

RES AMERICA DEVELOPMENTS, §  
INC., WHIRLWIND ENERGY § PUBLIC UTILITY COMMISSION  
L.L.C., AND HACKBERRY L.L.C.'s § OF TEXAS  
APPEAL AND COMPLAINT OF §  
ERCOT DECISION TO APPROVE §  
PRR 830 §

**RES AMERICA DEVELOPMENTS INC., WHIRLWIND ENERGY LLC, AND  
HACKBERRY WIND LLC's APPEAL AND COMPLAINT OF  
ERCOT DECISION TO APPROVE PRR 830**

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DOCKET NO. \_\_\_\_\_

<b>RES AMERICA DEVELOPMENTS, INC., WHIRLWIND ENERGY L.L.C., AND HACKBERRY L.L.C.’s APPEAL AND COMPLAINT OF ERCOT DECISION TO APPROVE PRR 830</b>	<b>§ § § § § §</b>	<b>PUBLIC UTILITY COMMISSION OF TEXAS</b>
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**RES AMERICA DEVELOPMENTS INC., WHIRLWIND ENERGY LLC, AND  
HACKBERRY WIND LLC’s APPEAL AND COMPLAINT OF  
ERCOT DECISION TO APPROVE PRR 830**

Pursuant to P.U.C. PROC. R. 22.251, RES America Developments Inc. and its affiliates Whirlwind Energy LLC and Hackberry Wind LLC (collectively “RES”) file this complaint and appeal of the November 17, 2009 decision of the Board of Directors of the Electric Reliability Council of Texas (“ERCOT”) to approve Protocol Revision Request 830 (“PRR 830”). RES requests that PRR 830 be suspended while this appeal is pending and that, at the conclusion of this proceeding, the Commission reverse ERCOT’s decision and order that PRR 830 not be implemented. The grounds for RES’ appeal are set forth below.

**I. INTRODUCTION**

PRR 830 imposes a dramatic, costly change in the reactive power requirements applicable to Windpower Generation Resources (“WGRs”). Prior to PRR 830, the ERCOT protocols required WGRs to supply Reactive Power in direct proportion to the actual power generated – the so-called “triangle” configuration, referring to its graphical representation. Wind generators’ understanding that they complied with the reactive power protocols by constructing and operating their facilities to meet the “triangle”

requirement was disclosed to ERCOT repeatedly in interconnection and other formal submittals. That ERCOT shared this understanding was evidenced in ERCOT documents and in the absence of any questions or enforcement referrals coming from ERCOT on this subject, despite years of open, widespread use of the triangle configuration.

PRR 830 replaces the triangle with a “rectangle” – WGRs are required to supply Reactive Power at the highest possible level regardless of wind level and actual power output. PRR 830 does not limit this new requirement to wind projects that are now under development, but also applies it to existing facilities – facilities that were planned and financed on the premise that the triangle configuration complied with ERCOT requirements. Compliance with PRR 830 will require expensive retrofits for many existing facilities, and it will add substantial cost to future units.

Advocates of PRR 830 now argue that the ERCOT Protocols have always required the rectangle, and that PRR 830 merely clarifies that interpretation. That position is belied not only by ERCOT documents and the long history of WGR submittals based on the triangle, without reaction from ERCOT, but also by the express language of the protocols. Prior to 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.*”<sup>1</sup> The italicized language unambiguously describes the proportional, triangular requirement.

ERCOT has imposed the costly requirements of PRR 830 in a rush, without conducting a technical study or developing any empirical basis to determine that these

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<sup>1</sup> ERCOT Protocol § 6.7.6(5) as in effect between March 1, 2004 and October 1, 2008.

revisions are needed, or that they will improve rather than impair system reliability. It is not adoption of a costly new protocol requirement in and of itself that has led RES to appeal PRR 830. Rather, it is ERCOT's adoption of a costly requirement that falls only on WGRs, *without any reasoned technical or engineering basis*. 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, with consequent harm to competition and end users.

Lacking a reasoned factual basis, PRR 830 is unlawful in the several respects shown below. It should be reversed to avoid imposing a costly, ill-considered requirement on WGRs. But it should be reversed as well because the requirement that ERCOT actions be grounded in sound technical and economic analysis is essential to the integrity of ERCOT market rules.

## **I. AUTHORIZED REPRESENTATIVES**

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

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RES requests that all information and documents in this proceeding be served on each of the persons above at their respective addresses, fax numbers, or, if e-mail service is authorized, at the respective e-mail addresses.

### **III. RESPONDENT**

The legal representative of Respondent ERCOT is:

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### **IV. STATEMENT OF THE CASE**

*Underlying Proceedings.* ERCOT Staff submitted PRR 830 on September 8, 2009, pursuant to Section 21 of the Protocols. PRR 830 was approved by the Protocol Revisions Subcommittee on October 22, 2009, by the Technical Advisory Commission on November 5, 2009, and by the ERCOT Board on November 17, 2009. The issue of ERCOT's reactive power capability requirements for wind generation resources, the

subject of this appeal, 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.<sup>2</sup> That appeal opposed ERCOT's November 13, 2008, legal interpretation of ERCOT Protocols §§ 6.5.7.1(2) and 6.7.6(5), which is reflected in PRR 830.

***Identity of Directly Affected Entities or Classes.*** The Commission's decision in this matter will affect ERCOT and all WGRs in ERCOT, except for those that commenced operation prior to February 17, 2004 and are therefore exempt from PRR 830.<sup>3</sup>

***Concise Description of Conduct From Which Relief is Sought.*** RES seeks relief from implementation or enforcement of PRR 830.

***Statement of Applicable ERCOT Procedures and Protocols.*** The following ERCOT Protocols are relevant to this appeal: §§ 2.1 (Definitions); 6.5.7.1 (Generation Resources Required to Provide VSS Installed Reactive Capacity); 6.5.7.2 (QSE Responsibilities) and 6.7.6 (Deployment of Voltage Support Service). This appeal also involves consideration of several provisions of the Public Utility Regulatory Act ("PURA"), including, without limitation, PURA §§ 35.104(e), 39.001(c)-39.001(d), 39.904(l), and P.U.C. SUBST. R. 25.362 and P.U.C. PROC. R. 22.251.

This is an appeal from an ERCOT decision regarding a protocol revision request. RES participated in the protocol revision process, specifically commenting on the absence of a study to support PRR 830 and urging ERCOT to defer action until a study

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<sup>2</sup> 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).

<sup>3</sup> See ERCOT Protocol 6.5.7.1(2).

could be completed.<sup>4</sup> ERCOT Protocol section 21.4.11.3 specifies that any Market Participant may appeal any decision by the ERCOT Board within the deadline provided by the Commission's rules. This appeal is filed within 35 days after ERCOT's November 17, 2009 adoption of PRR 830. All prerequisites to appeal under Section 21 of the Protocols have been satisfied, and this appeal is timely filed.

***Statement Related to Suspension.*** RES requests suspension of PRR 830 during the pendency of this appeal, as permitted under P.U.C. PROC. R. 22.251(d)(2) and (i). RES's request for suspension is set out in section IX of this appeal.

***Commission Jurisdiction.*** The Commission has jurisdiction over this appeal under PURA § 39.151 and P.U.C. PROC. R. 22.251.

## **V. ISSUES TO BE ADDRESSED**

1. Whether PRR 830 violates PURA § 39.001(c) and (d) because it discriminates against wind generators and is neither practical nor limited so as to impose the least impact on competition.
2. Whether PRR 830 violates PURA § 35.004(e) because it creates unreasonably discriminatory terms and conditions for the procurement and provision of ancillary services.
3. 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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<sup>4</sup> See 830PRR-39 RES America Developments Comments 111709 (included in Appendix A). The documentary record assembled and posted by ERCOT related to PRR 830, consisting of 42 documents, accompanies this appeal as Appendix A. Individual documents within Appendix A are referred to in this brief using the same identifier used by ERCOT, e.g., 830PRR-01 through 830PRR-42. The transcript of the ERCOT board's discussion of PRR 830 at its November 17, 2009 Meeting is included in Appendix A, immediately following 830PRR-42.



4. Whether ERCOT's approval of PRR 830 was arbitrary and capricious, and unsupported by substantial evidence of a need for changes to ERCOT's reactive power capability requirements.

## **VI. STATEMENT OF FACTS**

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.

PRR 830 requires RES 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.<sup>5</sup> PRR 830, which ERCOT Staff authored, also deleted key substantive elements of the then-existing reactive power capability standard language and included new compliance deadlines.<sup>6</sup>

### **Pre-PRR 830 Protocols**

The reactive power protocols that existed prior to the ERCOT Board's action 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. 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

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<sup>5</sup> ERCOT Protocol § 6.5.7.1(1) (*as amended by PRR 830*).

<sup>6</sup> See Appendix A, 830PRR-01 Reactive Power Capability Requirement 090809 at 4-8.

“reactive power up to the unit’s operating capability be available.” 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.” ERCOT included very similar language in its “Generation Interconnection or Change Request Procedure” dated August 2004, shortly after adoption of the pre-PRR 830 reactive power requirements.

Prior to 2008, ERCOT required all generation resources to complete a reporting form entitled the Generation Resource Asset Registration Form (“GRARF”). As part of the GRARF, generators were required to report on various aspects of their units’ capabilities, including the unit’s reactive capability. ERCOT has recently developed a similar form for use in the nodal market, entitled the Resource Asset Registration Form (“RARF”). ERCOT began the development of the RARF in late 2007. As early as Version 0.08 dated December 13, 2007, the RARF Guide included a Section 11.0 that described the development of the Reactive Capability Curve, or D-Curve, to demonstrate a unit’s reactive power capability. The RARF Guide included an illustration, Figure 11-1: Sample D-Curve, which showed the MVAR capability of a sample unit at varying levels of MW capacity. It also included two lines designated “Minimum Reactive Required” that showed the requirement in a triangle configuration consistent with the industry-accepted definition of a “power factor.” It did not include the “top” and “bottom” lines that would be necessary to illustrate a “rectangle” requirement. This same illustration was included in Section 8.4 of the Official RARF Guide Version 4.00,

adopted by ERCOT and effective April 8, 2008. It was later moved to Section 7.4, due to renumbering of the RARF Guide, and remained in the RARF Guide until at least July 24, 2009.

The reactive power requirements in ERCOT's pre-PRR 830 protocols were consistent with the inherent characteristics of wind generation facilities and with industry-wide standards established by FERC. In adopting standard procedures and technical requirements for the interconnection of wind generating plants to transmission systems, FERC noted: "Conventional generators inherently provide reactive power, whereas most induction-type generators used by wind plants currently can only provide reactive power through the addition of external devices."<sup>7</sup> In its final decision, FERC adopted a +/- 0.95 standard for wind generators as well as conventional sources, but with the caveat that this factor would apply to wind generators "only if the Transmission Provider shows, through the System Impact Study, that such capability is required of that plant to ensure safety or reliability."<sup>8</sup> FERC explained that:

Establishing an achievable reactive power standard if it is needed for safety or reliability provides assurance to wind plant developers that their interconnection to the grid will not be frustrated or face uncertainty due to lack of standards, and thus will limit opportunities for undue discrimination.<sup>9</sup>

[The standard] also ensures that the Transmission Provider does not require a wind plant to install costly equipment that is not needed for grid safety or reliability. Furthermore, requiring that the System Impact Study find a need for reactive power will limit the opportunities for undue discrimination; a wind plant Interconnection Customer will not have its interconnection frustrated by unnecessary requirements that are not necessary to maintain safety or reliability.<sup>10</sup>

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<sup>7</sup> *Interconnection for Wind Energy*, Order on Rehearing, Order No. 661, FERC Stats. & Regs. ¶31,198 at ¶39, n. 27 (2005).

<sup>8</sup> Order No. 661, ¶50.

<sup>9</sup> *Id.*

<sup>10</sup> Order No. 661, ¶51.

In Order 661-A, FERC rejected complaints about the case-by-case approach to imposing reactive power requirements:

...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 will also limit opportunities for undue discrimination by ensuring that Transmission Providers do not require costly equipment that is not necessary for reliability.<sup>11</sup>

Likewise, it rejected complaints that the new rule was discriminatory because it imposed different standards on wind generators and conventional generators:

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.<sup>12</sup>

RES submitted registration forms for its 60 MW Whirlwind Energy unit and for its 165 MW Hackberry unit, showing that they would provide the reactive power capability associated with the triangle. These forms were submitted before there was any indication of a change in ERCOT's interpretation of these protocols. In response, ERCOT raised no question or concern regarding compliance with the reactive power requirements or the suitability of RES's submittals for purposes of ERCOT planning and modeling.

### **The Adoption of PRR 830**

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. PRR 830 now requires that

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<sup>11</sup> Order 661-A, ¶41.

<sup>12</sup> Order 661-A, ¶45.

the reactive power requirements “shall be available at all MW output levels.”<sup>13</sup> In addition to changing the Protocols themselves, on July 24, 2009, ERCOT revised its RARF Guide to remove the triangular depiction of the “Reactive Capability Curve.”

The events that precipitated approval of PRR 830 began in 2008 when ERCOT issued an official interpretation of the reactive power capability requirements relating to wind generation resources.<sup>14</sup> ERCOT’s November 13, 2008 Interpretation articulated the rectangle requirement for the first time.<sup>15</sup> By the time ERCOT announced this interpretation RES’s Whirlwind unit had been in commercial operation for almost a year, and its Hackberry unit had been energized.

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.”<sup>16</sup> 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.<sup>17</sup> The appeal initiated by wind developers was ultimately denied on

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<sup>13</sup> See Appendix A, 830PRR-01 Reactive Power Capability Requirement 090809 at 5, § 6.5.7.1(1).

<sup>14</sup> "Protocol Interpretation Request on Reactive Power Capability Requirements," M-D111308-01 Legal (Nov. 13, 2008) (“Interpretation”).

<sup>15</sup> "Protocol Interpretation Request on Reactive Power Capability Requirements," M-D111308-01 Legal (Nov. 13, 2008).

<sup>16</sup> *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.

<sup>17</sup> *Appeal of Competitive Wind Generators*, Docket No. 36482, Electric Reliability Council of Texas, Inc.’s (ERCOT) Motion to Dismiss Competitive Wind Generators’ Appeal at 1 (June 2, 2009).

December 8, 2009, for failure to follow ERCOT ADR procedures pursuant to P.U.C. PROC. R. 22.251(c).<sup>18</sup>

Before the Commission issued a final order in Docket No. 36482, and while several ERCOT ADR proceedings related to the November 13, 2008, interpretation were on-going, ERCOT filed PRR 830.<sup>19</sup> On September 30, 2009, NextEra Energy Resources filed a compromise proposal, PRR 835, which offered a means for ensuring system reliability without requiring WGRs to install supplemental reactive capability in locations where it would have little or no value.<sup>20</sup> ERCOT rejected PRR 835 on October 22, 2009.<sup>21</sup> PRR 830, authored by ERCOT Staff, was approved on November 17, 2009 by the ERCOT Board.<sup>22</sup>

Compliance with PRR 830 will be costly, both to retrofit existing facilities and to procure the required reactive power capability for projects under development. RES is still determining what level of retrofitting may be required at either of its two operating ERCOT WGRs, but it is evident that the cost to existing WGRs across ERCOT will be massive. Retrofitting costs represent a deadweight loss that must be absorbed by generators who financed their projects and negotiated long-term purchased power agreements under cost assumptions that were reasonably based upon the prevailing triangle configuration. For units under development, PRR 830 will increase turbine costs and increase the cost of the energy to be produced, to the detriment of end users, as increased capital costs are passed through in PPA prices. In consequence, PRR 830 will

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<sup>18</sup> *Appeal of Competitive Wind Generators*, Docket No. 36482, Order (Dec. 8, 2009).

<sup>19</sup> See Appendix A, 830PRR-01 Reactive Power Capability Requirement 090809.

<sup>20</sup> See 835PRR-01 Reactive Power Capability Requirement 093009 at 1.

<sup>21</sup> See 835PRR-06 PRS Roll Call Vote 102209.

<sup>22</sup> See Appendix A, 830PRR-41 Board Action Report 111709.

reduce wind energy production with a corresponding loss of environmental benefits, and it will benefit competing conventional fossil generation.

Despite the impact of PRR 830's requirements, no study (economic or technical) was performed by ERCOT in connection with the adoption of PRR 830 to determine whether the new requirements are needed for system reliability.<sup>23</sup> RES specifically commented on the lack of any technical assessment of the need to increase the Reactive Power requirement beyond the triangle configuration. RES urged unsuccessfully that action on PRR 830 be deferred until a technical study could 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."<sup>24</sup>

The ERCOT system operated for a number of years with wind generation units that produce reactive power in the triangle configuration or less,<sup>25</sup> and there has been no evidence of any related reliability problems. Moreover, reactive power does not travel well. ERCOT wind units, both existing and planned, are largely located far from the load centers where voltage control issues arise in ERCOT. Because reactive power primarily addresses local reliability concerns and is not effective in addressing voltage problems in remote locations. For all these reasons, there was an evident need for sound, comprehensive technical analysis before imposing additional reactive power requirements on WGRs.

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<sup>23</sup> ERCOT Bd Transcript at 120:14-16 ("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.")

<sup>24</sup> Appendix A, 830PRR-39 RES America Developments Comments 111709.

<sup>25</sup> Some very early wind generation units provide no reactive power but have been "grandfathered" from the reactive power requirements under the Protocols.

In its own actual operations, RES has not often been called upon by its TSP to supply voltage support, and it has been able to meet all the voltage support requests that it has received. RES has operated its 60 MW Whirlwind Energy Center, located in the CREZ Panhandle A zone, since December 1, 2007, without receiving a single voltage support requests. RES has operated its 165 MW Hackberry project, located in the Abilene area, for approximately a year now. RES has received sporadic voltage support requests from the TSP at Hackberry, and it has been able to satisfy each one.

The serious expected impacts of PRR 830, the retroactive application of a burdensome requirement on a single set of market participants, and the absence of actual and demonstrated operating problems associated with the triangle configuration all underscore the critical importance of a sound technical assessment of the need for additional reactive power capability at WGR points of interconnection. Unfortunately, that assessment is entirely lacking here.

## **VII. ARGUMENT**

### **A. 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 at least three important provisions of PURA: § 39.001; § 35.004(e); and § 39.904(1). Section 39.001 addresses broad policy concerns, section 35.004(e) regulates the procurement and provision of ancillary services, such as voltage support services and reactive power, and section 39.904(1) specifically addresses the reactive power capabilities of renewable generators. PRR 830 violates them all.

- 1. PRR 830 violates PURA § 39.001 because it discriminates against a single class of market participants without a showing of need and is**



**neither practical nor limited so as to impose the least impact on competition.**

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.*<sup>26</sup>

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 competition.” PRR 830 contravenes both of these legislative mandates.

PRR 830 discriminates against wind generators in multiple 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. RES itself supported the recognition of nuclear plant operating characteristics when that subject arose in the second phase of the original CREZ proceeding, Docket 33672. For example, pursuant to ERCOT Protocol § 4.4.15 (QSE Resource Plans), “ERCOT shall

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<sup>26</sup> PURA § 39.001(c) (emphasis added).

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.” 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.<sup>27</sup>

Similarly, FERC has recognized 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.*<sup>28</sup>

In contrast, 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.

Second, PRR 830 discriminates against wind generators in the most basic sense by imposing new requirements that will be costly for them to meet (but will not have a similar impact on competing conventional resources), without a study or any reasonable empirical determination that the requirements are needed for system reliability. Section 39.001(c) surely requires that, in order to pass muster at this Commission, ERCOT rules that have a significant adverse impact on a single “type of participant” must be based on sound technical and economic analysis. Without enforcement of a sound empirical predicate for protocol revisions, any group market participants will be vulnerable to

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<sup>27</sup> ERCOT Protocol 6.7.12(15).

<sup>28</sup> *Interconnection for Wind Energy*, Order No. 661, FERC Stats. & Regs. ¶31,186 (2005) at ¶ 45 (emphasis added).

arbitrary action whenever their interests line up opposite the economic interests of the stakeholder majority. PRR 830 fails this test.

Third, 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 an alleged reactive power problem. 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.<sup>29</sup> 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.<sup>30</sup> This despite the fact that reactive power capability is less practical and more expensive for wind generators than for conventional generators.<sup>31</sup> 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 is to the contrary. PRR 830 is both discriminatory and anticompetitive in violation of PURA § 39.001(c) and § 39.001(d).

**2. PRR 830 violates PURA § 35.004(e) because it creates terms and conditions for the provision and procurement of ancillary services that are unreasonably discriminatory.**

**PURA § 35.004(e) requires the Commission to**

ensure that ancillary services necessary to facilitate the transmission of electric energy are available at reasonable prices with terms and conditions that are not

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<sup>29</sup> ERCOT Bd Transcript at 120:14-16 (“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.”)

<sup>30</sup> ERCOT Bd Transcript at 139:1-3.

<sup>31</sup> See Order No. 661-A at 28.

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. On the introduction of customer choice in the ERCOT power region, acquisition of generation-related ancillary services on a nondiscriminatory basis by the independent organization in ERCOT on behalf of entities selling electricity at retail shall be deemed to meet the requirements of this subsection.

Applying this provision, the Commission previously reversed ERCOT's approval of PRR 676 regarding the allocation of costs incurred in providing the ancillary service known as replacement reserve service ("RPRS"). The Commission recognized that section 39.004(e) does not condemn all differences in treatment, but only conduct that is "unreasonably" discriminatory. The Commission found that PRR 676 violated that standard, because ERCOT and the PRR proponents had failed to conduct a study or otherwise develop cost-causation data to justify allocation of RPRS costs to the single type of market participants targeted by the revision.<sup>32</sup>

The same analysis applies here, and the same result should follow. Voltage Support Service is an ancillary service provided by a generation resource that provides Reactive Power to the grid. Unlike most ancillary services, it is provided without compensation to the supplying party. PRR 830 imposes unique burdens on WGRs to supply this ancillary service, and it does so without providing any revenue stream to compensate for either retrofits or increased future turbine costs. Fatally, it imposes these unique burdens on WGRs without a supporting technical or economic study to demonstrate any need for the change in requirements.

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<sup>32</sup> *Constellation New Energy, Inc.'s Appeal and Complaint of ERCOT Decision to Approve PRR 676, PRR 674 and Request for Expedited Relief*, Docket No. 33416, Final Order at 7-8 (April 13, 2007).

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

The Legislature also 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.<sup>33</sup>

PURA § 39.904(I) 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. This provision means that a wind generator cannot be required to provide reactive power capability to address reliability problems not of its own making. PRR 830 is unsupported by *any* study or other evidence indicating either that the facilities of the wind generators affected by PRR 830 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 their own effects.<sup>34</sup> As their generation output increases, thus increasing their effects on system reliability, their ability to provide reactive power also increases (thus 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, necessarily seeks to require WGRs to add capabilities to reduce reliability effects from *other facilities*, and in so doing it violates the limitation imposed by PURA § 39.904(I).

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<sup>33</sup> PURA § 39.904(I) (emphasis added).

<sup>34</sup> ERCOT Bd Transcript at 154:21-23.

**B. ERCOT’s approval of PRR 830 was arbitrary and capricious and unsupported by substantial evidence.**

Independent of the statutory boundaries of ERCOT’s authority, the process by which PRR 830 was adopted justifies its rejection by the Commission. 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 has failed to follow required standards of reasoned decision-making. More is at stake here than PRR 830 itself, though the consequences of that revision are high enough. Meaningful enforcement of the requirement that protocol revisions have a sound technical, economic basis is fundamental to the integrity of the market rules on which investment in ERCOT depends.

