field with regard to Reactive Power capability, this PRR does not accomplish that objective. Instead it singles out one group, WGRs, to which this retroactive standard is applied. The current Reactive Power protocols exempt conventional generation pre-1999 from the Reactive Power requirements, and this PRR only seeks to place the retroactive "rectangle" requirements on WGRs, and not other types of generation to which the retroactive provisions could also be applied if the purpose was to make the playing field level—albeit at significant cost to those conventional generators as well.

Reconsideration of Reactive Power capability required by the ERCOT System, and of the most reliable and cost-effective way to provide it, will be a lengthy project, and should be a separate effort from this PRR as part of a study process—however Horizon does not support the retroactive application of Reactive Power requirements or other standards to existing generation once the capital investment has been made and the generator has no way to recover tens of millions of dollars in new, unanticipated capital outlays.

The background relating to Reactive Power is significant. WGRs have given ERCOT their Resource Asset Registration Forms (RARF & GARF) for years demonstrating compliance with the Reactive Power standards in the shape of the "cone." The RARF example clearly demonstrates what the minimum requirement is, and that is the "cone" as can be seen in the pictorial that accompanies it.

WGRs developed their projects on the understanding that ERCOT required, at most, Reactive Power be provided as shown by the "cone" plot, consistent with the rest of the country. However, PRR830 was precipitated by a new interpretation issued by ERCOT as part of its ERCOT Protocol Interpretation issued November 13, 2008 (Interpretation), which was also subsequently withdrawn as a result of defects in the adoption of the Interpretation. This matter is the subject of a contested case before the PUCT. The PUCT will decide the interpretation of the Protocols as applied to existing generation and has indicated its willingness to do so by twice refusing to grant ERCOT's Motions to Dismiss. Instead of embarking on a lengthy debate about re-defining Reactive Power capability requirements as applied to existing WGRs in the consideration of PRR830, Horizon recommends limiting this discussion to clearly defining what new WGRs need to provide. This will remove financial concerns for operating and prospective wind projects, that otherwise may have to make costly retrofits or install unnecessary equipment.

Reactive Power capability requirements for ERCOT are clear from Protocols and other binding documents. Those requirements are the maximum Reactive Power performance required in FERC Order 661A: WGRs are to maintain a power factor within the range of 0.95 leading to 0.95 lagging, measured at the point of interconnection. All WGRs must maintain at least this capability, using static and/or dynamic reactive equipment, as they decide is most cost-effective. WGRs should only be required to provide additional Reactive Power capability if needed for system reliability, as determined by the Transmission Service Provider (TSP) conducting the interconnection study. Review of the Protocols and of Other Binding Documents show consistent support for this requirement. Examples from those documents are provided below.

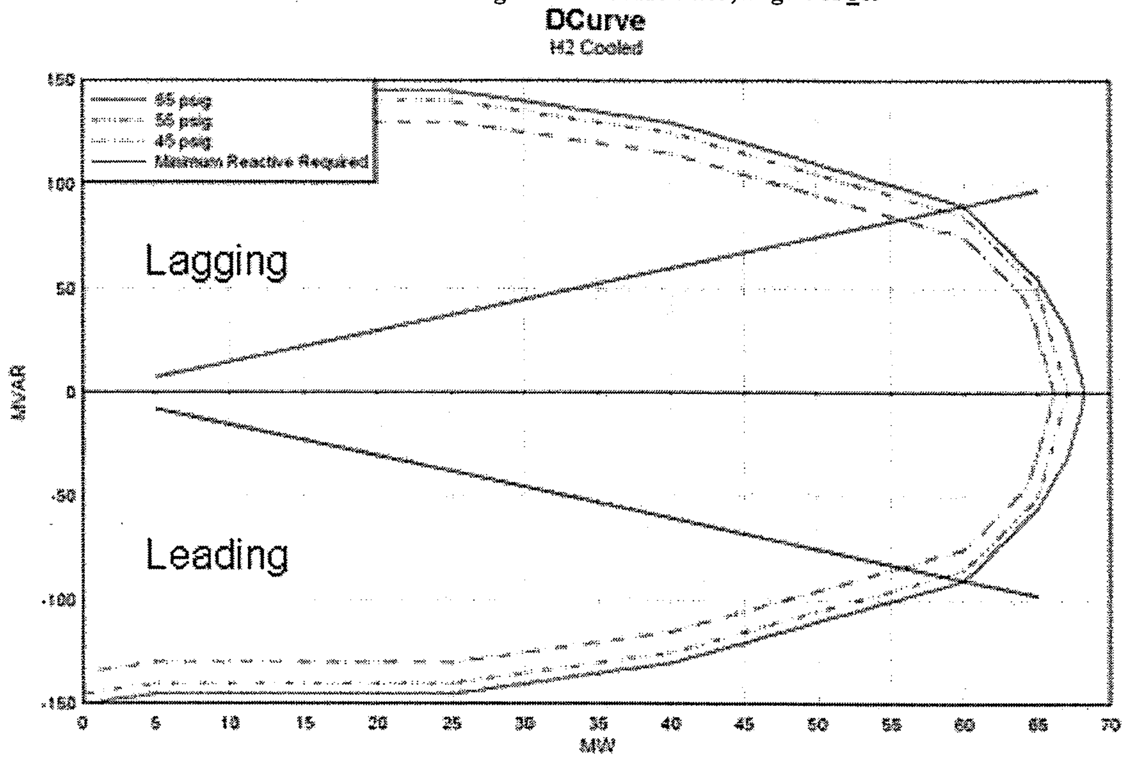
Existing WGRs interconnected with the ERCOT Transmission Grid with the understanding of Reactive Power requirements as described above. Their capabilities were clearly reported in their Interconnection Agreements and Registration Forms. The additional retroactive requirements PRR830 would impose have not been shown to be needed by any study. For all these reasons, in addition to the costly retrofits PRR830 would impose, Horizon recommends rejection of PRR830.

The current Protocols are clear that URL refers to Reactive Power produced when a Resource is operating at its rated capability, and that the required reactive capability varies with the Resource's real power production. At full output, a Resource must be capable of providing reactive power per its URL. There is no confusion there. The Protocols also say: "In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ***ratio*** of the lower active power output to the generating unit's continuous rated active power output…" (emphasis added). There should be no confusion that the Protocols intend for Reactive Power capability to vary with output.

This clear meaning is supported by ERCOT's actions and in Other Binding Documents. WGRs have clearly and repeatedly communicated their Reactive Power capability through the interconnection process, the asset registration process, the synchronization approval process, ERCOT surveys, and in response to request letters from ERCOT.

ERCOT's Resource Asset Registration Guide, effective March 10, 2009, reflects the Protocol requirement that the "Minimum Reactive Required" vary with a Resource's output. The chart reproduced below appears in version 4.03 of the Resource Asset Registration Guide, published two months after ERCOT issued its Reactive Power interpretation. WGRs registering their assets clearly indicated that their Reactive Power capability varies with power production.

Resource Asset Registration Guide v4.03, Page 4 of ~~6~~9



From the letters ERCOT sent on June 5, 2009, it appears that many, if not all, WGRs registered their assets indicating that their Reactive Power capability varies with power production. ERCOT sanctioned their interconnection while understanding that their Reactive Power varied with real power production. This understanding is reflected in a draft revision to ERCOT's Generation Interconnection or Change Request Procedure, offered for comments in February 2007, which includes the language quoted below. It would accommodate actual WGR Reactive Power capability and provides that Reactive Power can be provided using either static or dynamic equipment.

4.7 Special Requirements for Wind Generation

4.7.1 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 the SGIA. The power factor range standard can be met by using, for example, power electronics designed to supply this level of reactive capability (taking into account any limitations due to voltage level, real power output, etc.) or fixed and switched capacitors if agreed to by ERCOT and the TSP. The GE or PGC 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.[1]

There is still no requirement to provide Reactive Power using dynamic equipment in ERCOT's New Generator Commissioning Checklist. The version effective since April 07, 2009 includes a requirement for each Generation Resource to telemeter the status of its "Station Static Reactive Device(s)" status. Clearly ERCOT accepts that Generation Resources could reliably meet their Reactive Power capability requirements with static devices.

Revised Proposed Protocol Language

None.

1 http://www.ercot.com/content/meetings/ros/keydocs/2007/0215/06._ERCOTGenerationInterconnectOrChangeRequestProcedures0214.doc

EXHIBIT H

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	September 15, 2009

Submitter's Information	
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Cell Number	
Market Segment	Independent Generator

Comments

Horizon does not agree with the changes proposed in Protocol Revision Request (PRR) 830, Reactive Power Capability Requirement. The PRR as drafted would require significant retrofitting by wind generators that have been providing service to the ERCOT market for years without justification. It would impose additional capital expenditures for existing generation many years after these assets have been financed. The substantial retrofit obligations to be placed on wind developers are tantamount to enforcement of and retroactive application of the ERCOT interpretation of Reactive Power capability requirements that has been withdrawn. Such requirements placed on a single segment of the generation market harms the investment-backed expectations of wind developers like Horizon who have invested hundreds of millions of dollars in the ERCOT market. PRR830 in its current form should be rejected.

The proposed language attempts to remove all Protocol language that conflicts with the legal interpretation ERCOT issued in its notice, M-D111308-01 Legal, issued November 13, 2008, and replace it with language supporting ERCOT's interpretation. This raises questions about the meaning of the deleted language. PRR830 also requires Wind powered Generation Resources (WGRs) to retrofit their equipment to comply with the new requirements in which the expense would be, for individual wind developers, in the tens of millions of dollars. Significantly, ERCOT has performed no studies that demonstrate that these large expenditures need to be made for any reason and has not shown reliability events that would require costly retrofits to existing generation.

The language proposed in PRR830 goes beyond removing Protocol language that conflicts with ERCOT's interpretation; it is contrary to ERCOT's introductory remarks, in that it is retrospective, not prospective. It would require Wind Generation Resources that commenced operation on or after February 16, 2004 and have a signed Interconnection Agreement on or before November 1, 2009 to take necessary actions to comply with ERCOT's interpretation, under a mitigation plan that meets ERCOT approval. There is no basis for this requirement. As discussed by the ERCOT Board in taking up Operating Guide Revision Request, (OGRR) 208, Voltage Ride-Through (VRT) Requirement, ERCOT should study whether there is a need for requirements that burden existing generation by retroactive application of new standards. It is also unclear whether reactive power requirements of the level intended by PRR830 will be at all useful to the market as the system is clearly functioning without these requirements, and the investment in retrofits may in fact be wasted capital investment. This is particularly troubling given that most projects are financed through a variety of means ultimately relying on the value of the asset and based on the capital investment associated with construction. These new and substantial capital outlays cannot be "added" into the financing years later.

There may be, in the future, situations when Market Participants need to provide additional services other than those originally contemplated -- including additional Reactive Power above required capability. Protocols now provide that conventional generation will do so – for compensation. However, the key is that such additional expenditures must be compensated in a market such that there is certainty and that investment backed expectations are met. This is not the case with PRR830. Although it singles out a specific technology for retrofits, this requirement is not supported by studies or independent reviews.

WGRs in general and Horizon, in particular, have been willing to modify their equipment and operating procedures when needed for system reliability. Examples include:

- Changing control systems to limit ramp rates in response to ERCOT Dispatch Instructions.
- Revising operating procedures to use ERCOT's Wind-powered Generation Resource Production Potential (WGRPP) forecast for their Day Ahead schedule instead of WGR's own forecasts.
- PRR811, Real Time Production Potential, which is likely to be approved, would require WGRs to provide their best estimate of production output at all times, in addition to its Resource Plan.

These changes do not reach the level of significance for unrecoverable cost that ERCOT is now asking one segment of the market to bear through PRR830. ERCOT has not shown the need for a change in the reactive requirement for WGRs and any changes to the Reactive Power requirements should truly be prospective in nature, not creating substantially increased costs for existing generation.

Revised Proposed Protocol Language

None.

830PRR-34
Oncor Comments
111009

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	November 10, 2009

Submitter's Information	
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Cell Number	
Market Segment	Investor Owned Utility (IOU)

Comments

Oncor Electric Delivery Company LLC is very pleased to support ERCOT's independence and objectivity in maintaining reliability in operations and planning activities. Oncor supports ERCOT's efforts to maintain system reliability with PRR830 and provides the following material and attached documents.

For the bulk power system to operate reliably, it must be designed and operated based on the following principles:

* The total generation (MW & Mvar) at any moment must be kept equal to total electricity consumption and losses on the system

* The electricity is allowed to flow through the transmission system in accordance with physical laws and cannot be directed to flow through specific lines

* The system must be designed with reserve capacity in generation (MW & Mvar) and transmission to allow for uninterrupted service when contingencies occur

Voltage, a pressure-like quantity, is a measure of the electromotive force necessary to maintain a flow of electricity on a transmission line. Voltage fluctuations can occur due to variations in electricity demand, lack of reactive reserve and to failures on transmission equipment. Constraints on the maximum voltage levels are set by the design of the transmission line and station equipment. If the maximum is exceeded, short circuits (faults), radio interference, and noise may occur. Also, transformers and other equipment at stations and/or customer facilities may be damaged or destroyed. Minimum voltage constraints also exist based on the power requirements of the customers and lack of reactive reserve. Low voltages cause inadequate operation of equipment and may damage motors.

Voltage on a transmission line tends to "drop" from the sending end to the receiving end and varies based upon the flow. The voltage drop along the AC line is almost directly proportional to reactive power flows and line reactance (impedance). The line reactance increases with the length of the line. Capacitors and inductive reactors are installed, as needed, on lines and in stations to, in part; control the amount of voltage drop or rise. This is important because voltage levels and current levels determine the power that can be delivered to the customers.

A variety of reactive power (Mvar) producing equipment exists. They can generally be broken down into two categories; "Dynamic Resources" and "Static Resources". The total production of reactive power must equal customer demand plus losses under normal, fault and contingency conditions.

Small Mvar production shortages will result in degradation of grid voltage, while larger Mvar production shortages lead to severe low voltage or collapse. Over production Mvar results in high voltage with possible long term damage to grid facilities, generation equipment and customer facilities. Reactive power must be constantly produced/absorbed locally and cannot be transported over long distances. Reactive energy (Mvar) cannot be transmitted as far as real energy (MW). This is primarily due to the bulk electric transmission line impedances which have a naturally large X to R ratio usually in the range of 5 to 25.

High voltage transmission lines are a local source of shunt reactive energy (line charging). This local reactive energy source is similar to a fixed static capacitor connected to each end of the line. However, reactive Mvar losses on heavily loaded transmission lines often exceed the local static reactive energy produced by line charging. Large X to R ratios produces significant difference in MW losses compared to Mvar losses. Due to this X to R ratio Mvar losses are typically 5 to 25 times higher than MW losses and are constantly varying.

Generators, static var compensators (SVCs), static compensators (STATCOMs), other Flexible AC Transmission Systems (FACTS) and synchronous condensers provide dynamic reactive power with various time responses to quickly changing system conditions.

Under low voltage conditions, static capacitors used in stations (and line charging) do not produce maximum reactive power as reliably as dynamic self excited power equipment because capacitor reactive power output depends on substation voltage. Capacitor reactive power output changes in proportion to the square of voltage magnitude. For example if substation voltage declines from 100% to 90% of nominal voltage, static reactive power output declines from 100% of capability to 81%. Low voltage also increases Mvar needed by motor loads further degrading the voltage.

Dynamic reactive resources are used to adapt to rapidly changing conditions on the transmission system, such as faults, sudden loss of generators or transmission facilities. In contrast switched static devices are typically used to adapt to slowly changing system conditions such as daily and seasonal load cycles and changes to scheduled transactions.

Static capacitor resources have lower capital cost than dynamic devices, and from a systems point of view, static capacitors are used to provide normal or intact-system voltage support. Locating static capacitors and dynamic reactive devices near to reactive load/losses, increases their effectiveness. Dynamic reactive resources are used to adapt to rapidly changing conditions on the transmission system, such as sudden loss of generators, faults or transmission facilities.

An appropriate combination of both static and dynamic resources is needed to ensure reliable operation of the transmission system under normal and changing conditions.

Revised Proposed Protocol Language

None proposed

ERCOT
THE TEXAS CONNECTION

GENERATION INTERCONNECTION OR CHANGE REQUEST PROCEDURE

August, 2004

ERCOT
System Planning, Transmission Services
2705 West Lake Drive
Taylor, Texas 76574-2136
Main Office Phone (512) 248-3000

PURPOSE

The primary purpose of this procedure is to facilitate the interconnection of new and changes to existing generating units/plants to/in the Electric Reliability Council of Texas, Inc. (ERCOT) transmission system. Through the review of all interconnection or change requests, the following objectives will be accomplished:

a) **Identify electric system security concerns with interconnecting new or changed generation**
b) **Increase communications between the Generating Entity (GE), Power Generation Company (PGC), Transmission Service Providers (TSP) and ERCOT**
c) **Provide information on future capacity additions for use in reviewing projected total ERCOT capability, demand and reserve**
d) **Provide accurate/appropriate data to help identify possible future transmission constraints, maintain reliability of the ERCOT System and propose related transmission projects**

INTRODUCTION

A GE or PGC requesting transmission interconnection for new generation, adding additional generating capacity (more than 10 MW within a year) at an existing plant or changing the connection of an existing plant must submit an application to ERCOT. The application shall include information necessary to allow timely development, design, and implementation of electric system enhancements needed to serve the generation entity requirements. The information must include sufficient detail for use in establishing transfer capabilities, operating limits (including stability) and planning margins to provide both reliability and operating efficiency, designing future system facility additions, and facilitating coordinated planning. Applicable ERCOT and North American Electric Reliability Council (NERC) standards, protocols, guides and/or procedures for accurate system representation and modeling shall be followed.

The Public Utility Commission of Texas (PUCT) Substantive Rules (§25.191) require a TSP to build facilities to interconnect a new generating plant. The rules indicate that the interconnection planning will include transmission line interconnection and grid upgrades. The TSPs shall provide transmission service including the construction of the transmission line and upgrading the transmission grid within reasonable efforts considering economics and good utility practice.

The building of interconnection facilities and/or grid upgrades may or may not require a Certificate of Convenience and Necessity (CCN), depending upon the circumstances specific to the individual project, and are addressed in the appropriate sections of the PUCT rules. The generation owner should identify expected markets, and ERCOT along with the TSPs would identify known transmission constraints that impair the generator's ability to reach those markets (without employing the congestion management system). In many instances, additional transmission lines may be needed to enable the generator to reach the desired markets. When ERCOT identifies specific transmission expansions that will facilitate the competitive market while mitigating constraints, ERCOT will develop proposed transmission additions using the ERCOT Power System Planning Charter and Processes. ERCOT's evaluation of need in the regional planning process is important, but the PUCT (via the CCN process) will ultimately decide whether the transmission line should be built.

Both new transmission line construction and some line reconstruction require the approval of the PUCT, granted in the form of a CCN. The present PUCT rules allow the PUCT up to 12 months for processing a CCN. The need to use a consultant to route future transmission lines and the TSP to hold public meetings also adds around 12 months to the time required to certificate and build a new transmission line. In most new transmission projects, the acquisition of right-of-way and construction will take 10 to 18 months after a CCN is granted by the PUCT. Therefore, if the GE or PGC desires full transfer capability when generation is first available for transfer to the grid, **it is recommended that firm commitments be made by the GE or PGC at least three years ahead of required in-service dates for the related transmission line projects. Moreover, the GE or PGC should recognize that some projects might require commitments four to eight years in advance of system needs.**

STUDY TIME TABLE

Every interconnection may be different and unique to the particular project. A timetable for studies will be developed and included in the study scope. Major improvements to the transmission system resulting from interconnection requests should be identified early in the process so project validity can be considered before going ahead with extensive studies. Adjustments to the completion date of review may be necessary for the study scope. If adjustments are necessary for the study scope, ERCOT shall provide notice as soon as practicable to both the GE and the TSP indicating the revised expected completion date. Some of these procedures may be done in parallel with others; for example, in some cases, the Facilities Study can be initiated upon completion of the Steady State Study, although the results of the Short Circuit Study and Stability Study may change the scope of the study. The TSP and the GE are encouraged to optimize the process to reduce the time necessary for the studies. The timely completion of all studies is dependent upon the availability of relevant data and appropriate study assumptions. The GE should ensure that ERCOT and the TSPs performing the studies receive all required data in order to establish study models that provide meaningful results and recommendations for interconnection.

Sample Study Time Table (calendar days):

Security Screening Study – ERCOT Staff	
Review of Request, Fee and Acknowledgement	1 to 7 days
Performs Steady State Security Screening Study	3 to 90 days
GE or PGC Agrees to Proceed, Model Fee, Deposit and Proof of Site Control Received	**180-day time limit after completion of Security Screening Study**
Full Interconnection Study – TSPs and ERCOT Staff	
Notify and Set Up Meeting	1 to 14 days
Propose Study Scope (at or after meeting)	1 to 14 days
Complete Study Scope and Sign Study Agreement	**60-day time limit to go forward**
Perform Full Interconnection Study	
Steady State & Transfer Analysis Study	10 to 90 days
System Protection Analysis	10 to 30 days, **after Steady State Study**
Dynamics Analysis	10 to 90 days, **after System Protection**
Facilities Study	10 to 90 days
Study Report Review	5 to 15 days after completion of study
Complete Interconnection Agreement with TSP	**180-day time limit after completion of Full Interconnect Study**
Typical Time	**90 to 270 days**
Total Range of Possible Time	**52 to 440 days**

FEE SCHEDULE

ERCOT Security Screening Study and Full Interconnection Study Fees are charged to entities filing generation interconnection requests to add new or additional generation capacity to the ERCOT System. These fees are based on the total plant capacity associated with the request because the capacity determines the amount of work necessary to complete the study. The ERCOT Security Screening Study fee is a nonrefundable fee and ranges from $1,000 to $5,000 per study as shown below. Generation Interconnection Requests are for each individual interconnection location, in-service date, and total plant capacity at this interconnection location.

ERCOT Security Screening Study Fee

Total Capacity	Fee
10 MW to 74 MW	$1,000 Not Refundable
75 MW to 149 MW	$2,000 Not Refundable
150 MW to 249 MW	$3,000 Not Refundable
250 MW to 499 MW	$4,000 Not Refundable
500 MW and above	$5,000 Not Refundable

The ERCOT Full Interconnection Study Fee consists of two parts. The first part of the fee is a charge of $15 per megawatt of total capacity (nonrefundable) which is used to develop stability models for generation units and to continually update the current models as new equipment changes are made. Providing this modeling fee to ERCOT **does not release** the GE or PGC from the obligation to provide accurate/appropriate stability models and data (including load) for their plant.

The second part of the fee is a deposit of $15,000 or $30,000 based upon total plant capacity, from which ERCOT will fund the study. Any unused portion of the deposit will be returned. The TSP will invoice the GE or PGC for any additional work that is necessary and creates charges exceeding the amount of the deposit, and ERCOT will refund any portion of the deposit not used to perform the study.

Both fees along with proof of site control must be received at ERCOT within 180 days after completion of the security screening study before a full interconnection study is started.

ERCOT Full Interconnection Study Fees

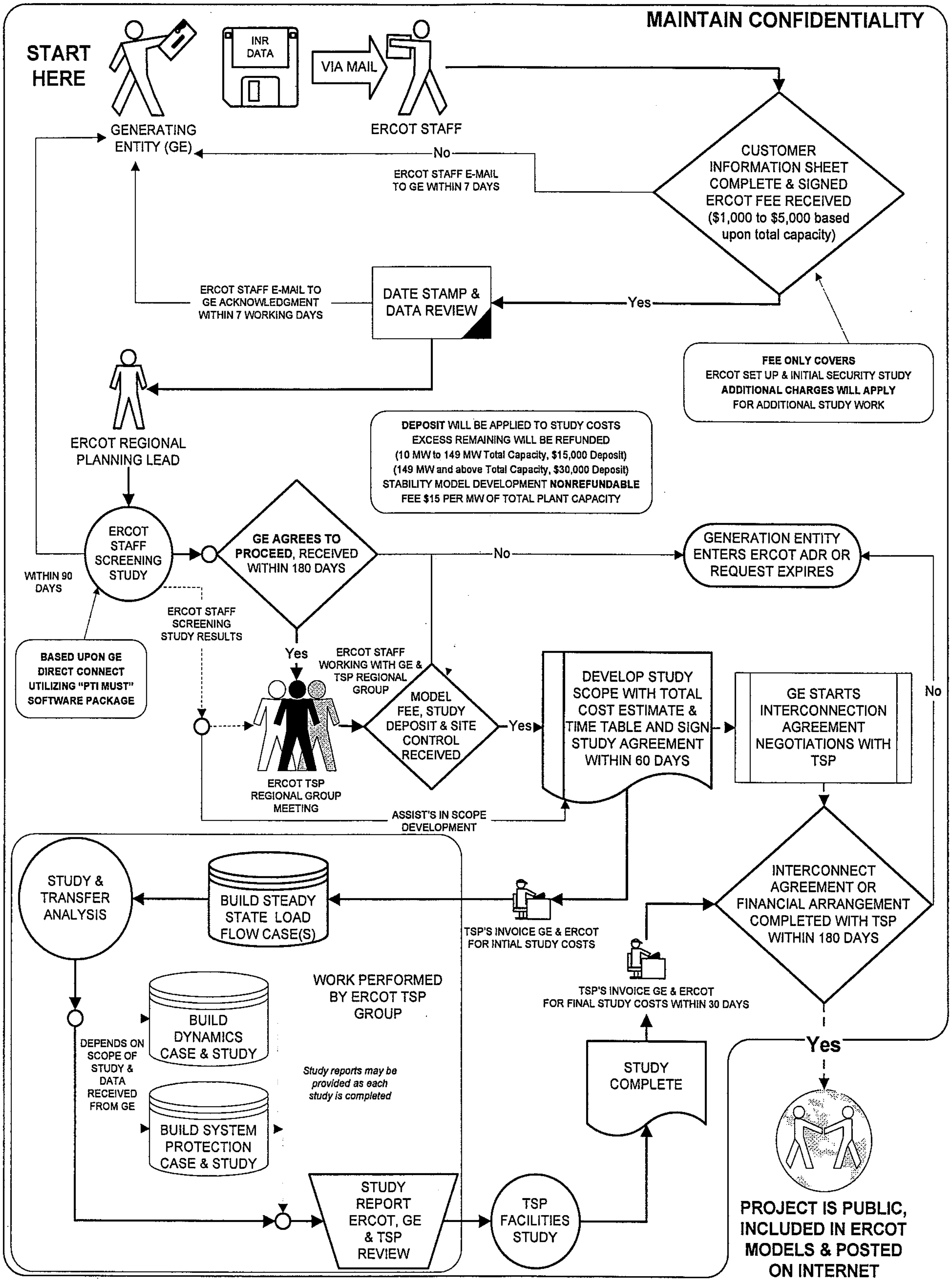
Total Capacity	Fee
10 MW to 149 MW	$15 per MW of total capacity, not refundable $15,000 deposit
150 MW and above	$15 per MW of total capacity, not refundable $30,000 deposit

INTERCONNECTION AGREEMENTS

ERCOT is the proper place to submit the request for generation interconnection. However, the negotiation of an interconnection agreement shall be conducted directly between the GE and TSP. ERCOT does not arrange interconnection agreements.

Municipals and/or coops developing generation projects do not require interconnection agreements to connect to their transmission systems. Generation interconnection requests will remain confidential until an interconnection agreement or financial agreement for transmission construction is completed with a transmission owner. An official letter from a municipal utility or electric cooperative will also serve as a public commitment. At that time, the generation project will be regarded as a confirmed project and will be posted on the ERCOT Internet website along with copies of generation interconnection impact studies and related proposed transmission projects.

ERCOT Generation Interconnection Process



ERCOT AND TSP PROCESS

After receiving an interconnection request and the associated security screening study fee (reference "Fee Schedule" in document) and preliminary data, ERCOT will date stamp the request. This date stamp is not a reservation of transmission capacity. ERCOT will acknowledge the request via email and notify the GE or PGC of missing data for the security screening study within seven days. ERCOT staff will then perform a steady state security screening study (including power flow and transfer studies) in the in-service year to determine the feasibility of the site for interconnection selected by the GE or PGC. This study will indicate the level at which the generator can expect to operate simultaneously with other known generation in the area before significant transmission additions may be required.

Based upon the security screening study, ERCOT will make a preliminary estimate of future transmission additions needed to effect full transfer of the new generation. This information will be presented to the GE or PGC requesting interconnection or change to the total output capability. ERCOT will also inform the GE or PGC about any basic system additions required for security and reliability. Based on this information, the GE or PGC can decide whether it wants to request interconnection or withdraw the application. If the GE or PGC decides to go forward at the named site, ERCOT will then initiate a full interconnection study in coordination with the transmission service providers in the appropriate regional planning group.

Unless ERCOT receives notice from the GE or PGC of its decision to go forward with the proposed project, ERCOT will not initiate a full interconnection study. Such notice must be received by ERCOT within 180 days after completion of the security screening study. If such notice is not received within 180 days, the request for interconnection will be considered cancelled and no longer valid. If the GE or PGC wishes to proceed after 180 days, they must begin the process again starting with a new security screening study.

When notice is received from the GE or PGC to go forward with a full interconnection study, ERCOT will schedule a meeting with the study group made up of only ERCOT Staff and TSPs in the respective Regional Planning Group. At this meeting, the project will be presented and general discussion of the study required will be proposed with general timelines. Deposit and cost requirements will also be determined at this meeting.

All TSPs within the appropriate regional planning group shall be part of the study group usually with the primary interconnecting TSP as facilitator of the study. All studies, data and related information shall be communicated to this whole group and ERCOT in performance of this work. The TSPs are most aware of the actual physical circumstances in the project area that can support or counter the interconnection or change in generation. The assistance of more than one TSP may be required in areas where transmission facilities are provided by multiple entities. ERCOT will maintain the lead role in this study and may include additional steady state, transient stability, system protection and facilities analysis.

Before a full interconnection study starts, the GE or PGC must submit to ERCOT the model fee (Reference "Fee Schedule" in document), deposit (if needed) and proof of site control. The GE or PGC must demonstrate proof of site control and maintain control of the site on which the generator is to be constructed. The applicant must demonstrate, through an affiliated company, through a trustee or directly in its name that: (a) it is the owner in fee simple of the real property to be utilized by the facilities for which new interconnection is sought; or (b) that it holds a valid written leasehold interest in the real property to be utilized by the facilities for which new interconnection is sought; or (c) that it holds a valid written option to purchase or obtain a leasehold interest in the real property to be utilized by the facilities for which new interconnection is sought; or (d) that it holds a duly executed written contract to purchase or obtain a leasehold interest in the real property to be utilized by the facilities for which new interconnection is sought. Site control must be maintained throughout the duration of the study until the establishment of an Interconnection Agreement. Otherwise, the request for interconnection will be deemed withdrawn as of the date of loss of site control, unless the applicant can show within 30 days that it has re-established site control or has established control of a new site which would not result in the material modification of any study requested under these procedures.

The model fee is $15 per megawatt of total capacity, nonrefundable, and is used to develop stability models for generation units and to continually update the current models as new equipment changes are made. Provision of this modeling fee to ERCOT **does not release** the GE or PGC from the obligation to provide accurate/appropriate stability models and data (including load) for their plant.

The deposit will be applied toward study costs. The TSP will invoice the GE or PGC for any study costs exceeding the amount of the deposit, and it will refund any remaining funds not used to perform in the study.

The GE or PGC and TSPs must complete (reach agreement on) the study scope within 60 days after the full interconnection study meeting. The agreement shall include assumptions, timetable, study cost estimate(s) and determination of requirements for interconnection. If the GE or PGC does not agree to a study scope within 60 days, the request for interconnection will be considered cancelled and no longer valid. If the GE or PGC wishes to proceed after such a cancellation, they must begin the process again starting with a new security screening study. The study scope developed may be minimal, very detailed or a phased study. The ERCOT security screening study and other preliminary studies provided by the GE or PGC shall be considered when developing the study scope. These studies may reduce the work and/or the time necessary for the full interconnection studies. The full interconnection study can be phased/separated in several sections with notice to proceed from the GE required for each section. This can limit the GE's costs if the project is not viable at the selected location.

The generation entity requesting interconnection is responsible for all costs of the full interconnection study. The study deposit (if needed) will be used to make payments to the TSPs. TSP costs greater than the deposit amount should be directly billed to the GE. A payment methodology and cancellation provision should be included in the full interconnection study agreement. If the GE or PGC cancels the generating project during the study, they are required to immediately notify ERCOT and all the TSPs in the study group. **The GE or PGC is responsible for all costs associated with any work performed or non-cancelable commitments made prior to the termination date.**

When the full interconnection study is completed, the GE and study group shall examine the results and append any comments within ten working days. The final study report shall be provided to the GE and all TSPs in the study group. When an interconnection agreement is completed or a financial arrangement with a TSP for transmission construction is effected within 180 days of completion of the full interconnection study, the project will be regarded as a confirmed project.

If the GE or PGC does not complete an interconnection agreement or a financial arrangement with a TSP for transmission construction is not completed within 180 days after the full interconnection study, the request for interconnection will be considered cancelled and no longer valid. If the GE wishes to proceed after the request has been deemed invalid, it must begin the process again starting with a new security screening study.

Generation interconnection requests will remain confidential until an interconnection agreement with a TSP or financial agreement for transmission construction is completed. An official letter from a municipal utility or electric cooperative will also serve as a public commitment. At that time, the generation project will be regarded as a confirmed project and will be posted on the ERCOT Internet website along with copies of generation interconnection impact studies and related proposed transmission projects.

GENERATION PLANT DESCRIPTION & DATA REQUIREMENTS

The acquisition of data to realistically simulate the electrical behavior of system components is a fundamental requirement for the development of a reliable interconnected transmission system, accurate studies, the prevention of outages and protection of generation equipment. Therefore, the GE or PGC is required to submit specific information regarding the electrical characteristics of their proposed facilities with their request. Failure to supply the required data will result in delay of the study, and may adversely influence reliability or result in damage to generation equipment. Ongoing data updates and reviews are necessary throughout the service life of the plant.

The most current facility data or expected performance data should be submitted to ERCOT with the initial study request. Data submitted for stability models shall be compatible with ERCOT standard models (Shaw/PTI PSS/E and Powertech Labs Inc TSAT, VSAT and SSAT). If there is no compatible model(s), the GE or PGC is required to work with a consultant and/or software vendor to develop and supply accurate/appropriate models along with associated data. It is recommended that generation owners and developers encourage manufacturers and software vendors to work together to develop/maintain these important models. ERCOT recommends wind generation owners and/or developers join the modeling efforts of the Utility Wind Interest Group (UWIG, www.uwig.org).

Prior to start of construction, the GE or PGC shall inform ERCOT and TSP of any significant design changes in the generators or main power transformers to ensure compatibility with the transmission system.

Prior to commercial operation of a facility, the GE or PGC shall supplement the initial data submissions with any and all as-built facility data or as-tested performance data which differs from the initial submissions or, alternatively, written confirmation that no such differences exist.

Subsequent to commercial operation of a new facility and during continuing operation of existing facilities, the GE shall provide ERCOT and the TSP with any data changes made appropriate by equipment replacement, repair, or adjustment. The GE shall provide such data not later than 60 days after the date of the actual change in equipment characteristics. This requirement also applies to all future owners of a project/plant throughout the service life of the plant.

Each request should include the following information or best estimate about the generating facility when submitting a request to ERCOT.

- ✓ REQUIRED FOR SECURITY SCREENING STUDY
  - Signed Generation Entity Information Sheet (included with procedure)
  - Generation Summary (MS Excel Workbook)
- ✓ REQUIRED FOR FULL INTERCONNECTION STUDY
  - Any and All Updates to the Data Above
  - Detailed Generation Information - By Unit For Each Unit
  - Generator Data For Transient Stability Studies – By Unit For Each Unit
  - Electrical network drawing including all transformers, capacitors and electrical equipment
  - Generator Step-Up Or Unit Main Power Transformer(s) Data

- ✓ REQUIRED BY COMMERCIAL OPERATION DATE AND WHENEVER CHANGES ARE MADE
  - o Subsynchronous Resonance (SSR) Data – By Unit For Each Unit
    - May be needed to support studies in full interconnect study
  - o Any and All Updates to the Data Above

GENERATION ENTITY POWER SYSTEM STABILIZER REQUIREMENTS

Several studies of the ERCOT transmission system have indicated that, with the addition of new generation, the transmission system will be utilized at or near its maximum capability. Several recent studies have identified dynamic stability and small signal stability oscillations that can be mitigated by applying PSS at existing and new generation sites. The GE or PGC shall install a PSS on each new generating unit added unless specifically exempted from this requirement by ERCOT. All PSS on existing units shall be kept in-service and maintained, whenever possible, throughout the service life of the plant.

Maintenance and periodic tuning of the stabilizer and excitation system is the only way to sustain the benefits of the PSS. It may be necessary to re-tune the stabilizer/exciter when the voltage regulation systems (including generator field windings) are modified and/or local transmission system changes are made. The PSS and excitation system should also be tested periodically; the longest interval between tests should be five years. A poorly tuned PSS and excitation system will adversely affect system stability and may result in oscillations. Continuing oscillations could result in separation of the transmission system, loss of generation and/or damage to generation units. PSS settings should not be changed without performing proper and accurate tuning studies. Periodically, the TAC Reliability Operations Subcommittee Dynamics Working Group will perform studies to determine if PSS setting changes are necessary.

Generation owners and transmission service providers shall work jointly to prevent these possible adverse conditions by communicating changes in a timely manner.

GENERATION STABILITY DATA FORMS

In order to perform stability (transient and voltage) analyses, unit stability information and data will be required by the full interconnection study group. Updates will be also necessary after start of commercial operation or when any changes/updates are made during the life of the plant. Provision of valid complete data for stability studies are the responsibility of the GE or PGC. Typical data is permissible for security studies, but valid actual data must be provided prior to interconnection. Four sets of forms have been developed to aid the requester in providing this information. These forms are provided with the procedures as separate files included in the downloaded zip-compressed file. These forms represent models currently in common use in ERCOT. If an appropriate model is not represented therein, the GE or PGC should contact the study leader to obtain forms for other models. If no appropriate model exists, the GE or PGC must provide both an accurate/appropriate model and the associated data in the appropriate format. Accurate/appropriate information and test data about generator step up transformers, all generator data including data for stability studies (transient, voltage, etc...) and subsynchronous resonance (SSR) data shall be provided to ERCOT and interconnected TSP before the generation goes into commercial operation.

EXCMODEL.PDF – Exciter Model Forms
GENMODEL.PDF – Generator Model Forms
GOVMODEL.PDF – Governor Model Forms
STABMODL.PDF – Stabilizer Model and Excitation Limiter Forms

GENERATION ENTITY REACTIVE POWER REQUIREMENTS

Power system voltage control and stability involves all parties connected to the electric system including generation, transmission, distribution and load. Voltage is closely associated with other aspects of power system steady state and dynamic performance. Voltage control, power factor correction (reactive power compensation) and management, generator rotor angle (synchronous) stability, protective relaying, and control center operations all influence voltage stability.

ERCOT's overriding concern regarding application of reactive power requirements is the security of the complete power system, maintaining service to load and preventing damage to equipment (generation and transmission). In some cases, proper reactive controls may be required to keep a plant in service. Failures, collapse, and blackouts of the complete power delivery system must be avoided. Economic system operation is of secondary importance during emergency conditions but is very important during normal conditions. In power system design and operation, there should be a balance between economy and security. To obtain optimal benefits from the complete power system, a good voltage profile achieved by controlling reactive compensation (including power factor correction) must be maintained at all times.

Large interconnected power systems are exposed to many disturbances that threaten security. Recent requirements for more intensive use of available generation and transmission have magnified the possible effects of such disturbances. Many of these disturbances directly affect voltage and stability (including unit stability).

Voltage stability is directly related to the ability of a power system to maintain acceptable voltages at all places in the system under normal and contingent conditions. A power system enters a state of voltage instability when a disturbance causes a progressive uncontrolled variations in voltage. Voltage collapse is the result of irreversible voltage instability and is results in localized or system-wide load interruption. Voltage security is the ability of a system not only to operate stably under normal conditions, but also to remain stable following any reasonably foreseeable contingency or adverse system change as defined in the ERCOT Planning Criteria.

Inadequate reactive power support from generation units, transmission lines, and load power factor correction equipment leads to voltage instability or voltage collapse. This scenario has resulted in several major system failures in recent years. The voltage control and instability phenomenon is not new to power system managers, operators, engineers, and researchers. It is well recognized in radial distribution systems. Most of the early development of the major transmission network faced the classical generator machine angle stability problem limiting transactions. Innovations in both analytical techniques and stabilizing measures made it possible to maximize the power transfer capabilities of the transmission system. The result is increased transfers of power over long transmission lines, and increased awareness of voltage control a major concern in transmission system operations.

An electric system becomes voltage unstable when a disturbance (sudden increase in load, loss of generation, system change) causes voltage to drop quickly or drift downward, and operators and automatic system controls cannot or fail to halt the decay. The voltage decay may take only a few seconds or 10 to 20 minutes. If the decay continues unabated, voltage collapse and load interruption will occur.

During the period of voltage decay, many automatic and manual controls in the electric system and within customer load devices may come into play. These include operation of generator field and exciter protective devices, actions of plant operators (e.g., voltage regulator set point reduction to reduce generator reactive loading), actions of system operators (e.g., adjustment of load tap changers [LTCs]), operation of distribution transformer LTCs and regulators, operation of voltage-controlled shunt capacitor banks, operation of thermostatically controlled loads, manual control of loads, and others. The relatively slow actions and interactions of such devices following disturbances affecting voltage have caused this period of voltage decay to be called a period of "slow dynamics."

If voltages reach a level at which torque on the most marginal motor on the system drops below load torque, that motor may stall, causing voltage to drop further and other motors to stall in cascade fashion. The collapse may be followed by loss of some load and voltage recovery or, alternately, tripping of lines and/or generators and a complete shutdown (blackout) of the affected area.

Voltage security has been defined as the ability of a system to maintain voltage stability within specified limits following defined first and/or second contingencies. A system may also be deemed voltage secure only if voltages at customer service points remain within an acceptable band. However, having voltage within tolerances at customer service points does not necessarily ensure a secure system. A system may enter a state of voltage instability with voltages at or close to nominal levels.

Generator reactive capability is commonly derived from the generator real and reactive capability curves supplied by the manufacturer. Reactive power generation limits derived in this manner can be overly optimistic because heating or auxiliary bus voltage limits may be encountered before the generator reaches its maximum sustained reactive power capability. Manufacturer-provided design data also may not accurately reflect the characteristics of operational field equipment because settings can drift and components deteriorate over time. Field personnel may also change equipment settings (to resolve specific local problems) and the changes may not be communicated to personnel responsible for developing a system-modeling database and conducting system assessments. It is important to know the actual reactive power limits, control settings, and response times of generation equipment and to represent this information accurately in the system-modeling data that is supplied to those entities responsible for the reliability of the interconnected transmission systems.

The following standards were reviewed and approved by the ERCOT Technical Advisory Committee on August 6, 2003. They are currently being incorporated to the ERCOT Protocols and Operating Guides.

Application

- All generating units (including self-serve generating units) that have a gross generating unit rating greater than 20 MVA or those units connected to the same transmission bus that have gross generating unit ratings aggregating to greater than 20 MVA, that supply power to the ERCOT transmission grid, and that were not in operation prior to Board approval of this standard shall meet all of the requirements of this Standard.
- Any such generating units in operation earlier than the ERCOT Board approval date for this Standard shall meet the requirements of Standards applicable to that generating unit prior to the Board approval date for this Standard, and shall meet all of the requirements of this Standard except the Installed Capability Requirements. Previously applicable Standards include the Interim Standards approved by the ERCOT Board, the Standards enumerated in the Protocols Section 6.5.7, and such other Standards outlined in interconnection requirements and Operating Guides.
- Upon submission by a Generation Resource to ERCOT of a specific proposal for requirements to substitute for those of the applicable Standard, ERCOT shall either approve such alternative requirements or provide the submitter an explanation of its objections to the proposal. Alternative requirements may include supplying additional static and/or dynamic reactive power capability as necessary to meet the area's reactive power requirements. Pending changes to PUCT Rules, an induction generator may elect to contribute (to what or whom?) to be credited to TCOS in lieu of meeting the Installed Capability Requirements contained herein. In addition, ERCOT shall apply previous standards to new generating units connected within 15

months after Board approval whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to Board approval based upon previous standards.