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, as detailed in the statement of facts above. The changes go well beyond mere textual clarification; they represent a broad transformation of reactive power capability requirements. The changes to the text of § 6.5.7.1 and § 6.7.6 cannot reasonably be called a clarification. PRR 830 changed the definition of terms,<sup>35</sup> struck entire existing paragraphs,<sup>36</sup> inserted entirely new paragraphs,<sup>37</sup> and created new compliance deadlines.<sup>38</sup> PRR 830’s dramatic break from prior ERCOT conduct is

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<sup>35</sup> See, e.g., Appendix A, 830PRR-01 Reactive Power Capability Requirement 090809 (changing the definition of “Wind-powered Generation Resource” in Protocol § 2.1).

<sup>36</sup> See, e.g., Appendix A, 830PRR-01 Reactive Power Capability Requirement 090809 at § 6.7.6(5).

<sup>37</sup> See, e.g., Appendix A, 830PRR-01 Reactive Power Capability Requirement 090809 at § 6.5.7.1(2).

<sup>38</sup> See, e.g., Appendix A, 830PRR-01 Reactive Power Capability Requirement 090809 at § 6.5.7.1(2).

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, Protocol § 6.5.7.1(1) and § 6.7.6(5) indicated that “Unit Reactive Limit” refers to the amount of reactive power produced when a resource is operating at its full rated capability, and that the reactive power capability varies with the resource’s actual power production.<sup>39</sup> PRR 830, however, deleted the reference to “URL” in § 6.5.7.1(1), and also deleted all of § 6.7.6(5). Indeed, § 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.” For lower levels of power output, however, it required that “Reactive Power *up to the unit’s operating capability* must be available.” The fact that the 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.

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.<sup>40</sup> 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.”<sup>41</sup> That assertion, however, is contradicted by an

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<sup>39</sup> See ERCOT Protocol § 6.5.7.1(1) and § 6.7.6(5) (pre-PRR 830).

<sup>40</sup> ERCOT Bd Transcript at 119:9.

<sup>41</sup> ERCOT Bd Transcript at 119:17-20.

ERCOT representative's later statement that of the seventy wind generators ERCOT contacted, only sixteen actually met the rectangular requirement.<sup>42</sup> Even excluding another sixteen generators who are exempted under a grandfathering provision, the fact that so many generators were operating outside the rectangular requirement<sup>43</sup> is evidence that the vast majority of wind developers did not read the Protocols to require the rectangle.

The cost of compliance with PRR 830 is unknown but will be substantial. Maintaining a rectangle configuration will add significant additional and unanticipated cost for RES and other wind developers, whether in the form of retrofits or in increased costs for future projects. The new requirements imposed by PRR 830 will have a substantial effect on RES and other wind generators and will disadvantage them in the marketplace.

However, and 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."<sup>44</sup> That rejection took place over the objections and in disregard of the comments filed by RES and others. The lack of data, a study, report, or other analysis to support the significant capital infusion required to meet the PRR 830 requirements undercuts the new requirements. Although ERCOT is "about to embark on a significant study of the reactive requirements associated with the many billions of

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<sup>42</sup> ERCOT Bd Transcript at 136:12-18.

<sup>43</sup> ERCOT Bd Transcript at 136:12-18 (noting that "29 met the triangle requirement").

<sup>44</sup> ERCOT Bd Transcript at 120:14-16.



dollars associated with the CREZ investment,”<sup>45</sup> 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. RES 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 reactive power requirements imposed by PRR 830 do not and cannot justify the costs associated with compliance. Left to stand, PRR 830 creates a dangerous precedent for the imposition of market rules that disadvantage a single class of market participants without a reasoned technical or economic basis.

### **VIII. REQUEST FOR EVIDENTIARY HEARING**

RES requests that this matter be set for evidentiary hearing, in that the protocol revision process at ERCOT does not satisfy the standards for factual determinations set out in P.U.C. Proc. R. 22.251(1)(2). Evidentiary hearing is required to determine at least the following questions of fact, if disputed<sup>46</sup>:

1. What is the expected impact of PRR 830 on WGRs, competition, and end users, as enforced both retrospectively and prospectively?
2. Does PRR 830 (and ERCOT’s November 2008 interpretation imposing the rectangle requirement) represent a substantial change in the ERCOT Protocol reactive power requirements applicable to WGRs, as interpreted and enforced by ERCOT and understood by wind generators?

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<sup>45</sup> ERCOT Bd Transcript at 122:22-25.

<sup>46</sup> RES asserts the right to an evidentiary hearing on disputed factual issues under P.U.C. Proc. R. 22.251(1)(2) in this matter, but does so reserving the right to seek reversal of PRR 830 by motion for summary decision under P.U.C. Proc. R. 22.182.

3. What study or analysis was undertaken by or on behalf of ERCOT to determine whether the reactive power requirements in the Protocols prior to PRR 830 as applied to WGRs were inadequate to maintain system reliability, or to determine whether PRR 830 requirements (or less burdensome alternatives) were needed for reliability purposes?

4. What, if any, contribution to system reliability can be expected from enforcement of PRR 830?

### **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[.]”<sup>47</sup> Good cause exists to grant RES’s request for suspension of implementation and enforcement of PRR 830.

Under the new protocol, RES and other wind generators will have until December 31, 2010, to bring existing equipment into compliance with the new protocol.<sup>48</sup> Without a suspension, RES and others must begin very quickly to dedicate technical and financial resources to meet the December 31st deadline even while this appeal is pending, and to alter its procurement for projects in development. These costs to comply with PRR 830 will be significant, and they will not be recoverable if the Commission grants RES’s request and PRR 830 is reversed.

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<sup>47</sup> P.U.C. PROC. R. 22.251(i).

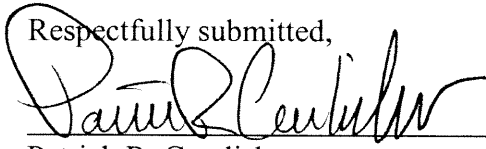
<sup>48</sup> ERCOT Protocol § 6.5.7.1(2) (*as amended by PRR 830*).

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. No study supports the position that reliability is actually at issue or that PRR 830 is an appropriate solution. Suspension 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, RES has established that there is no factual predicate – related to reliability or otherwise – to justify the reactive power capability requirements imposed by PRR 830 or the discriminatory cost burden they create on wind generation resources. These facts create a likelihood that RES will succeed on the merits. For the reasons set forth above, RES requests that the Commission expeditiously consider and grant this motion and suspend implementation and enforcement of PRR 830.

#### **X. CONCLUSION**

RES requests that the Commission expeditiously suspend and then prohibit implementation and enforcement of PRR 830. RES 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. RES further requests all other relief, legal and equitable, to which it is justly entitled.

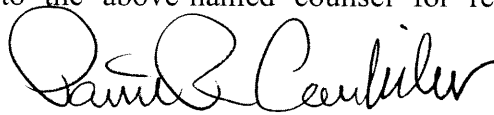
Respectfully submitted,  
  
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Patrick R. Cowlshaw  
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JACKSON WALKER L.L.P.  
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Dallas, TX 75202  
Telephone: 214.953.6000  
Facsimile: 214.661-6614

**ATTORNEYS FOR RES AMERICA  
DEVELOPMENTS INC.**

**CERTIFICATE OF SERVICE**

I hereby certify that on the 22<sup>nd</sup> of December, 2009, a true and correct copy of the above and foregoing document was delivered by first class mail, by courier receipted delivery, or by facsimile transmission to the above-named counsel for respondent ERCOT.



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Patrick R. Cowlshaw

AFFIDAVIT

STATE OF COLORADO           §  
  §  
COUNTY OF BROOMFIELD   §

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

“My name is Matthew Burt. I am of legal age and a resident of the State of Colorado. I am employed as Vice President, Operations of Renewable Energy Systems Americas, Inc. and I am authorized to make this affidavit on behalf of RES America Developments, Inc., Whirlwind Energy, Inc., and Hackberry Wind, Inc. The facts stated in the foregoing Res America Developments, Inc., Whirlwind Energy LLC, And Hackberry Wind LLC’s Appeal And Complaint Of ERCOT Decision To Approve PRR 830 are, in my opinion and based upon my professional experience, true and correct.”

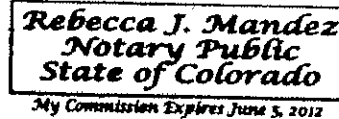
Matthew Burt

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

Rebecca J. Mandez  
Notary Public in and for the State of Colorado

My commission expires:

June 5, 2012



- **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 Invenegy 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-1

## Protocol Revision Request

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
<b>Date Posted</b>	September 8, 2009		

<b>Protocol Section(s) Requiring Revision</b>	<p>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</p>
<b>Requested Resolution</b>	<p>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 (<u>see</u> 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 <u>compliance</u> 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.</p>
<b>Revision Description</b>	<p>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).</p> <p>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.</p>
<b>Reason for Revision</b>	<p>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.</p>



## Protocol Revision Request

<b>Overall Market Benefit</b>	Provides additional clarity to the reactive requirements for wind generation.
<b>Overall Market Impact</b>	Unknown.
<b>Consumer Impact</b>	None.
<b>Credit Implications</b>	Unknown.
<b>Relevance to Nodal Market</b>	Yes. The Reactive Power capability requirements exist in Nodal as well.
<b>Nodal Protocol Section(s) Requiring Revision</b>	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	<i>Clarifies the reactive requirements for wind generation.</i>	
	2		
	3		
	4		
Additional Qualitative Information	1		
	2		
	3		
	4		
Other Comments	1		
	2		
	3		
	4		

## Protocol Revision Request

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Market Segment	N/A

Market Rules Staff Contact	
Name	Sandra Tindall
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Phone Number	512-248-3867

# Protocol Revision Request

## 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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## Protocol Revision Request

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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<b>Deleted:</b> 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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# Protocol Revision Request

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: objections to the proposal~~
- ~~Deleted: Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements~~
- ~~Deleted: An 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 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.~~
- ~~Deleted: For Generation Resources required to provide VSS~~
- ~~Deleted: to be met by~~
- ~~Deleted: unit~~
- ~~Deleted: , unless specifically approved by ERCOT~~
- ~~Deleted: required to provide VSS~~
- ~~Formatted: Indent: Left: 0.5"~~

## 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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- ~~Deleted: -~~
- ~~Deleted: a~~
- ~~Deleted: s~~
- ~~Deleted: r~~
- ~~Deleted: Unit Reactive Limits (~~
- ~~Deleted: )~~

## Protocol Revision Request

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-2

## ERCOT Preliminary Impact Analysis Report

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
<b>Impact Analysis Date</b>	September 8, 2009		
<b>Cost/Budgetary Impact</b>	None.		
<b>Estimated Project Time Requirements*</b>	No project required. This Protocol Revision Request (PRR) can take effect upon ERCOT Board approval.		
<small>*Unless otherwise indicated, project time requirements begin upon project initiation.</small>			
<b>ERCOT Staffing Impacts (across all areas)</b>	No additional full time equivalents (FTEs) needed.		
<b>ERCOT Computer System Impacts</b>	Minor changes to ERCOT databases to incorporate additional SCADA points, which will be managed under the O&M budgets of affected departments.		
<b>ERCOT Business Function Impacts</b>	Existing business functions can accommodate this revision request.		
<b>Grid Operations &amp; Practices Impacts</b>	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.



# ERCOT Preliminary Impact Analysis Report

830PRR-3

# CEO Revision Request Review

I. REVISION REQUEST DETAILS	
Date	9/8/09
Revision Request Number	PRR830
Revision Request Name	Reactive Power Capability Requirement
<b>ERCOT Position – PROVIDED BY CEO</b>	
<input type="checkbox"/> Needed for Go-Live <input type="checkbox"/> Not Needed for Go-Live <input checked="" type="checkbox"/> No opinion on the need for Go-Live	
<p>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.</p> <p>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.</p> <p>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.</p>	

## 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

<input type="checkbox"/> Does <u>not</u> apply to my area  <input checked="" type="checkbox"/> No opinion on the need for Go-Live	<input type="checkbox"/> Perform complete impact analysis prior to recommending ERCOT position  <input type="checkbox"/> High level (1-4) <input type="checkbox"/> Full Impact Analysis
<input type="checkbox"/> "Needed for Go-Live"  Indicate criteria not met unless this revision request is implemented <input type="checkbox"/> Nodal system to work properly <input type="checkbox"/> Reliability <input type="checkbox"/> Compliance <input type="checkbox"/> Fair Market Practices <input type="checkbox"/> Synchronization <input type="checkbox"/> Cost-Benefit  Explain: _____	<input type="checkbox"/> "Not Needed for Go-Live"          Explain: _____
Indicate potential impact <input type="checkbox"/> Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other) <input type="checkbox"/> No impact to ERCOT  Explain: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.	

Wholesale Markets

<input type="checkbox"/> Does <u>not</u> apply to my area  <input checked="" type="checkbox"/> No opinion on the need for Go-Live	<input type="checkbox"/> Perform complete impact analysis prior to recommending ERCOT position  <input type="checkbox"/> High level (1-4) <input type="checkbox"/> Full Impact Analysis
<input type="checkbox"/> "Needed for Go-Live"  Indicate criteria not met unless this revision request is implemented <input type="checkbox"/> Nodal system to work properly <input type="checkbox"/> Reliability <input type="checkbox"/> Compliance <input type="checkbox"/> Fair Market Practices <input type="checkbox"/> Synchronization <input type="checkbox"/> Cost-Benefit  Explain: _____	<input type="checkbox"/> "Not Needed for Go-Live"          Explain: _____
Indicate potential impact <input type="checkbox"/> Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other) <input type="checkbox"/> No impact to ERCOT  Explain: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.	

System Planning

<input type="checkbox"/> Does <u>not</u> apply to my area  <input checked="" type="checkbox"/> No opinion on the need for Go-Live	<input type="checkbox"/> Perform complete impact analysis prior to recommending ERCOT position  <input type="checkbox"/> High level (1-4) <input type="checkbox"/> Full Impact Analysis
<input type="checkbox"/> "Needed for Go-Live"  Indicate criteria not met unless this revision request is implemented <input type="checkbox"/> Nodal system to work properly <input type="checkbox"/> Reliability <input type="checkbox"/> Compliance <input type="checkbox"/> Fair Market Practices <input type="checkbox"/> Synchronization <input type="checkbox"/> Cost-Benefit  Explain: _____	<input type="checkbox"/> "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 <input type="checkbox"/> Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other) <input type="checkbox"/> No impact to ERCOT  Explain: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.	
<b>IT Perspective</b>	
<input type="checkbox"/> Does <u>not</u> apply to my area  <input checked="" type="checkbox"/> No opinion on the need for Go-Live	<input type="checkbox"/> Perform complete impact analysis prior to recommending ERCOT position  <input type="checkbox"/> High level (1-4) <input type="checkbox"/> Full Impact Analysis
<input type="checkbox"/> "Needed for Go-Live"  Indicate criteria not met unless this revision request is implemented <input type="checkbox"/> Nodal system to work properly <input type="checkbox"/> Reliability <input type="checkbox"/> Compliance <input type="checkbox"/> Fair Market Practices <input type="checkbox"/> Synchronization <input type="checkbox"/> Cost-Benefit  Explain: _____	<input type="checkbox"/> "Not Needed for Go-Live"          Explain: _____
Indicate potential impact <input type="checkbox"/> Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other) <input type="checkbox"/> No impact to ERCOT  Explain: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.	

<b>III. OTHER VIEWS – PROVIDED BY AREA OWNERS</b>		
Alternate View / Rationale	Person holding alternate view	Alternate view provided by

<b>IV. SUGGESTED ERCOT POSITION – PROVIDED BY COO/CTO/CIO</b>
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-4

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 - Abstain													
Torrent	X													
Wardle														
<b>TOTAL</b>														
Morris	X													
Helpert	X													
<b>TOTAL</b>														
Jones	X													
Pieniazek														
<b>TOTAL</b>														
Walker	X													
Durrwachter														
<b>TOTAL</b>														
Detelich														
Bailey	X													
<b>TOTAL</b>														
Boehnemann	X													
Cochran														
<b>TOTAL</b>														
Madden	X													
Carr	X													
<b>TOTAL</b>														
<b>VOTE TOTALS</b>	9	0	0	0	0	0	0	0	0	0	0	0	0	0

A - Abstain

1 To grant PRR830 Urgent status - PASSED

2  
3  
4  
4  
5  
6  
7

830PRR-5

## PRR Comments

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	September 15, 2009
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Submitter's Information	
<b>Name</b>	Matt Daniel
<b>E-mail Address</b>	<a href="mailto:Matthew.Daniel@horizonwind.com">Matthew.Daniel@horizonwind.com</a>
<b>Company</b>	Horizon Wind Energy LLC
<b>Phone Number</b>	713-265-0350
<b>Cell Number</b>	
<b>Market Segment</b>	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

## PRR Comments

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-6

## PRS Action Report

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
<b>Timeline</b>	Urgent	<b>Action</b>	Tabled
<b>Date of Decision</b>	September 17, 2009		
<b>Proposed Effective Date</b>	To be determined.		
<b>Priority and Rank Assigned</b>	To be determined.		
<b>Protocol Section(s) Requiring Revision</b>	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		
<b>Revision Description</b>	<p>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).</p> <p>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.</p>		
<b>Reason for Revision</b>	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.		
<b>Overall Market Benefit</b>	Provides additional clarity to the reactive requirements for wind generation.		
<b>Overall Market Impact</b>	Unknown.		
<b>Consumer Impact</b>	None.		
<b>Credit Impacts</b>	To be determined.		
<b>Relevance to Nodal Market</b>	Yes. The Reactive Power capability requirements exist in Nodal as well.		



## PRS Action Report

<b>Nodal Protocol Section(s) Requiring Revision</b>	2.1, Definitions 3.15, Voltage Support 6.5.7.7, Voltage Support Service
<b>Procedural History</b>	<ul style="list-style-type: none"> <li>➤ On 9/08/09, PRR830, a preliminary Impact Analysis, and CEO Revision Request Review were posted.</li> <li>➤ On 9/10/09, PRR830 was granted Urgent status via a PRS e-mail vote.</li> <li>➤ On 9/15/09, Horizon Wind Energy LLC comments were posted.</li> <li>➤ On 9/17/09, PRS considered PRR830.</li> </ul>
<b>PRS Decision</b>	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.
<b>Summary of PRS Discussion</b>	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.

<b>Quantitative Impacts and Benefits</b>
--

<b>Assumptions</b>	1		
	2		
	3		
	4		
<b>Market Cost</b>		<b>Impact Area</b>	<b>Monetary Impact</b>
	1		
	2		
	3		
<b>Market Benefit</b>		<b>Impact Area</b>	<b>Monetary Impact</b>
	1	<i>Clarifies the reactive requirements for wind generation.</i>	
	2		
	3		
<b>Additional Qualitative Information</b>	1		
	2		
	3		
	4		
<b>Other Comments</b>	1		
	2		
	3		
	4		

<b>Sponsor</b>
----------------

## PRR Action Report

<b>Name</b>	John Dumas
<b>E-mail Address</b>	<a href="mailto:jdumas@ercot.com">jdumas@ercot.com</a>
<b>Company</b>	ERCOT
<b>Phone Number</b>	(512) 248-3195
<b>Cell Number</b>	
<b>Market Segment</b>	N/A

Market Rules Staff Contact	
<b>Name</b>	Sandra Tindall
<b>E-Mail Address</b>	<a href="mailto:stindall@ercot.com">stindall@ercot.com</a>
<b>Phone Number</b>	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

# PRS Action Report

## 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).

~~Deleted:~~ to  
~~Deleted:~~ transmission bus

### 6.5.7.1 Installed Reactive Power Capability Requirement for Generation Resources Required to Provide VSS,

~~Deleted:~~ Installed Reactive Capability

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.

~~Deleted:~~ (1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power at rated capability (MW)

~~Deleted:~~ This quantity of Reactive Power is the Unit Reactive Limit (URL).

~~Deleted:~~ required to provide VSS except as noted below in items (3) or (4).

~~Deleted:~~ have and maintain a URL which

~~Deleted:~~ has

~~Deleted:~~ i

~~Deleted:~~ p

~~Deleted:~~ point of interconnection

~~Deleted:~~ to the TDSI

(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

# PRS Action Report

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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<del>Deleted:</del> (7) An 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 this paragraph (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection... [1]
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# PRS Action Report

(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 5: [1] Deleted** **ERCOT** **9/4/2009 11:27:00 AM**  
(7) An 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 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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**Page 5: [2] Deleted** **ERCOT** **8/19/2009 6:23:00 PM**  
For Generation Resources required to provide VSS

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830PRR-7

## PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement
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Date	September 28, 2009
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Submitter's Information	
Name	Randy Jones
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Company	Calpine
Phone Number	713.830.8846
Cell Number	832.385.3322
Market Segment	Independent Generators

Comments
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### **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."*

PRR493 provided clarification on the mechanics of how that contribution would be



## PRR Comments

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.

<b>Revised Proposed Protocol Language</b>
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None.

830PRR-8

## PRR Comments

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	October 7, 2009
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Submitter's Information	
<b>Name</b>	Tom Shields
<b>E-mail Address</b>	<a href="mailto:Tom.shields@iberdrolausa.com">Tom.shields@iberdrolausa.com</a>
<b>Company</b>	Iberdrola Renewables, Inc.
<b>Phone Number</b>	281-374-3064
<b>Cell Number</b>	
<b>Market Segment</b>	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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# PRR Comments

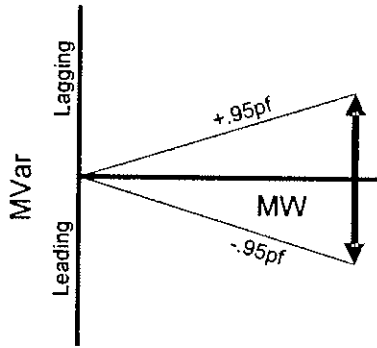


Figure 1: Reactive Power Requirement

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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## PRR Comments

be treated as a single Generation Resource or WGR if the units are connected to the same POI or 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 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.
- (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) 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) 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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## PRR Comments

- (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 (4) of Section 6.5.7.1, Installed Reactive Power Capability Requirements for Generation Resources Required to Provide VSS, 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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(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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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 aid 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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(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.

830PRR-9

## PRR Comments

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
-------------------	-----	------------------	---------------------------------------

<b>Date</b>	October 8, 2009
-------------	-----------------

<b>Submitter's Information</b>	
<b>Name</b>	Matt Daniel
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<b>Company</b>	Horizon Wind Energy LLC
<b>Phone Number</b>	713-265-0350
<b>Cell Number</b>	
<b>Market Segment</b>	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

## PRR Comments

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

## PRR Comments

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.