Installed Capability Requirements

- Power Factor Requirements
  - Generating units to which this Standard applies **shall have and maintain an overexcited (lagging) power factor capability, of 0.95 or less and an under-excited (leading) power factor capability of 0.95 or less. Both capabilities shall be determined at the generating unit's maximum net power output to be supplied to the transmission grid and at the transmission system voltage profile established by ERCOT, and both shall be measured at the point of interconnection to the TDSP.** *(please note: not measured at generator unit terminals)*
  - Upon request to and with approval from ERCOT, multiple generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these Power Factor Requirements only. For any unit so aggregated, specific power factor requirements based upon the reactive power contribution of that unit to the total reactive power obligation of the aggregation will be assigned to that unit and shall become that unit's required installed reactive capability at the generating unit's maximum net active power output.
  - No generating unit equipment replacement or modification shall reduce the reactive capability of the generating unit below the level required of that generating unit prior to the replacement/modification, unless specifically approved by ERCOT.
- Other Installed Capability Requirements
  - Generating units to which this Standard applies shall have and maintain the following capability:
    - Over-excitation limiters shall be provided and coordinated with the thermal capability of the generator field winding and protective relays in order to permit short-term reactive capability that allows at least 80% of the unit design standard (ANSI C50.13-1989), as follows:

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

      After allowing temporary field current overload, the limiter shall operate through the automatic AC voltage regulator to reduce field current to the continuous rating. Return to normal AC voltage regulation after current reduction shall be automatic. The over-excitation limiter shall be coordinated with the over-excitation protection so that over-excitation protection only operates for failure of the voltage regulator/limiter.
    - Under-excitation limiters shall be provided and coordinated with loss-of-field protection to eliminate unnecessary generating unit disconnection resulting from operator error or equipment misoperation.

Operating Requirements

- All generating units shall maintain the transmission voltage at the point of interconnection to the transmission grid as directed by ERCOT within the operating reactive power capability of the unit(s).
- At all times a generating unit is on line, the required installed reactive capability must be available for utilization at the generating unit's continuous rated active power output, and reactive power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the reactive power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any reactive power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a Transmission Operator designated by ERCOT.

- Each generating unit shall be operated with any automatic voltage regulator (AVR) set to regulate generator terminal voltage and any Power System Stabilizers (PSS) in use, whenever possible, unless specifically permitted to operate otherwise by ERCOT. If the service status of a PSS is changed, it shall be reported to ERCOT as soon as practicable.
- Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

Information Supply Requirements

- Unit AVR and PSS modeling information required in the ERCOT Planning Criteria shall be determined from actual unit testing described in the Operating Guides. Within 30 days of ERCOT's request, the results of the latest test performed shall be supplied to ERCOT and the TSP.
- When the operating mode of a generating unit's AVR or PSS is changed while the unit is operating, the QSE shall promptly inform ERCOT. The QSE shall also supply AVR or PSS status logs to ERCOT upon request.
- Within 30 days of ERCOT's request, Generation Resources shall provide ERCOT with the operating characteristics of any generating unit's equipment protective relay system or controls that may respond to temporary excursions in voltage with actions that could lead to tripping of the generating unit.
- Any short-term inability of a generating unit to meet its reactive capability requirements shall be immediately reported to ERCOT and the Transmission Operator.
- ERCOT and the TSP shall be notified of any anticipated equipment changes that affect the reactive capability of an operating generating unit no less than 60 days prior to implementation of the changes, and any such changes that decrease the reactive capability of the generating unit below the required level must be approved by ERCOT prior to implementation.
- High reactive loading and reactive oscillations on generation units should be immediately communicated to the QSE, the Transmission Operator, and ERCOT.
- The tripping off line of a generating unit due to voltage or reactive problems should be immediately reported to ERCOT, the Transmission Operator, and the QSE.

Generator And QSE Compliance Monitoring

- Generation Resources shall conduct generating unit reactive capability tests as specified in ERCOT Protocols and Operating Guides. Test results shall be reported to ERCOT which shall forward them to the TSPs. If reactive output of the generating units is limited by transmission system conditions during the tests, this shall be noted on the test report.
- Failure of a generating unit to provide either leading or lagging reactive up to the required capability of the unit upon request from a Transmission Operator or ERCOT may, at the discretion of ERCOT, be reported to the ERCOT Compliance Office, except under Force Majeure conditions or ERCOT-permitted operation of the generating unit.
- If a Generating Resource fails to maintain transmission system voltage at the point of interconnection with the TSP within 2% of the scheduled voltage while operating at less than the maximum reactive capability of the generating unit, ERCOT may, at its discretion, report this to the ERCOT Compliance Office, except under Force Majeure conditions or ERCOT-permitted operation of the generating unit.
- The ERCOT Compliance Office will investigate alleged non-compliance and Force Majeure conditions using ERCOT Compliance Office Procedures. The ERCOT Compliance Office will use its Compliance Procedures to address confirmed non-compliance situations. The ERCOT Compliance Office will advise the Generation Resource, its QSE, ERCOT and the TSP planning and operating staffs of the results of such investigations.

GE HARMONICS REQUIREMENTS

PUCT Substantive Rule Power Quality

(c) Harmonics. In 60-Hertz electric power systems, a harmonic is a sinusoidal component of the composite 60 Hertz wave having a frequency that is an integral multiple of the fundamental frequency. "Excessive harmonics," in this subsection, shall mean levels of current or voltage waveform distortion at the point of common coupling between the electric utility and the customer exceeding the levels recommended in the IEEE standard referenced in paragraph (1) of this section. Each electric utility shall assist every customer affected with problems caused by excessive harmonics and customers affected in exceptional cases as described in paragraph (5) of this section.

(1) Applicable standards. In addressing harmonics problems, the electric utility and the customer shall implement to the extent reasonably practicable, and in conformance with prudent operation, the practices outlined in IEEE Standard 519-1992, IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power Systems, or any successor IEEE standard, to the extent not inconsistent with law, including state and federal statutes, orders, and regulations, and applicable municipal regulations.

(2) Investigation. If a utility receives notice that a customer is experiencing problems caused by harmonics, or if an electric utility otherwise becomes aware of harmonics conditions adversely affecting a customer, the electric utility shall determine whether the condition constitutes excessive harmonics. If so, the electric utility shall investigate and determine the cause of the excessive harmonics.

(3) Excessive harmonics created by customer. If an electric utility determines that a customer has created excessive harmonics that causes or are reasonably likely to cause another customer to receive unsafe, unreliable or inadequate electric service, the electric utility shall provide written notice to the customer creating excessive harmonics. The notice shall state that the utility has determined that the customer has created an excessive harmonics condition and that the utility has (identified?) explained (to whom?) the source and consequences of the harmonics problem. The notice shall give the customer two options to cure the problem.

(A) The electric utility may cure the problem by working on the customer's electric facilities at a mutually agreeable time and assess the repair costs to the customer.
(B) The customer may elect to cure the problem at its option and its cost, but the remedy must occur within a reasonable time specified in the notice.

(4) Failure of the customer to remedy the problem. In the event the customer refuses to allow the electric utility to remedy the problem and does not stop creating excessive harmonics within the time specified, the electric utility may disconnect the customer's service. The electric utility shall then remedy the excessive harmonics condition, or the electric utility may determine that the customer has remedied the condition within the time specified (if disconnection has occurred, this determination should not be possible since disconnection would have been inappropriate). Before disconnecting pursuant to this subsection, the electric utility must provide written notice of its intent to disconnect at least five working days before doing so.. The electric utility may disconnect the customer five working days after providing the notice, unless the customer grants the electric utility access to its electric facilities or ceases creating excessive harmonics.

(5) Excessive harmonics created by an electric utility or third party. If an electric utility determines that its operation or facilities, or the operations or facilities of a third party other than a customer, created excessive harmonics that causes or is reasonably likely to cause a customer to receive unsafe, unreliable or inadequate electric service, the electric utility shall remedy the excessive harmonics condition at the earliest practical date.

(6) Excessive total harmonic distortion (THD) created by two or more harmonic sources within IEEE 519 limits. If, in its investigation of a harmonics problem, an electric utility determines that two or more customers' harmonic inputs to the transmission (and/or distribution?) system are individually within IEEE 519 limits but the sum of the inputs exceeds the IEEE 519 limits, the utility may require each customer to reduce its harmonic levels below the limits specified in IEEE 519 to achieve a THD level within acceptable limits..

GENERATION INTERCONNECTION STUDY GUIDELINES

Each generation resource which constitutes a separate generation interconnection will be an individual study analyzed separately from all other such requests unless additional studies are specified and agreed to by the GE in the study scope.

With the concurrence of ERCOT, the GE may specify any reasonable allocation of the resource output among load serving entities (LSE) in the study cases. Absent such specification by the GE, ERCOT, for study purposes, will assume the output is used to displace proportionately unspecified generation resources in ERCOT. ERCOT will determine how to treat any output remaining after displacement on a case-by-case basis (e.g., ERCOT could proportionally increase all ERCOT loads in an aggregate amount to balance the resource's output).

Simulation of the future transmission grid is necessary to develop these studies. Such simulation, however, requires several types of forecasted information that is supplied by the ERCOT transmission customers. Diversified station load forecasts are derived from the customers' total system load forecasts and undiversified station load forecasts. The customers' distribution requirements, including new substations as well as the load forecasts mentioned, are all communicated to ERCOT through the Annual Load Data Request (ALDR) process.

The performance criteria used in evaluating system security includes the NERC Planning Standards and the ERCOT Planning Criteria.

The study process begins with computer modeling of the generation and transmission facilities and loads under normal conditions. Contingency conditions that are reasonably anticipated are also modeled. To maintain adequate service and minimize interruptions of service during facility outages, model simulations are used to identify adverse results and examine the effectiveness of various alternatives in alleviating those adverse results.

The effectiveness of each grid configuration and facility change must be evaluated under a variety of possible operating environments because future loads and operating conditions cannot be predicted with certainty. As a result, repeated simulations are often required. In addition, alternatives considered for future installation may affect other alternatives so that several different combinations must be evaluated, thereby increasing the number of simulations required.

Once feasible alternatives have been identified, the process is continued by preparing a preliminary cost comparison of those alternatives. In comparing these costs to determine the most favorable alternative, the short-range and long-range effectiveness of each alternative must be considered from both a cost and reliability standpoint. Consideration is also given to operating flexibility and compatibility with future plans. ERCOT along with the TSPs will propose the most effective transmission additions to the GE.

To define the additional transmission facilities necessary to reliably accommodate the addition of the generation resource that is the subject of the request, the guidelines below shall be used unless otherwise directed by ERCOT.

Steady-State Analyses (load flow, power flow, transfer analysis)

Approved ERCOT Steady State Working Group (SSWG) Base Cases shall be used as the starting point for the creation of study base cases. Any non-existing transmission facility expected to significantly affect the study results and not already determined by ERCOT to be necessary shall be removed. In addition, ERCOT may direct that resources proposed in other prior Generation Interconnection Requests be included in the study base cases as it deems appropriate.

Using the study base cases, the study group shall perform contingency analyses as outlined in the ERCOT Planning Criteria (includes NERC Planning Standards) and identify any additional transmission facilities necessary to ensure that expected system performance conforms to the standards in that criteria. Transmission facility additions that are infeasible due to time constraints or other reasons will not be studied. All facilities necessary to accommodate the proposed generation will be identified and studied. Those facilities that cannot be completed in time to accommodate the generation will be identified and communicated to the generation entity along with likely limitations of generation output.

Loss-of-generation analyses shall assume that the lost generation will be replaced from all remaining ERCOT units in proportion to their nominal capacity (i.e., inertial response) and respecting generation limits.

Each member of the study group is responsible for analyses of any contingency outages anticipated to result in study criteria violations, regardless of which TSP owns the facilities involved. The results of each member's analysis will be shared within the study group, and those TSPs that have facilities involved in ERCOT Planning Criteria violations will be responsible for attempting to verify the validity of the anticipated violations for the study group.

Transient Analyses (unit stability, voltage, subsynchronous resonance)

Transient stability studies will be performed when stability concerns exist. In the performance of such studies, all existing or committed generation in the area of study will normally be represented at full net output, including resources for which Planned Service has not been requested. Any resulting increase in generation will be balanced as addressed in the study scope. The study group, ERCOT, and the GE shall define the study scope.

Stability study base cases shall be formed from the latest available approved ERCOT SSWG Base Cases that are consistent with the most recently approved ERCOT DWG Stability Data Base. The initial transmission configuration in the area of study included in a stability study base case should be identical to that used in the steady-state studies of the same period. Typical transient stability studies include critical clearing time analyses. In such analyses, the number of cycles for which a transmission line can sustain a fault without causing loss of synchronism of any of the generators is compared to the response of the protection systems

Any generation resource in a stability study base case for which data is not available in the most recently approved ERCOT Stability Data Base, or for which data is not otherwise provided to ERCOT and ERCOT SSWG, will be removed from the case and a corresponding reduction to the load in the LSE utilizing such resource will be uniformly applied.

Stability studies shall be performed in accordance with requirements of the ERCOT Planning Criteria and shall identify additional transmission facilities or other actions necessary to ensure conformance to that standard.

Other types of analyses, such as voltage stability or subsynchronous resonance studies, will be identified and defined in the study scope, if and as warranted.

System Protection (short circuit)

The study scope will specify where short circuit fault duties will be calculated and documented. ERCOT along with the TSP shall determine whether the interconnection of the generating plant and associated transmission system modifications will cause any transmission facility to violate the TSP short circuit criteria. ERCOT along with the TSP shall then determine what system improvements, if any, are necessary to address such violations. ERCOT along with the TSP shall also determine the available fault currents at the interconnection substation for relay setting purposes

CONFIDENTIALITY

Generation interconnection information and data are considered proprietary and market sensitive information. They are considered protected information and should not be publicly released until appropriate authorization has been received, an interconnection agreement is completed, or a financial arrangement for transmission construction is completed. To preserve the integrity of the marketplace, it is essential that such proprietary and market sensitive information not be disclosed to other market participants. This information will not be made public until transmission providers' reviews are completed. To insure that such data, documents and/or information continues to remain confidential,, the following guidelines shall apply.

Confidentiality Guidelines

Transmission Service Providers (TSPs) shall keep any data, documents and/or information provided by ERCOT and the generation entity (GE) confidential and will not disclose it to anyone outside the TSP organization and the TSP's appointed officials except at the written direction of the GE, and only to those TSP employees and/or TSP appointed officials who require its review to accomplish the goals of this procedure. .Information and data shall be provided only to the TSPs appointed officials and those individuals within the TSP who need to act on it.

1. The TSP will not copy, by mechanical reproduction, in writing or in any other form, any of the data, documents and/or information provided for dispersion within the TSP unless copying is performed by one of the employees or officials allowed to receive the information or their assistants. Any documents provided and/or copied by the TSP will be dispersed to the TSP employees in a secure manner.
2. The TSP shall keep the data, documents and/or information in a safe and secure manner at all times. .
3. The TSP shall destroy, in a confidential manner, the data, documents and/or information provided at the time the data, documents and/or information are no longer needed.
4. The data and information shall not be stored or posted on any unsecured computer network, Intranet or Internet. Data should only be shared between the TSP's officials or individuals within the TSP who need it to perform studies; review study results or negotiate an Interconnection Agreement.
5. Generation project data and information should not be discussed at any open meeting (TSP, ERCOT, etc)
6. Generation projects shall not be discussed outside of the work environment or with any other TSP not included in the study group. Informal discussion within TSP companies is discouraged.
7. TSPs shall not discuss or disclose information about generation projects to outside parties even if the project has been publicly announced, unless authorized by the GE to do so.
8. TSPs should include all generation projects under construction and may include all known generation projects in an area in their studies. General information should be provided to the GE (other local GEs?) if it has significant impact on the study results. But specific project information (net amounts, number of units, type of units, fuel type, generating company, specific location, etc) shall NOT be included in the study report or discussed with generating customers.
9. The use of email addresses and email exploder lists for sending information should be limited to TSPs and the GE only. The "open" regional planning email lists should not be used except for public projects.

When an interconnection agreement or a financial arrangement for transmission construction is completed with a TSP, the project will be regarded as a confirmed project and will become public. At this time, ERCOT and TSP will add the project to ERCOT databases and impact studies will be posted.

A failure by the TSP to observe these guidelines is not to be construed as a waiver by ERCOT of the confidential nature of the information.

SUBMITTING YOUR REQUEST TO ERCOT

Address To Submit Request

All interconnection requests should be sent to the following address:

GENERATION INTERCONNECTION REQUEST
ERCOT
2705 WEST LAKE DRIVE
TAYLOR, TEXAS 76574-2136

to clearly identify the application and ensure timely processing of the request, GENERATION INTERCONNECTION REQUEST should be the first line of the address.

The request for service and complete data must be received in writing at ERCOT. Facsimile (FAX) and Internet email or other electronic request for interconnection will not be accepted. This is necessary to maintain a fair and consistent date and time stamp.

Request Fees

To cover ERCOT costs, fees should be included with the request. **Checks** should be made payable to **Electric Reliability Council of Texas, Inc.**

Minimum Data Submission For Studies

ERCOT suggests data gathering begin as soon as equipment is selected. The following data shall be collected from the equipment manufacturer and provided to ERCOT. In order to perform studies the following information is needed:

Security Screening Study
- Generation Entity Information Sheet Complete and Signed
- Generation Summary Sheet

Full Interconnection Study
- Any Updates to All the Above Information
- Detailed Generation Information - By Unit For Each Unit
- Generator Data For Transient Stability Studies By Unit For Each Unit
- Electrical network drawing(s) including all transformers, capacitors and electrical equipment
- Generator Step-Up Or Unit Main Power Transformer Data

Commercial Service
- Subsynchronous Resonance (SSR) Data – By Unit For Each Unit
- Any and All Updates to the Above Information

Naming Convention

To facilitate reliable communication between ERCOT, eligible customers and transmission providers, all interconnection requests will be named by ERCOT according to the following convention:

YRINRXXXX

where:	YR	Calendar Year the Generation is Oline (03, 04, 05)
	INR	Indicates Interconnection Request
	XXXX	Sequence Number beginning with 1

ERCOT will assign a name and send an acknowledgment in response to each request. All correspondence relating to a specific request should refer to this application name.

Applications for generation interconnection will be date and time stamped when the application is received at ERCOT. This date and time stamp is not a reservation of transmission capacity, either planned or unplanned.

Questions

Any questions concerning the Generation Interconnection Procedure should be directed to GINR@ercot.com.

GENERATION ENTITY INFORMATION SHEET – PLEASE PRINT CLEARLY
FORM MUST BE SIGNED AND SUBMITTED WITH REQUEST

Transmission Customer (Generating Entity): ______________________________

Contact Person (Requester): ______________________________

Title: ______________________________

Company: ______________________________

Mailing Address: ______________________________

City: ______________ State: ________ Zip: __________

Street Address: ______________________________

City: ______________ State: ________ Zip: __________

Company Internal Mail Code(s): ______________________________

Telephone Number: (________) ______________________________

Facsimile (FAX) Number: (________) ______________________________

Internet email Address: ______________________________

Requested Transmission Energization Date (MM/DD/YYYY): ______________________________

Generation In Service (MM/DD/YYYY): start ______________ through ______________

______________________________: (generating entity) is, or will be upon commencement of service, an eligible customer. An eligible customer is any ofthe following: the transmission provider (for all uses of its transmission system) and any electric utility, federal power marketing agency, exempt wholesale generator, qualifying facility, or power marketer. An eligible customer may designate an agent to represent it in arranging for interconnection.

Accurate/appropriate information and test data about generator step up transformers, all generator data including data for stability studies (transient, voltage, etc...) and subsynchronous resonance (SSR) data will be provided to ERCOT and interconnected TSP before the generation goes into commercial operation. I understand that all of this data will become public and added to the ERCOT databases (including power flow base cases, stability, system protection, CDR, etc...) when an interconnection agreement is completed or a financial arrangement for transmission construction is completed with a TSP. This data shall be reviewed and updated when the plant goes into commercial operation. In addition, any updates to this information will be provided within 60 days to ERCOT and transmission provider as changes or upgrades are made during the life of the plant. This requirement also applies to all future owners of this project/plant.

The generating entity and any future owners of the plant agrees to comply with these data requirements along with all applicable ERCOT & NERC requirements, including, without limitation, those contained in the ERCOT Protocols and ERCOT Operating Guides. It is understood and agreed that such requirements are subject to change from time to time, and such changes shall automatically become applicable based upon the effective date of the approved change.

Authorized Signature,

______________________________ Date: __________

____
(Name printed or typed)

By: ______________________________

ONCOR

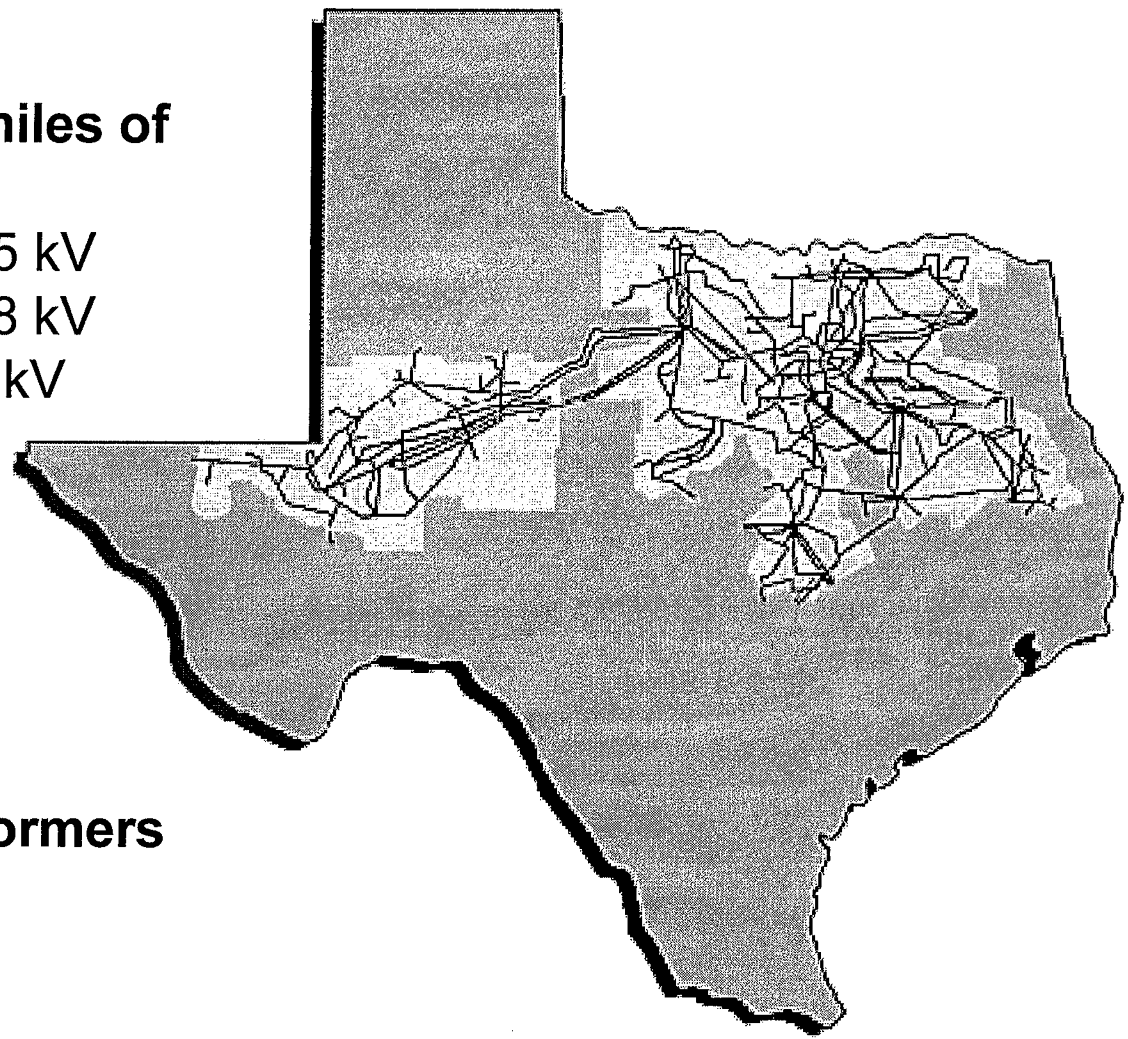
Reactive Discussion

Kenneth A. Donohoo, P.E.
Director, System Planning
Distribution and Transmission
Oncor Electric Delivery Company LLC

Presentation to ERCOT ROS
October 15, 2009
Austin, TX

ONCOR SYSTEM

- **Wires Only Company**
- **Innovative Solutions**
- **Agility in Execution**
- **More than 14,900 circuit miles of Transmission including:**
  - 5,044 circuit miles of 345 kV
  - 6,916 circuit miles of 138 kV
  - 2,946 circuit miles of 69 kV
- **More than 970 Stations**
- **More than 1,550 Power Transformers**
- **More than 6,000 Breakers**
- **More than 180 Autotransformers**
- **Significant Load Serving Distribution System**



RELIABILITY REQUIREMENTS

ONCOR

- **Planning Standards and Criteria**
  - Normal Condition
  - First Contingency Condition
  - Second Contingency Condition, with adjustment
- **Operations Constraints**
  - Maintenance and construction feasibility
  - Complexity
  - Outages and clearances
  - Constantly changing

TYPES OF PROBLEMS

ONCOR

- **Thermal Overload**
  - Loading on an element is too high to allow needed dissipation of heat, resulting in damage (substation equipment and cable) or clearance violations (lines).
- **Voltage Problems**
  - Voltage either cannot be stabilized (voltage collapse) following a contingency event, or it cannot be maintained within a band acceptable to avoid potential damage to customer or utility equipment. Low voltage rather than high voltage, is the more common problem, by far.
- **Stability**
  - Synchronism cannot be maintained between generators, either because of a contingency event (transient instability), or because a deficiency in system damping causes oscillations which continue to grow (dynamic instability).

TEMPORARY SOLUTIONS CONSIDERED

ONCOR

- **Thermal**
  - Add temperature monitoring to allow real-time dynamic rating
  - Add a Special Protection System to reduce generation or reconfigure network
  - Create a Remedial Action Plan which directs specific operator actions
- **Voltage**
  - Change transformer taps
  - Replace remote generation with local generation
  - Maintain extra reactive reserve
- **Stability**
  - Add Special Protection System that trips some units to save others
  - Adjust operations to maintain dynamic reactive reserve

PERMANENT SOLUTIONS CONSIDERED

ONCOR

- **Thermal**
  - Increase thermal capability of the overloaded element
    - Reconductor lines
    - Rebuild lines
    - Raise line voltage
    - Increase line clearance
    - Add cooling to transformers
  - Redirect excess flow onto unconstrained parallel path(s)
    - Increase impedance of overloaded path (switchable thermal equipment, series reactors, FACTS devices)
    - Decrease impedance of parallel path(s) (series capacitors)
    - Build new parallel path(s)
    - Add phase-shifting transformer(s) (change phase angle)

PERMANENT SOLUTIONS CONSIDERED

ONCOR

- **Voltage**
  - Increase reactive power support in areas of depressed voltage
    - Improve load power factor
    - Add distribution feeder capacitors
    - Add substation (distribution or transmission) capacitors
    - Add dynamic reactive device (STATCOM, FACTS device) (synchronous condensor option rare)
  - Decrease reactive power losses in the network
    - Add series capacitors to lines
    - Add Static Synchronous Series Compensator (SSSC, FACTS device) to lines
    - Add Superconducting Magnetic Energy Storage (SMES) device

PERMANENT SOLUTIONS CONSIDERED

ONCOR

- **Stability**
  - Minimize fault duration (trip breakers quickly)
  - Add independent pole fault clearing
  - Decrease impedance of network by adding or upgrading lines
  - Install fast generation excitation systems (usually new generating units only, difficult to retrofit)
  - Use FACTS devices to boost voltage during faults, decrease line impedance, or provide damping through the modulation of reactive power flow
  - Add power system stabilizer(s) to increase damping of oscillations

REACTIVE COMPENSATION

ONCOR

Voltage control has been problematic in West Texas due to varying load, generation and transmission topology conditions.

Distance from large load centers adds additional complexity and challenges operations.

Appropriate dynamic/static and series/shunt reactive devices should be included to handle possible operating conditions. Plan should not be limited to account for unidentified operating conditions (additional reactive reserve).

Generally, we include shunt reactors to compensate for about 30% line charging.

We apply series reactors to redirect flows.

Actual reactive design to meet ERCOT reactive standard varies by location, study and actual operating conditions.

REACTIVE CAPABILITY TESTING

ONCOR

ERCOT Protocols:

- **6.10.3.5:**
  - generator must conduct reactive tests
  - testing required on "initial qualification"Planning Standards and Criteria

REACTIVE CAPABILITY TESTING

ONCOR

ERCOT Operating Guides:

- **3.1.4.3.1:**
  - Reactive capability curve (CURL) must be suppled by Generator to ERCOT
- **3.1.4.3.2:**
  - Non-coordinated Testing...QSE must schedule reactive verification tests with ERCOT
- **3.1.4.3.3:**
  - Coordinated testing: discusses testing
- **3.1.4.3.4:**
  - ERCOT implementation: ...ERCOT to review results of tests. Reactive tests to be reviewed by ERCOT to determine if they fall within 90% of CURL curve.
- **3.1.4.3.5:**
  - Enforcement of Unit Reactive Capability Testing....details of enforcement of reactive testing can be found on Compliance Template on ERCOT Compliance Web Page.

REACTIVE CAPABILITY TESTING

ONCOR

ERCOT Procedure:

- Go to Services, Registration & Qualification, Resource Entities...
- New gen commissioning checklist...Operating Day....gen should make plans for MVAR testing
- RARF Guide, section 7.3 and 7.4 says gen to provide reactive curve data points and perform reactive testing.

ERCOT VOLTAGE AND REACTIVE REQUIREMENTS AND COMPLIANCE MONITORING

(TAC Approved – August 6, 2003)

GENERATOR AND QSE REQUIREMENTS

Application

- All generating units (including self-serve generating units) that have a gross generating unit rating greater than 20 MVA or those units connected to the same transmission bus that have gross generating unit ratings aggregating to greater than 20 MVA, that supply power to the ERCOT transmission grid, and that were not in operation prior to Board approval of this standard shall meet all of the requirements of this Standard.
- Any such generating units in operation earlier than the ERCOT Board approval date for this Standard shall meet the requirements of Standards applicable to that generating unit prior to the Board approval date for this Standard, and shall also meet all of the requirements of this Standard except the Installed Capability Requirements. Previously applicable Standards include the Interim Standards approved by the ERCOT Board, the Standards enumerated in the Protocols Section 6.5.7, and such other Standards outlined in interconnection requirements and Operating Guides.
- Upon submission by a Generation Resource to ERCOT of a specific proposal for requirements to substitute for those of the applicable Standard, ERCOT shall either approve such alternative requirements or provide the submitter an explanation of its objections to the proposal. Alternative requirements may include supplying additional static and/or dynamic reactive power capability as necessary to meet the area's reactive power requirements. Pending changes to PUCT Rules, an induction generator may elect to make a contribution to be credited to TCOS in lieu of meeting the Installed Capability Requirements contained herein. Also, ERCOT shall apply previous standards to new generating units connected within 15 months after Board approval whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to Board approval based upon previous standards.

Installed Capability Requirements

- Power Factor Requirements
  - Generating unit installations to which this Standard applies shall have and maintain an overexcited (lagging) power factor capability, of 0.95 or less and an under-excited (leading) power factor capability of 0.95 or less, both determined at the generating unit's maximum net power to be supplied to the transmission grid and at the transmission system voltage profile established by ERCOT, and both measured at the point of interconnection to the TDSP.
  - Upon request to and with the approval of ERCOT, multiple generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these Power Factor Requirements only. For any unit so aggregated, specific power factor requirements based upon the reactive power contribution of that unit to the total reactive power obligation of the aggregation will be assigned to that unit and shall become that unit's required installed reactive capability at the generating unit's maximum net active power output.
  - No generating unit equipment replacement or modification shall reduce the reactive capability of the generating unit below the requirements to be met by that generating unit prior to the replacement/modification, unless specifically approved by ERCOT.
- Other Installed Capability Requirements
  - Generating unit installations to which this Standard applies shall have and maintain the following capability:
    - Over-excitation limiters shall be provided and coordinated with the thermal capability of the generator field winding and protective relays in order to permit short-term reactive capability that allows at least 80% of the unit design standard (ANSI C50.13-1989), as follows:

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

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

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

Operating Requirements

- All generating units shall maintain the transmission voltage at the point of interconnection to the transmission grid as directed by ERCOT within the operating reactive power capability of the unit(s).
- At all times a generating unit is on line, the required installed reactive capability must be available for utilization at the generating unit's continuous rated active power output, and reactive power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the reactive power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any reactive power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a Transmission Operator designated by ERCOT.
- Each generating unit shall be operated with any automatic voltage regulator (AVR) set to regulate generator terminal voltage and any power system stabilizers (PSS) in use unless specifically permitted to operate otherwise by ERCOT.
- Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

Information Supply Requirements

- Unit AVR and PSS modeling information required in the ERCOT Planning Criteria shall be determined from actual unit testing described in the Operating Guides. Within 30 days of ERCOT's request, the results of the latest test performed shall be supplied to ERCOT and the TSP.
- When the operating mode of a generating unit's AVR or PSS is changed while the unit is operating, the QSE shall promptly inform ERCOT. The QSE shall also supply AVR or PSS status logs to ERCOT upon request.
- Within 30 days of ERCOT's request, Generation Resources shall provide ERCOT with the operating characteristics of any generating unit's equipment protective relay system or controls that may respond to temporary excursions in voltage with actions that could lead to tripping of the generating unit.
- Any short-term inability of a generating unit to meet its reactive capability requirements shall be immediately reported to ERCOT and the Transmission Operator.
- ERCOT and the TSP shall be notified of any equipment changes that affect the reactive capability of an operating generating unit no less than 60 days prior to implementation of the changes, and any such changes that decrease the reactive capability of the generating unit below the required level must be approved by ERCOT prior to implementation.
- High reactive loading and reactive oscillations on generation units should be immediately communicated to the QSE, the Transmission Operator, and ERCOT.
- The tripping off line of a generating unit due to voltage or reactive problems should be immediately reported to ERCOT, the Transmission Operator, and the QSE.

GENERATOR AND QSE COMPLIANCE MONITORING

- Generation Resources shall conduct generating unit reactive capability tests as specified in ERCOT Protocols and Operating Guides. Test results shall be reported to ERCOT who shall forward them to the TSPs. If reactive output of the generating units is limited by transmission system conditions during the tests, this shall be noted on the test report.
- Failure of a generating unit to provide either leading or lagging reactive up to the required capability of the unit upon request from a Transmission Operator or ERCOT may, at the discretion of ERCOT, be reported to the ERCOT Compliance Office, except under Force Majeure conditions or ERCOT-permitted operation of the generating unit.

- If a Generating Resource fails to maintain transmission system voltage at the point of interconnection with the TSP within 2% of the scheduled voltage while operating at less than the maximum reactive capability of the generating unit, ERCOT may, at its discretion, report this to the ERCOT Compliance Office, except under Force Majeure conditions or ERCOT-permitted operation of the generating unit.
- The ERCOT Compliance Office will investigate claims of alleged non-compliance and Force Majeure conditions using ERCOT Compliance Office Procedures. The ERCOT Compliance Office will use its Compliance Procedures to address confirmed non-compliance situations. The ERCOT Compliance Office will advise the Generation Resource, its QSE, ERCOT and the TSP planning and operating staffs of the results of such investigations.

TDSP REQUIREMENTS

Application

- Each TSP and DSP must meet the requirements specified herein, or at their option, meet alternative requirements specifically approved by ERCOT. Such alternative requirements may include requirements for aggregated groups of facilities.
- This Standard is not intended to apply to retail customers (including any load served by an REP or load not served from the ERCOT transmission grid), since their reactive power supply requirements are addressed in other documents, including tariffs.

Installed Capability Requirements

- Sufficient static reactive power capability shall be installed by a DSP in substations and on the distribution voltage system to maintain at least a 0.97 lagging power factor for the maximum net active power supplied from a substation transformer at its distribution voltage terminals to the distribution voltage system. For any substation transformer serving multiple DSPs, this power factor requirement shall be applied to each DSP individually for its portion of the total load served.
- Assuming optimal use of all other required installed reactive power capability, ERCOT (Regional Planning Groups or Transmission Planning) shall determine and demonstrate the need for any additional static and/or dynamic reactive power capability necessary to ensure compliance with the ERCOT Planning Criteria, and ERCOT (Transmission Planning) shall establish responsibility for any associated facility additions among ERCOT TSPs.
- The ERCOT Planning Criteria shall require voltage stability margin sufficient to maintain post-transient voltage stability within a defined importing (load) area under the following study conditions:
  - Peak load conditions, with import to the area increased by 5% of the forecasted area load, and NERC Category A or B operating conditions (see NERC Table I in ERCOT Planning Criteria); and
  - Peak load conditions, with import to the area increased by 2.5% of the forecasted area load, and NERC Category C operating conditions;

Operating Requirements

- The operation of all reactive power devices under the control of a Transmission Operator or a QSE will be coordinated under the direction of ERCOT to maintain transmission voltage levels established by ERCOT. Static reactive devices will be managed to ensure that adequate dynamic reactive reserves are maintained at all times.
- The Transmission Operator, under ERCOT direction, is responsible for monitoring and ensuring that all generator dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed reactive capability requirements

Information Supply Requirements

- Any short-term inability to meet these minimum reactive requirements shall be immediately reported to ERCOT by way of the Transmission Operator.

- Any long-term changes to the reactive capability must be provided by the facility owner to ERCOT, as-planned at least 30 days prior to implementation and as-built no later than 30 days after implementation, as changes or upgrades are made during the life of the reactive power facilities.

TDSP COMPLIANCE MONITORING

DSP compliance monitoring

- Annually, ERCOT will review DSP power factors using the actual summer load and power factor information included in the Annual Load Data Request (ALDR) to assess whether DSPs comply with these requirements. All DSP substations whose annual peak load has exceeded 10 MW shall have and maintain watt/var metering sufficient to monitor compliance; otherwise, DSPs will not be required to install additional metering to determine compliance. At times selected by ERCOT, ERCOT will require manual power factor measurement at substations and points of interconnection that do not have power factor metering. ERCOT will endeavor to provide DSPs sufficient notice to perform the manual measurements. Such requests shall be limited to four times per calendar year for each DSP substation or point of interconnection where power factor measurements are not available.
- If actual conditions indicate probable non-compliance, ERCOT will require power factor measurements at the time of its choice while providing sufficient notice to perform the measurements.
- The ERCOT Compliance Office will investigate claims of alleged non-compliance using ERCOT Compliance Procedures. The ERCOT Compliance Office will use its Compliance Procedures to address confirmed non-compliance situations. The ERCOT Compliance Office will advise ERCOT and TSP planning and operating staffs of the results of such investigations.

TSP compliance monitoring

- For monitoring of compliance of the TSP's planned facilities to the ERCOT Planning Criteria performance requirements, a self-certification process with random audits (similar to compliance to NERC Planning Standards), in conjunction with work performed in the ERCOT Regional Planning Groups, shall be used. If a TSP fails to maintain transmission system voltage within 2% of the scheduled voltage while reactive sources under its direct control are not fully utilized, ERCOT may, at its discretion, report this to the ERCOT Compliance Office, except under Force Majeure conditions.
- The ERCOT Compliance Office will investigate claims of alleged non-compliance using ERCOT Compliance Procedures. The ERCOT Compliance Office will use its Compliance Procedures to address confirmed non-compliance situations. The ERCOT Compliance Office will advise ERCOT and TSP planning and operating staffs of the results of such investigations.

ERCOT REQUIREMENTS

- ERCOT shall specify voltage levels that are to be maintained on the transmission system.
- For any market participant's failure to meet the requirements of this Standard, ERCOT shall notify the participant in writing of such failure and, upon a request from the participant, explain whether and why the failure must be corrected.
- ERCOT (Regional Planning Groups or Transmission Planning) shall determine and demonstrate the need for any static and/or dynamic reactive power capability in excess of the explicit requirements of this Standard that is necessary to ensure compliance with the ERCOT Planning Criteria, and ERCOT (Transmission Planning) shall establish specific DSP and/or TSP responsibility for any associated facility additions.
- ERCOT shall consider specific stakeholder proposals for alternate requirements and, upon approval by ERCOT, post a description of such alternative requirements and any associated compliance monitoring procedures on a secured ERCOT website.

830PRR-35
TAC Advocate Position Statement
111009

PRR Position Statement

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	November 10, 2009

Submitter's Information	
Name	John Houston, TAC Advocate
E-mail Address	
Company	CenterPoint Energy Houston Electric
Phone Number	
Cell Number	
Market Segment	

Comments

John Houston, Vice President of Transmission and Substation Operations for CenterPoint Energy Houston Electric, has agreed to serve as the Technical Advisory Committee ("TAC") Advocate for the appeal of PRR 830. Due to business meetings in Washington D.C., Mr. Houston was not contacted until late in the day on Monday, November 9, 2009; therefore, Mr. Houston has not had adequate time to prepare documents to submit to the Board of the Electric Reliability Council of Texas ("ERCOT Board") by the deadline of Tuesday, November 10, 2009. Mr. Houston will submit more complete documents prior to the ERCOT Board's consideration. The following information is submitted in support of the TAC approval of PRR 830.

The issues raised in PRR 830 have been adequately vetted through the stakeholder process and it passed each vote with overwhelming approval rates. At the October 12, 2009, Reliability and Operations Subcommittee ("ROS") meeting, at least two hours were spent on presentations and consideration of comments. The vote passed with 5.5 in favor, 2.0 opposed, and two abstentions. As the ERCOT Board is aware, ROS "is responsible to review operations of ERCOT in relation to system security, operating guides application, and emergency operations." At the October 19, 2009, Protocol Revision Subcommittee meeting, several hours were also spent in consideration of the issues raised by various interested persons. The vote passed with 5.889 in favor, 1.111 opposed, and five abstentions. Another thorough vetting occurred at the November 5, 2009, TAC meeting. The PRR was approved with a vote of 23 in favor, one opposed, and six abstentions.

PRR 830 was proposed by ERCOT Staff. PRR 830 clarifies the reactive power capability requirement applicable to generators. Reactive power requirements are fundamentally a reliability concern to ensure voltage stability is maintained on the ERCOT network. ERCOT requirements relating to reactive power capability were originally developed by ROS and approved by TAC. The requirements are based upon an equitable and workable approach that recognizes ensuring voltage stability requires reactive power performance from three entities: generators, loads, and transmission owners. Generators and loads have a fixed reactive power requirement and transmission owners supply whatever additional reactive power is needed based upon engineering analyses. For generators, the fixed performance requirement is to provide and maintain reactive power (MVAR) capability based on 0.95 power factor or less calculated at the unit's maximum real power (MW) capability throughout the range of the unit's real power output. The generator reactive power requirement does not vary based on need determined by engineering analysis. For example, engineering analysis performed at various times have determined the Dallas-Fort Worth metroplex and the greater Houston area required significant reactive resources, both static and dynamic, to ensure voltage stability is maintained. The identified need is not met by requiring additional reactive capability from generators located in such areas because, as previously noted, the philosophy behind the ERCOT requirements is that generators have a fixed requirement. Instead, the additional reactive resources are provided by the transmission owners that have the variable requirement based on need identified through engineering analysis.

The overwhelming majority of the members of ROS, PRS, and TAC support PRR 830 due to reliability concerns for the electric transmission grid within ERCOT as well as concerns that all generators within ERCOT are treated equitably. The ERCOT transmission system was designed and built upon the criteria that all generators would provide the specified requirement for reactive power. PRR 830 clarifies the reactive requirement for generators to ensure that the system is operated in the manner in which it was planned and built. The majority of the ROS, PRS, and TAC members agree that PRR 830, as proposed by ERCOT, is a well-reasoned, flexible, and fair approach consistent with the reliability requirements understood and implemented by the majority of industry participants.

Lastly, the issues raised in PRR 830 do not need further study. As previously noted, generators have a fixed reactive capability requirement. The requirements for generators are not determined based on study and do not increase or decrease based on need identified by a different studies performed at different times over the life of the generating units. Instead, studies are performed to identify the variable transmission owner requirements.

830PRR-36
ERCOT ISO Position Statement
111009

MEMORANDUM

To: Board of Directors

From: Kent Saathoff, Vice President of System Planning & Grid Operations

Date: November 10, 2009

RE: November 17, 2009 Board Agenda Item XX – ERCOT ISO's Position Statement regarding TAC Approval of PRR830 and NextEra Energy Resource's Appeal

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Greetings:

Protocol Revision Request (PRR) 830, *Reactive Power Capability Requirement*, has been approved overwhelmingly at the Reliability Operations Subcommittee (ROS), the Protocol Revision Subcommittee (PRS), and the Technical Advisory Committee (TAC) and should now be approved by the ERCOT Board of Directors (ERCOT Board). This PRR will preserve important reliability requirements, maintain parity among Generation Resources, reduce uplift of costs to Load, and at the same time it will grant major concessions to Wind-powered Generation Resources (WGRs), both in the form of increased flexibility regarding alternative means of compliance to the existing Protocols and in the form of an entire year to bring substandard equipment into compliance. Pursuant to Section 8.3.3 of the ERCOT Board Policies and Procedures, Electric Reliability Council of Texas, Inc. (ERCOT ISO) submits this Position Statement encouraging the ERCOT Board to approve PRR830 as recommended by TAC and to reject NextEra Energy Resource's appeal as without merit.