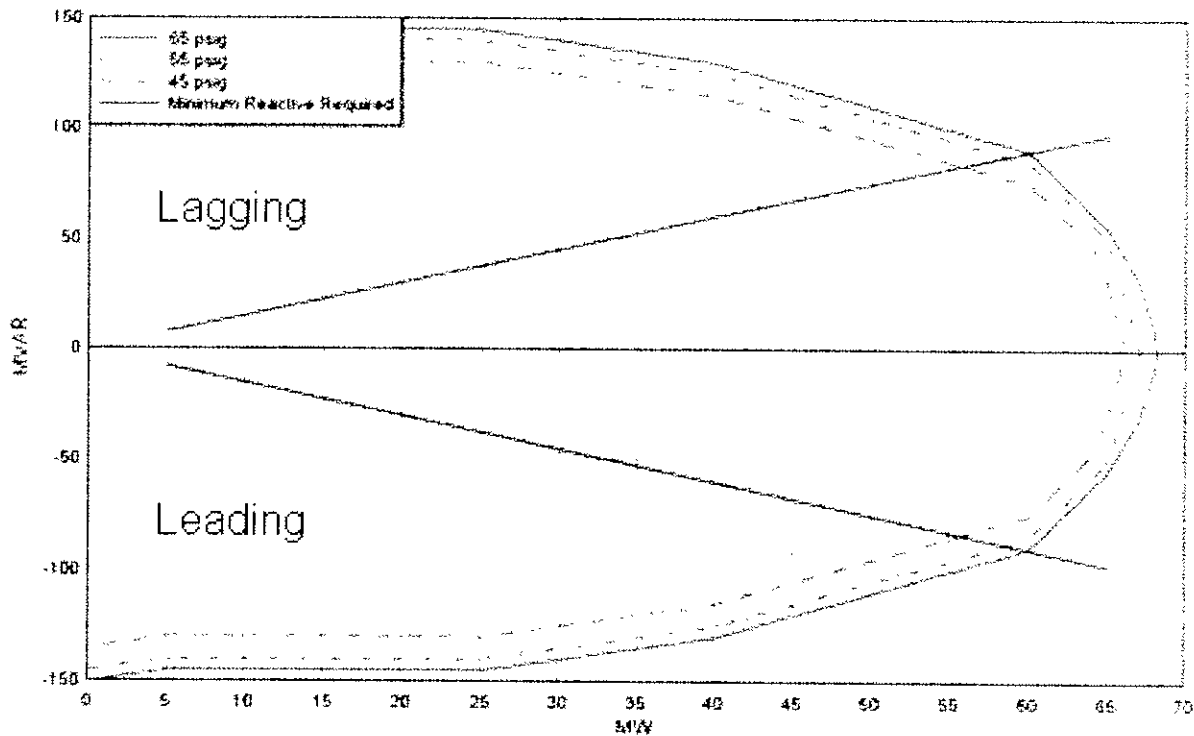
ERCOT's Resource Asset Registration Guide, effective March 10, 2009, reflects the Protocol requirement that the "Minimum Reactive Required" vary with a Resource's output. The chart reproduced below appears in version 4.03 of the Resource Asset Registration Guide, published two months after ERCOT issued its Reactive Power interpretation. WGRs registering their assets clearly indicated that their Reactive Power capability varies with power production.

# PRR Comments

Resource Asset Registration Guide v4.03, Page 4 of 5

## DCurve

H3 Cooled



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

## PRR Comments

dynamic voltage support in lieu of the power system stabilizer and automatic voltage regulation at the generator excitation system.<sup>1</sup>

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.

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<sup>1</sup>

[http://www.ercot.com/content/meetings/ros/keydocs/2007/0215/06.\\_ERCOTGenerationInterconnectOrChangeRequestProcedures0214.doc](http://www.ercot.com/content/meetings/ros/keydocs/2007/0215/06._ERCOTGenerationInterconnectOrChangeRequestProcedures0214.doc)

830PRR-10



## PRR Comments

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	October 8, 2009
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Submitter's Information	
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<b>Phone Number</b>	512-473-3200
<b>Cell Number</b>	
<b>Market Segment</b>	Cooperative

Comments
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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.

# PRR Comments

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

<u>POI</u>	<u>Point of Interconnection</u>
<u>GSU</u>	<u>Generation Step Up Transformer</u>
<u>SGIA</u>	<u>Standard Generation Interconnection Agreement</u>

### 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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## PRR Comments

(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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## PRR Comments

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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## PRR Comments

- (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.
- (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).

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## PRR Comments

- (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 aid 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.

For Generation Resources required to provide VSS

, unless specifically approved by ERCOT

830PRR-11



## PRR Comments

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	October 19, 2009
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Submitter's Information	
<b>Name</b>	Ken Donohoo on behalf of the Reliability and Operations Subcommittee (ROS)
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<b>Cell Number</b>	
<b>Market Segment</b>	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

<u>POI</u>	<u>Point of Interconnection</u>
<u>GSU</u>	<u>Generation Step Up Transformer</u>
<u>SGIA</u>	<u>Standard Generation Interconnection Agreement</u>

# 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,

## PRR Comments

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>Deleted:</b> Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements
<b>Deleted:</b> An induction generator may elect to make a contribution in lieu 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. [1]
<b>Deleted:</b> For Generation Resources. [2]
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## PRR Comments

(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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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 aid 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.

For Generation Resources required to provide VSS

, unless specifically approved by ERCOT

830PRR-12

RJones/Green motion to recommend approval of PRR830 as submitted.

**Tally Votes**

Clear

Date: 20091015

Prepared by: B. Albracht

TALLY TOTAL			
Voting Structure	Motion Carries		Total Abstentions
ROSRMASWMS			
Segment Vote:	5,500	2,000	2
Percentage Vote:	73.3%	26.7%	

Sector / Entity	Representative	Present	Yes	No	Abstain
<b>Coop</b>					
Lower Colorado River Authority	Bill Hatfield (Jerry Wilms)	y	0.333		
Brazos Electric Power Cooperative, Inc.	Randy Ryno	y	0.333		
STEC	John Moore	y	0.333		
	<b>Segment Vote:</b>	3	1,000	0,000	0
<b>Municipal</b>					
Brownsville Public Utilities Board	James McCann				
Austin Energy	James Arnke	y	0.333		
Gartland Power & Light	Bob Green	y	0.333		
CPS Energy	Blake Williams	y	0.333		
	<b>Segment Vote:</b>	3	1,000	0,000	0
<b>Investor Owned Utilities</b>					
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 Donohoe	y	0.250		
	<b>Segment Vote:</b>	4	1,000	0,000	0
<b>Independent Generator</b>					
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		
	<b>Segment Vote:</b>	4	0.750	0.250	0
<b>Consumers</b>					
City of Dallas	Divide Subsegments? y				
Air Liquide	Consumer Vote Total	1.5			
	Comm Jesse Dillard				
	Resi David DeTullio	y	1.500		
	Indu				
	<b>Segment Vote:</b>	1	1,500	0,000	0
<b>Independent REP</b>					
Direct Energy	Mark Garrett	y		1,000	
Reliant Energy	Rick Keetch	y			
Texas Power	Tony Marsh	y			
	<b>Segment Vote:</b>	3	0,000	1,000	2
<b>Independent Power Marketers</b>					
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 Co. Co.	Scott Helyer	y		0.250	
	<b>Segment Vote:</b>	4	0.250	0.750	0
<b>All Sectors Voting Totals</b>					
	<b>Segment Vote:</b>	22	5,500	2,000	2
	<b>TALLY TOTAL</b>		73.3%	26.7%	

830PRR-13



## PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement
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Date	October 21, 2009
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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
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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.

<b>Overall Market Benefit</b>	Improve system voltage management.
<b>Overall Market Impact</b>	Reduce the likelihood of equipment damage or outage.
<b>Consumer Impact</b>	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.

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### 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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## PRR Comments

### 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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## PRR Comments

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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# PRR Comments

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 WTC aggregation connected to each step-up-to-transmission transformer.

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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 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 4: [1] Deleted** **ERCOT** **9/4/2009 11:27:00 AM**  
An 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 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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**Page 4: [2] Deleted** **ERCOT** **8/19/2009 6:23:00 PM**  
For Generation Resources required to provide VSS

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**Page 4: [3] Deleted** **ERCOT** **8/19/2009 6:23:00 PM**  
, unless specifically approved by ERCOT

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**Page 4: [4] Deleted** **Wind Coalition 102109** **10/20/2009 9:54:00 AM**  
WGRs must also provide two other Real Time SCADA points that communicate to ERCOT the following:

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**Page 4: [5] Deleted** **Wind Coalition 102109** **10/21/2009 9:07:00 AM**  
. WGRs must comply with these requirements by no later than six months after the effective date of this paragraph.

830PRR-14

## PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement
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Date	October 22, 2009
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Submitter's Information	
Name	Henry R. Tilghman
E-mail Address	<a href="mailto:hetil@vestas.com">hetil@vestas.com</a>
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

<b>Overall Market Benefit</b>	Increased Reliability
<b>Overall Market Impact</b>	Capital cost savings
<b>Consumer Impact</b>	Reduced production costs

### Revised Proposed Protocol Language

None at this time.

830PRR-15

## PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement
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Date	October 22, 2009
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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:

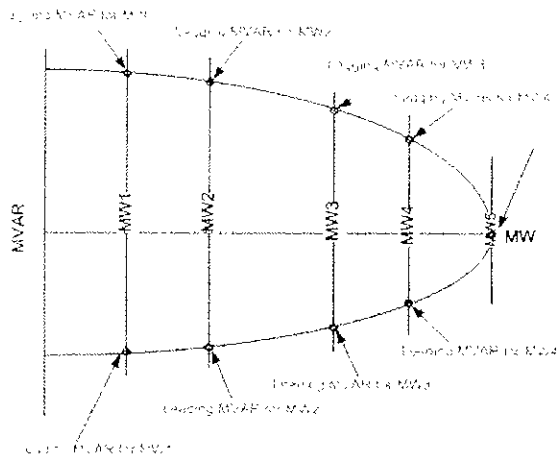
- PRR 830 adds costs to generation projects in some instances where the benefits are minimal or non-existent. These additional costs are ultimately borne by consumers through market prices.
- PRR 830 can actually create costly reliability problems during periods when generators are operating in low load 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 tremendous 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

## PRR Comments

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

## PRR Comments

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.

## PRR Comments

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.

<b>Revised Proposed Protocol Language</b>
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See PRR 835 as filed by NextEra for alternative proposed Protocols language.

830PRR-16



## PRS Recommendation Report

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
<b>Timeline</b>	Urgent	<b>Recommended Action</b>	Approval
<b>Date of Decision</b>	October 22, 2009		
<b>Proposed Effective Date</b>	December 1, 2009		
<b>Priority and Rank Assigned</b>	Not applicable.		
<b>Protocol Section(s) Requiring Revision</b>	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		
<b>Revision Description</b>	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.		
<b>Reason for Revision</b>	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.		
<b>Overall Market Benefit</b>	Provides additional clarity to the reactive requirements for wind generation.		
<b>Overall Market Impact</b>	Unknown.		
<b>Consumer Impact</b>	None.		
<b>Credit Impacts</b>	To be determined.		
<b>Relevance to Nodal Market</b>	Yes. The Reactive Power capability requirements exist in Nodal as well.		

## PRS Recommendation Report

<b>Nodal Protocol Sections Requiring Revision</b>	2.1, Definitions 3.15, Voltage Support 6.5.7.7, Voltage Support Service
<b>Procedural History</b>	<ul style="list-style-type: none"> <li>➤ On 9/08/09, PRR830, a preliminary Impact Analysis, and CEO Revision Request Review were posted.</li> <li>➤ On 9/10/09, PRR830 was granted Urgent status via a PRS e-mail vote.</li> <li>➤ On 9/15/09, Horizon Wind Energy LLC comments were posted.</li> <li>➤ On 9/17/09, PRS considered PRR830.</li> <li>➤ On 9/28/09, Calpine comments were posted.</li> <li>➤ On 10/7/09, Iberdrola Renewables comments were posted.</li> <li>➤ On 10/8/09, a second set of Horizon Wind Energy LLC comments were posted.</li> <li>➤ On 10/8/09, LCRA comments were posted.</li> <li>➤ On 10/19/09, ROS comments were posted.</li> <li>➤ On 10/21/09, Wind Coalition comments were posted.</li> <li>➤ On 10/22/09, Vestas comments were posted.</li> <li>➤ On 10/22/09, PRS again considered PRR830.</li> <li>➤ On 10/22/09, NextEra Energy Resources comments were posted.</li> </ul>
<b>PRS Decision</b>	<p>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.</p> <p>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.</p>
<b>Summary of PRS Discussion</b>	<p>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.</p> <p>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.</p>

# PRR Recommendation Report

Quantitative Impacts and Benefits		
<b>Assumptions</b>	1	
	2	
	3	
	4	
<b>Market Cost</b>		<b>Impact Area</b>
	1	<b>Monetary Impact</b>
	2	
	3	
<b>Market Benefit</b>		<b>Impact Area</b>
	1	<i>Clarifies the reactive requirements for wind generation.</i>
	2	
	3	
<b>Additional Qualitative Information</b>	1	
	2	
	3	
	4	
<b>Other Comments</b>	1	
	2	
	3	
	4	

Sponsor	
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<b>Cell Number</b>	
<b>Market Segment</b>	N/A

Market Rules Staff Contact	
<b>Name</b>	Sandra Tindall
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<b>Phone Number</b>	512-248-3867

## PRR 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.

# PRS Recommendation Report

## 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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# PRS Recommendation Report

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:** Resource
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# PRS Recommendation Report

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.

## 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

~~Deleted:~~ such alternative requirements or

~~Deleted:~~ objections to the proposal

~~Deleted:~~ Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements

~~Deleted:~~ An 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 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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# PRS Recommendation Report

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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830PRR-17

**Issue: To approve PRR830 as endorsed by ROS.**

Date: 10/22/09

Prepared by:

<b>Tally Votes</b>		<b>TALLY TOTAL</b>		
		<b>Motion Passes</b>		<b>Total Abstention</b>
<b>Clear</b>	<b>Record Vote</b>	<b>Voting Structure</b>		
		<b>Segment Vote:</b>	<b>5.889</b>	<b>1.111</b>

Sector / Entity	Representative	Present	Yes	No	Abstain
<b>Coop</b>					
Lower Colorado River Authority	Sandy Morris	Y	0.500		
Brazos Electric Power Cooperative, Inc.	Billy Helpert	Y	0.500		
<b>Segment Vote:</b>		<b>2</b>	<b>1.000</b>	<b>0.000</b>	<b>0</b>
<b>Municipal</b>					
CPS Energy	David Detelich	Y	0.333		
Garland Power & Light	Dan Bailey	Y	0.333		
Austin Energy	Adrienne Brandt	y	0.333		
<b>Segment Vote:</b>		<b>3</b>	<b>1.000</b>	<b>0.000</b>	<b>0</b>
<b>Investor Owned Utilities</b>					
Luminant	Henry Durrwachter	Y			a
CenterPoint Energy	DeAnn Walker	Y	1.000		
AEP Energy Partners	Jennifer Troutman	y			a
<b>Segment Vote:</b>		<b>3</b>	<b>1.000</b>	<b>0.000</b>	<b>2</b>
<b>Independent Generator</b>					
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		
<b>Segment Vote:</b>		<b>11</b>	<b>0.222</b>	<b>0.778</b>	<b>2</b>
<b>Consumers</b>					
Occidental Chemical Corporation	Indu Scott Wardie	Y	0.500		
Office of Public Utility Counsel	Resi Gary Torrent	Y	0.500		
<b>Segment Vote:</b>		<b>2</b>	<b>1.000</b>	<b>0.000</b>	<b>0</b>
<b>Independent REP</b>					
StarTex	Steve Madden	Y	0.500		
Stream Energy	Pam Carr	Y	0.500		
<b>Segment Vote:</b>		<b>2</b>	<b>1.000</b>	<b>0.000</b>	<b>0</b>
<b>Independent Power Marketers</b>					
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	
<b>Segment Vote:</b>		<b>4</b>	<b>0.667</b>	<b>0.333</b>	<b>1</b>
<b>All Sectors Voting Totals</b>					
<b>Segment Vote:</b>		<b>27</b>	<b>5.889</b>	<b>1.111</b>	<b>Total 5</b>

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830PRR-18

# ERCOT Impact Analysis Report

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
<b>Impact Analysis Date</b>	October 26, 2009		
<b>Cost/Budgetary Impact</b>	None.		
<b>Estimated Project Time Requirements*</b>	No project required. This Protocol Revision Request (PRR) can take effect upon ERCOT Board approval.		
<small>*Unless otherwise indicated, project time requirements begin upon project initiation.</small>			
<b>ERCOT Staffing Impacts (across all areas)</b>	No additional full time equivalents (FTEs) needed.		
<b>ERCOT Computer System Impacts</b>	Minor changes to ERCOT databases to incorporate additional SCADA points, which will be managed under the O&M budgets of affected departments.		
<b>ERCOT Business Function Impacts</b>	Existing business functions can accommodate this revision request.		
<b>Grid Operations &amp; Practices Impacts</b>	No impact to ERCOT grid operations or practices.		

<b>Alternatives for a More Efficient Implementation</b> <i>(include explanation of impacts)</i>
None.

<b>Evaluation of Interim Solutions</b> <i>(e.g., manual workarounds)</i>
None.

<b>Feasibility of Implementation</b>
<b>Impact on Resource Availability:</b> None
<b>Impact on Other Projects:</b> None

<b>Comments</b>
None.

# ERCOT Impact Analysis Report

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## PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement
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Date	10/28/2009
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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**

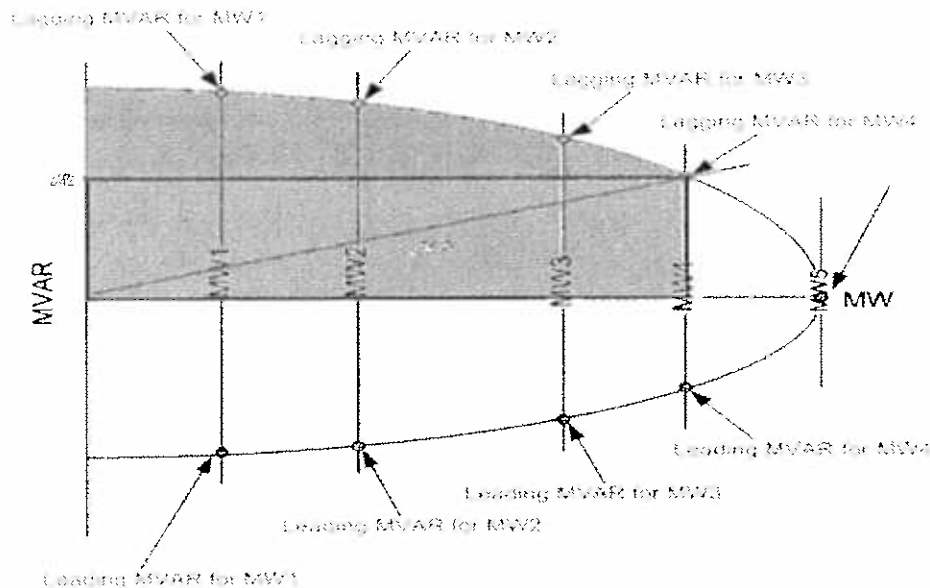
*Each generator shall respond to ERCOT instructed voltage control, including exceeding **its URL**, as specified in Protocol Section 6.8.4, Capacity Payments for Voltage Support Provided to ERCOT. For multi-generator busses, ERCOT shall not instruct any single*

## PRR Comments

generator to operate beyond its URL 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.



**Calpine strongly supports ERCOT's efforts to maintain system reliability and the fairness found in PRR830.** 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,



## PRR Comments

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.

<b>Revised Proposed Protocol Language</b>
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None proposed.

830PRR-20

## PRR Comments

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	October 29, 2009
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<b>Submitter's Information</b>	
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<b>Market Segment</b>	Investor Owned Utility (IOU)

<b>Comments</b>
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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

## PRR Comments

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.

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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.

<b>Revised Proposed Protocol Language</b>
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**None proposed**

830PRR-21

## PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement
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Date	October 29, 2009
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Submitter's Information	
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Cell Number	
Market Segment	N/A

<b>Comments</b>
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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.

<b>Revision Description</b>	<p>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).</p> <p>WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before <u>December 1, 2009</u> 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.</p>
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# 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)

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**



## PRR Comments

### **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 exceedance 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

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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**

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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

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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

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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

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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

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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

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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:]***



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- (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

## PRR Comments

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 paragraph (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.

## PRR Comments

- (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 Up SGIA 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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## PRR Comments

(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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## PRR Comments

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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~~Deleted:~~ An 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 this paragraph (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to [1]

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# PRR Comments

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 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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**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 aid 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



## PRR Comments

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	10/30/2009
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<b>Submitter's Information</b>	
<b>Name</b>	Dennis Kunkel
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<b>Cell Number</b>	361 813 4140
<b>Market Segment</b>	Investor Owned Utility (IOU)

<b>Comments</b>
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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).

<b>Revised Proposed Protocol Language</b>
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None proposed.

830PRR-23

## PRR Comments

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	November 2, 2009
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Submitter's Information	
<b>Name</b>	Mark Soutter
<b>E-mail Address</b>	msoutter@invernergyllc.com
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<b>Cell Number</b>	512-466-4554
<b>Market Segment</b>	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. Invernergy 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).

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# 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-

## PRR Comments

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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- Deleted:** Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements
- Deleted:** An 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 this paragraph (7), the generator must make payment to the interconnecting TDSP. [1]
- Deleted:** For Generation Resources required to provide VSS
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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.
- (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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# PRR Comments

- (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.
- (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.

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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 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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## PRR Comments

(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.

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An 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 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

## PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement
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Date	November 3, 2009
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Submitter's Information	
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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

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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

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"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. Section 6.5.7.1(3): NextEra strikes "February 17, 2004" and replaces it with "December 1, 2009" which is the anticipated effective date of PRR 830. This

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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

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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.

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## 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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### 2.2 Acronyms

POI	Point of Interconnection
GSU	Generator Step Up Transformer
SGIA	Standard Generation Interconnection Agreement
WTG	Wind-powered Turbine Generator

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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 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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~~Deleted:~~ 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 3.14.6.1, 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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- (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.

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<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	November 03, 2009
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<b>Comments</b>
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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.

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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

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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 requirements in 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 22<sup>nd</sup> 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<sup>1</sup> and Coal Power magazine<sup>2</sup>. 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.”<sup>3</sup>*

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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<sup>1</sup> “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/>

<sup>2</sup> “Texas Wind Boom Cutting into Fossil Generator Profits” in Coal Power magazine, October 8, 2009  
[http://www.coalpowermag.com/ops\\_and\\_maintenance/223.html](http://www.coalpowermag.com/ops_and_maintenance/223.html)

<sup>3</sup> 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
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None.

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830PRR-26

## PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement
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Date	11/04/2009
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Submitter's Information	
Name	Steven W. Saylor, 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.