ERCOT ISO proposed PRR830 after providing an interpretation of the existing Protocols (which was subsequently withdrawn) and determining that a majority of the WGRs were unable to meet the Reactive Power requirements under Section 6.5.7.1(2) of the ERCOT Protocols. Wind-powered Generation Entities have questioned the interpretation and responded that they were in compliance with the existing Protocols when ERCOT ISO requested a mitigation plan from them that would enable them to meet the Protocol requirement. ERCOT ISO drafted and proposed PRR830 to provide a framework and a pathway to compliance for existing WGRs. PRR830 is consistent with Section 6.5.7.1(6) of the Protocols which allows participants to propose alternative designs for meeting the 0.95 lead/lag rectangle requirement. These alternative designs can include static and/or dynamic reactive devices. The PRR also allows the stakeholder groups which drafted the existing Protocol requirements to consider the issue and decide whether ERCOT ISO's view is consistent with the understanding of the majority of stakeholders. As previously noted, the overwhelming majority of all three stakeholder groups that reviewed ERCOT ISO's proposal (ROS, PRS, and TAC) agree with the language proposed by ERCOT.

Wind-powered Generation Entities have argued that because PRR830 clarifies the existing Protocol requirements, the existing requirements were ambiguous and therefore should not be applied to certain WGRs who did not understand the requirements. The stakeholder groups that reviewed PRR830 heard and rejected such arguments. The existing Protocol requirements were developed through the stakeholder process, with multiple opportunities for parties to propose clarifications, and have been in place for several years without allegations being made that the requirements were ambiguous. Generation Entities have understood and complied with the requirements. For those WGRs that do not currently comply, there are workable and equitable ways to comply without a complete retrofit of the WGRs. Specifically, WGRs can install reactive resources at the Point of Interconnection to meet the requirement or pay a contribution-in-aid-of construction to Transmission Service Providers (TSPs) to offset the incremental cost paid by TSPs (who have the variable Reactive Power requirement) attributable to the generator's non-compliance, so that Consumers paying transmission rates are held harmless. The ERCOT Protocols also has a provision for generators that cannot meet the exact requirements to propose alternatives for ERCOT ISO to review and consider. In short, the majority of the ROS, PRS, and TAC agree that PRR830, as proposed by ERCOT ISO, is a well-reasoned, flexible, and fair approach consistent with the reliability requirements understood and implemented by the majority of industry participants.

ERCOT ISO believes that PRR830 addresses several key reliability and policy issues that the ERCOT Board should take into consideration.

Reliability of the ERCOT Transmission Grid. First and foremost, PRR830 emphasizes the importance of Reactive Power support in maintaining the reliability of the ERCOT Transmission Grid. ERCOT ISO believes that without the required Reactive Power support with the appropriate characteristics, the ERCOT Transmission Grid could face difficulties in maintaining required voltage levels and potentially voltage collapse. PRR830 ensures the reliability of the ERCOT Transmission Grid by allowing existing WGRs to meet the 0.95 lead/lag rectangle requirement through a combination of the WGR's Unit Reactive Limit (URL) and/or automatically switchable static and/or dynamic VAR capable devices. These existing WGRs have until December 31, 2010 to add necessary equipment in order to meet the Reactive Power capability requirement that was established in 2004. Thus, PRR830 offers a path to compliance for existing WGRs that are presently not meeting the longstanding 0.95 lead/lag rectangle requirement at the Point of Interconnection based solely on their URL.

Second, PRR830 emphasizes the importance of dynamic Reactive Power support going forward. Any new WGRs (with signed SGIAs after December 1, 2009) and all other Generation Resources must meet the 0.95 lead/lag rectangle requirement through a combination of the Generation Resource's URL (which is dynamic capability) and/or dynamic VAR capable devices. The ERCOT Transmission Grid operates in a dynamic environment, meaning that it is constantly changing to meet the demands and changing topology of the system. Requiring dynamic devices for voltage support ensures that the stability of the ERCOT Transmission Grid is maintained during Real Time events. PRR830 accomplishes this objective by requiring full dynamic capability for all Generation Resources in the ERCOT Region, whether conventional or renewable.

Parity Among Generation Resources. NextEra's appeal of PRR830 requires that the ERCOT Board consider whether existing WGRs should be given special treatment by exempting them from the Reactive Power rectangle requirement. With the exception of certain older generators, all Generation Resources have been required to provide equal Reactive Power support through either the inherent characteristics of their generation or through supplemental equipment. This requirement has existed in the ERCOT Protocols since 2004 and in other key documents, such as the Generation Interconnection Procedures, since 1999. The current language of the Protocols requires that all Generation Resources are required ***to have and maintain*** a URL with a power factor capability of 0.95 lead/lag ***both determined at the generating unit's maximum net power***. This capability must be dynamic and is determined at the Generation Resource's max output to the transmission system, and it must be maintained at all output levels.

From an ERCOT Planning perspective, ERCOT ISO assumes that all Generation Resources comply with this rectangle requirement when conducting long-term system planning studies. This assumption was used in the initial Competitive Renewable Energy Zones (CREZ) studies and is being used for the full CREZ Reactive Power studies (that are currently underway) which includes the integration of 18,000 MWs of wind onto the ERCOT Transmission Grid. Should the WGRs succeed in avoiding their Reactive Power requirements, the reliability assumptions underlying ERCOT ISO's planning studies will not be valid. Furthermore, ERCOT ISO believes that having a common, minimum set of standards for all Generation Resources levels the playing field and enables all Generation Resources to compete on an equal basis. PRR830 accomplishes this objective by keeping in place the same standard for all Generation Resources in the ERCOT Region.

Cost Responsibility. NextEra's appeal of PRR830 requires that the ERCOT Board consider the cost responsibility of who ultimately pays for Reactive Power support in the ERCOT Region. Again, ERCOT ISO believes that the current Protocol language requires all Generation Resources to provide Reactive Power support based upon the rectangle requirement. There are no exceptions to this requirement except for the exemptions noted in other paragraphs of Section 6.5.7.1 (pre September 1, 1999 Generation Resources and renewable Generation Resources in operation before February 17, 2004). Thus, Generation Resources pay for this required level of Reactive Power support in the ERCOT Region.

On the other hand, acceptance of NextEra's appeal of PRR830 would place the cost of full Reactive Power support on conventional Generation Resources and Consumers. From an ERCOT Operations perspective, it is suboptimal not to have the same Reactive Power support from all units, and ERCOT has experienced events that may not have occurred had all WGRs been capable of providing full Reactive Power support. Nevertheless, ERCOT ISO can maintain reliability with operational tools despite the additional complexity. However, a reduction in reactive reserves may make it more difficult to allow needed maintenance outages or take optimal operational actions when ERCOT's options are limited by voltage issues that could have been avoided with full Reactive Power capability. Moreover, there are cost issues. ERCOT ISO may have to bring on conventional Generation Resources who are able to provide full Reactive Power support, deny Resource or transmission outages, or open lines in order to maintain overall reliability of the ERCOT Transmission Grid. These actions will have cost impacts on other Market Participants and will be a direct result of not holding existing WGRs to the same Reactive Power requirements as conventional Generation Resources. Furthermore, if this requirement is not met, it will require ERCOT ISO to change its assumptions in the full CREZ Reactive Power studies to compensate for existing WGRs not providing full Reactive Power (the rectangle requirement). As such, the CREZ Reactive Power study results may show voltage issues which would require that TSPs provide that Reactive Power support with additional equipment on their systems. These types of upgrades will be included in the Transmission Cost of Service (TCOS), which is paid by Consumers. The needs of the system are constantly changing and a decision to allow the existing WGRs an exemption of the requirement may affect who pays in the future for Reactive Support.

For these reasons stated above, ERCOT ISO respectfully requests that the ERCOT Board reject NextEra's appeal and approve PRR830 as recommended by TAC.

I look forward to discussing this issue with you. Please let me know if you have any questions in the meantime.

830PRR-37
Wind Coalition Comments
111009

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	11/10/2009

Submitter's Information	
Name	Walter J. Reid
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Company	Wind Coalition
Phone Number	512-335-0664
Cell Number	512-335-0664
Market Segment	N/A

Comments

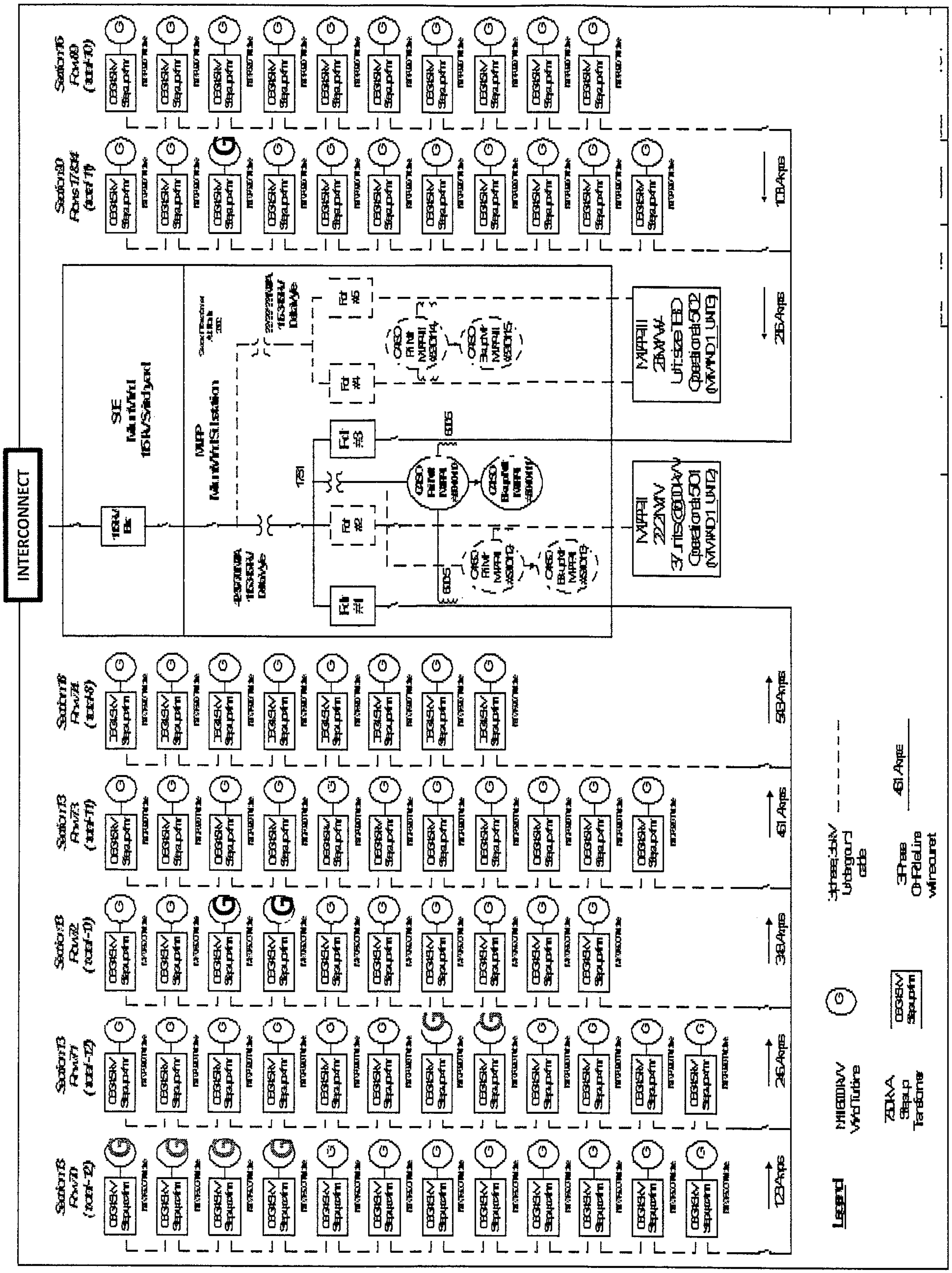
Please see PowerPoint presentation named 830PRR-37 Wind Coalition 111709 Board Presentation 111009.ppt.

PRR 830 ISSUES

- "VIRTUAL" UNITS DO NOT MAKE SENSE

"VIRTUAL" UNITS DO NOT MAKE SENSE

- NEW WGR DEFINITION CREATES AGGREGATIONS OF ACTUAL WIND-POWERED TURBINES OF THE SAME TYPE FOR MODELING PURPOSES
  - THE WIND COALITION SUPPORTS THE MODELING
  - BUT THE REDEFINITION WILL MAKE WGRs "UNITS" FOR ALL PURPOSES
    - NO METER POINT
    - ALL PROTOCOL AND GUIDE PROVISIONS APPLYING TO "UNITS" AND TO "RESOURCES" NOW APPLY TO THIS VIRTUAL POINT


INTERCONNECT

MODELING DATA MUST BE PROVIDED

- THE WIND COALITION STRONGLY SUPPORTS SUPPLYING THE NEEDED MODELING DATA
- ALTERNATIVE WORDING HAS BEEN PROVIDED
  - PROVIDES 100% OF THE DATA PROPOSED BY ERCOT
  - DOES NOT REQUIRE THE REDEFINITION OF "WGR"

830PRR-38
TAC Advocate Supporting Document
111109

Appeal of PRR 830

John Houston

Designated TAC Advocate

PRR 830 Procedural History

- **Proposed by ERCOT Staff to clarify reactive power requirements applicable to generators and provide a framework for non-compliant wind generators to comply**
- **At 9/17 meeting, PRS tabled consideration by unanimous vote to allow ROS to review and provide comments or a recommendation**
- **After consideration of multiple comments and extensive discussion at 10/15 meeting, ROS voted to recommend approval**
- **After consideration of additional comments and extensive discussion at 10/22 meeting, PRS voted to recommend approval**
- **After consideration of additional comments and extensive discussion at 11/5 meeting, TAC voted to approve**

ERCOT Reactive Power Requirements

- **Existing Protocol vetted through the stakeholder process in 2003 and 2004 with multiple opportunities for comment and changes**
- **Requirements have been in place for several years**
- **Requirements for generators and loads are fixed; i.e., the requirements do not increase or decrease as needs vary over time**
- **Incremental needs identified by engineering analysis to ensure remaining voltage stability requirements are provided by transmission owners**

Applicability to Existing Generators

- **Because PRR 830 was proposed to clarify, not change, the existing requirements, TAC and other stakeholder groups heard and rejected arguments that the clarification in PRR 830 should not apply to certain existing generators because the existing requirements were ambiguous**
- **PRR 830 does not affect pending ADR or PUC proceedings because it is not applicable to past compliance, but will become effective upon approval**
- **PRR 830 provides the means and time frame for non-compliant WGRs to fairly and equitably comply without a complete retrofit of certain existing units through installation of reactive resources, paying a contribution-in-aid-of-construction, or submittal of alternative proposals**

Need for Studies to Determine Need

- **TAC and other stakeholder groups heard and rejected arguments that studies should be performed to determine whether compliance with the requirements is needed for reliability, including consideration of a presentation by Siemens PTI and NextEra to ROS on this subject**

- **As previously noted, the requirements for generators are fixed – they do not vary over time as system needs change**

- **Taking the fixed capability of generators and loads as inputs, transmission planning studies are performed periodically to assess incremental reactive power needs that are then provided by transmission owners**

- **This approach is fair and workable**

830PRR-39
RES America Developments Comments
111709

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	November 17, 2009

Submitter's Information	
Name	Michael Hutson
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Company	RES America Developments Inc.
Phone Number	303 439 4708
Cell Number	
Market Segment	Independent Generator

Comments

RES America Developments Inc. (RES Americas) presents these comments regarding PRR830, Reactive Power Capability Requirement. RES Americas respectfully requests that the ERCOT Board of Director does not approve PRR830 as proposed for the reasons stated below.

PRR830 will require Generation Resources to be able to provide a level of Reactive Power in what is commonly referred to as the 'rectangle' response. This is beyond the existing requirement where Reactive Power output required is proportional to the MW output of the resource, referred to as the 'triangle' response. While the interpretation of the existing Protocol is subject to debate, there are currently operational Generation Resources that provide Reactive Power under the triangle response.

Implementation of the Reactive Power requirements in PRR830 will force some existing Generation Resources to retrofit operational equipment with supplemental Reactive Power devices, the additional cost of which is borne by the Generation Resource. To date, the necessity to increase the Reactive Power requirement beyond the triangle response has not been addressed through any technical assessment. The expectation that Generation Resources should willingly adopt the additional burden of Reactive Power requirements proposed in PRR830 without any proof of necessity is highly unreasonable. RES Americas believes a technical study should be performed to investigate whether i) Reactive Power capability as provided by the triangular Reactive Power response is inadequate to maintain system reliability; and ii) the Reactive Power requirements proposed in PRR830 are necessary to maintain system reliability. This study should assess the impact and necessity of PRR830 application on both existing and future Generation Resources.

PRR Comments

Implementation of PRR830 will place retroactive requirements on Generation Resources currently in operation. In many of these cases, these projects were financed under certain criteria and are bound by binding power purchase agreements. In this case, retroactive upgrades impose additional capital costs not accounted for at the time financial arrangements for the project were finalized. Subsequently, Generation Resources may not have the ability to recover the additional capital for retroactive upgrades while maintaining economically practical operating costs. Placing this financial burden on established Generation Resources is unreasonable.

Reactive Power deployment would be more efficiently realized by the Transmission Service Provider (TSP) than Generation Resources. If requirements for Reactive Power are such that system reliability is at risk of being compromised, these Reactive Power requirements should be the responsibility of and under control of TSPs.

RES Americas understands that Reactive Power is needed for reliable operation of an electrical network and understand there should be some requirement for Generation Resources to be partially responsible for its provision and believe this is sufficient as provided by the triangle Reactive Power requirement. However, Reactive Power requirements as proposed in PRR830, and the subsequent economic impacts, are unreasonable in the absence of technical evidence supporting this requirement. It is requested that the ERCOT Board of Directors does not approve PRR830.

830PRR-40
AES Board Presentation
111709

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	11/17/2009

Submitter's Information	
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Market Segment	Independent Generator

Comments

Please see PowerPoint presentation named 830PRR-39 AES Board Presentation 111709.ppt.

FERC Order 661A
Issued December 12, 2005
"Interconnection Requirements for a Wind Generator Plant"

- In 2005 & 2006 a considerable amount of work was performed by a large and broad group of grid operators and stakeholders to determine the Interconnection Requirements for Wind Generators.

- This work lead to FERC Issuing Order 661A and Exhibit G to the FERC Large Generator Interconnection Agreement and is now the required standard in most areas of the USA.

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FERC Order 661A
December 12, 2005
"Interconnection Requirements for a Wind Generator Plant"

Work Chronology:

- **July 2003** - FERC issues Order 2003 Standardizing the interconnection process, requirements, and agreement for all Large Generators over 20 MW (or 20 MW in aggregate) "LGIA"
- **March 2004** – As a result of stakeholder comments FERC Issues Order 2003A. This amendment recognizes that electrical machine technology differences affect interconnection requirements and provides a blank Exhibit G for the interconnection requirements for Wind Generators to be completed by stakeholders
- **September 2004** – FERC hosts a technical conference on the requirements for the interconnection of Wind Generators. The conference is broadly attended by industry stakeholders and sets the ground work for standardized interconnection requirements for wind turbines.

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FERC Order 661A
December 12, 2005
"Interconnection Requirements for a Wind Generator Plant"

- **December 2004** – NERC creates the Wind Generation Task Force to "*Review the bulk electric system reliability implications/concerns of wind generation.*" The Task Force has a broad membership of transmission and control area operators as well as generators. The group begins a series of regular working meetings.

July 2005 – FERC Issues Order 661 "Interconnection Requirements for a Wind Generator Plant." The Order defines the technical requirements including Low Voltage Ride Through (LVRT), Power Factor, and SCADA Communications to be included in Exhibit G of the Standardized Large Generator Interconnection Agreement (LGIA).

July 2005 – NERC Requests a rehearing on 661 based on the work of the Wind Generation Task Force, NERC's issues primarily relate to the LVRT requirements. FERC orders interested parties to come to an agreement for a revised requirement.

December 2005 – FERC Issues Final Order 661A and Exhibit G "Interconnection Requirements for a Wind Generator Plant"

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FERC Order 661A
December 12, 2005
"Interconnection Requirements for a Wind Generator Plant"

Parties that participated and filed comments in FERC 661 & 661A:

AEP - American Electric Power System
American Superconductor - American Superconductor Corporation
American Transmission - American Transmission Company, LLC
AWEA - American Wind Energy Association
BPA - Bonneville Power Administration
CenterPoint – CenterPoint Energy Houston Electric, LLC
CPUC - California Public Utilities Commission
EEI - Edison Electric Institute
Exelon - Exelon Corporation
FirstEnergy – FirstEnergy Companies
Fertilizer Institute – The Fertilizer Institute
FPL Energy – FPL Energy, LLC
Gamesa – Gamesa Energy USA, Inc
GE – General Electric
Great River - Great River Energy

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FERC Order 661A
December 12, 2005
"Interconnection Requirements for a Wind Generator Plant"

Parties that participated and filed comments in FERC 661 & 661A:

Innovation – Innovation Investments, LLC
ISO New England – ISO New England Inc
LADWP - Los Angeles Department of Water and Power
LIPA - Long Island Power Authority and LIPA
Midwest ISO - Midwest Independent Transmission System Operator, Inc.
Midwest ISO TOs - Midwest ISO Transmission Owners
Midwest Reliability Organization – Midwest Reliability Organization
Montana-Dakota Utilities – Montana-Dakota Utilities
NARUC - National Association of Regulatory Utility Commissioners
National Grid– National Grid USA
NERC - North America Electric Reliability Council
Nevada Power - Nevada Power Company/Sierra Pacific Power Company
New York PSC - New York State Public Service Commission
NRECA/APPA - National Rural Electric Cooperative Association and the

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FERC Order 661A
December 12, 2005
"Interconnection Requirements for a Wind Generator Plant"

Parties that participated and filed comments in FERC 661 & 661A:

NYISO - New York Independent Transmission System Operator, Inc.
NUSCo - Northeast Utilities Service Company
NorthWestern Energy – NorthWestern Energy
Ohio Consumers' Council- The Office of the Ohio Consumers' Council
PacifiCorp/PPM Energy – PacifiCorp and PPM Energy, Inc
PJM - PJM Interconnection, LLC
SoCal Edison - Southern California Edison Company
Southern – Southern Company Services, Inc.
Tucson Electric - Tucson Electric Power
Western - Western Area Power Administration
Xcel - Xcel Energy Services, Inc.
Zilkha - Zilkha Renewable Energy, LLC

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FERC Order 661A
December 12, 2005
"Interconnection Requirements for a Wind Generator Plant"

FERC 661A Power Factor Requirements:

"A wind generating plant shall maintain a power factor within the range of <u>0.95 leading to 0.95 lagging</u>, 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 (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"

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FERC Order 661A
December 12, 2005
“Interconnection Requirements for a Wind Generator Plant”

ERCOT is now asking for a higher level of reactive support than required by FERC and NERC under the Standardized Large Generator Interconnection Agreement and standard across most of the US power system, without any technical basis or studies to demonstrate the need for a higher standard.

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830PRR-41
Board Action Report
111709

Board Action Report

PRR Number	830	**PRR Title**	**Reactive Power Capability Requirement**
Timeline	Urgent	**Action**	Approved
Date of Decision	November 17, 2009		
Effective Date	December 1, 2009		
Priority and Rank Assigned	Not applicable.		
Protocol Section(s) Requiring Revision	2.1, Definitions 2.2, Acronyms 6.5.7, Voltage Support Service 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability 6.7.6, Deployment of Voltage Support Service		
Revision Description	This Protocol Revision Request (PRR) clarifies the Reactive Power capability requirement for all Generation Resources, including existing Wind-powered Generation Resources (WGRs) who are not able to meet the 0.95 lead/lag requirement with the Generation Resource's Unit Reactive Limit (URL). WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before December 1, 2009 may meet the Reactive Power requirements through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices.		
Reason for Revision	Clarification of Reactive Power capability requirements on a going-forward basis and path to compliance for certain WGRs that are not able to meet the 0.95 lead/lag requirement at the Point of Interconnection (POI) based on the Generation Resource's URL.		
Overall Market Benefit	Provides additional clarity to the reactive requirements for wind generation.		
Overall Market Impact	Unknown.		
Consumer Impact	None.		
Credit Impacts	ERCOT Credit Staff and the Credit Work Group (Credit WG) have reviewed PRR830 and do not believe that it requires changes to credit monitoring activity or the calculation of liability.		
Relevance to Nodal Market	Yes. The Reactive Power capability requirements exist in Nodal as well.		

Board Action Report

Nodal Protocol Sections Requiring Revision	2.1, Definitions 2.2, Acronyms and Abbreviations 3.15, Voltage Support 6.5.7.7, Voltage Support Service
Procedural History	➢ On 9/08/09, PRR830, a preliminary Impact Analysis, and CEO Revision Request Review were posted. ➢ On 9/10/09, PRR830 was granted Urgent status via a PRS e-mail vote. ➢ On 9/15/09, Horizon Wind Energy LLC comments were posted. ➢ On 9/17/09, PRS considered PRR830. ➢ On 9/28/09, Calpine comments were posted. ➢ On 10/7/09, Iberdrola Renewables comments were posted. ➢ On 10/8/09, a second set of Horizon Wind Energy LLC comments were posted. ➢ On 10/8/09, LCRA comments were posted. ➢ On 10/19/09, ROS comments were posted. ➢ On 10/21/09, Wind Coalition comments were posted. ➢ On 10/22/09, Vestas comments were posted. ➢ On 10/22/09, PRS again considered PRR830. ➢ On 10/22/09, NextEra Energy Resources comments were posted. ➢ On 10/26/09, the Impact Analysis was posted. ➢ On 10/28/09, a second set of Calpine comments were posted. ➢ On 10/29/09, Oncor comments were posted. ➢ On 10/29/09, ERCOT comments were posted. ➢ On 10/30/09, AEP comments were posted. ➢ On 11/2/09, Invenergy comments were posted. ➢ On 11/3/09, a second set NextEra Energy Resources comments were posted. ➢ On 11/3/09, a third set of Horizon Wind Energy LLC comments were posted. ➢ On 11/4/09, a second set of Vestas comments were posted. ➢ On 11/5/09, TAC considered PRR830. ➢ On 11/6/09, the NextEra Energy Resources appeal was posted. ➢ On 11/10/09, the NextEra Energy Resources appeal supporting documents were posted. ➢ On 11/10/09, a second set of AEP comments were posted. ➢ On 11/10/09, AES comments were posted. ➢ On 11/10/09, the Horizon position statement was posted. ➢ On 11/10/09, a second set of ONCOR comments were posted. ➢ On 11/10/09, the TAC Advocate position statement was posted. ➢ On 11/10/09, an ERCOT ISO position statement was posted. ➢ On 11/10/09, the TAC Advocate supporting document was posted. ➢ On 11/10/09, a second set of Wind Coalition comments were

	posted. ➢ On 11/17/09, RES America Developments comments were posted. ➢ On 11/17/09, a second set of AES comments were posted. ➢ On 11/17/09, the ERCOT Board considered PRR830. ➢ On 11/20/09, the NextEra Energy Resources ERCOT Board presentation was posted.
PRS Decision	On 9/17/09, PRS unanimously voted to table PRR830 for one month and to encourage ROS to provide comments on PRR830. All Market Segments were present for the vote. On 10/22/09, PRS voted to recommend approval of PRR830 as endorsed by ROS. The motion passed via roll call vote. All Market Segments were present for the vote.
Summary of PRS Discussion	On 9/17/09, there was discussion regarding the appeal currently at the Public Utility Commission of Texas (PUCT) which stemmed from an ERCOT interpretation of the current Protocols regarding Reactive Power. It was debated whether or not the proposed content of PRR830 was being addressed in the contested case. On 10/22/09, ERCOT Staff explained that PRR830 is not intended to change the philosophy of the Protocols. ERCOT Staff also provided clarification of the proposed change to the WGR definition, and noted that dynamic devices will be required going forward, but that existing WGRs can meet the requirement with static devices. There was also discussion regarding the use of the "cone" versus the "rectangle" for Reactive Power capability and that having differing requirements makes planning difficult and may pose fairness and grid stability issues. Some Market Participants expressed concerns that requirements of PRR830 would impose costs to retrofit existing units and that studies should be performed to demonstrate need.
TAC Decision	On 11/5/09, TAC voted to recommend approval of PRR830 as recommended by PRS in the 10/22/09 PRS Recommendation Report and as amended by the 10/29/09 ERCOT comments. All Market Segments were present for the vote.
Summary of TAC Discussion	On 11/5/09, TAC reviewed PRR830 comments. A Market Participant proposed including language that allowed a hybrid solution to meet Reactive Power capability requirements. ERCOT Staff explained that paragraph (6) of Section 6.5.7.1 allows Market Participants to submit alternative proposals to ERCOT for meeting the requirement, which could include a hybrid solution. Some Market Participants opined that changing the definition of WGR would have repercussions not only where "WGR" is used in the Protocols or market guides, but could also create complications in instances where the terms "generator," "Resource," or "unit" are

	used. ERCOT Staff contended that the definition change is needed in order to ensure that ERCOT has an accurate representation of each WGR's Reactive Power capability. Questions were raised regarding ERCOT's acceptance of the "triangle" that was provided in the Resource Asset Registration Forms (RARFs). ERCOT Staff explained that the RARFs should provide an accurate representation of what a unit is physically capable of doing and should not be taken as a substitute for the requirements in the Protocols, which require the "rectangle". Some Market Participants expressed concern regarding retrofits to existing units. It was stated that in the past, most rules that would impose cost on existing units were implemented on a prospective basis unless there was a demonstrated need, and it was argued that at this point, there has been no evidence provided indicating that there is a need to retrofit. Others countered that if generators are not operating in the "rectangle" as the current system was designed that it is a reliability issue versus a cost issue since the risk of a voltage collapse increases as you increase capacity not operating within the "rectangle."
Board Decision	On 11/17/09, the ERCOT Board approved PRR830 as recommended by TAC in the 11/5/09 TAC Recommendation Report and rejected the NextEra Energy Resources appeal.

Quantitative Impacts and Benefits			
Assumptions	1		
	2		
	3		
	4		
Market Cost		**Impact Area**	**Monetary Impact**
	1		
	2		
	3		
	4		
Market Benefit		**Impact Area**	**Monetary Impact**
	1	*Clarifies the reactive requirements for wind generation.*	
	2		
	3		
	4		
Additional Qualitative Information	1		
	2		
	3		
	4		
Other Comments	1		
	2		
	3		

Board Action Report

	4	

Sponsor	
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Cell Number	
Market Segment	N/A

Market Rules Staff Contact	
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Comments Received	
Comment Author	**Comment Summary**
Horizon Wind Energy LLC 091509	Recommended that PRR830 be rejected as submitted.
Calpine 092809	Supported approval of PRR830.
Iberdrola Renewables 100709	Suggested existing Protocol language is clear. Proposed additional revisions only as an alternative to the ERCOT proposed changes.
Horizon Wind Energy LLC 100809	Opined that PRR830 is contrary to existing Protocols, and is proposed without demonstration of need. Commented that PRR830 re-defines Reactive Power capability requirements for Generation Resources interconnected with the ERCOT Transmission Grid, imposing new requirements on WGRs and requiring retrofits to the majority of operating WGRs.
LCRA 100809	Proposed clarifying language which would allow Resources to start at lower voltage levels. Also proposed changes related to establishing Reactive Power requirements.
ROS 101909	Endorsed PRR830 as submitted.
Wind Coalition 102109	Provided alternative language to the definition of a WGR and the subsequent changes that are intended to improve the modeling of wind-powered generation reactive capabilities.
Vestas 102209	Stated that if PRR830 is adopted as proposed, it may unnecessarily increase the costs of WGRs in Texas with no improvements in reliability. Suggested that hybrid systems that have the effective

	performance of a fully dynamic system should be allowed.
NextEra Energy Resources102209	Recommended that PRS reject PRR830 and instead recommended that PRR835 be approved.
Calpine 102809	Responded to NextEra's 10/22/09 comments and supported ERCOT's efforts to maintain system reliability and the fairness found in PRR830.
Oncor 102909	Supported ERCOT's efforts to maintain system reliability with PRR830.
ERCOT 102909	Provided comments to support the need for the WGR definition change. Also proposed additional language changes which revised the effective date in both the Revision Description and in paragraph (2) of Section 6.5.7.1 to December 1, 2009 and provided administrative edits and clarification to proposed language revisions.
AEP 103009	Supported the passage of PRR830.
Invenergy 110209	Proposed the addition of paragraph (12) to Section 6.5.7.1 to clarify the requirements and approximated the treatment afforded to other types of Generation Resources that have multiple turbines behind the same POI such as combined cycle units
NextEra Energy Resources 110309	Incorporated concepts and specific amendments proposed in comments submitted by LCRA (10/08/09), The Wind Coalition (10/21/09), ERCOT (10/29/09), and Invenergy (11/02/09). Also proposed additional language changes that utilized the "rectangle" requirement for all technologies as proposed by ERCOT.
Horizon Wind Energy 110309	Recommended that PRR830 be rejected.
Vestas 110409	Provided additional language changes so that dynamic VAR capable devices would include hybrid devices and would be considered as an acceptable alternative to meet ERCOT's Reactive Power interconnection requirement.
NextEra Energy Resources 110609	Appealed the TAC action of recommending approval of PRR830. Opined that TAC erred in its decision with respect to technical concerns raised but not resolved in the proposed language and that PRR830 contradicts previous ERCOT Board policy on imposing new technical capabilities on existing Resources.
NextEra Energy Resources 111009	Opined that PRR830 does not meet the ERCOT policy standard for retroactive application of technical capabilities; that further examination of technical issues is needed; that PRR830 does not maximize Consumer benefit; that Protocols can only be revised and not clarified; that the Alternative Dispute Resolution (ADR) process should not be circumvented; and that the NextEra proposal would address issues prospectively while allowing the PUCT to interpret Protocols retrospectively. Provided additional supporting documents for position.
AEP 111009	Stated support for TAC recommendation and provided examples for AEP's belief that the ERCOT Transmission Grid has significant Reactive Power deficiency that is directly correlated to WGRs.

	Suggested the NextEra proposed language would require TSPs to submit reactive element upgrades and opined that related costs should be borne by those causing the costs.
AES 111009	Suggested PRR830 should not be implemented as recommended by TAC because: 1) PRR830 requires voltage and power factor capabilities higher than the Federal Energy Regulatory Commission (FERC) 661A requirements for which ERCOT has not demonstrated the need; 2) PRR830 is a piecemeal approach and ERCOT should take a comprehensive approach along with the Low Voltage Ride Through study; and 3) PRR830 retroactively changes the interconnection requirements for operating wind projects with no documented need.
Horizon Wind Energy LLC 111009	Suggested PRR830 does not clarify existing Protocols and will create hardships on a sub-segment of generation. Provided documents to support position.
Oncor 111009	Noted support for PRR830 and described principles needed for the bulk power system to operate reliably. Provided documents to support position.
TAC Advocate 111009	Explained the TAC position on PRR830 highlighting the discussion and vote tallies at various stakeholder meetings. Noted support was due to reliability concerns for the grid as well as desire that all generators be treated equitably. Highlighted need to ensure that the system is operated in manner in which it was planned and built and suggested further study is not needed as generators have a fixed reactive capability requirement.
ERCOT 111009	Requested rejection of the NextEra appeal and approval of PRR830 as recommended by TAC to preserve important reliability requirements, to maintain parity among Generation Resources, and to reduce uplift of costs to Load.
Wind Coalition 111009	Supported creating aggregations of actual wind-powered turbines of the same type for modeling purposes but argued the redefinition of WGRs will make WGRs "units" for all purposes in the Protocol and market guides.
TAC Advocate 111109	Provided a supporting document to review PRR830 procedural history, to note Reactive Power requirements and the applicability to existing Generation Resources, and to counter the argument for additional studies to determine need.
RES America Developments Inc. 111709	Requested that the ERCOT Board not approve PRR830 because it will force some existing Generation Resources to retrofit equipment which would impose additional costs on the Generation Resource which would more efficiently be realized by TSPs. Suggested a technical study should be performed to determine whether Reactive Power response via the triangle is inadequate to maintain reliability.
AES 111709	Provided chronological summary and list of parties participating in the proceedings related to FERC Order 661A.
NextEra Energy	Opined that reinterpreting existing Protocols and applying them

Resources 112009	retroactively is bad policy and a bad precedent. Suggested the following were myths: 1) reliability requires PRR830 and 2) PRR830 is nothing new.

Revised Proposed Protocol Language

2.1 Definitions

Point of Interconnection (POI)
The location(s) where a Generation Entity's interconnection Facilities connect to the Transmission Facilities as reflected in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and a Transmission and/or Distribution Service Provider (TDSP).

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Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind. Wind turbines may be aggregated together to form a WGR if each turbine is the same model and size and located behind the same Generator Step Up (GSU) transformer.

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2.2 Acronyms

POI Point of Interconnection
GSU Generator Step UpSGIA Standard Generation Interconnection Agreement

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6.5.7 Voltage Support Service

All Generation Resources (including self-serve generating units) that have a gross generating unit rating greater than twenty (20) MVA or those units connected at the same Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

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6.5.7.1 Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS

(1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT. Generation Resources shall comply with the following Reactive Power requirements: an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ERCOT Transmission Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the POI. The Reactive Power requirements shall be

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available at all MW output levels and may be met through a combination of the Generation Resource's Unit Reactive Limit (URL), which is the generating unit's dynamic leading and lagging operating capability, and/or dynamic VAR capable devices. For Wind-powered Generation Resources (WGRs), the Reactive Power requirements shall be available at all MW output levels at or above 10 percent (10%) of the WGR's nameplate capacity. When a WGR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT may require a WGR to disconnect from the ERCOT System. The Reactive Power requirements of this paragraph shall apply to all Generation Resources except as otherwise provided in paragraphs (2) through (4) below.

(2) WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before December 1, 2009, must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (1) above. However, the Reactive Power requirements may be met through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices. WGRs shall comply with the Reactive Power requirements of this paragraph by no later than December 31, 2010, unless it is known by July 31, 2010, that related retrofits are required by the Voltage Ride-Through study conducted in accordance with Operation Guide Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-powered Generation Resources, in which event ERCOT may in its discretion modify the deadline for an affected WGR. ERCOT, in its sole discretion, also may grant an extension of time for other reasons.

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(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the qualified renewable Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

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(4) New generating units connected before May 17, 2005, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to February 17, 2004, based upon previous standards, whose design does not allow them to meet the Reactive Power requirements established in paragraph (1) above, will be required to maintain a Reactive Power requirement as defined by the Generation Resource's URL that was submitted to ERCOT and established per the criteria in the Operating Guides.

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(5) For purposes of meeting the Reactive Power requirements in paragraphs (1) and (2) above, multiple generation units including wind turbines shall, at a Generation Entity's option, be treated as a single Generation Resource or WGR if the units are connected to the same transmission bus.

Deleted: Upon request to, and with the approval of ERCOT, multiple generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these URL requirements only.

(6) Generation Entities may submit to ERCOT specific proposals to meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices. ERCOT may, at its sole discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall provide the submitter an explanation of its decision.

(7) A Generation Resource and TDSP may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1).

(8) Unless specifically approved by ERCOT, no unit equipment replacement or modification at a Generation Resource shall reduce the capability of the unit below the Reactive Power requirements that applied prior to the replacement/modification.

(9) Generation Resources shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

(10) WGRs must provide a Real Time Supervisory Control and Data Acquisition (SCADA) point that communicates to ERCOT the number of wind turbines that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid. WGRs must also provide two (2) other Real Time SCADA points that communicate to ERCOT the following:

(a) The number of wind turbines that are not able to communicate and whose status is unknown; and

(b) The number of wind turbines out of service and not available for operation.

WGRs must comply with the requirements of paragraph (10) by no later than June 1, 2010.

(11) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by automatically switchable static VAR capable devices.

6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or Transmission and/or Distribution Service Providers (TDSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional Megavolt Ampere Reactive (MVAR), nor will they be requested to operate on a voltage schedule

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Deleted: Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements.

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outside the URL specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

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(2) ERCOT and TDSPs shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, GSU transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

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(3) The TDSP, under ERCOT direction, is responsible for monitoring and ensuring that all Generation Resources required to provide VSS dynamic reactive sources in a local area are deployed in approximate proportion to their respective installed Reactive Power capability requirements.

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(4) All Generation Resources required to provide VSS shall support the transmission voltage at the POI to the ERCOT Transmission Grid, or at the transmission bus in accordance with paragraph (5) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

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(5) The QSEs providing VSS shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

Deleted: (5) At all times a Generation Resource unit required to provide VSS is On-line, the URL must be available for utilization at the generating unit's continuous rated active power output, and Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any Reactive Power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP.¶

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An induction generator may elect to make a contribution in aide of construction in lieu of meeting the installed capacity VSS requirements contained herein. In order to comply with the VSS requirements under this paragraph (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to that used to collect payments for the direct assignment of interconnection Facilities under applicable Public Utility Commission of Texas (PUCT) rules. The level of payment shall reflect the cost to the TDSP of procuring, installing, operating, and maintaining any Reactive Power equipment required to replace the Reactive Power capability that otherwise would be necessary for the interconnection of the generator. In order for this paragraph (7) to be effective for VSS compliance, the TDSP shall certify to ERCOT that the induction generator has complied with these requirements.

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For Generation Resources required to provide VSS

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, unless specifically approved by ERCOT

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six (6) months after the effective date of this paragraph

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months after the effective date of this paragraph

830PRR-42
NextEra Energy Resources Board Presentation
112009

PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement

Date	November 20, 2009

Submitter's Information	
Name	Dave Markarian
E-mail Address	David.Markarian@nexteraenergy.com
Company	NextEra Energy Resources
Phone Number	
Cell Number	
Market Segment	Independent Generator

Comments

Please see PowerPoint presentation named 830PRR-42 NextEra Energy Resources Board Presentation 112009.ppt.

Dave Markarian, Esq.