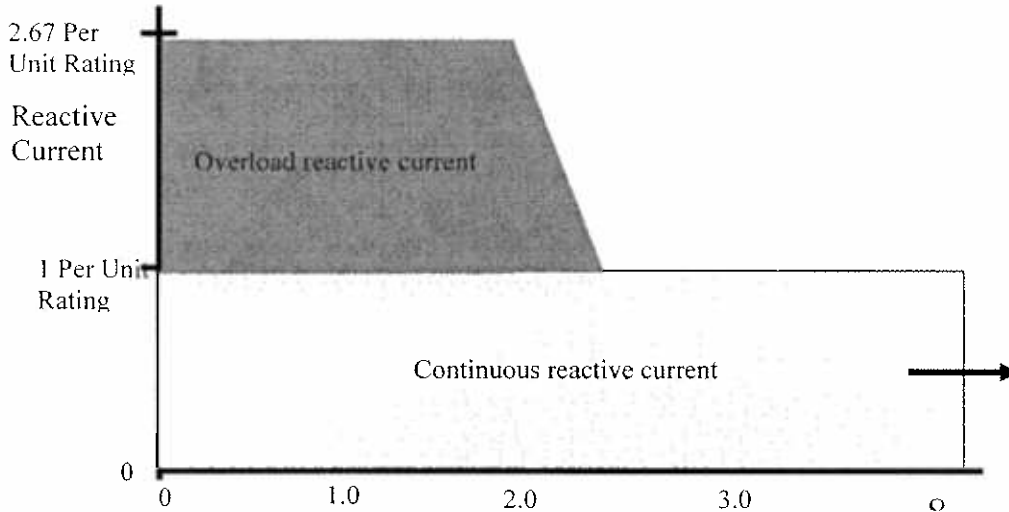
Only a very small number of wind turbine manufacturers currently provide a full dynamic solution to Reactive Power requirements within the turbine alone.

Moreover, other regional authorities have allowed manufacturers the option to employ a "hybrid" solution incorporating a combination of a Statcom and automatically switched

## PRR Comments

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

## PRR Comments

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

## PRR Comments

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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## PRR Comments

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:~~ described

~~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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## PRR Comments

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.

### 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

~~Deleted:~~ such alternative requirements or

~~Deleted:~~ objections to the proposal

~~Deleted:~~ Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements

~~Deleted:~~ An 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 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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## PRR Comments

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

<b>PRR Number</b>	830	<b>PRR Title</b>	<b>Reactive Power Capability Requirement</b>
<b>Timeline</b>	Urgent	<b>Recommended Action</b>	Approval
<b>Date of Decision</b>	November 5, 2009		
<b>Proposed Effective Date</b>	December 1, 2009		
<b>Priority and Rank Assigned</b>	Not applicable.		
<b>Protocol Section(s) Requiring Revision</b>	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		
<b>Revision Description</b>	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.		
<b>Reason for Revision</b>	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.		
<b>Overall Market Benefit</b>	Provides additional clarity to the reactive requirements for wind generation.		
<b>Overall Market Impact</b>	Unknown.		
<b>Consumer Impact</b>	None.		
<b>Credit Impacts</b>	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.		
<b>Relevance to Nodal Market</b>	Yes. The Reactive Power capability requirements exist in Nodal as well.		

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## TAC Recommendation Report

<b>Nodal Protocol Sections Requiring Revision</b>	2.1, Definitions 2.2, Acronyms and Abbreviations 3.15, Voltage Support 6.5.7.7, Voltage Support Service
<b>Procedural History</b>	<ul style="list-style-type: none"> <li>➤ On 9/08/09, PRR830, a preliminary Impact Analysis, and CEO Revision Request Review were posted.</li> <li>➤ On 9/10/09, PRR830 was granted Urgent status via a PRS e-mail vote.</li> <li>➤ On 9/15/09, Horizon Wind Energy LLC comments were posted.</li> <li>➤ On 9/17/09, PRS considered PRR830.</li> <li>➤ On 9/28/09, Calpine comments were posted.</li> <li>➤ On 10/7/09, Iberdrola Renewables comments were posted.</li> <li>➤ On 10/8/09, a second set of Horizon Wind Energy LLC comments were posted.</li> <li>➤ On 10/8/09, LCRA comments were posted.</li> <li>➤ On 10/19/09, ROS comments were posted.</li> <li>➤ On 10/21/09, Wind Coalition comments were posted.</li> <li>➤ On 10/22/09, Vestas comments were posted.</li> <li>➤ On 10/22/09, PRS again considered PRR830.</li> <li>➤ On 10/22/09, NextEra Energy Resources comments were posted.</li> <li>➤ On 10/26/09, the Impact Analysis was posted.</li> <li>➤ On 10/28/09, a second set of Calpine comments were posted.</li> <li>➤ On 10/29/09, Oncor comments were posted.</li> <li>➤ On 10/29/09, ERCOT comments were posted.</li> <li>➤ On 10/30/09, AEP comments were posted.</li> <li>➤ On 11/2/09, Invenegy comments were posted.</li> <li>➤ On 11/3/09, a second set NextEra Energy Resources comments were posted.</li> <li>➤ On 11/3/09, a third set of Horizon Wind Energy LLC comments were posted.</li> <li>➤ On 11/4/09, a second set of Vestas comments were posted.</li> <li>➤ On 11/5/09, TAC considered PRR830.</li> </ul>
<b>PRS Decision</b>	<p>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.</p> <p>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.</p>
<b>Summary of PRS Discussion</b>	<p>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.</p>

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## TAC Recommendation Report

	<p>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.</p>
<p><b>TAC Decision</b></p>	<p>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.</p>
<p><b>Summary of TAC Discussion</b></p>	<p>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.</p> <p>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.</p> <p>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".</p> <p>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</p>

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## TAC Recommendation Report

	collapse increases as you increase capacity not operating within the "rectangle."
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Quantitative Impacts and Benefits		
<b>Assumptions</b>	1	
	2	
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	4	
<b>Market Cost</b>		<b>Impact Area</b>
	1	
	2	
	3	
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<b>Market Benefit</b>		<b>Monetary Impact</b>
	1	<i>Clarifies the reactive requirements for wind generation.</i>
	2	
	3	
	4	
<b>Additional Qualitative Information</b>	1	
	2	
	3	
	4	
<b>Other Comments</b>	1	
	2	
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Sponsor	
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<b>E-mail Address</b>	<a href="mailto:jdumas@ercot.com">jdumas@ercot.com</a>
<b>Company</b>	ERCOT
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<b>Market Segment</b>	N/A

Market Rules Staff Contact	
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<b>Phone Number</b>	512-248-3867

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## TAC 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 Resources 102209	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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# TAC Recommendation Report

	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 Up
SGIA	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-

# TAC Recommendation Report

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.

## TAC Recommendation Report

- (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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# TAC Recommendation Report

## 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, QSE 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 aid 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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2009 TAC MOTION: H.

To recommend approval of PRR830 as recommended by PRS with ERCOT comments.

Tally Votes

TALLY TOTAL		Motion Passes		Total Abstentions
Voting Structure	67% of non-abst TAC Votes = 17			
TAC	23	1	6	
TAC Vote:				

Date: November 5, 2009  
Prepared by: B. Albracht

Clear

Sector / Entity	Representative	Present	Yes	No	Abstain
<b>Cooperatives</b>					
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		
	<b>Segment Vote:</b>	<b>4</b>	<b>4</b>	<b>0</b>	<b>0</b>
<b>Municipals</b>					
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		
	<b>Segment Vote:</b>	<b>4</b>	<b>4</b>	<b>0</b>	<b>0</b>
<b>Investor Owned Utilities</b>					
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		
	<b>Segment Vote:</b>	<b>4</b>	<b>3</b>	<b>0</b>	<b>1</b>
<b>Independent Generators</b>					
FPL Energy	Mark Bruce	y		1	
Calpine Corporation	Randy Jones	y	1		
NRG Texas	Adrian Pieniazek	y			a
PSEG TX	Marguerite Wagner	y	1		
	<b>Segment Vote:</b>	<b>4</b>	<b>2</b>	<b>1</b>	<b>1</b>
<b>Consumers</b>					
Residential Consumer	Shannon McClendon	y			a
Office of Public Utility Counsel	Danny Bivens	y	1		
City of Lewisville	Phillip Boyd	y	1		
City of Eastland	Chris Brewster	y	1		
Austin White Lime Company	Oscar Robinson (Mark Smith)	y			a
Air Liquide	Bill Smith	y	1		
	<b>Segment Vote:</b>	<b>6</b>	<b>4</b>	<b>0</b>	<b>2</b>
<b>Independent Retail Electric Providers</b>					
Strategic Energy, LLC	Read Comstock	y	1		
TriEagle Energy	Martin Downey	y	1		
Cirro Group	William Lewis (Marcie Zlotnik)	y	1		
Star Electricity dba StarTex Power	Marcie Zlotnik	y	1		
	<b>Segment Vote:</b>	<b>4</b>	<b>4</b>	<b>0</b>	<b>0</b>
<b>Independent Power Marketers</b>					
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
	<b>Segment Vote:</b>	<b>4</b>	<b>2</b>	<b>0</b>	<b>2</b>
<b>All Sectors Voting Totals</b>					
	<b>Segment Vote:</b>	<b>30</b>	<b>23</b>	<b>1</b>	<b>Total 6</b>

Divide Subsegments?

n	Consumer Vote Total
1	1

830PRR-29



## PRR Appeal of Decision

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	November 6, 2009
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<b>Decision Being Appealed</b>	Technical Advisory Committee Recommendation Report
<b>Date of Decision</b>	November 5, 2009

<b>Submitter's Information</b>	
<b>Name</b>	Todd Kimbrough
<b>E-mail Address</b>	todd.kimbrough@fpl.com
<b>Company</b>	NextEra Energy Resources
<b>Phone Number</b>	512-466-3190
<b>Cell Number</b>	512-466-3190
<b>Market Segment</b>	Independent Generator

<b>Comments</b>
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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.

830PRR-30

## **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. PRR 830 as recommended by TAC does not meet the ERCOT policy standard for retroactive application of technical capabilities.**

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. NextEra's proposal addresses key deficiencies in PRR 830 while delivering the full "rectangle" solution and keeps the door open on the retrofitting issue by respecting the PUCT's authority to interpret the Protocols and by proposing technical analysis to develop the right solution.**

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.

**Attachment A**

**November 3, 2009 Comments of NextEra Energy Resources  
Regarding PRR 830**

PRR Number	830	PRR Title	Reactive Power Capability Requirement
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Date	November 3, 2009
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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
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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. Section 6.5.7.1(3): 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.



## 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

<u>POI</u>	<u>Point of Interconnection</u>
<u>GSU</u>	<u>Generation Generator Step Up Transformer</u>
<u>SGIA</u>	<u>Standard Generation Interconnection Agreement</u>
<u>WTG</u>	<u>Wind-powered Turbine Generator</u>

### 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 (1) 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 TDS. 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 aid 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 Megavolt-Amperes 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~~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 ~~maintain~~support the transmission voltage at the ~~point of interconnection~~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 ~~Voltage Support Service~~SSe 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		

<p>Protocol Section(s) Requiring Revision (Include Section No. and Title)</p>	<p>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</p>
<p>Requested Resolution (Normal or Urgent, and justification for Urgent status)</p>	<p><u>Urgent.</u> 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.</p> <p>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.</p> <p>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.</p> <p>This PRR also provides for the imposition of additional Reactive</p>

	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	<i>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.</i>	
	2	<i>Avoidance of unnecessary cost impacts to existing wind generators assumed to be \$10k/MW installed.</i>	
	3	<i>Avoids installation of additional reactive capability not justified for reliability.</i>	
	4		
Market Cost		<b>Impact Area</b>	<b>Monetary Impact</b>
	1	WGRs.	Potentially \$100M.
	2		
	3		
Market Benefit		<b>Impact Area</b>	<b>Monetary Impact</b>



	1	<i>System reliability</i>	<i>Potentially none</i>
	2		
	3		
	4		
Additional Qualitative Information	1	<i>Avoidance of the imposition of additional reactive requirements under the presumption of reliability without technical justification is economically inefficient.</i>	
	2		
	3		
	4		
Other Comments	1		
	2		
	3		
	4		

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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<sub>max</sub>**

A wind power generation facility's revised maximum output submitted in Real Time via SCADA based on the number of wind turbine generators that are 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**

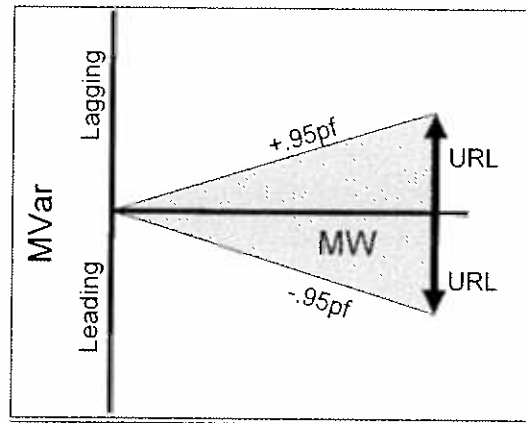
- (1) Generation Resources required to provide VSS must be capable of producing a defined quantity of Reactive Power at rated capability (MW) to maintain a Voltage Profile established by ERCOT. This quantity of Reactive Power is the Unit Reactive Limit (URL).
- (2) Generation Resources required to provide 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 44, 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.~~
- (53) 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.
- (64) 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-kind of construction-in-kind 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 (PUC) 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.~~
- (85) 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.
- (96) 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.

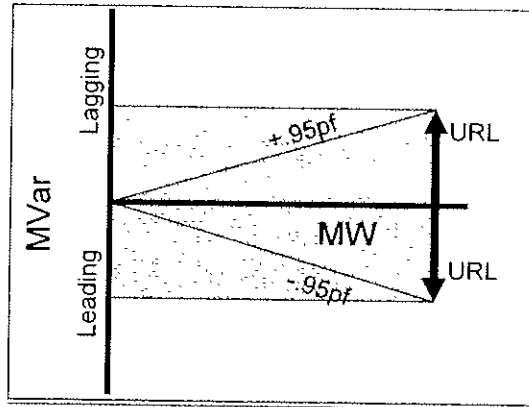
**6.5.7.4 Wind-powered Generation Resources Required to Provide VSS Installed Reactive Capability**

- (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 (PUC) 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 ~~megawatt~~ Megavolt amperes ~~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 LRL 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~~ 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**



# **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 1 and 2 induction generators with no reactive capability
    - 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**

Not only is the current ERCOT Protocol obsolete...it's also ambiguous

## Ancillary Services Section 6.5.7 needs to be revised

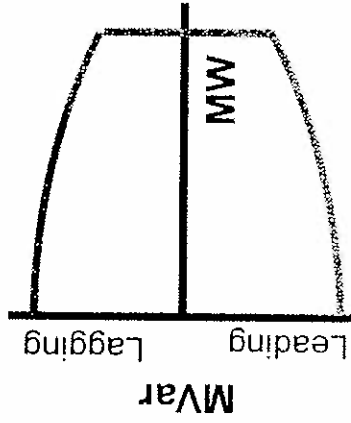
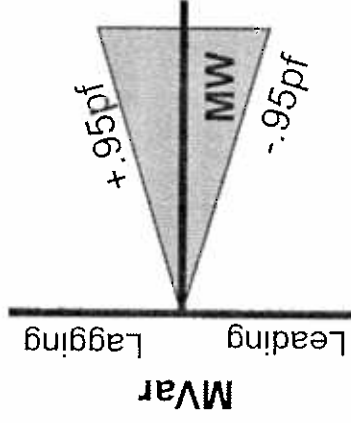
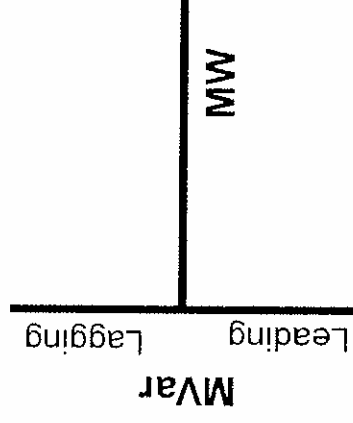
- Protocol 6.5.7.1 (2) states that...

*“Generation Resources required to provide VSS...shall have and maintain a URL which has an over-excited (lagging) power factor 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.”*

- 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.

## 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)

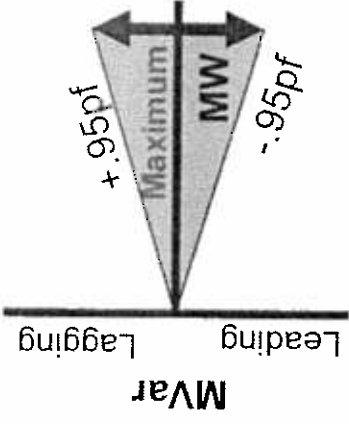


## **PRR835 does several things...**

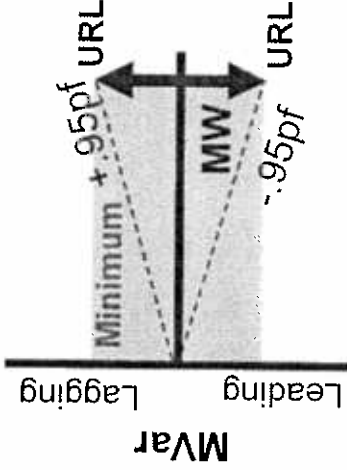
- **It carves out a separate section for the reactive power requirements of Wind Generating Resources and requires a +/- 0.95 power factor range as the minimum requirement**
- **It provides for the imposition of additional reactive requirements consistent with PRR830 where it can be demonstrated through 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**

# Comparison of PRR835 to PRR830 and FERC Order 661-A

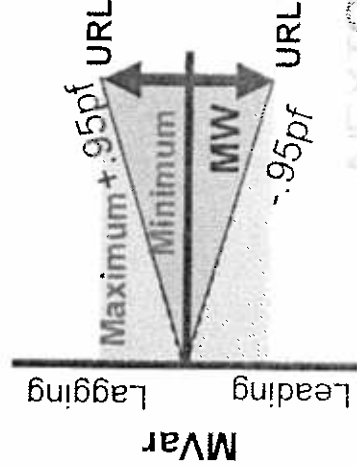
- FERC Order 661-A
  - Adopts +/- 0.95PF range as the maximum requirement
  - Requires wind plants to maintain the required power factor range only if the Transmission Provider shows, through the System Impact Study, that such capability is required of the plant to ensure safety and reliability



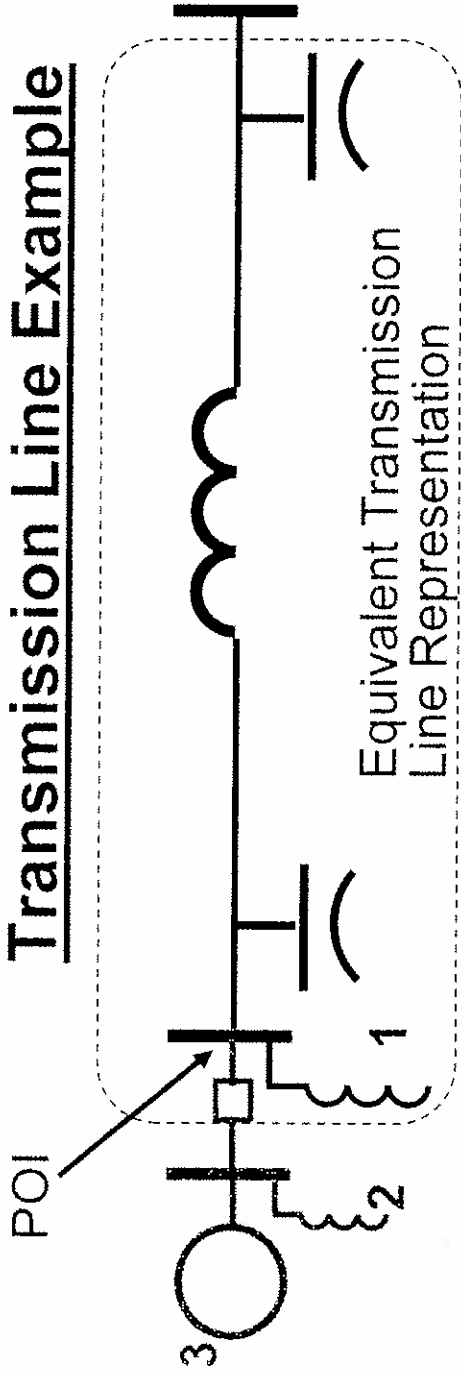
- PRR830
  - Adopts the URL measured at +/-0.95 PF and maximum net MW output
  - Requires URL over the full operating range of the plant



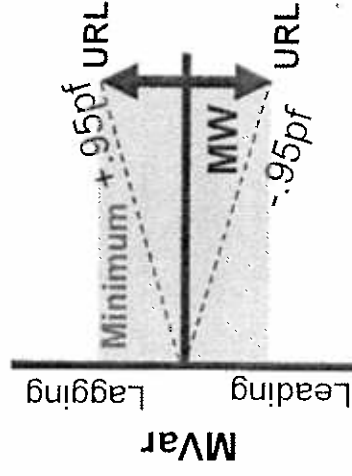
- PRR835
  - Adopts +/-0.95PF as the minimum reactive capability
  - May require URL over the full operating range of the plant only if the Transmission Provider demonstrates it is needed to ensure safety and reliability through a System Impact Study



**PRR830 will result in redundant and excessive reactive capability where it is not needed**



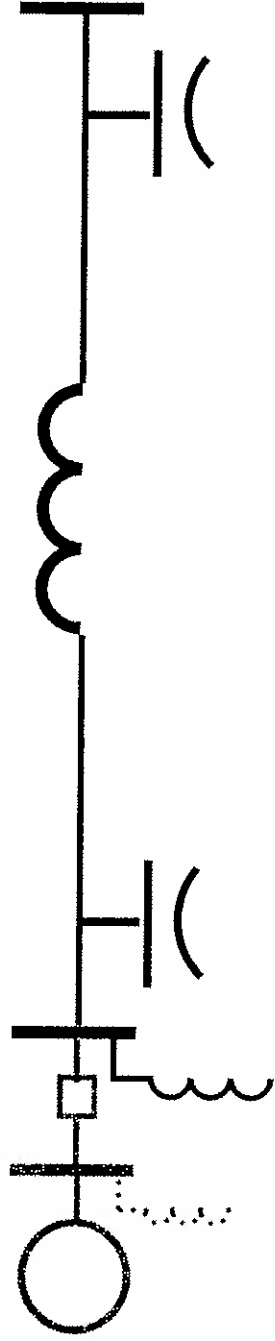
1. Transmission Owner must provide shunt reactors to offset line charging when wind is calm and generator is not generating
2. PRR830 would have the Generator install an additional shunt reactor to meet its URL requirement for leading reactive capability over its range of output
3. Inherent Generator reactive capability



**PRR830 will result in the wasteful installation of redundant reactive resources.**

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 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)

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**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**

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!

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830PRR-31

## PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement
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Date	11/10/2009
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Submitter's Information	
Name	Kip Fox on behalf of American Electric Power Service Corp.
E-mail Address	kmfox@aep.com
Company	American Electric Power Service Corp.
Phone Number	214 777 1063
Cell Number	972 400 1384
Market Segment	Investor Owned Utility (IOU)

Comments
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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

## PRR Comments

- 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



## PRR Comments

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

## PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement
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Date	11/10/2009
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Submitter's Information	
Name	Robert L. Sims
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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

## PRR Comments

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).