Managing Attorney,
NextEra Energy Resources
Litigation & State Regulatory

NEXTera ENERGY RESOURCES

Bad Policy

Reinterpreting Existing Protocols and Applying Them Retroactively is **Bad Policy**

NEXTera ENERGY RESOURCES

NextEra – A Reliability Leader

- We understand and take reliability concerns very seriously
- A reliability leader in ERCOT – **we seek to do the right thing**

NEXTera ENERGY RESOURCES

First Myth

Reliability Requires PRR 830

NEXTera ENERGY RESOURCES

Myth – Reliability

- No System Emergencies

NEXTera ENERGY RESOURCES

Second Myth:

PRR 830 Is Nothing New

NEXTera ENERGY RESOURCES

ERCOT Claims PRR 830 Is Nothing New

ERCOT Reactive Power Requirements

- Existing Protocol vetted through the stakeholder process in 2003 and 2004 with multiple opportunities for comment and changes
- Requirements have been in place for several years
- Requirements for generators and loads are fixed; i.e., the requirements do not increase or decrease as needs vary over time
- Incremental needs identified by engineering analysis to ensure remaining voltage stability requirements are provided by transmission owners

Requirements have been in place for several years

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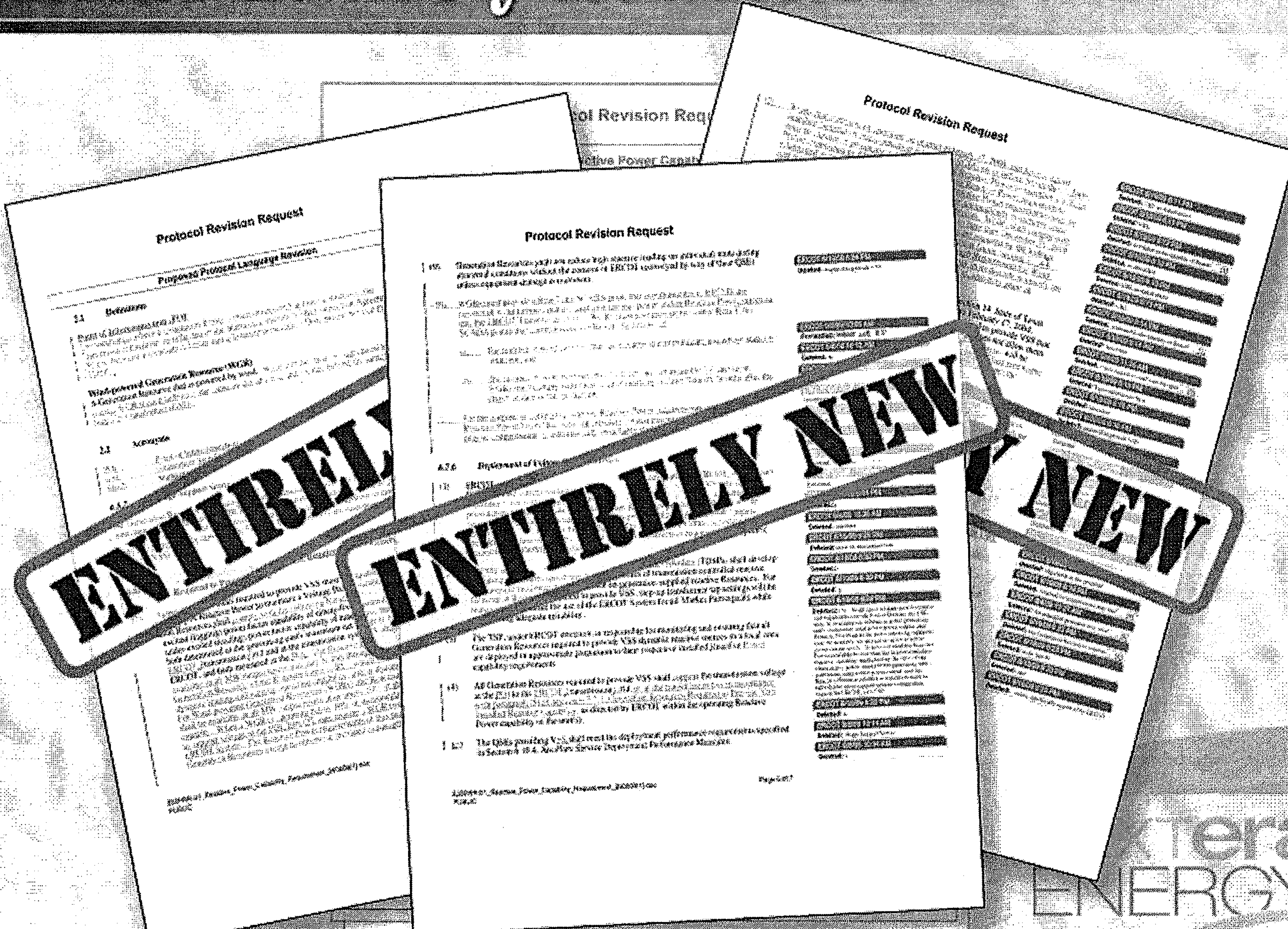
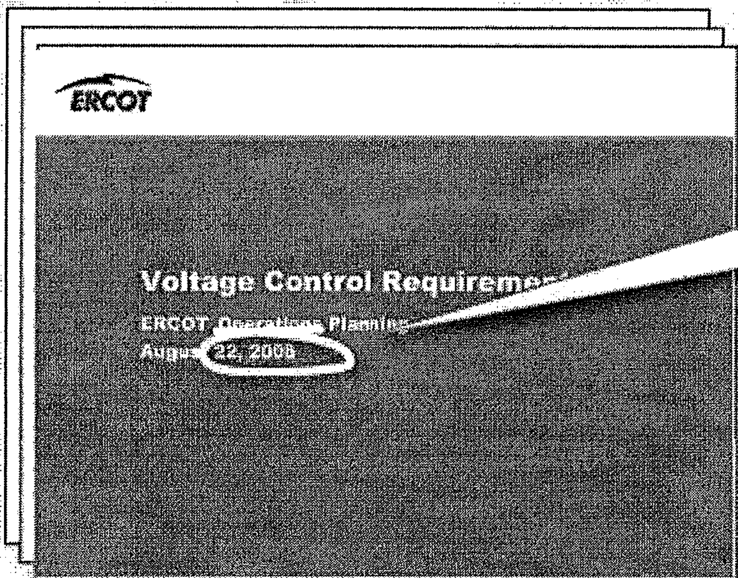
PRR Is Entirely Rewritten



NextEra ENERGY RESOURCES

ERCOT "Requirements"



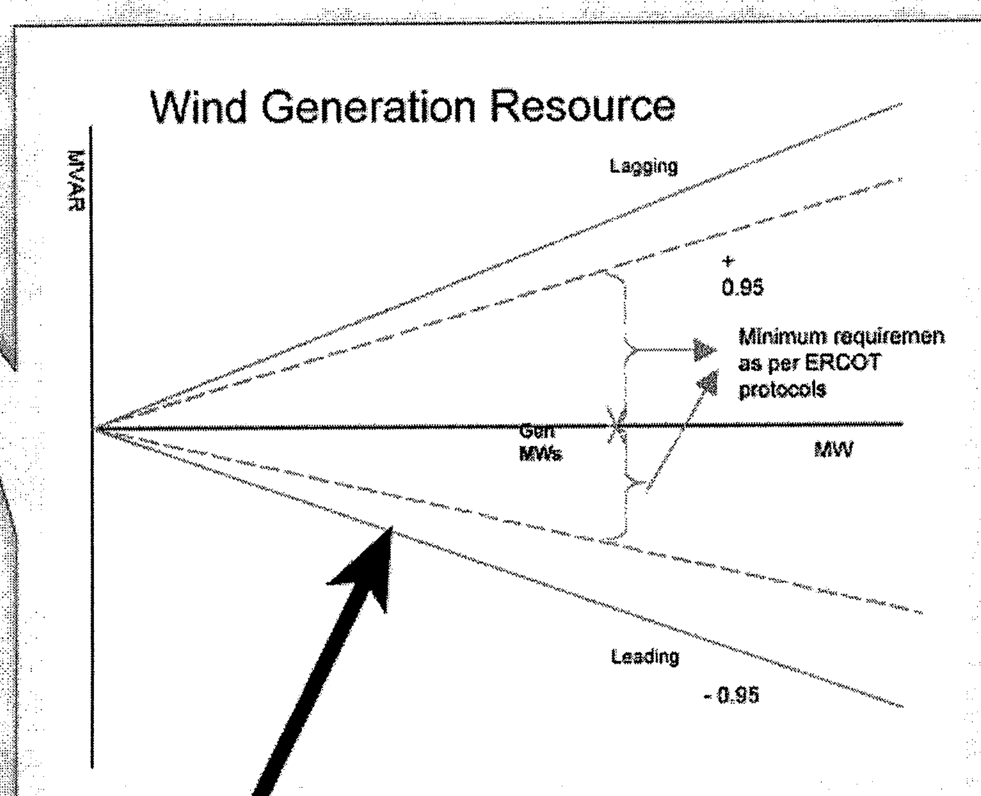
2008

ERCOT "Requirements"

ERCOT

Voltage Control Requirement

ERCOT Operations Planning
August 22, 2008



The Triangle

NEXTera ENERGY RESOURCES

Conventional Generator

- Shown to the right are the reactive capability curves for a conventional generator and a WGR

Shown to the right are the reactive capability curves for a conventional generator and a WGR

MVAR at Point of Interconnect

- Wind generation output equals 0 MW, MVAR requirement = 0 MVAR at Point of Interconnect

August, 2008

0.95 PF requirement for generators

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- As seen from the figures, each generator is required to provide a + 0.95 to -0.95 pf voltage support
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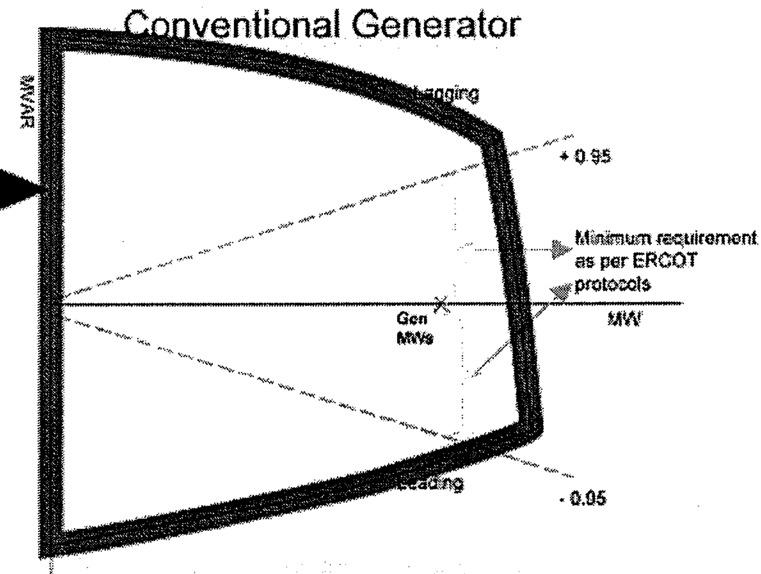
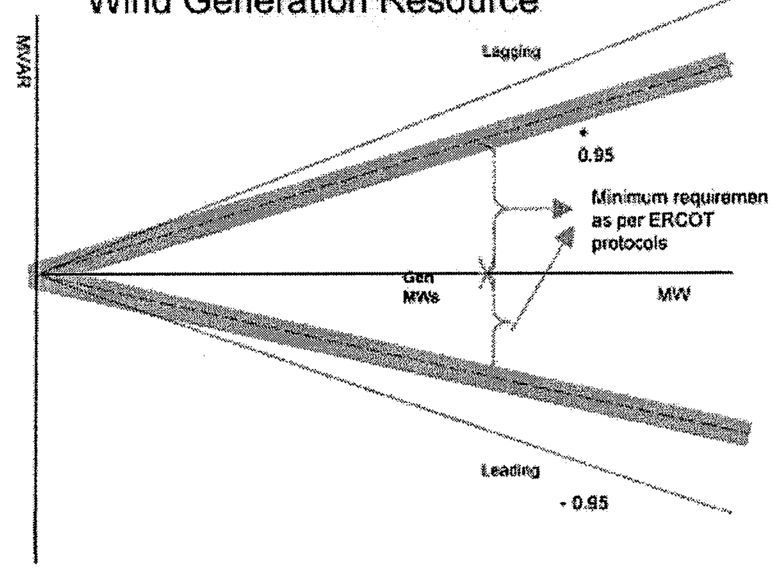
Conventional Generator



Wind Generation Resource



ERCOT

August, 2008

- **ERCOT APPROVED** Transmission Interconnection Service Provided To Wind Farms

NEXTera ENERGY RESOURCES

ERCOT Would Not Approve Anything That Adversely Affected Reliability

NEXTera ENERGY RESOURCES

§25.361

ERCOT SHALL:

(6) Accept and **supervise** all requests for interconnection

(9) **Plan** the transmission system

NEXTera ENERGY RESOURCES

Known to ERCOT:

- At Least 80 RARFs Submitted To and Approved By Ercot

NEXTera ENERGY RESOURCES

Known to ERCOT:

- RARFs Demonstrated Wind Was Not Designed To Meet The Rectangle

NextEra Energy Resources

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- Local TSPs Performed Interconnection Studies Based Upon Triangle

NEXTera ENERGY RESOURCES

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NEXTera ENERGY RESOURCES

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- ERCOT Approved The Transmission Interconnection

Retroactivity Sets Bad Precedent

- Retroactivity Can Be Imposed Upon ***Anyone***

Retroactivity Sets Bad Precedent

- Imposes Regulatory Risk On Future Investment Decisions

NEXTera ENERGY RESOURCES

Retroactivity Sets Bad Precedent

- Will Chill Future Investment Decisions in Texas

Departure From Precedent

- Historically, the Board has been committed to a reasonable policy precedent:
  - Evolving technical requirements should be applied on a going forward basis…
  - …***unless compelling evidence supporting retroactive application is presented.***

NEXTera ENERGY RESOURCES

ERCOT

Request for Proposal:

Analysis and Design of Series Compensation and other Reactive Equipment for the Transmission Improvements Designated to Serve Competitive Renewable Energy Zones

ENERGY RESOURCES

1.2 Functions of ERCOT

- Ensure access to the transmission and distribution systems for all buyers and sellers of electricity on **nondiscriminatory** terms.
- ...**act in a reasonable, nondiscriminatory manner**.

NEXTera ENERGY RESOURCES

We Should Be Guided By...

- Is it Fair?
- Reasonable?
- Non-Discriminatory?
- Necessary?

NEXTera ENERGY RESOURCES

Dave Markarian, Esq.

Managing Attorney,
NextEra Energy Resources
Litigation & State Regulatory

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NEXTera ENERGY RESOURCES

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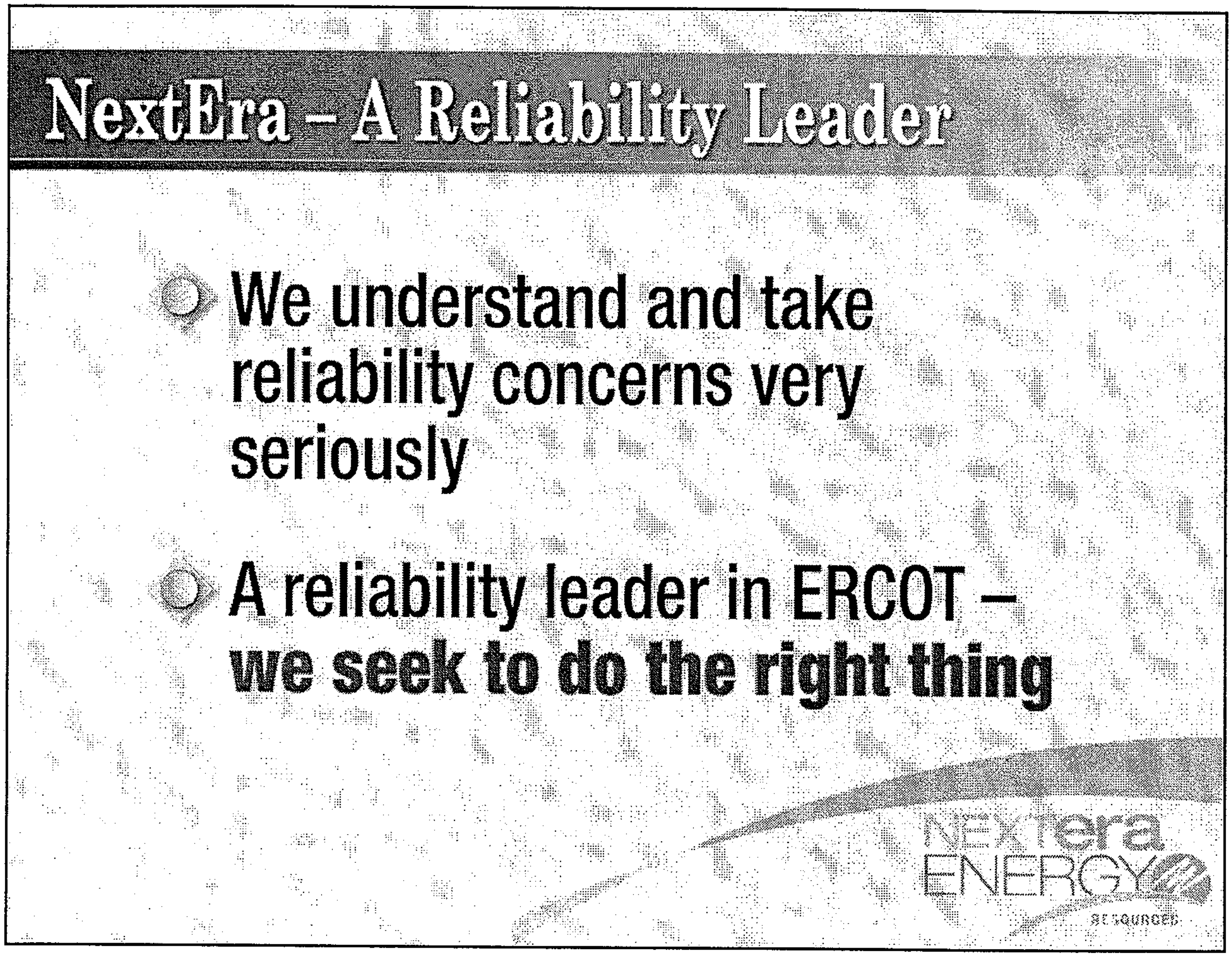
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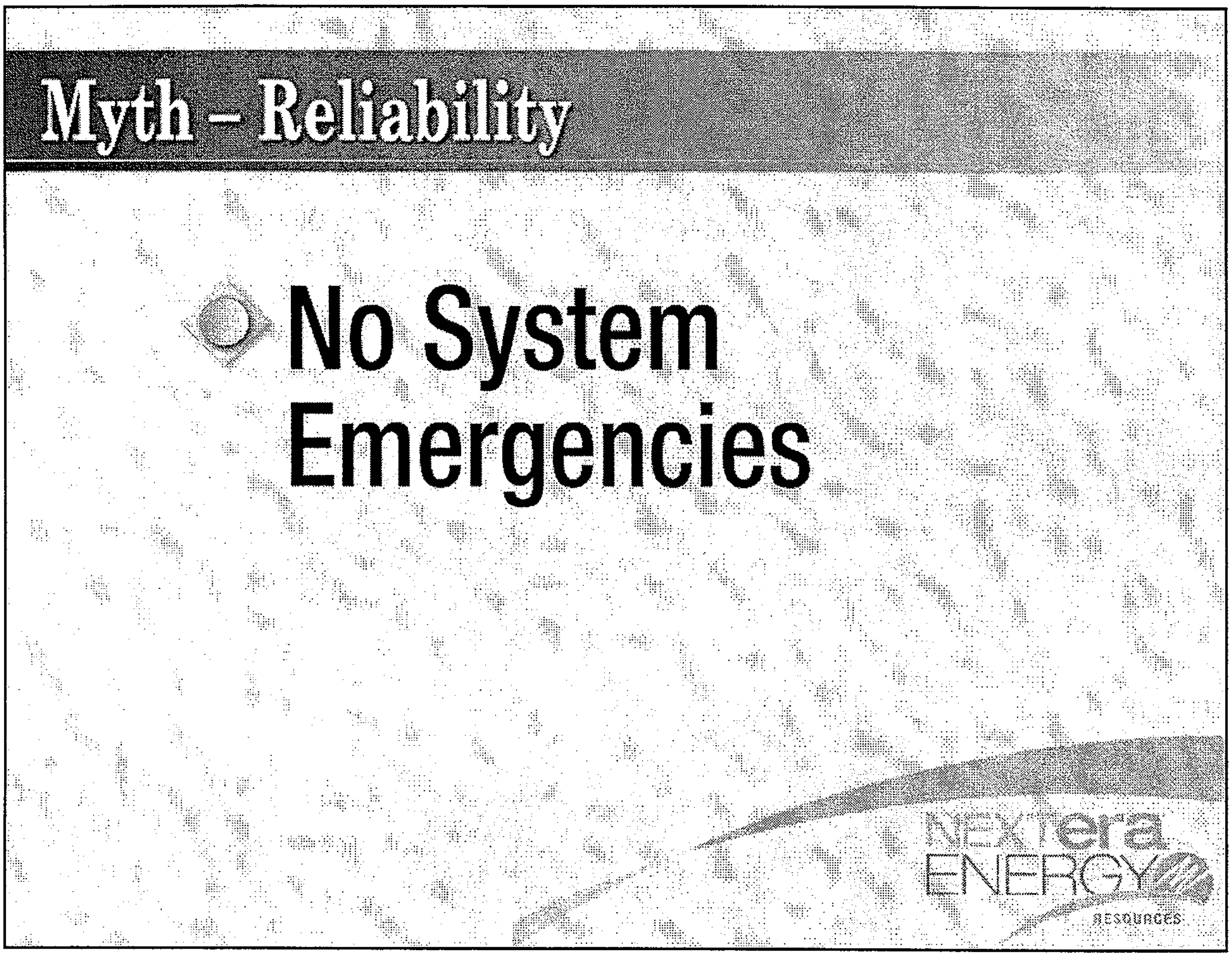
NEXTera ENERGY RESOURCES