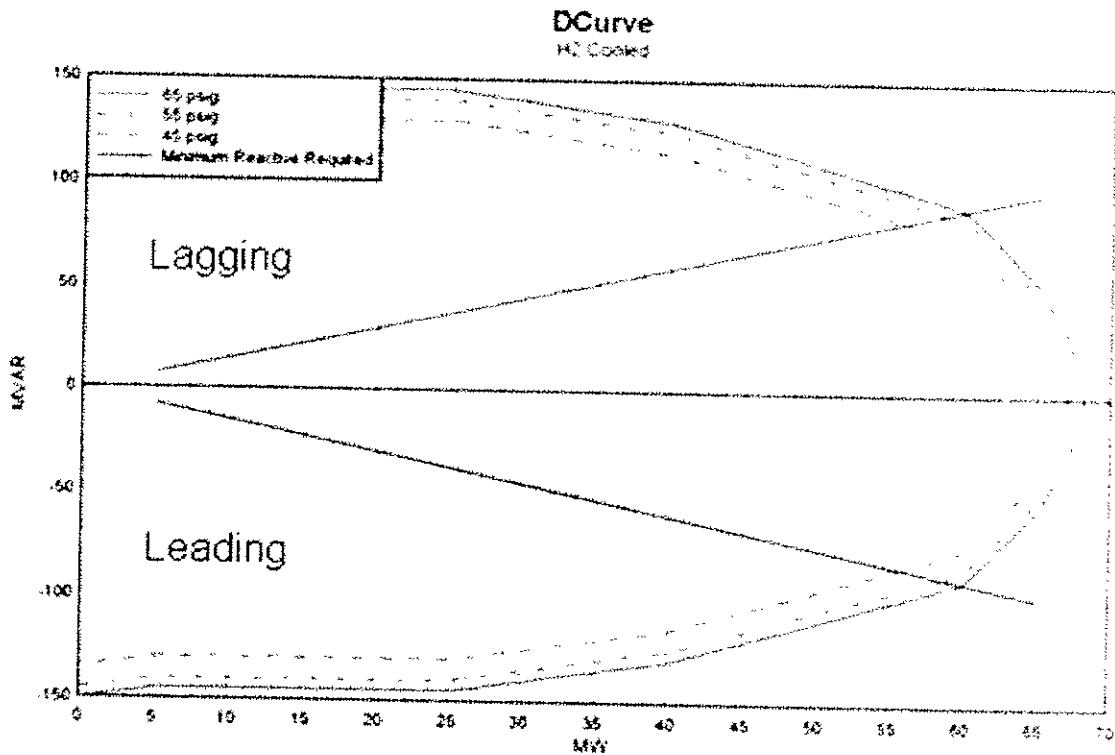
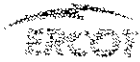
a) The current ERCOT Protocols state the reactive “cone” requirement in paragraph (5) of Section 6.7.6, Deployment of Voltage Support Service (below). PRR 830 deletes this paragraph entirely and effectively changes the reactive requirement retroactively for operating projects.

*(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 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*

# PRR Comments

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

## 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
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Date	November 10, 2009
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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
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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")<sup>1</sup> 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.

<sup>1</sup> 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

## Brief in Support of the NextEra Appeal of the Technical Advisory Committee Recommendation Report Relating to PRR 830

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 Checklist, 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 multiplies 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

## Brief in Support of the NextEra Appeal of the Technical Advisory Committee Recommendation Report Relating to PRR 830

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.

## Brief in Support of the NextEra Appeal of the Technical Advisory Committee Recommendation Report Relating to PRR 830

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 than 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

## **Brief in Support of the NextEra Appeal of the Technical Advisory Committee Recommendation Report Relating to PRR 830**

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**



# **Voltage Control Requirement**

**ERCOT Operations Planning**

**August 22, 2008**

# Voltage Control Protocols that apply to WGRs

- Protocol 6.5.7.1-

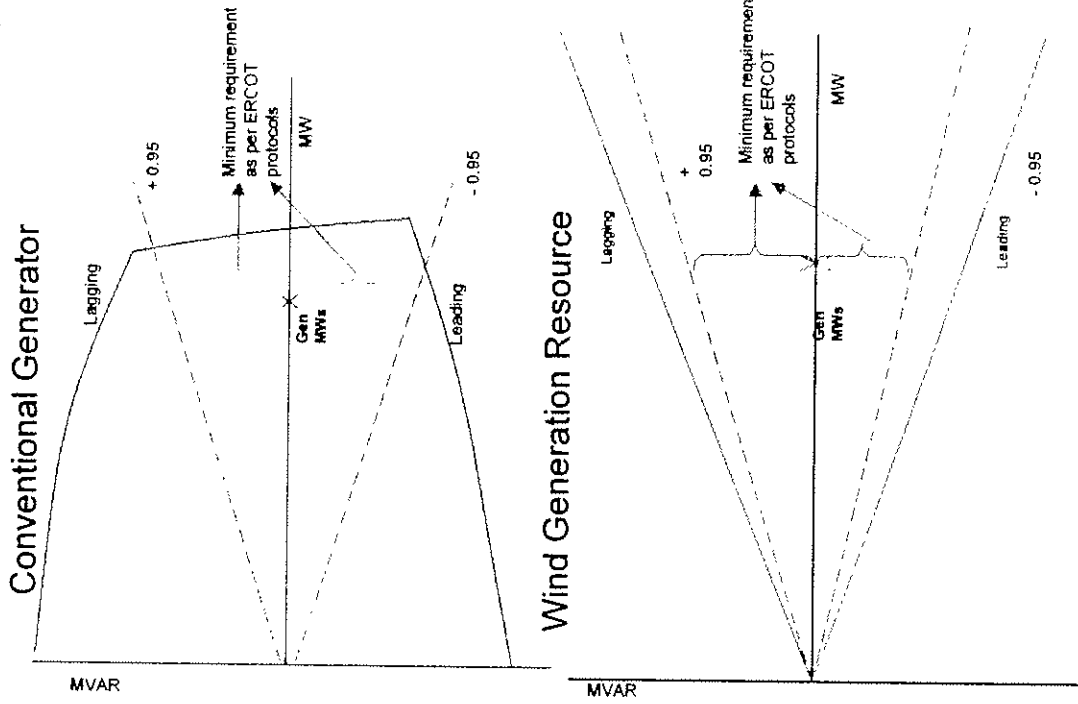
- Generation Resources Required to Provide VSS Installed Reactive Capability

- (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



# 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 **Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels.**

Therefore, under this Protocol as well, the power factor capability requirement does **not** 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](mailto:ClientRelations@ercot.com).

**If you are receiving e-mail from an ERCOT distribution list that you no longer wish to receive, please follow this link in order to unsubscribe from this list:** <http://lists.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
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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





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## 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).

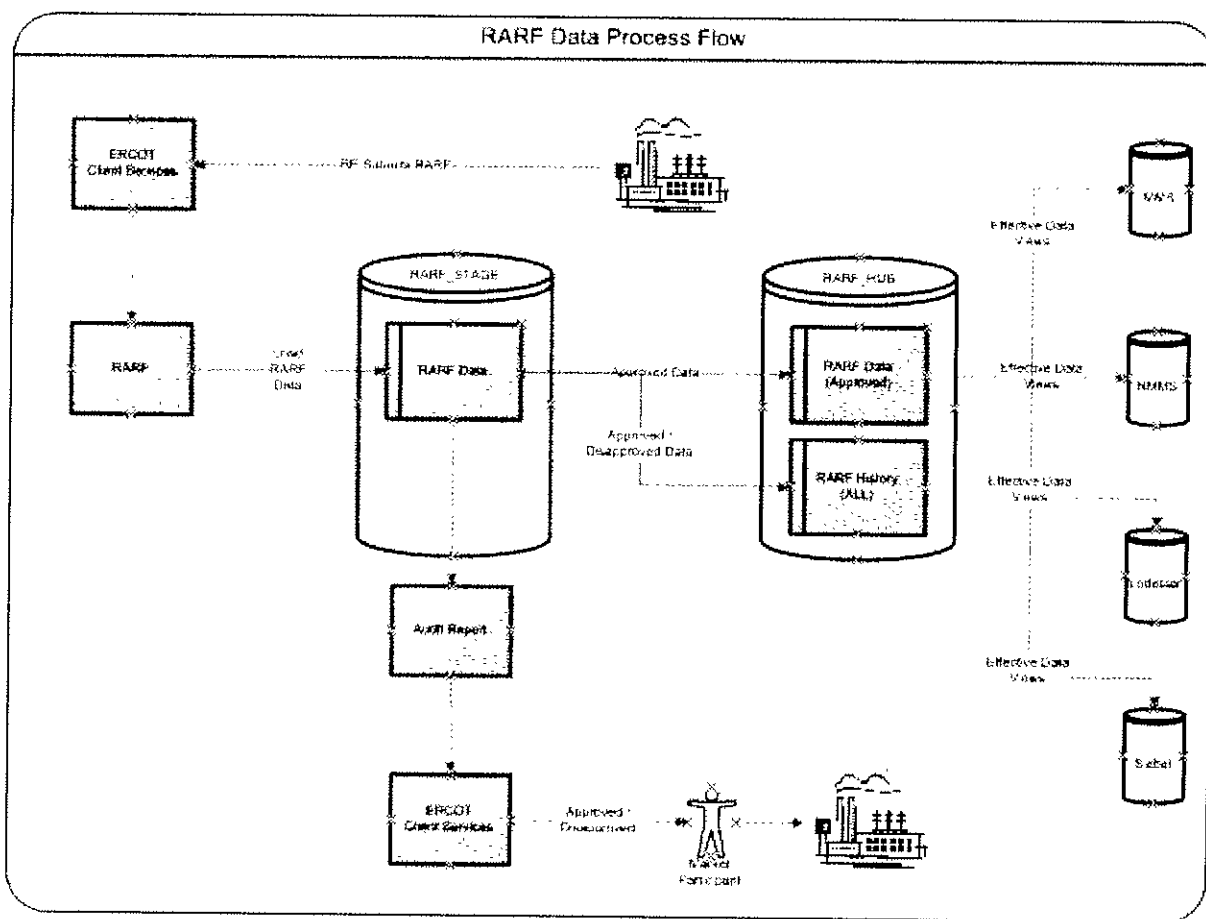


Figure 1



## Structure of Resource Asset Registration Form (RARF)

### 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.

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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.

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 (MCFRs)?	Y/N		Y	
Name Plate Rating	MVA		200.00	
Real Power Rating	MW		180.00	
Reactive Power Rating	MVAR		100.00	
Unit Generation Voltage (kV)	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	
<b>Turbine Details - Turbine information by Model</b>				
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.

				Reactive Capability	
162	Reactive Capability	GEN, CC, WIND	MW	MW1	Reactive Capability curve - point on curve of MW output for this unit, MW1
163	Reactive Capability		MVAR	Lagging MVAR limit associated with MW1 output	Unit's Lagging reactive power output capability associated with its MW1 out
164	Reactive Capability		MVAR	Leading MVAR limit associated with MW1 output	Unit's Leading reactive power output capability associated with its MW1 out negative number
165	Reactive Capability		MW	MW2	Reactive Capability curve - point on curve of MW output for this unit, MW2
166	Reactive Capability		MVAR	Lagging MVAR limit associated with MW2 output	Unit's Lagging reactive power output capability associated with its MW2 out
167	Reactive Capability		MVAR	Leading MVAR limit associated with MW2 output	Unit's Leading reactive power output capability associated with its MW2 out negative number
168	Reactive Capability		MW	MW3	Reactive Capability curve - point on curve of MW output for this unit, MW3
169	Reactive Capability		MVAR	Lagging MVAR limit associated with MW3 output	Unit's Lagging reactive power output capability associated with its MW3 out
170	Reactive Capability		MVAR	Leading MVAR limit associated with MW3 output	Unit's Leading reactive power output capability associated with its MW3 out negative number
171	Reactive Capability		MW	MW4	Reactive Capability curve - point on curve of MW output for this unit, MW4
172	Reactive Capability		MVAR	Lagging MVAR limit associated with MW4 output	Unit's Lagging reactive power output capability associated with its MW4 out
173	Reactive Capability		MVAR	Leading MVAR limit associated with MW4 output	Unit's Leading reactive power output capability associated with its MW4 out negative number
174	Reactive Capability		MW	MW5 - Unity Power Factor	From the Reactive Capability curve - the MW output at Unity Power Factor (2)
175	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
176	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
177	Reactive Capability		MVAR	Net Maximum Lagging Operating Capability (MVAR)	From manufacturer Reactive Capability Curve or data sheet
178	Reactive Capability		YN	Manufacturer's Capability Curve submitted?	Has a recent curve been submitted to ERCOT? If not, please submit.
179	Reactive Capability	WIND	YN	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](mailto: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](mailto:MPAPPL@ERCOT.COM) and [NodalMarketTransition@ercot.com](mailto: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

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**Map of the ERCOT Resource Asset Registration Form**  
*This worksheet tab identifies the necessary work sheets and provides links to the pages.*

<b>WIND</b>	<b>RARF Guide / Protocol Reference</b>	<b>Worksheets included in this form:</b>
<i>Instructions</i>	RARF Guide: Section 3.0	Instructions
<i>Map (this page)</i>	RARF Guide: Section 3.0	Spreadsheet Map (this page)
<i>General Information - ALL</i>	RARF Guide: Section 4.0	General Information
<i>Site Information - GEN CC WIND</i>	RARF Guide: Section 4.0	Site Information
<i>Unit Info - WIND</i>	RARF Guide: Section 5.3	Unit Information
<i>Resource Parameters - WIND</i>	RARF Guide: Section 6.3	Resource Parameters
<i>Operational Resource Parameters - WIND</i>	RARF Guide: Section 7.3	Operational Resource Parameters
<i>Reactive Capability - WIND</i>	RARF Guide: Section 8.3	Reactive Capability
<i>GSU Transformer - ALL</i>	RARF Guide: Section 9.1	GSU Transformer
<i>Ownership - WIND</i>	RARF Guide: Section 10.3	Ownership
<i>Planning - WIND</i>	RARF Guide: Section 12.1	Planning
<i>Protection - WIND</i>	RARF Guide: Section 12.3	Planning
<i>Private Network - PUN</i>	RARF Guide: Section 13.0	Private Use Network
<i>Generation Owned Transmission Assets - ALL</i>	RARF Guide: Section 14.0	Generation Owned Transmission Assets
<b>GEN</b>		
<i>Instructions</i>	RARF Guide: Section 3.0	Instructions
<i>Map (this page)</i>	RARF Guide: Section 3.0	Spreadsheet Map (this page)
<i>General Information - ALL</i>	RARF Guide: Section 4.0	General Information
<i>Site Information - GEN CC WIND</i>	RARF Guide: Section 4.0	Site Information
<i>Unit Info - GEN</i>	RARF Guide: Section 5.1	Unit Information
<i>Resource Parameters - GEN</i>	RARF Guide: Section 6.1	Resource Parameters
<i>Operational Resource Parameters - GEN</i>	RARF Guide: Section 7.3	Operational Resource Parameters
<i>Reactive Capability - GEN</i>	RARF Guide: Section 8.1	Reactive Capability
<i>GSU Transformer - ALL</i>	RARF Guide: Section 9.1	GSU Transformer
<i>Ownership - GEN</i>	RARF Guide: Section 10.1	Ownership
<i>Planning - GEN</i>	RARF Guide: Section 12.1	Planning
<i>Protection - GEN</i>	RARF Guide: Section 12.2	Planning
<i>Subsynchronous Resonance - GEN</i>	RARF Guide: Section 12.3	Planning
<i>Private Network - PUN</i>	RARF Guide: Section 13.0	Private Use Network
<i>Generation Owned Transmission Assets - ALL</i>	RARF Guide: Section 14.0	Generation Owned Transmission Assets
<b>COMBINED CYCLE</b>		
<i>Instructions</i>	RARF Guide: Section 3.0	Instructions
<i>Map (this page)</i>	RARF Guide: Section 3.0	Spreadsheet Map (this page)
<i>General Information - ALL</i>	RARF Guide: Section 4.0	General Information
<i>Site Information - GEN CC WIND</i>	RARF Guide: Section 4.0	Site Information
<i>Unit Info - CC</i>	RARF Guide: Section 5.2	Unit Information
<i>Resource Parameters - CC</i>	RARF Guide: Section 6.2	Resource Parameters
<i>Resource Parameters - CC CFG (ensure configurations are entered first)</i>	RARF Guide: Section 6.2	Resource Parameters
<i>Operational Resource Parameters - CC CFG (ensure configurations are entered first)</i>	RARF Guide: Section 7.3	Operational Resource Parameters
<i>Reactive Capability - CC</i>	RARF Guide: Section 8.2	Reactive Capability
<i>GSU Transformer - ALL</i>	RARF Guide: Section 9.1	GSU Transformer
<i>Ownership - CC</i>	RARF Guide: Section 10.2	Ownership
<i>Configurations - CC1</i>	RARF Guide: Section 11.2	Combined Cycle Configuration Details
<i>Configurations - CC2</i>	RARF Guide: Section 11.2	Combined Cycle Configuration Details
<i>Configurations - CC3</i>	RARF Guide: Section 11.2	Combined Cycle Configuration Details
<i>Transitions - CC1</i>	RARF Guide: Section 11.3	Combined Cycle Configuration Details
<i>Transitions - CC2</i>	RARF Guide: Section 11.3	Combined Cycle Configuration Details
<i>Transitions - CC3</i>	RARF Guide: Section 11.3	Combined Cycle Configuration Details
<i>Planning - CC</i>	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.

<i>ERCOT Confidential</i>	<b>RETURN TO MAP</b>
<b>General Information - All Resource Entities</b>	
<i>This worksheet tab contains information on the Resource Entity responsible for submitting this form. Please complete this section and select RETURN TO MAP</i>	
<b>This submittal is for:</b>	
<i>* Deletions are accepted as intentions. This form does not supersede the Notice of Suspension of Operations requirements.</i>	
<b>Submittal Information</b>	
Date Form Completed	
Resource Entity Submitting Form	
Resource Entity DUNS #	
<b>Primary Contact (name of person ERCOT can contact with questions regarding this form)</b>	
Printed Name:	
Title:	
Phone Number:	
E-mail Address:	
Fax Number:	
<b>Secondary Contact (if available)</b>	
Printed Name:	
Title:	
Phone Number:	
E-mail Address:	
Fax Number:	
<b>Instructions for Revisions</b>	
<b>Tab name (Use Drop-Down List):</b>	<b>Describe revision and whether revision is to be applied in Zonal Market. All revisions will be applied to Nodal as default.</b>

#### 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](mailto:NodalMarketTransition@ercot.com).



Please verify the transmission provider, as some names may have changed over time.

This section does not apply to load resources.

ERCOT Confidential		<b>RETURN TO MAP</b>
<b>Site Information</b>		
<i>This worksheet tab contains site-specific information</i>		
<i>Please complete this section and select RETURN TO MAP</i>		
<b>Site Info for Generation Resources (Load Resources and Block Load Transfers should skip this section)</b>		
<b>All Generation Resources</b>	Resource Site Name	
	<b>Resource Site Code:</b>	
	Street Address	
	City	
	State & Zip	
	County	
	Site In-Service Date	
	Site Stop Service Date	
	Congestion Management Zone for 2003	
	Resource owned by NOE?	
	Is Resource behind a NOE 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.

ERCOT Confidential		<b>RETURN TO MAP</b>
<b>Site Information</b>		
<i>This worksheet tab contains site-specific information</i>		
<i>Please complete this section and select RETURN TO MAP</i>		
<b>Complete this section if the Gen Site Load is split among multiple ESI IDs.</b>		
<b>Site Load Split</b>	<b>ESI ID 1:</b>	
	Fixed Load Splitting %	
	Competitive Retailer	
	Competitive Retailer DUNS #	
	TDSP Providing Service To Resource	
	TDSP DUNS Number	
	<b>ESI ID 2:</b>	
	Fixed Load Splitting %	
	Competitive Retailer	
	Competitive Retailer DUNS #	
	TDSP Providing Service To Resource	
	TDSP DUNS Number	
	<b>ESI ID 3:</b>	
	Fixed Load Splitting %	
	Competitive Retailer	
	Competitive Retailer DUNS #	
	TDSP Providing Service To Resource	
	TDSP DUNS Number	
	<b>ESI ID 4:</b>	
	Fixed Load Splitting %	
	Competitive Retailer	
	Competitive Retailer DUNS #	
	TDSP Providing Service To Resource	
	TDSP DUNS Number	
<b>ESI ID 5:</b>		
Fixed Load Splitting %		
Competitive Retailer		
Competitive Retailer DUNS #		
TDSP Providing Service To Resource		
TDSP DUNS Number		
<b>ESI ID 6:</b>		
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.

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.*

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			

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## 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.

ERCOT Confidential		RETURN TO MAP				
<b>Unit Information</b>						
<i>This worksheet tab applies to all combined cycle generation resources. This information is UNIT and TRAIN specific. Please complete this section (one for each train at the facility) and click RETURN TO MAP</i>						
COMBINED-CYCLE GENERATION RESOURCES CCI	<b>Train Details</b>		<b>Labels</b>	<b>Train 1</b>		
	Name of Combined Cycle Train					
	<b>Mnemonic for Combined Cycle Train</b>			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			
	<b>Unit Details</b>		<b>Labels</b>	<b>Unit 1</b>	<b>Unit 2</b>	<b>Unit 3</b>
	Unit Name					
	<b>Resource Name (Unit Code Mnemonic)</b>			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		MYAR				
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.

ERCOT Confidential		RETURN TO MAP		
<b>Unit Information</b>				
<i>This worksheet tab applies only to Wind generation resources. This tab is UNIT specific for all Wind.</i>				
<i>Please complete this section and select RETURN TO MAP</i>				
<b>Unit Details</b>	<b>Labels</b>	<b>Unit 1</b>	<b>Unit 2</b>	<b>Unit 3</b>
Unit Name		TEST_A		
Resource Name (Unit Code/Mnemonic)				
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 (MCFRs)?	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			
<b>Turbine Details - Turbine Information by Model</b>				
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

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## 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 MAP*

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		

GENERATION RESOURCES (non-WIND, non-CC)





## 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:

ERCOT Confidential		RETURN TO MAP			
Resource Parameters					
<i>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 MAP.</i>					
CC GENERATION RESOURCES CCI	Reasonability Limits		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		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:

ERCOT Confidential		RETURN TO MAP			
Resource Parameters					
<i>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.</i>					
CC GENERATION RESOURCES CCI CONFIGURATIONS	Reasonability Limits		TEST_CCI_1	TEST_CCI_2	TEST_CCI_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		TEST_CCI_1	TEST_CCI_2	TEST_CCI_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 section.

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		

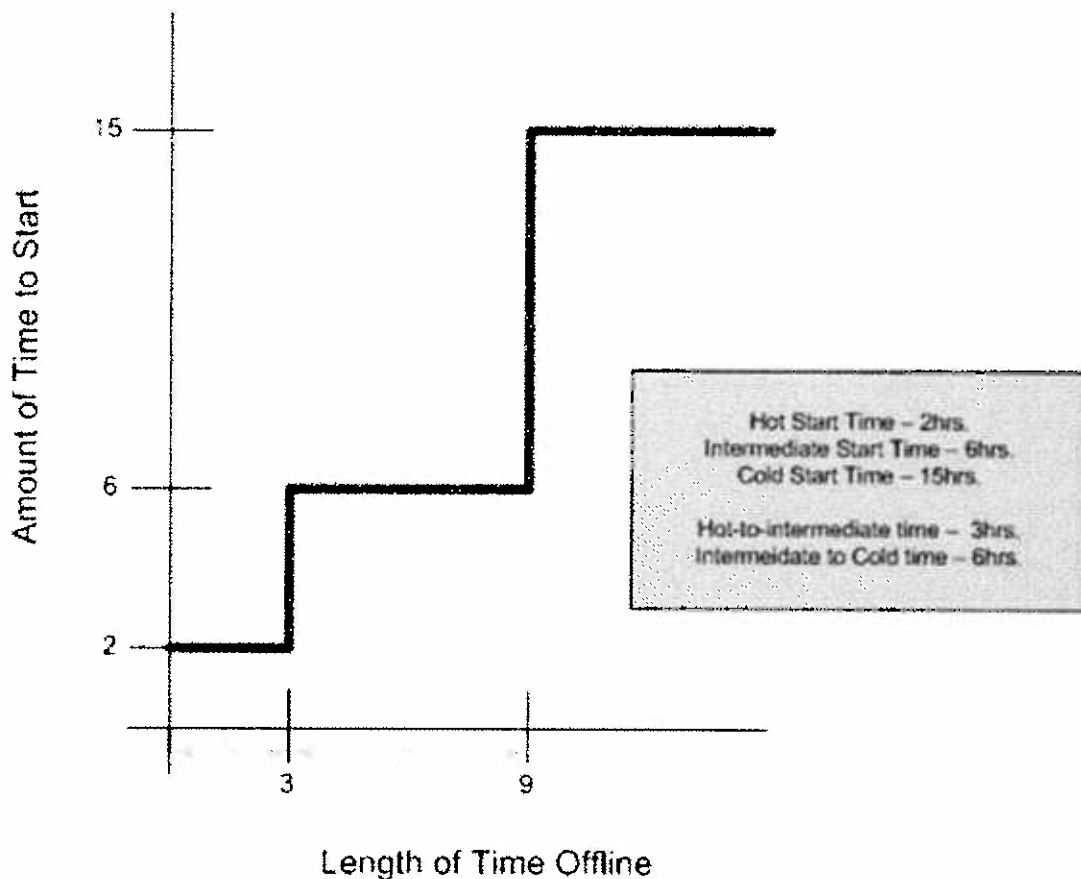


## 6.0 Operational Resource Parameters

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:





## 6.1 Operational Resource Parameters – non-Wind, non-CC Generation Units

ERCOT Confidential		RETURN TO MAP	
<b>Operational Resource Parameters</b>			
Resource Entity authorizes QSE representing this Generating 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 <b>generation</b> resources. This tab is LMT specific for <b>all non-Wind and non-CC</b> . Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section and save.			
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		

GENERATION RESOURCES (non-WIND, non-CC)



## 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.

[RETURN TO MAP](#)

**Operational Resource Parameters**  
 Resource Entity authorizes GSE representing this Generating 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

Resource Parameters		s	TEST_CCI_1	TEST_CCI_2	TEST_CCI_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_CCI_1	TEST_CCI_2	TEST_CCI_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_CCI_1	TEST_CCI_2	TEST_CCI_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				

CC GENERATION RESOURCES CCI CONFIGURATIONS



### 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 complete*

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	

WIND GENERATION RESOURCES



## 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:

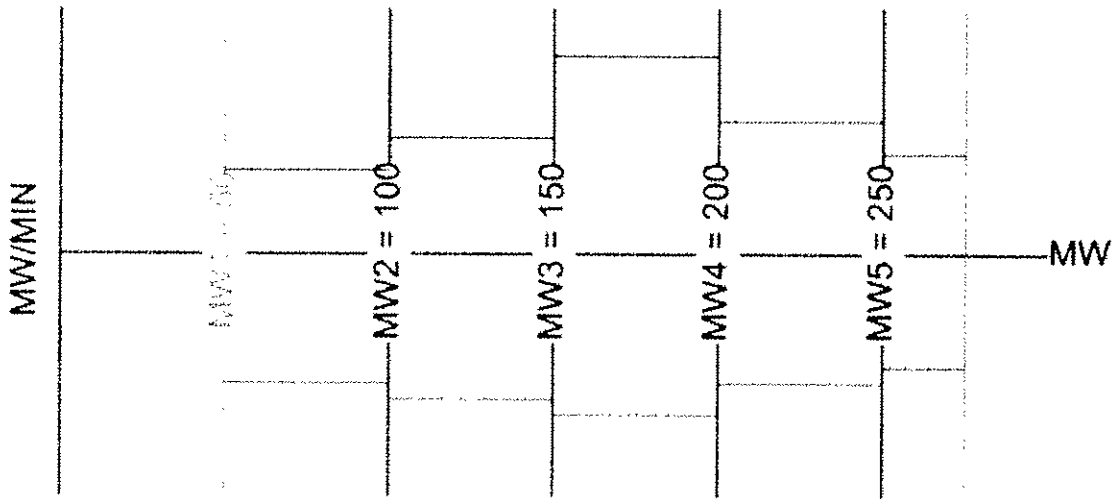


Figure 1: MW/MIN vs. MW





## 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		
<b>Reactive Capability</b>				
<i>This worksheet tab provides reactive capability for <b>generation</b> resources. This tab is <b>UNIT</b> specific for <b>all non-Wind and non-CC</b>. Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section</i>				
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			



## 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.

ERCOT Commercial

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

Reactive Capability Curve		Labels	TEST A	TEST B	TEST C
CC GENERATION RESOURCES CCT	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 CCT	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.

ERCOT Confidential		RETURN TO MAP				
Reactive Capability						
<i>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</i>						
WIND GENERATION RESOURCES UNIT	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				

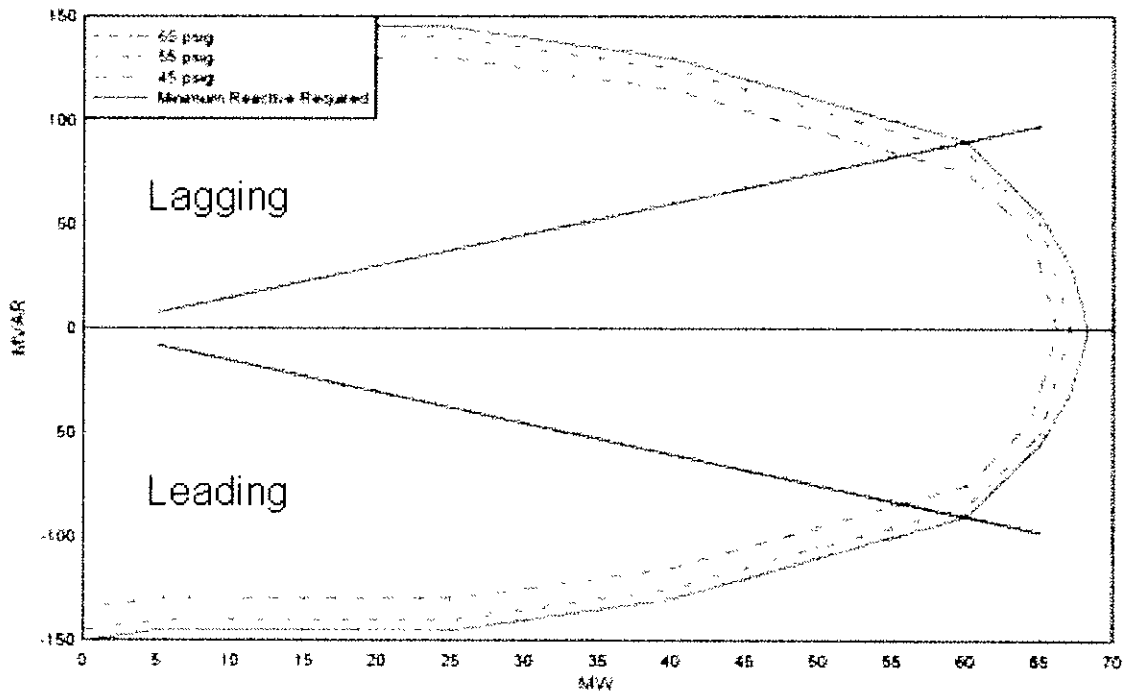
### 7.4 D-Curve / REACTIVE CAPABILITY CURVES

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

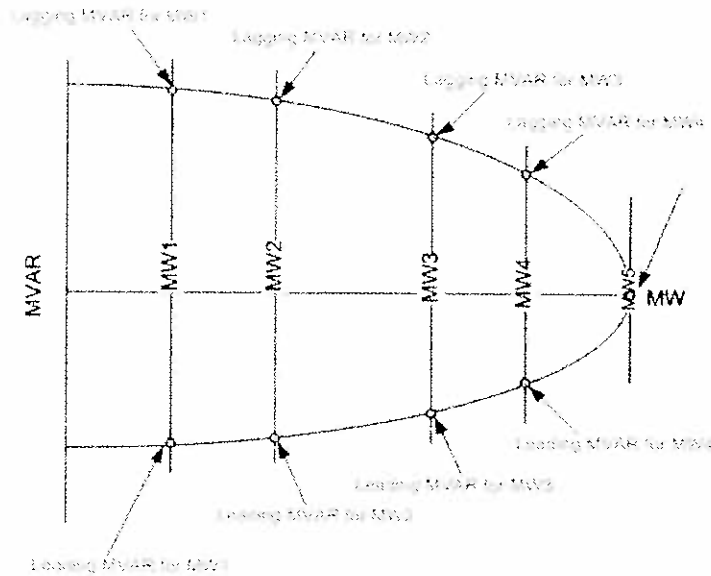




To establish the curve in the RARF, ERCOT requests nine points of data. When entering data on the RARF, use POSITIVE values to represent the lagging MVARs and NEGATIVE values to represent leading MVARs. If the unit is hydrogen cooled, indicate pressure of hydrogen in psi; otherwise leave the cell blank. 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		
Resource Entity Name	Owner 1	
Resource Duns Number		
Complete the following sections if units at the same site are represented by different Resource Entities (RE) or represented :		
TEST A	Owner 1	Owner 2
Market Participant (Resource) Name	RESOURCEOWNER1	RESOURCEOWNER2
Market Participant (Resource) Duns Num	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.



CG1	Complete this section if a single Resource Entity (RE) represents 100% of all units	
	Resource Owner Data - TEST_CCI	Owner
	Resource Entity Name	RESOURCEOWNER1
	Resource Duns Number	123456789
CG2	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
CG3	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

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[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 section.

WIND 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 Resources.	
	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					
<i>This worksheet tab applies to all Combined Cycle Generation Resources. Please complete this section and select RETURN TO MAP</i>					
<i>As a configuration is entered into the CCx Config tab, the hatched cells will open up in the corresponding CCx Transition tab</i>					
Resource Name (Unit Code)	Unit Type	TEST_CC1_1	TEST_CC1_2	TEST_CC1_3	
TEST_A	0	X	X	X	
TEST_B	0	a	X	X	
TEST_C	0			X	
CC1					
<i>Number of units and MW increase from left to right.</i>					





## 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						
<i>This worksheet tab applies to all Combined Cycle Generation Resources. This tab defines the operating transitions.</i>						
<i>Transition cells will open as a configuration is entered into the corresponding CCx Config tab. After completing this section, select RETURN TO MAP</i>						
From \ To	Offline	TEST_CCL_1	TEST_CCL_2	TEST_CCL_3	TEST_CCL_4	TEST_CCL_5
Offline		X				
TEST_CCL_1	X		X			
TEST_CCL_2	X	X		X		
TEST_CCL_3	X	X	X			
TEST_CCL_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.

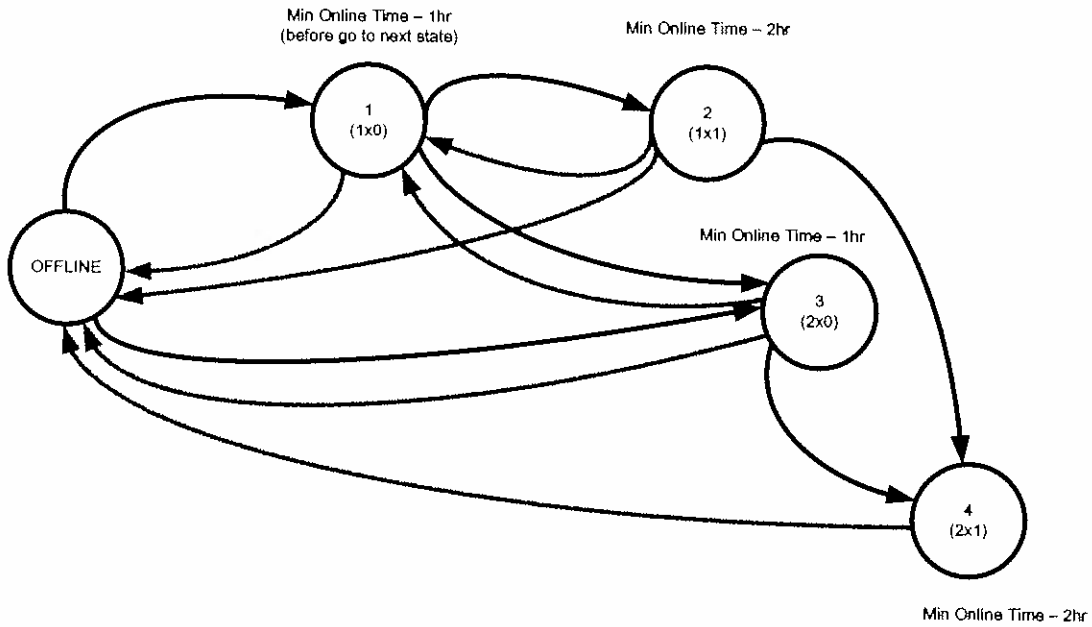
**Step 4:**

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.

From \ To	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  $Z_{eq}$ , 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](mailto:NodalMarketTransition@ercot.com).

All fields in this section should be completed.



### 10.1.1 Planning – non-Wind, non-CC Generation Units

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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.

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 $Z_{eq} (R+jX)$		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		
<b>Planning Information</b>				
<i>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</i>				
<b>Generator Details</b>				
What is the MVA base that the following data is based on?	MVA	TEST_A	TEST_B	TEST_C
What is the KV base that the following data is based on?	KV			
Machine Impedance Zeq (R+X)	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.			
<b>Generator Auxiliary Load</b>				
Average Amount of Auxiliary Real Power	MW	TEST_A	TEST_B	TEST_C
Average Amount of Auxiliary Reactive Power	MVAR			
<b>Generation Auxiliary Load Characteristics for MW Load</b>				
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	%			
<b>Generation Auxiliary Load Characteristics for MVAR Load</b>				
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	%			
<b>PSSE Model</b>				
Generator Form on file with ERCOT?	Y/N	TEST_A	TEST_B	TEST_C
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			
<b>Reactances</b>				
Direct Axis Subtransient reactance, X'd		TEST_A	TEST_B	TEST_C
Direct Axis Transient reactance, X'dl				



### 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.

ERCOT Confidential		RETURN TO MAP	
<b>Planning Information</b>			
<i>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-highlighted on this tab. Then complete this section and select RETURN</i>			
Field Description	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 $Z_{eq} (R+jX)$	R in pu		
	X in pu		
Armature Z	R in pu		
	X in pu		
Rotor Z	R in pu		
	X in pu		
Mutual coupling Armature-Rotor Z	R in pu		
	X in pu		
Positive Sequence Z	R in pu		
	X in pu		
Negative Sequence Z	R in pu		
	X in pu		
Zero Sequence Z	R in pu		
	X in pu		
<b>PSSE MODEL</b>		<b>TEST_A</b>	<b>TEST_B</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		
<b>Transient and Subtransient Reactances</b>		<b>TEST_A</b>	<b>TEST_B</b>
Direct Axis Subtransient reactance, $X''_d$			
Direct Axis Transient reactance, $X'_d$			





## 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

ERCOT Confidential		RETURN TO MAP			
<b>Planning Information</b>					
<i>This worksheet tab provides protection information for <b>generation</b> 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</i>					
GEN (non-wind, non-CC)	<b>Plant Voltage Protection</b>		<b>Label</b>	<b>TEST_A</b>	<b>TEST_B</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		
	<b>Plant Frequency Protection</b>		<b>Label</b>	<b>TEST_A</b>	<b>TEST_B</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			
<b>Breaker Interruption Time</b>		<b>Label</b>	<b>TEST_A</b>	<b>TEST_B</b>	
Breaker Interruption Time		cycles			



## 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*

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			
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	TEST_C
Breaker Interruption Time		cycles			



### 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 the

WIND	Plant Voltage Protection		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		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		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

ERCOT Confidential		RETURN TO MAP	
<b>Planning Information</b>			
<i>This worksheet tab provides subsynchronous resonance planning information for <b>generation</b> resources. This tab is <b>UNIT</b> specific for <b>all non-Wind</b>. Please complete this section and select RETURN TO MAP</i>			
GEN (non-wind, non-CC)	<b>Subsynchronous Resonance - Mass 1</b>	<b>TEST_A</b>	<b>TEST_B</b>
	Name of Mass 1		
	Mass Inertia		
	Inertia units		
	Associated damping		
	Damping units		
	<b>Subsynchronous Resonance - Mass 2</b>	<b>TEST_A</b>	<b>TEST_B</b>
	Name of Mass 2		
	Mass Inertia		
	Inertia units		
	Associated damping		
	Damping units		
	Stiffness between Masses 1 and 2		
	Stiffness units		
	<b>Subsynchronous Resonance - Mass 3</b>	<b>TEST_A</b>	<b>TEST_B</b>
	Name of Mass 3		
	Mass Inertia		
	Inertia units		
	Associated damping		
	Damping units		
Stiffness between Masses 2 and 3			
Stiffness units			
<b>Subsynchronous Resonance - Mass 4</b>	<b>TEST_A</b>	<b>TEST_B</b>	
Name of Mass 4			
Mass Inertia			
Inertia units			
Associated damping			
Damping units			
Stiffness between Masses 3 and 4			
Stiffness units			
<b>Subsynchronous Resonance - Mass 5</b>	<b>TEST_A</b>	<b>TEST_B</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			
<b>Planning Information</b>					
<i>This worksheet tab provides subsynchronous resonance planning information for <b>Combined Cycle</b> generation resources. This tab is UNIT specific. Please complete this section and select RETURN TO MAP.</i>					
CCT	<b>Subsynchronous Resonance - Mass 1</b>		<b>TEST_A</b>	<b>TEST_B</b>	<b>TEST_C</b>
	Name of Mass 1				
	Mass Inertia				
	Inertia units				
	Associated damping				
	Damping units				
	<b>Subsynchronous Resonance - Mass 2</b>		<b>TEST_A</b>	<b>TEST_B</b>	<b>TEST_C</b>
	Name of Mass 2				
	Mass Inertia				
	Inertia units				
	Associated damping				
	Damping units				
	Stiffness between Masses 1 and 2				
	Stiffness units				
	<b>Subsynchronous Resonance - Mass 3</b>		<b>TEST_A</b>	<b>TEST_B</b>	<b>TEST_C</b>
	Name of Mass 3				
	Mass Inertia				
	Inertia units				
	Associated damping				
	Damping units				
Stiffness between Masses 2 and 3					
Stiffness units					
<b>Subsynchronous Resonance - Mass 4</b>		<b>TEST_A</b>	<b>TEST_B</b>	<b>TEST_C</b>	
Name of Mass 4					
Mass Inertia					
Inertia units					
Associated damping					
Damping units					
Stiffness between Masses 3 and 4					
Stiffness units					
<b>Subsynchronous Resonance - Mass 5</b>		<b>TEST_A</b>	<b>TEST_B</b>	<b>TEST_C</b>	
Name of Mass 5					
Mass Inertia					
Inertia units					
Associated damping					
Damping units					
Stiffness between Masses 4 and 5					
Stiffness units					



## 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%.

ERCOT Contract		RETURN TO MAP	
<b>Private Network - Site and Unit Information</b>			
<i>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.</i>			
<b>SITE</b>	<b>PRIVATE NETWORK - SITE INFORMATION</b>		<b>Labels</b>
	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	
	<b>Load Characteristics:</b>		
	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
CC1	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?	%			
CC2	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?	%				
CC3	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 $\geq 0.0001$ 3) If Line Data - Line Voltage Level = 69kV, value must be $\leq 1.5$ If Line Data - Line Voltage Level = 138kV or 345kV, value must be $\leq 0.5$ WARN if value is outside of these conditions	Float
Reactance in P.U. (100 MVA Base)	1) Field is required 2) Value must be $\geq 0.0001$ If Line Data - Line Voltage Level = 69kV, value must be $\leq 1.0$ If Line Data - Line Voltage Level = 138kV, value must be $\leq 0.1$ If Line Data - Line Voltage Level = 345kV, value must be $\leq .05$ WARN if value is outside of these conditions	Float
Charging Susceptance in PU (100 MVA Base)	1) Field is required 2) Value must be $\geq 0$ If Line Data - Line Voltage Level = 69kV, value must be $\leq 0.3$ If Line Data - Line Voltage Level = 138kV, value must be $\leq 0.5$ If Line Data - Line Voltage Level = 345kV, value must be $\leq 1.75$	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 $486 * \text{SQRT}(X_{\text{pu}} * \text{Chg}_{\text{pu}})$ . 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 $\leq$ Nominal (Static) - 2-hr Emergency Rating	Integer



	<p>3) Value must be <math>\leq</math> Nominal (Static) - 15-min Rating</p> <p>4) Conditional Rule (if Line Rating (Static or Dynamic) = Dynamic): Value must be <math>\leq</math> 20 °F - Continuous Rating AND value must be <math>\geq</math> 115 °F Continuous Rating</p>	
Nominal (Static) - 2-hr Emergency Rating	<p>1) This field is required regardless of STATIC or DYNAMIC</p> <p>2) Value must be <math>\geq</math> Nominal (Static) - Continuous Rating</p> <p>3) Value must be <math>\leq</math> Nominal (Static) - 15-min Rating</p> <p>4) Conditional Rule (if Line Rating (Static or Dynamic) = Dynamic): Value must be <math>\leq</math> 20 °F - 2-hr Emergency Rating AND value must be <math>\geq</math> 115 °F 2-hr Emergency Rating</p>	Integer
Nominal (Static) - 15-min Rating	<p>1) This field is required regardless of STATIC or DYNAMIC</p> <p>2) Value must be <math>\geq</math> Nominal (Static) - Continuous Rating</p> <p>3) Value must be <math>\geq</math> Nominal (Static) - 2-hr Emergency Rating</p> <p>4) Conditional Rule (if Line Rating (Static or Dynamic) = Dynamic): Value must be <math>\leq</math> 20 °F - 15-min Rating AND value must be <math>\geq</math> 115 °F 15-min Rating</p>	Integer
20 °F - Continuous Rating - 115 °F Continuous Rating	<p>1) These field are conditionally required. If Line Rating (Static or Dynamic) = Dynamic this field is required</p> <p>2) Line Rating (Static or Dynamic) = Static, this field must be blank</p> <p>3) If required, these values must be <math>\leq</math> the subsequent dynamic rating. For example: 20 °F - Continuous Rating <math>\geq</math> 25 °F - Continuous Rating 25 °F - Continuous Rating <math>\geq</math> 30 °F - Continuous Rating</p> <p>4) If required, within each temp rating, the following must apply Continuous Rating <math>\leq</math> 2-hr Emergency Rating <math>\leq</math> 15-min rating</p>	Integer
20 °F - 2-hr Emergency Rating - 115 °F 2-hr Emergency Rating	<p>1) These field are conditionally required. If Line Rating (Static or Dynamic) = Dynamic this field is required</p> <p>2) Line Rating (Static or Dynamic) = Static, this field must be blank</p> <p>3) If required, these values must be <math>\geq</math> the subsequent dynamic rating. For example: 20 °F - 2-hr Emergency Rating <math>\geq</math> 25 °F - 2-hr Emergency Rating 25 °F - 2-hr Emergency Rating <math>\geq</math> 30 °F - 2-hr Emergency Rating</p> <p>4) If required, within each temp rating, the following must apply Continuous Rating <math>\leq</math> 2-hr Emergency Rating <math>\leq</math> 15-min rating</p>	Integer
20 °F - 15-min Rating - 115 °F 15-min Rating	<p>1) These field are conditionally required. If Line Rating (Static or Dynamic) = Dynamic this field is required</p> <p>2) Line Rating (Static or Dynamic) = Static, this</p>	Integer



	field must be blank 3) If required, these values must be $\geq$ the subsequent dynamic rating. For example: 20 °F - 2-hr 15-min Rating $\geq$ 25 °F - 15-min Rating 25 °F - 2-hr 15-min Rating $\geq$ 30 °F - 15-min Rating 4) If required, within each temp rating, the following must apply Continuous Rating $\leq$ 2-hr Emergency Rating $\leq$ 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 $\leq$ 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 $\leq$ 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 $\geq$ 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 $\leq$ 17 characters	Alpha