First Myth

Reliability Requires PRR 830


Myth – Reliability
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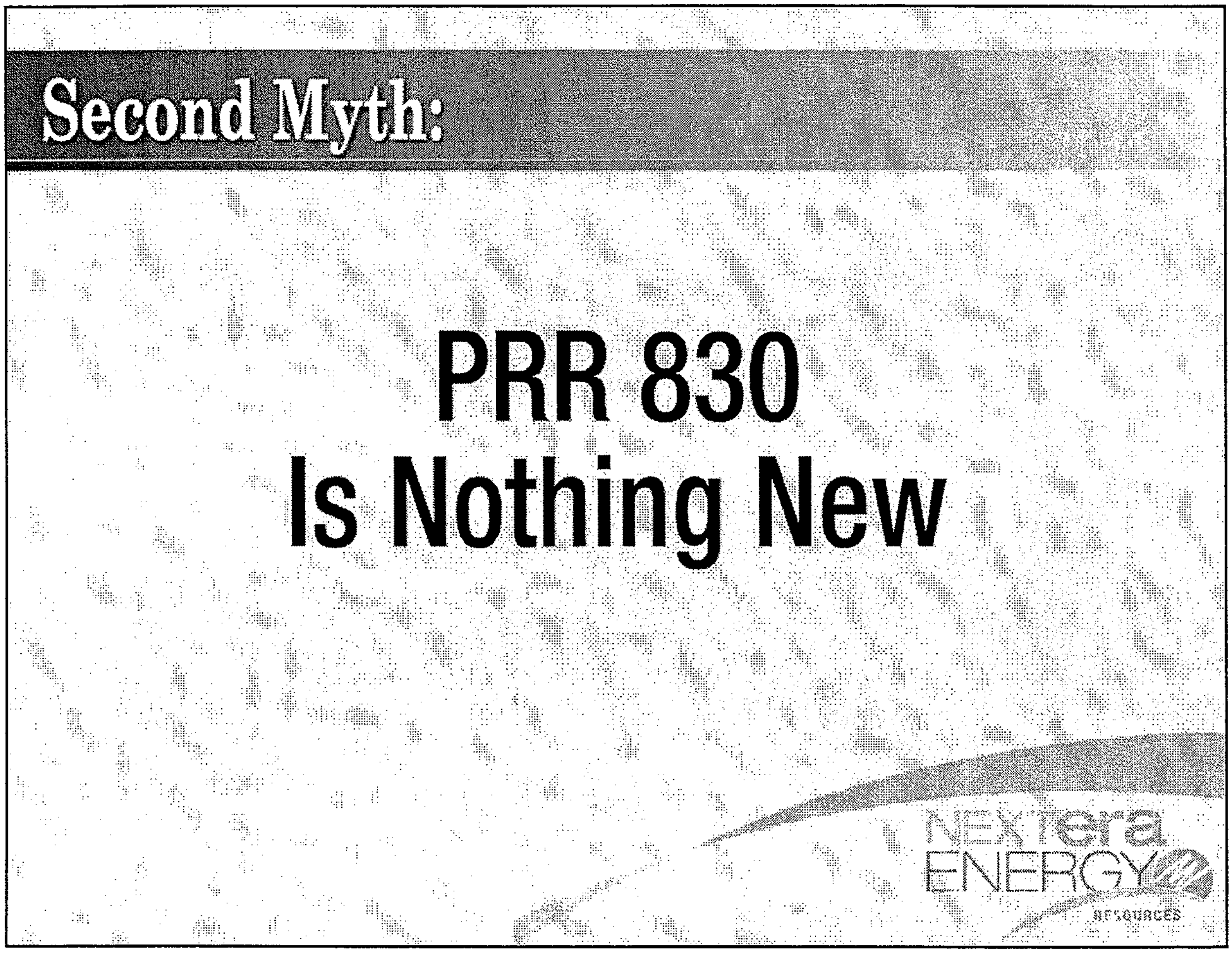
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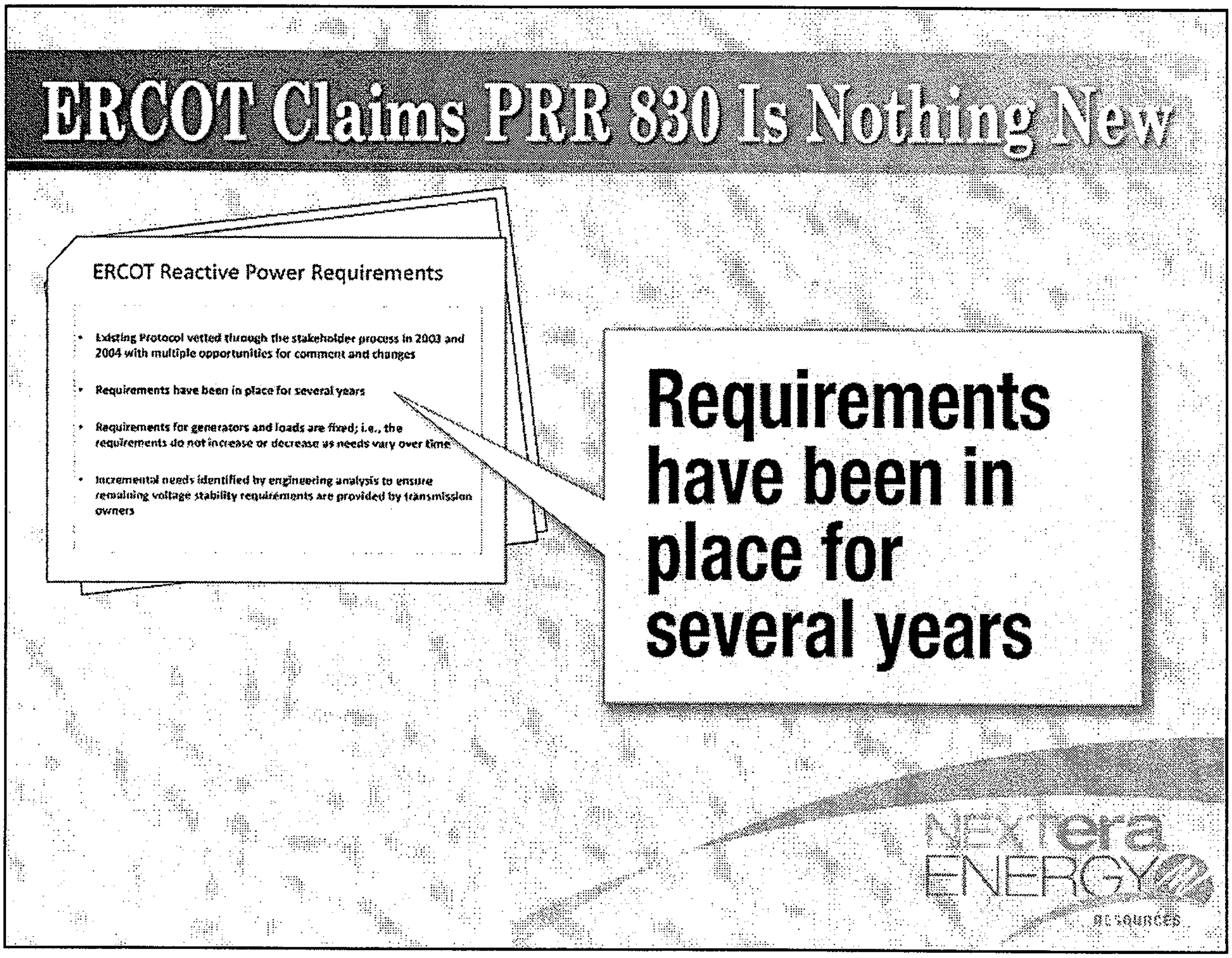
ENERGY
RESOURCES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NextEra ENERGY RESOURCES


PRR Is Entirely Rewritten
Protocol Revision Request
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ENTIRELY NEW
ENTIRELY
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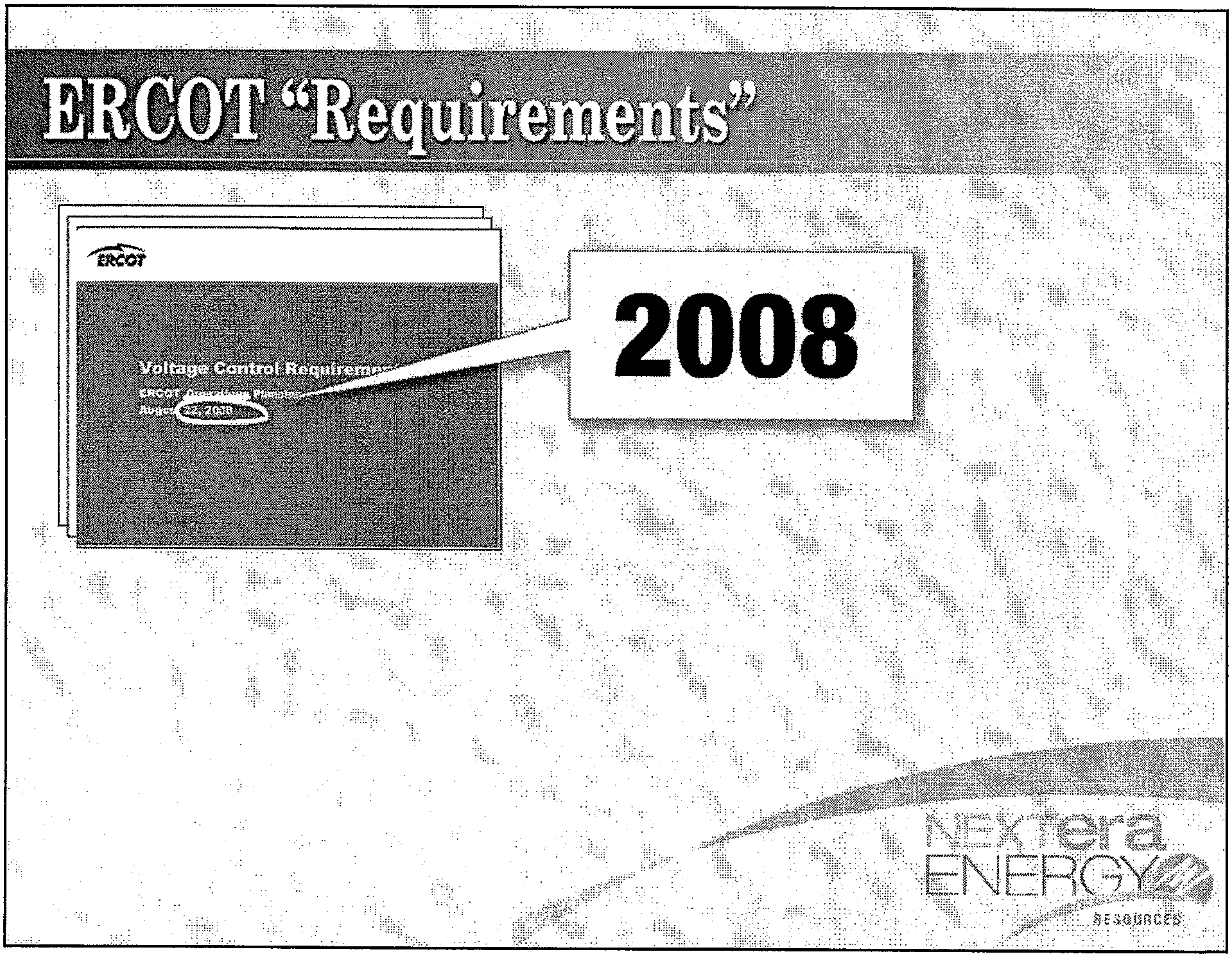
ENERGY
RESOURCES


ERCOT "Requirements"
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2008
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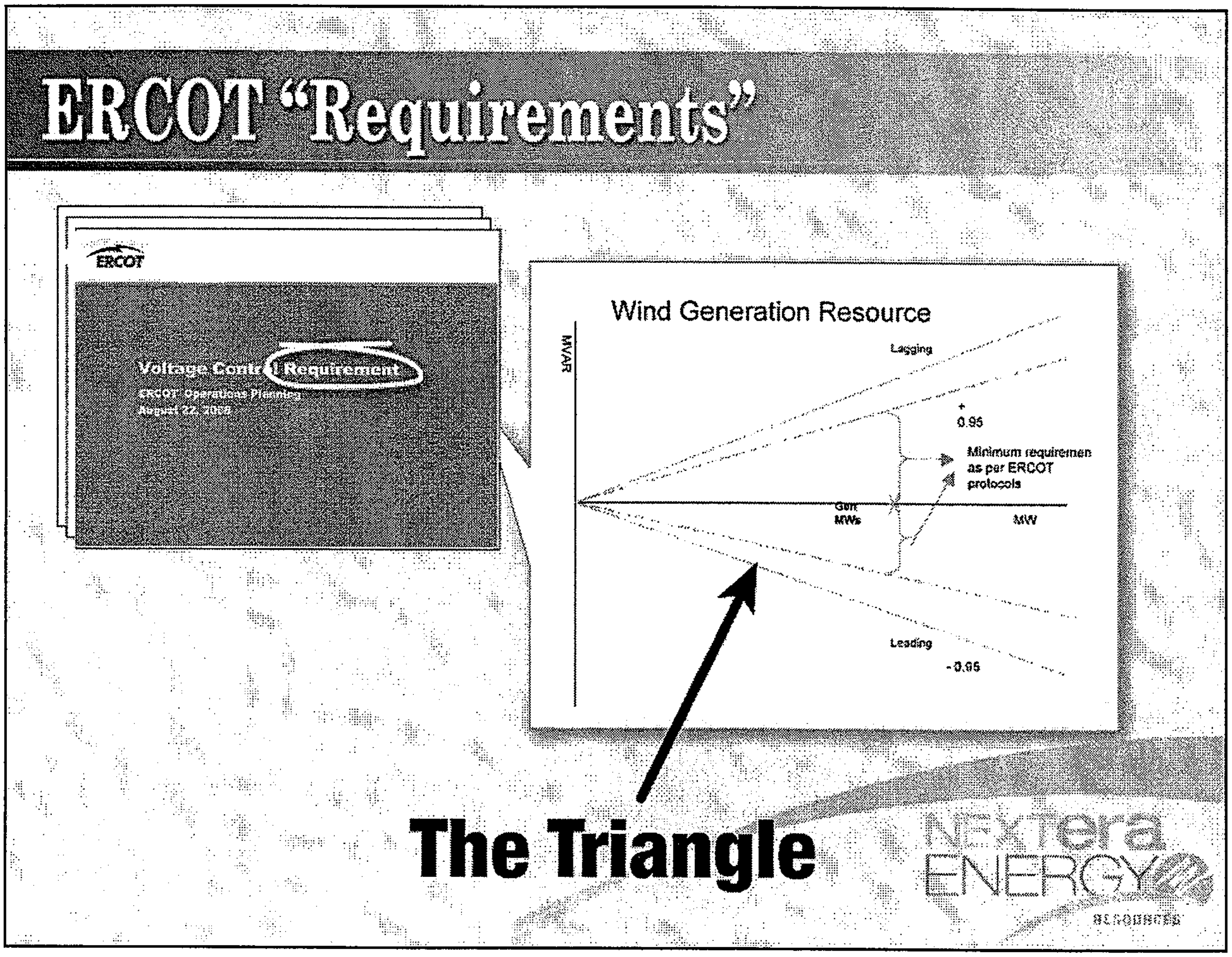
ERCOT "Requirements"
ERCOT
Voltage Control Requirement
ERCOT Operations Planning
August 22, 2006
Wind Generation Resource
MVAR
Lagging
+
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as per ERCOT
protocols
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- 0.95
The Triangle
NEXTera
ENERGY
RESOURCES

10

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August 2008

11

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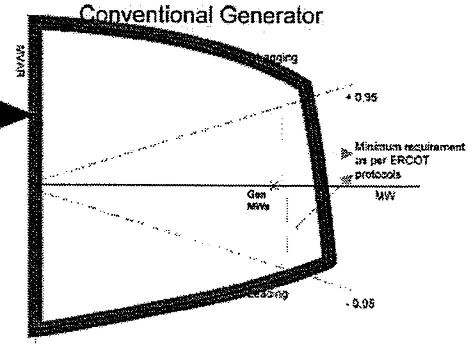
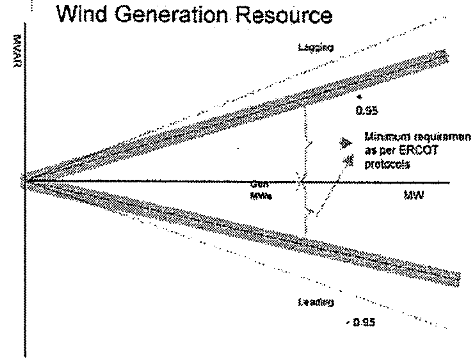


Wind Generation Resource



ERCOT

August, 2008

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12


ERCOT APPROVED
Transmission
Interconnection
Service Provided To
Wind Farms
NEXTera
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RESOURCES

ERCOT Would Not Approve Anything That Adversely Affected Reliability

NEXTera ENERGY RESOURCES

§25.361

ERCOT SHALL:

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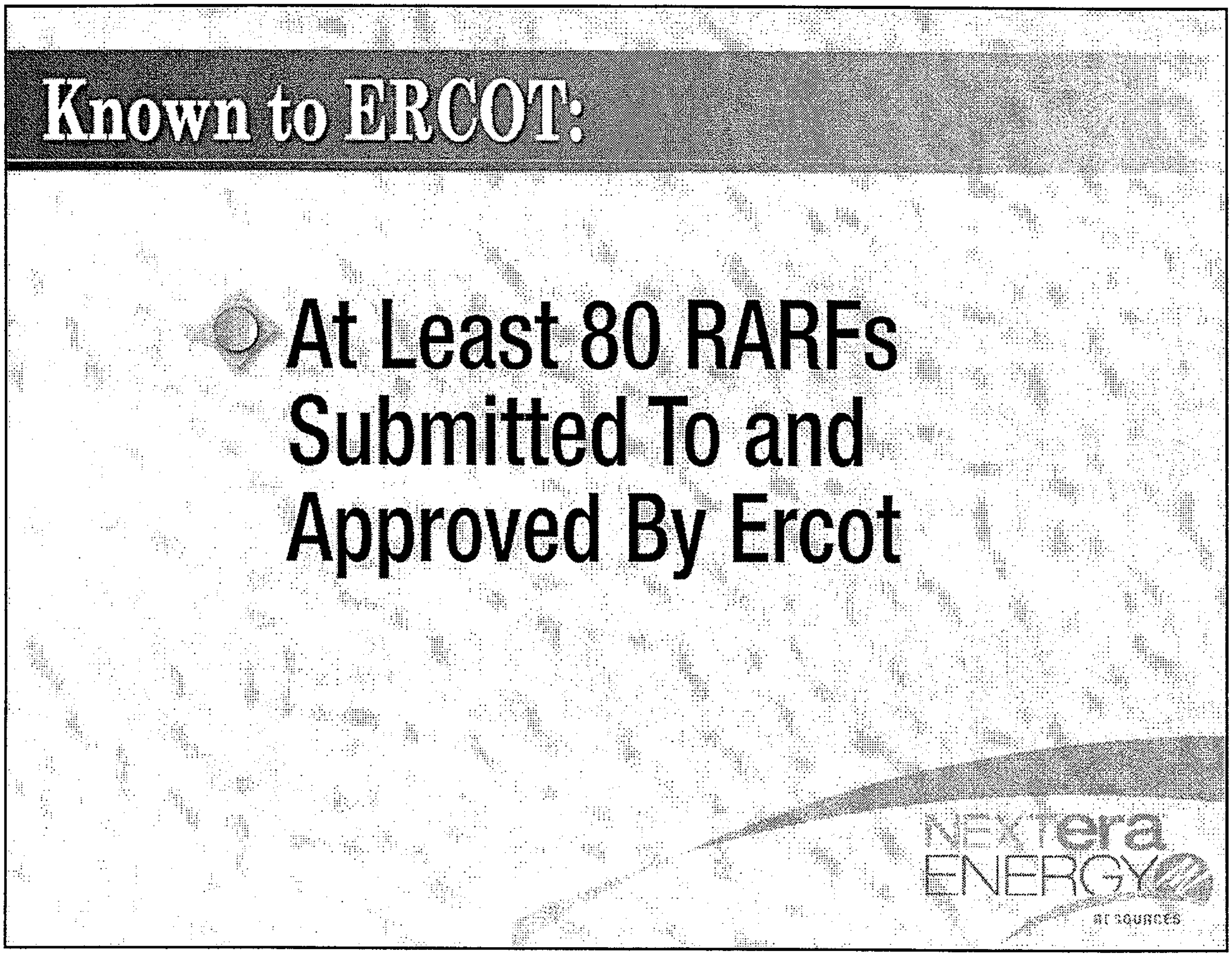
(9) **Plan** the transmission system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NEXTera ENERGY RESOURCES

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NEXTera ENERGY RESOURCES

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NEXTera ENERGY RESOURCES

§25.361

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NEXTera ENERGY RESOURCES

ERCOT Approved The Transmission Interconnection

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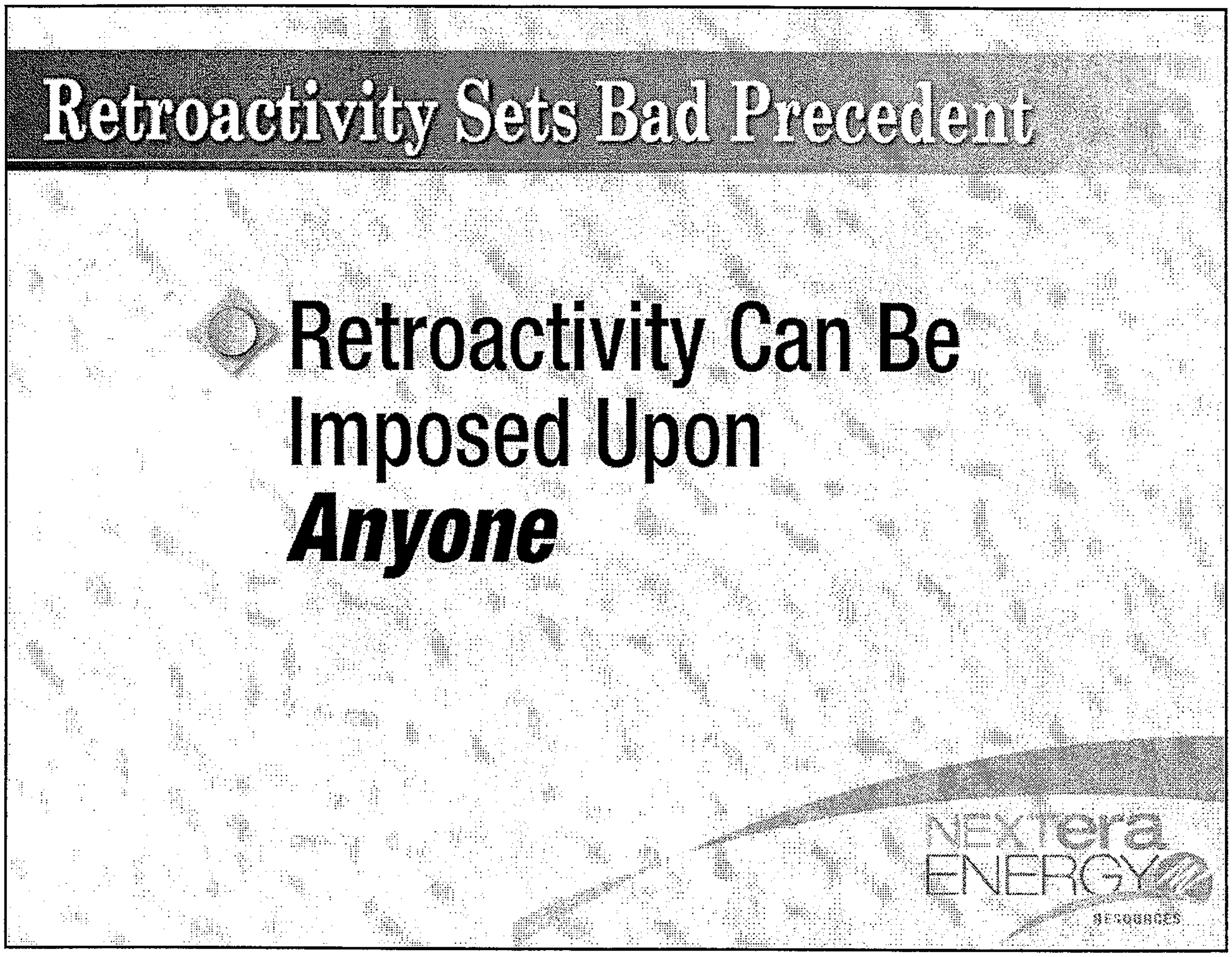
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RESOURCES

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NEXTera ENERGY RESOURCES


Retroactivity Sets Bad Precedent
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NEXTera ENERGY
RESOURCES

Departure From Precedent

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NEXTera ENERGY RESOURCES

Request for Proposal:

Analysis and Design of Series Compensation and other Reactive Equipment for the Transmission Improvements Designated to Serve Competitive Renewable Energy Zones

1.2 Functions of ERCOT

- Ensure access to the transmission and distribution systems for all buyers and sellers of electricity on **nondiscriminatory** terms.
- **...act in a reasonable, nondiscriminatory manner.**

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29

We Should Be Guided By...

- Is it Fair?
- Reasonable?
- Non-Discriminatory?
- Necessary?

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