General	This tab is required	N/A
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## 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	<ul style="list-style-type: none"> <li>1) This field is optional</li> <li>2) This field must be between 1 - 99,999</li> </ul>	Float
Device Name(s) - that this reactive device is directly connected to	<ul style="list-style-type: none"> <li>1) This field is optional</li> <li>2) May not be &gt; than 17 characters</li> <li>3) May not contain special characters except for an underscore "_" and a dash "-"</li> </ul>	Alpha
Automatic Voltage Regulation	<ul style="list-style-type: none"> <li>1) This field is required</li> <li>2) Value must be from the following list: 'Y', 'N'</li> </ul>	Alpha
Voltage Level of Busbar being regulated	<ul style="list-style-type: none"> <li>1) This field is conditionally required if Automatic Voltage Regulation = 'Y'</li> <li>2) If the value <math>\geq</math> 69kv it must be 69, 138, or 345</li> <li>3) The value may not exceed 345</li> <li>4) The value must be <math>&gt; 0</math></li> </ul>	Float
Desired Regulating voltage	<ul style="list-style-type: none"> <li>1) This field is conditionally required if Automatic Voltage Regulation = 'Y'</li> <li>2) The value may not exceed 345</li> <li>3) The value must be <math>&gt; 0</math></li> <li>4) The value must <math>\geq</math> Minimum Regulating Voltage</li> <li>5) The value must <math>\leq</math> Maximum Regulating Voltage</li> </ul>	Float
Minimum Regulating Voltage	<ul style="list-style-type: none"> <li>1) This field is conditionally required if Automatic Voltage Regulation = 'Y'</li> <li>2) The value may not exceed 345</li> <li>3) The value must be <math>&gt; 0</math></li> <li>4) The value must be <math>\leq</math> Maximum Regulating Voltage</li> <li>5) Warning if value exceeds 50% from Maximum Regulating Voltage</li> </ul>	Float
Maximum Regulating Voltage	<ul style="list-style-type: none"> <li>1) This field is conditionally required if Automatic Voltage Regulation = 'Y'</li> <li>2) The value may not exceed 345</li> <li>3) The value must be <math>&gt; 0</math></li> <li>4) The value must be <math>\geq</math> Minimum Regulating Voltage</li> <li>5) Warning if value exceeds 50% from Minimum Regulating Voltage</li> </ul>	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 <b>Accepted</b> if value (using 5%) Deviates <  3.45  kV from 69 Deviates <  6.9  kV from 138 Deviates <  17.25  kV from 345 <b>Warn</b> 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 <b>Error</b> 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 $\geq$ 60kV and Low Side Voltage $>$ 1kV b) Warn: if High Side Voltage $<$ 60kV and Low Side Voltage = 1kV 2) Warn if $\geq$ 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 $\geq$ 69kv: <b>Accepted</b> if value (using 5%) Deviates $<$  3.45  kV from 69 Deviates $<$  6.9  kV from 138 Deviates $<$  17.25  kV from 345 <b>Warn</b> if value (using $\geq$ 5% and $<$ 10%) Deviates $> =$  3.45  but deviates $<$  6.9  from 69 Deviates $\geq$  6.9  but deviates $<$ 13.8 from 138 Deviates $\geq$  17.25  but deviates $<$ 34.5 from 345 <b>Error</b> if value (using $\geq$ 10%) Deviates $\geq$  6.9  kV from 69 Deviates $\geq$  13.8 kV from 138 Deviates $\geq$  34.5 kV from 345 3) Warn if value $>$ 345 4) The value must be $>$ 0 5) High Side Manufactured Nominal Voltage $\geq$ Low Side Manufactured Nominal Voltage	Float
Series Resistance (100 MVA Base)	1) This field is required 2) Value must be $\geq$ 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 $\leq$ 2-hr Emergency Rating 3) Value must be $\leq$ 15-min Rating	Integer
2-hr Emergency Rating	1) This field is required 2) Value must be $\geq$ Continuous Rating 3) Value must be $\leq$ 15-min Rating	Integer
15-min Rating	1) This field is required 2) Value must be $\geq$ Continuous Rating 3) Value must be $\geq$ 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 $\geq$ 69kv it must be 69, 138, or 345	Float





	<p>3) The value may not exceed 345</p> <p>4) The value must be &gt; 0</p> <p>5) The value must be &gt;= Low Voltage Level (no-load)</p>	
Target kV of Regulated Side	<p>1) This field is conditionally required if Automatic Voltage Regulation = 'Y'</p> <p>2) Value must be &gt; 0</p>	Float
Acceptable Deviation of Target Voltage in Percent	<p>1) This field is conditionally required if Automatic Voltage Regulation = 'Y'</p> <p>2) Value must not exceed 50%</p>	Percentage
Low Tap Settings - Tap position at Manufactured Nominal Voltage	<p>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</p> <p>Second Condition: This field must be left blank if Low Voltage Level = 1</p> <p>2) Note: this value may be negative</p>	Integer
Low Tap Settings - Total Number of Tap Positions	<p>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</p> <p>Second Condition: This field must be left blank if Low Voltage Level = 1</p> <p>2) Value must be &gt;= 2</p> <p>3) Warn if value &lt; 16 and "Automatic Voltage Regulation" = 'Y'</p>	Integer
Low Tap Settings - Normal Tap Position	<p>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.</p> <p>Second Condition: This field must be left blank if Low Voltage Level = 1</p> <p>2) Value must be &gt;= Low Tap Settings - Lowest Tap Position</p> <p>3) Value must be &lt;= Low Tap Settings - Highest Tap Position</p> <p>4) Note: this value may be negative</p>	Integer
Low Tap Settings - Lowest Tap Position	<p>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,</p>	Integer



	<p>Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap</p> <p>Second Condition: This field must be left blank if Low Voltage Level = 1</p> <p>2) Value must be <math>\leq</math> Low Tap Settings - Highest Tap Position</p> <p>3) Note: this value may be negative</p>	
Low Tap Settings - Voltage at Lowest Tap Position	<p>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</p> <p>Second Condition: This field must be left blank if Low Voltage Level = 1</p> <p>2) Value must be <math>\leq</math> Low Tap Settings - Voltage at Highest Tap Position</p> <p>3) Value must be <math>&lt;</math> High Tap Settings - Voltage at Lowest Tap Position</p> <p>4) Value must be <math>\geq 0</math></p>	Float
Low Tap Settings - Highest Tap Position	<p>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.</p> <p>Second Condition: This field must be left blank if Low Voltage Level = 1</p> <p>2) Value must be <math>\geq</math> Low Tap Settings - Low Tap Position</p> <p>3) Note: this value may be negative</p>	Integer
Low Tap Settings - Voltage at Highest Tap Position	<p>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.</p> <p>Second Condition: This field may be left blank if Low Voltage Level = 1</p> <p>2) Value must be <math>\geq</math> Low Tap Settings - Voltage at Lowest Tap Position</p> <p>3) Value must be <math>\leq</math> High Tap Settings - Voltage at Highest Tap Position</p> <p>4) Value must be <math>\geq 0</math></p>	Float
Low Tap Settings – Size of each Voltage Step	<p>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</p>	Float



	<p>the Load Tap</p> <p>Second Condition: This field may be left blank if Low Voltage Level = 1</p> <p>2) Value must &gt; 0</p> <p>3) Warn if &lt; 0.002 * Low Side Voltage Level (no-load)</p> <p>4) Warn if &gt; 0.05 * Low Side Voltage Level (no-load)</p>	
High Tap Settings - Tap position at Manufactured Nominal Voltage	<p>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</p> <p>2) Note: this value may be negative</p>	Integer
High Tap Settings - Total Number of Tap Positions	<p>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</p> <p>2) Value must be &gt;= 2</p> <p>3) Warn if value &lt; 16 and "Automatic Voltage Regulation" = 'Y'</p>	Integer
High Tap Settings - Normal Tap Position	<p>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</p> <p>2) Value must be &gt;= High Tap Settings - LowestTap Position</p> <p>3) Value must be &lt;= High Tap Settings - Highest Tap Position</p> <p>4) Note: this value may be negative</p>	Integer
High Tap Settings - Lowest Tap Position	<p>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</p>	Integer



	<p>2) Value must be <math>\leq</math> High Tap Settings - Highest Tap Position</p> <p>3) Note: this value may be negative</p>	
High Tap Settings – Voltage at Lowest Tap Position	<p>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</p> <p>2) Value must be <math>\leq</math> High Tap Settings - Voltage at Highest Tap Position</p> <p>3) Value must be <math>&gt;</math> Low Tap Settings - Voltage at Lowest Tap Position</p> <p>4) Value must be <math>\geq 0</math></p>	Float
High Tap Settings - Highest Tap Position	<p>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</p> <p>2) Value must be <math>\geq</math> Low Tap Position</p> <p>3) Note: this value may be negative</p>	Integer
High Tap Settings - Voltage at Highest Tap Position	<p>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</p> <p>2) Value must be <math>\geq</math> High Tap Settings - Voltage at Lowest Tap Position</p> <p>3) Value must be <math>&gt;</math> Low Tap Settings - Voltage at Highest Tap Position</p> <p>4) Value must be <math>&gt; 0</math></p>	Float
High Tap Settings – Size of each Voltage Step	<p>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</p> <p>2) Value must <math>&gt; 0</math></p> <p>3) Warn if <math>&lt; 0.002 * \text{High Side Voltage Level}</math></p>	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	<ul style="list-style-type: none"> <li>1) This field is required</li> <li>2) If the value <math>\geq 69\text{kv}</math> it must be 69, 138, or 345</li> <li>3) The value may not exceed 345</li> <li>4) The value must be <math>&gt; 0</math></li> </ul>	Float
Fixed MVAR (VAR injection at nominal voltage)	<ul style="list-style-type: none"> <li>1) This field is required</li> <li>2) Value must be <math>&gt; 0</math></li> </ul>	Float
Minimum Admittance Limits (100 MVA Base)	<ul style="list-style-type: none"> <li>1) This field is required</li> <li>2) Value must be <math>\leq</math> Maximum Admittance</li> </ul>	Float
Maximum Admittance Limits (100 MVA Base)	<ul style="list-style-type: none"> <li>1) This field is required</li> <li>2) Value must be <math>\geq</math> Minimum Admittance</li> </ul>	Float
Minimum Steady State Reactive Power Limits	<ul style="list-style-type: none"> <li>1) This field is required</li> <li>2) Value must be <math>\geq</math> Maximum Steady State Reactive Power Limits</li> </ul>	Float
Maximum Steady State Reactive Power Limits	<ul style="list-style-type: none"> <li>1) This field is required</li> <li>2) Value must be <math>\geq</math> Minimum Steady State Reactive Power Limits</li> </ul>	Float
Minimum Threshold (post contingency) Reactive Power Limits	<ul style="list-style-type: none"> <li>1) This field is required</li> <li>2) Value must be <math>\leq</math> Maximum Threshold (post contingency) Reactive Power Limits</li> </ul>	Float
Maximum Threshold (post contingency) Reactive Power Limits	<ul style="list-style-type: none"> <li>1) This field is required</li> <li>2) Value must be <math>\geq</math> Minimum Threshold (post contingency) Reactive Power Limits</li> </ul>	Float



Minimum Voltage Threshold (100 MVA Base)	<ol style="list-style-type: none"> <li>1) This field is required</li> <li>2) Value must be <math>\leq</math> Maximum Voltage Threshold (100 MVA Base)</li> <li>3) The value may not exceed 345</li> <li>3) The value must be <math>&gt; 0</math></li> <li>4) Warn if Max / Min exceed 50% of one another</li> </ol>	Float
Maximum Voltage Threshold (100 MVA Base)	<ol style="list-style-type: none"> <li>1) This field is required</li> <li>2) Value must be <math>\geq</math> Minimum Voltage Threshold (100 MVA Base)</li> <li>3) The value may not exceed 345</li> <li>4) The value must be <math>&gt; 0</math></li> <li>5) Warn if Max / Min exceed 50% of one another</li> </ol>	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	<ol style="list-style-type: none"> <li>1) This field is conditionally Required - If there is a change to a tab, the change must be described.</li> </ol>	Alpha
Series Device Name	<ol style="list-style-type: none"> <li>1) This field is required</li> <li>2) Warn if <math>\geq 14</math> characters. First 14 characters must be unique</li> <li>3) No special characters except and underscore</li> </ol>	Alpha
ERCOT Station Name (Station Code or Station Mnemonic)	<ol style="list-style-type: none"> <li>1) This field is required</li> <li>2) Must match ERCOT records (unless new)</li> <li>3) Must be <math>\leq 8</math> characters</li> </ol>	Alpha
Voltage Level	<ol style="list-style-type: none"> <li>1) This field is required</li> <li>2) If the value <math>\geq 69</math>kv it must be 69,138, or 345</li> <li>3) The value may not exceed 345</li> <li>4) The value must be <math>&gt; 0</math></li> </ol>	Float
Side 1 - Connected Switching Device Name(s)	<ol style="list-style-type: none"> <li>1) This field is required</li> <li>2) May not be <math>&gt;</math> than 17 characters</li> <li>3) May not have duplicates within the TO or FROM Station</li> <li>4) May not contain special characters except for an underscore "_" and a dash "-"</li> </ol>	Alpha
Side 1 - Bus Number (PTI Bus Number)	<ol style="list-style-type: none"> <li>1) This field is optional</li> <li>2) This field must be between 1 - 99,999</li> </ol>	Integer
Side 2 - Connected Switching Device Name(s)	<ol style="list-style-type: none"> <li>1) This field is required</li> <li>2) May not be <math>&gt;</math> than 17 characters</li> <li>3) May not have duplicates within the TO or FROM Station</li> <li>4) May not contain special characters except for an underscore "_" and a dash "-"</li> </ol>	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

ERCOT Confidential		RETURN TO MAP		
<b>Load Resource Information Tab</b>				
<i>This worksheet tab provides information for Load Resources.</i>				
<i>Please complete this section and select RETURN TO MAP</i>				
<b>LOAD RESOURCES</b>	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		
	<b>Dispatch Asset Code (provided by ERCOT)</b>			
	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			
	ESID 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

ERCOT Confidential		RETURN TO MAP	
<b>Load Resource Parameters</b>			
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.			
<i>This worksheet tab provides information for Load Resources. Resource Parameters - Initial submittal by RE, update Please complete this section and select RETURN TO MAP</i>			
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.

CLR - Normal Ramp Rate Curve		Labels	TEST_LD1
LOAD RESOURCES	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](mailto:NodalMarketTransition@ercot.com).

# **EXHIBIT D**



**Operations Support Engineering**

**New Generator Commissioning Checklist**

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



**Operations Support Engineering**

**New Generator Commissioning Checklist**

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: _____
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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: \_\_\_\_\_

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**Operations Support Engineering**

**New Generator Commissioning Checklist**

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
<input type="checkbox"/>	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) <b>RE Comment:</b>
<input type="checkbox"/>	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) <b>RE Comment:</b>
<input type="checkbox"/>	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) <b>RE Comment:</b>
<input type="checkbox"/>	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) <b>RE Comment:</b>



**Operations Support Engineering**

**New Generator Commissioning Checklist**

	<b>Data</b>	<b>Frequency</b>	<b>Mode</b>	<b>Reference/Comments</b>
<input type="checkbox"/>	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). <b>RE Comment:</b>



### 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: \_\_\_\_\_



## Operations Support Engineering

### New Generator Commissioning Checklist

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
<input type="checkbox"/>	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. <b>QSE Comment:</b>
<input type="checkbox"/>	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. <b>QSE Comment:</b>
<input type="checkbox"/>	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. <b>QSE Comment:</b>
<input type="checkbox"/>	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. <b>QSE Comment:</b>
<input type="checkbox"/>	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. <b>QSE Comment:</b>
<input type="checkbox"/>	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. <b>QSE Comment:</b>
<input type="checkbox"/>	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. <b>QSE Comment:</b>
<input type="checkbox"/>	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. <b>QSE Comment:</b>
<input type="checkbox"/>	Generating Unit Power System Stabilizer status			Protocol Section 6.5.7.2 QSE Responsibilities. Applies to units required to provide VSS. <b>QSE Comment:</b>

**Wind-Generation Resource Only**



Operations Support Engineering

New Generator Commissioning Checklist

	Additional Wind Resource Data	Frequency (sec)	Protocol Reference
<input type="checkbox"/>	Wind Speed (Miles per Hour)	10	6.5.11 (7)
<input type="checkbox"/>	Wind Direction (Degrees)	10	6.5.11 (7)
<input type="checkbox"/>	Temperature (Celsius)	10	6.5.11 (7)
<input type="checkbox"/>	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](mailto:NodalMarketTransition@ercot.com).

Sincerely,

ERCOT Wholesale Client Services

Classification: ERCOT Confidential

No virus found in this incoming message.

Checked by AVG - [www.avg.com](http://www.avg.com)

Version: 9.0.702 / Virus Database: 270.14.58/2493 - Release Date: 11/10/09 01:38:00



# **EXHIBIT F**

## PRR Comments

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	November 03, 2009
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Submitter's Information	
<b>Name</b>	Matt Daniel
<b>E-mail Address</b>	<a href="mailto:Matthew.Daniel@horizonwind.com">Matthew.Daniel@horizonwind.com</a>
<b>Company</b>	Horizon Wind Energy LLC
<b>Phone Number</b>	713-265-0350
<b>Cell Number</b>	
<b>Market Segment</b>	Independent Generator

Comments
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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

## PRR Comments

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 requirements in 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 22<sup>nd</sup> 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<sup>1</sup> and Coal Power magazine<sup>2</sup>. 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.”<sup>3</sup>*

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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<sup>1</sup> “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/>

<sup>2</sup> “Texas Wind Boom Cutting into Fossil Generator Profits” in Coal Power magazine, October 8, 2009  
[http://www.coalpowermag.com/ops\\_and\\_maintenance/223.html](http://www.coalpowermag.com/ops_and_maintenance/223.html)

<sup>3</sup> P. 4, Bernstein Commodities & Power: The Impact of Wind on Power Prices and Coal and Gas Consumption, September 4, 2009

# PRR Comments

<b>Revised Proposed Protocol Language</b>
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None.

# **EXHIBIT G**

## PRR Comments

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	October 8, 2009
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Submitter's Information	
<b>Name</b>	Matt Daniel
<b>E-mail Address</b>	<a href="mailto:Matthew.Daniel@horizonwind.com">Matthew.Daniel@horizonwind.com</a>
<b>Company</b>	Horizon Wind Energy LLC
<b>Phone Number</b>	713-265-0350
<b>Cell Number</b>	
<b>Market Segment</b>	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



## PRR Comments

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

## PRR Comments

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.

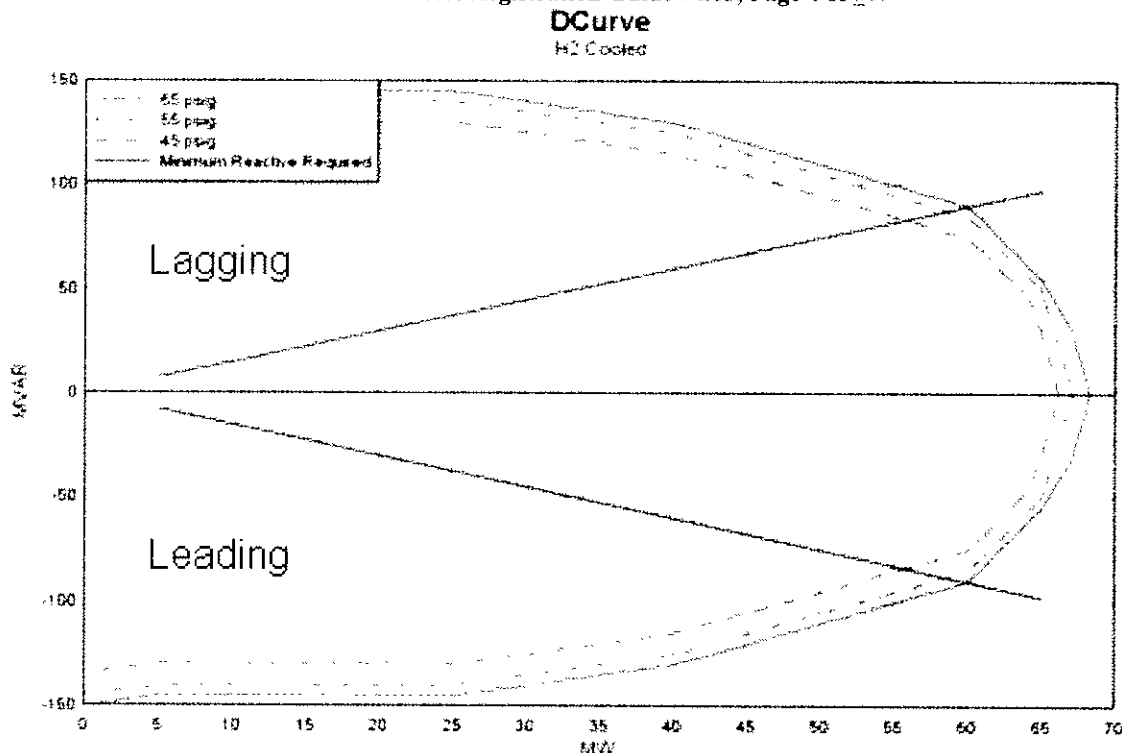
The current Protocols are clear that URL refers to Reactive Power produced when a Resource is operating at its rated capability, and that the required reactive capability varies with the Resource's real power production. At full output, a Resource must be capable of providing reactive power per its URL. 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.

# PRR Comments

Resource Asset Registration Guide v4.03, Page 4 of 569



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

## PRR Comments

dynamic voltage support in lieu of the power system stabilizer and automatic voltage regulation at the generator excitation system.<sup>1</sup>

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.

<b>Revised Proposed Protocol Language</b>
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None.

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1

[http://www.ercot.com/content/meetings/ros/keydocs/2007/0215/06.\\_ERCOTGenerationInterconnectOrChangeRequestProcedures0214.doc](http://www.ercot.com/content/meetings/ros/keydocs/2007/0215/06._ERCOTGenerationInterconnectOrChangeRequestProcedures0214.doc)

# **EXHIBIT H**

## PRR Comments

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	September 15, 2009
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<b>Submitter's Information</b>	
<b>Name</b>	Matt Daniel
<b>E-mail Address</b>	<a href="mailto:Matthew.Daniel@horizonwind.com">Matthew.Daniel@horizonwind.com</a>
<b>Company</b>	Horizon Wind Energy LLC
<b>Phone Number</b>	713-265-0350
<b>Cell Number</b>	
<b>Market Segment</b>	Independent Generator

<b>Comments</b>
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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

## PRR Comments

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



## PRR Comments

PRR Number	830	PRR Title	Reactive Power Capability Requirement
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Date	November 10, 2009
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Submitter's Information	
Name	Ken Donohoo
E-mail Address	<a href="mailto:kdonoho1@oncor.com">kdonoho1@oncor.com</a>
Company	Oncor Electric Delivery Company LLC
Phone Number	214-743-6823
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

## PRR Comments

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

## PRR Comments

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



# **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
<b>Complete Study Scope and Sign Study Agreement</b>	<b>60-day time limit to go forward</b>
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**

<b>Total Capacity</b>	<b>Fee</b>
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**

<b>Total Capacity</b>	<b>Fee</b>
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

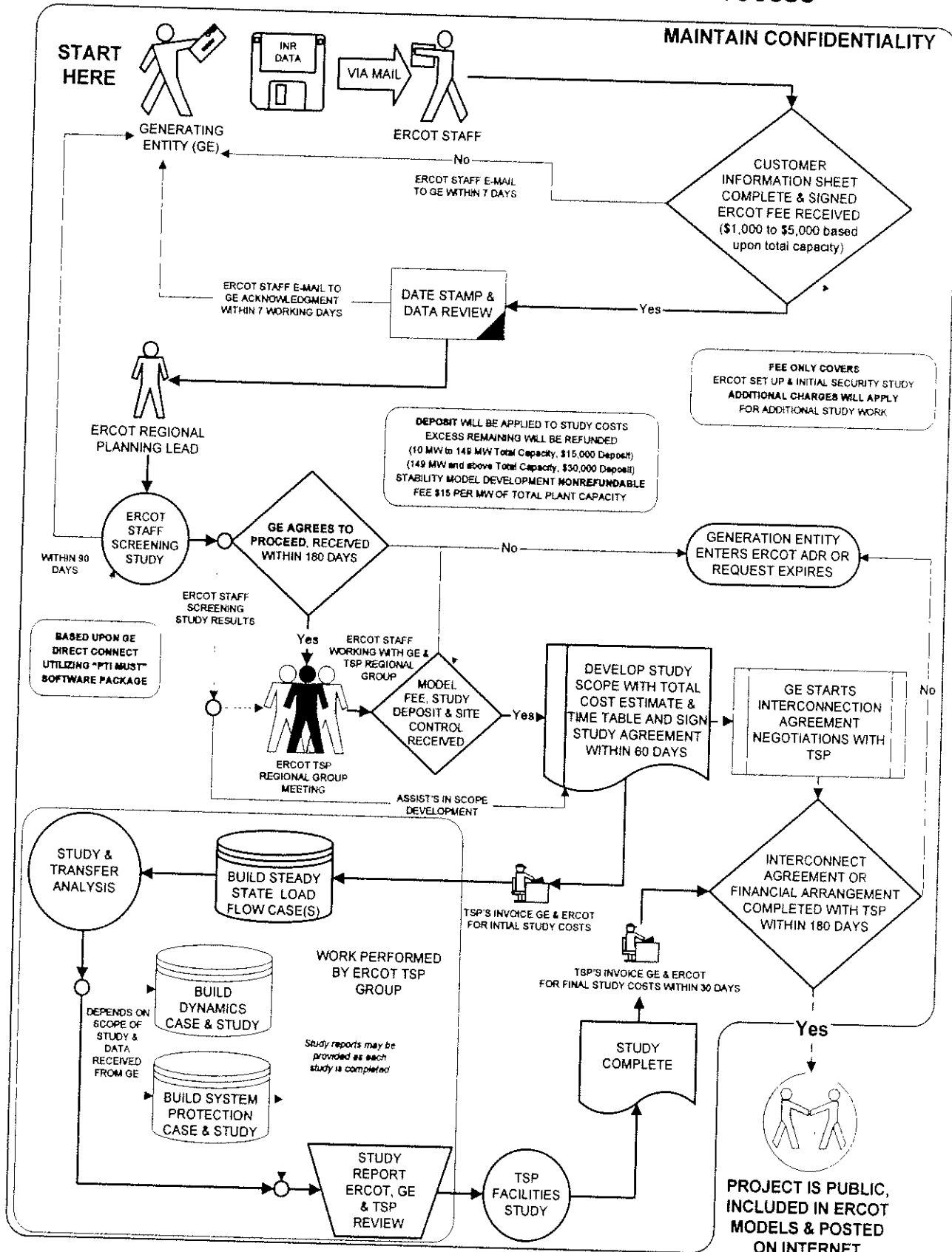
**INTERCONNECTION AGREEMENTS**

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](http://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
  - Subsynchronous Resonance (SSR) Data – By Unit For Each Unit
    - May be needed to support studies in full interconnect study
  - 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](mailto: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 of the 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.

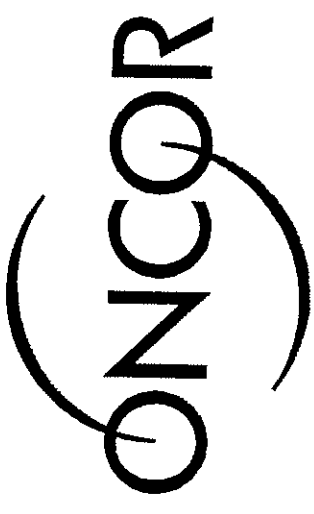
**Accurate/appropriate information and test data about generator step up transformers, all generator data including data for stability studies (transient, voltage, etc...) and subsynchronous resonance (SSR) data will be provided to ERCOT and interconnected TSP before the generation goes into commercial 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: \_\_\_\_\_



# **Reactive Discussion**

**Kenneth A. Donohoo, P.E.  
Director, System Planning  
Distribution and Transmission  
Oncor Electric Delivery Company LLC**

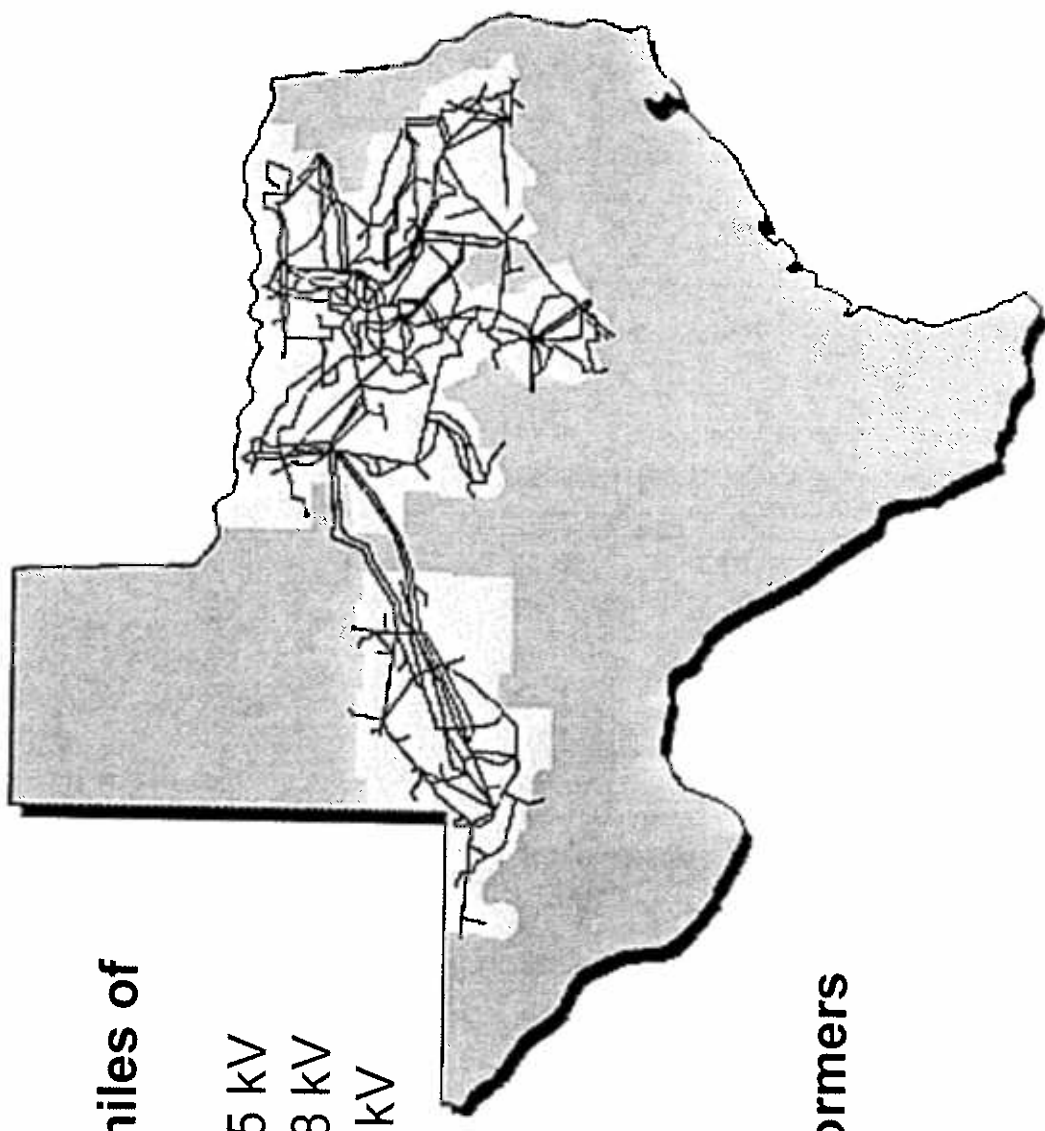
**Presentation to ERCOT ROS  
October 15, 2009  
Austin, TX**



# **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



- **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



- **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



- **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



- **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



- **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 condenser 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



- **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



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



## **ERCOT Protocols:**

- **6.10.3.5:**
  - generator must conduct reactive tests
  - testing required on "initial qualification" Planning Standards and Criteria

# REACTIVE CAPABILITY TESTING



## ERCOT Operating Guides:

- **3.1.4.3.1:**
  - Reactive capability curve (CURL) must be supplied 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



## **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



## PRR Position Statement

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	November 10, 2009
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<b>Submitter's Information</b>	
<b>Name</b>	John Houston, TAC Advocate
<b>E-mail Address</b>	
<b>Company</b>	CenterPoint Energy Houston Electric
<b>Phone Number</b>	
<b>Cell Number</b>	
<b>Market Segment</b>	

<b>Comments</b>
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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

## PRR Position Statement

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

## 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 SGIA's 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



## PRR Comments

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	11/10/2009
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<b>Company</b>	Wind Coalition
<b>Phone Number</b>	512-335-0664
<b>Cell Number</b>	512-335-0664
<b>Market Segment</b>	N/A

<b>Comments</b>
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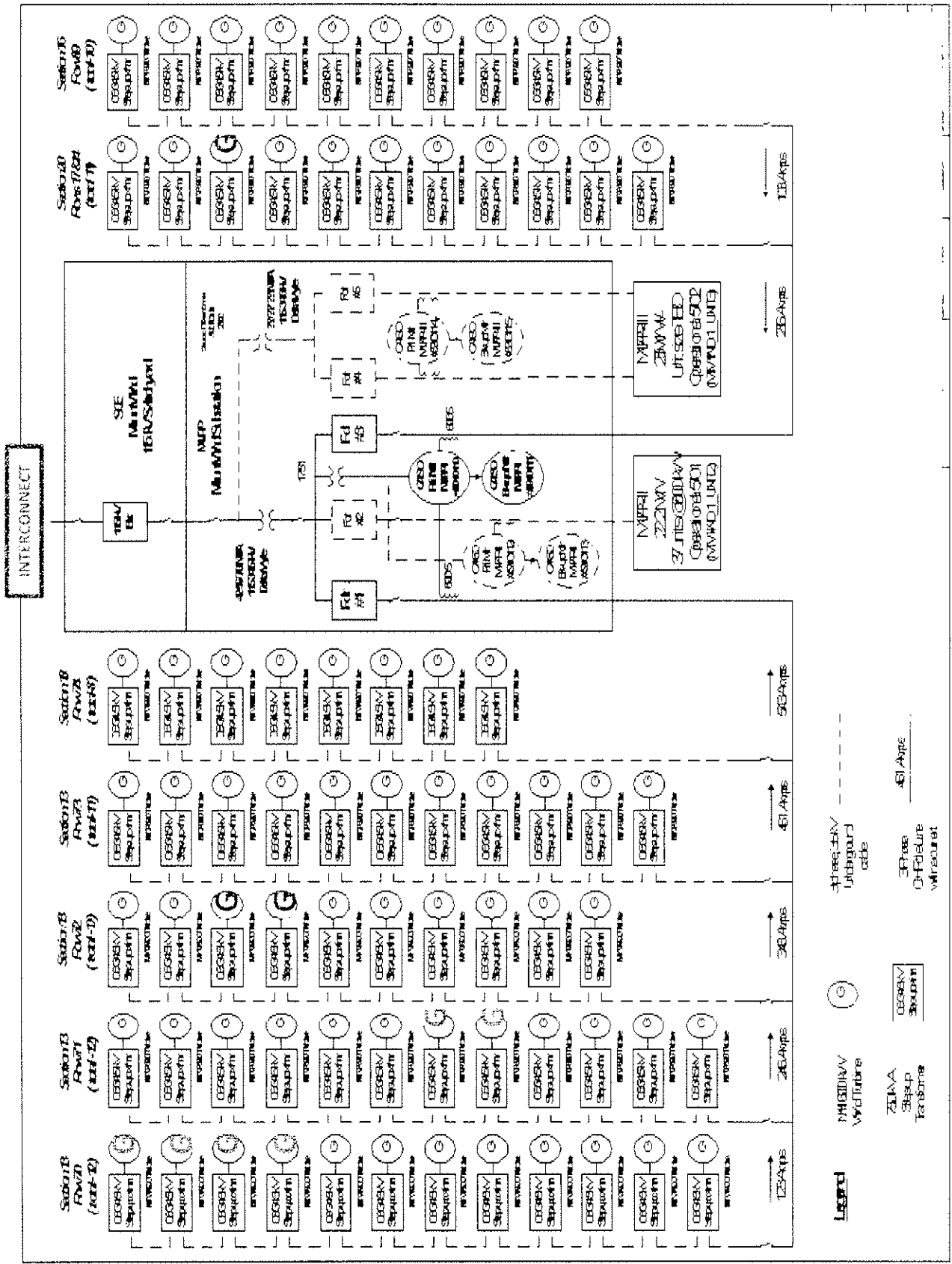
Please see PowerPoint presentation named 830PRR-37 Wind Coalition 111709 Board Presentation 111009.ppt.

## **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



# 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

# 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

## PRR Comments

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	November 17, 2009
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Submitter's Information	
<b>Name</b>	Michael Hutson
<b>E-mail Address</b>	<a href="mailto:michael.hutson@res-americas.com">michael.hutson@res-americas.com</a>
<b>Company</b>	RES America Developments Inc.
<b>Phone Number</b>	303 439 4708
<b>Cell Number</b>	
<b>Market Segment</b>	Independent Generator

Comments
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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

## PRR Comments

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	11/17/2009
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<b>Submitter's Information</b>	
<b>Name</b>	Robert L. Sims
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<b>Cell Number</b>	(619) 992-8381
<b>Market Segment</b>	Independent Generator

<b>Comments</b>
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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 led 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.**

**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.**

**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**



**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

**EEl** - 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



*the power of being global*

**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



**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



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 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 (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”*

**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.**



830PRR-41

## Board Action Report

<b>PRR Number</b>	830	<b>PRR Title</b>	<b>Reactive Power Capability Requirement</b>
<b>Timeline</b>	Urgent	<b>Action</b>	Approved
<b>Date of Decision</b>	November 17, 2009		
<b>Effective Date</b>	December 1, 2009		
<b>Priority and Rank Assigned</b>	Not applicable.		
<b>Protocol Section(s) Requiring Revision</b>	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		
<b>Revision Description</b>	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.		
<b>Reason for Revision</b>	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.		
<b>Overall Market Benefit</b>	Provides additional clarity to the reactive requirements for wind generation.		
<b>Overall Market Impact</b>	Unknown.		
<b>Consumer Impact</b>	None.		
<b>Credit Impacts</b>	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.		
<b>Relevance to Nodal Market</b>	Yes. The Reactive Power capability requirements exist in Nodal as well.		

## Board Action Report

<b>Nodal Protocol Sections Requiring Revision</b>	2.1, Definitions 2.2, Acronyms and Abbreviations 3.15, Voltage Support 6.5.7.7, Voltage Support Service
<b>Procedural History</b>	<ul style="list-style-type: none"> <li>➤ On 9/08/09, PRR830, a preliminary Impact Analysis, and CEO Revision Request Review were posted.</li> <li>➤ On 9/10/09, PRR830 was granted Urgent status via a PRS e-mail vote.</li> <li>➤ On 9/15/09, Horizon Wind Energy LLC comments were posted.</li> <li>➤ On 9/17/09, PRS considered PRR830.</li> <li>➤ On 9/28/09, Calpine comments were posted.</li> <li>➤ On 10/7/09, Iberdrola Renewables comments were posted.</li> <li>➤ On 10/8/09, a second set of Horizon Wind Energy LLC comments were posted.</li> <li>➤ On 10/8/09, LCRA comments were posted.</li> <li>➤ On 10/19/09, ROS comments were posted.</li> <li>➤ On 10/21/09, Wind Coalition comments were posted.</li> <li>➤ On 10/22/09, Vestas comments were posted.</li> <li>➤ On 10/22/09, PRS again considered PRR830.</li> <li>➤ On 10/22/09, NextEra Energy Resources comments were posted.</li> <li>➤ On 10/26/09, the Impact Analysis was posted.</li> <li>➤ On 10/28/09, a second set of Calpine comments were posted.</li> <li>➤ On 10/29/09, Oncor comments were posted.</li> <li>➤ On 10/29/09, ERCOT comments were posted.</li> <li>➤ On 10/30/09, AEP comments were posted.</li> <li>➤ On 11/2/09, Invenergy comments were posted.</li> <li>➤ On 11/3/09, a second set NextEra Energy Resources comments were posted.</li> <li>➤ On 11/3/09, a third set of Horizon Wind Energy LLC comments were posted.</li> <li>➤ On 11/4/09, a second set of Vestas comments were posted.</li> <li>➤ On 11/5/09, TAC considered PRR830.</li> <li>➤ On 11/6/09, the NextEra Energy Resources appeal was posted.</li> <li>➤ On 11/10/09, the NextEra Energy Resources appeal supporting documents were posted.</li> <li>➤ On 11/10/09, a second set of AEP comments were posted.</li> <li>➤ On 11/10/09, AES comments were posted.</li> <li>➤ On 11/10/09, the Horizon position statement was posted.</li> <li>➤ On 11/10/09, a second set of ONCOR comments were posted.</li> <li>➤ On 11/10/09, the TAC Advocate position statement was posted.</li> <li>➤ On 11/10/09, an ERCOT ISO position statement was posted.</li> <li>➤ On 11/10/09, the TAC Advocate supporting document was posted.</li> <li>➤ On 11/10/09, a second set of Wind Coalition comments were</li> </ul>

## Board Action Report

	<p>posted.</p> <ul style="list-style-type: none"> <li>➤ On 11/17/09, RES America Developments comments were posted.</li> <li>➤ On 11/17/09, a second set of AES comments were posted.</li> <li>➤ On 11/17/09, the ERCOT Board considered PRR830.</li> <li>➤ On 11/20/09, the NextEra Energy Resources ERCOT Board presentation was posted.</li> </ul>
<p><b>PRS Decision</b></p>	<p>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.</p> <p>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.</p>
<p><b>Summary of PRS Discussion</b></p>	<p>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.</p> <p>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.</p>
<p><b>TAC Decision</b></p>	<p>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.</p>
<p><b>Summary of TAC Discussion</b></p>	<p>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.</p> <p>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</p>

## Board Action Report

	<p>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.</p> <p>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".</p> <p>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."</p>
<b>Board Decision</b>	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		
<b>Assumptions</b>	1	
	2	
	3	
	4	
<b>Market Cost</b>		<b>Impact Area</b>
	1	<b>Monetary Impact</b>
	2	
	3	
<b>Market Benefit</b>		<b>Impact Area</b>
	1	<b>Monetary Impact</b>
	2	<i>Clarifies the reactive requirements for wind generation.</i>
	3	
<b>Additional Qualitative Information</b>	1	
	2	
	3	
	4	
<b>Other Comments</b>	1	
	2	
	3	

## Board Action Report

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Sponsor	
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<b>Market Segment</b>	N/A

Market Rules Staff Contact	
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<b>Phone Number</b>	512-248-3867

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

## Board Action Report

	performance of a fully dynamic system should be allowed.
NextEra Energy Resources 102209	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.

## Board Action Report

	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



# Board Action Report

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.
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## 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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Deleted: (GSU)

### 2.2 Acronyms

POI	Point of Interconnection
GSU	Generator Step Up
Agreement	SGIA Standard Generation Interconnection Agreement

Deleted: Generation

Deleted: Transformer

#### 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

Deleted: Installed Reactive Capability

Deleted: at rated capability (MW)

Deleted: This quantity of Reactive Power is the Unit Reactive Limit (URL) § (2)

Deleted: required to provide VSS except as noted below in items (3) or (4).

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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

## Board Action Report

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.

Deleted: November

(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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Deleted: 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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Deleted: URL as stated above

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Deleted: is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and

Deleted: described

(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.

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

(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.

# Board Action Report

- (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

<del>Deleted:</del> Upon submission by a
<del>Deleted:</del> Resource
<del>Deleted:</del> required to provide VSS
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<del>Deleted:</del> shall
<del>Deleted:</del> such alternative requirements or
<del>Deleted:</del> objections to the proposal
<del>Deleted:</del> Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements.
<del>Deleted:</del> An 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 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 [1]
<del>Deleted:</del> For Generation Resources required to provide VSS
<del>Deleted:</del> to be met by
<del>Deleted:</del> unit
<del>Deleted:</del> , unless specifically approved by ERCOT
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<del>Deleted:</del> six (6) months after the effective date of this paragraph
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# Board Action Report

outside the URL, specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

**Deleted:** Unit Reactive Limits ( )  
**Deleted:** )

(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, GSI transformer tap settings will be managed to maximize the use of the ERCOT System for all Market Participants while maintaining adequate reliability.

**Deleted:** Transmission and/or Distribution Service Providers ( )  
**Deleted:** )  
**Deleted:** step-up

(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 §  
**Deleted:** 6  
**Deleted:** oltage Support Servic  
**Deleted:** e

An 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 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-42

## PRR Comments

<b>PRR Number</b>	830	<b>PRR Title</b>	Reactive Power Capability Requirement
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<b>Date</b>	November 20, 2009
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Submitter's Information	
<b>Name</b>	Dave Markarian
<b>E-mail Address</b>	David.Markarian@nexteraenergy.com
<b>Company</b>	NextEra Energy Resources
<b>Phone Number</b>	
<b>Cell Number</b>	
<b>Market Segment</b>	Independent Generator

<b>Comments</b>
-----------------

Please see PowerPoint presentation named 830PRR-42 NextEra Energy Resources Board Presentation 112009.ppt.

# **Dave Markarian, Esq.**

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**Managing Attorney,  
NextEra Energy Resources  
Litigation & State Regulatory**



# **Reinterpreting Existing Protocols and Applying Them Retroactively is Bad Policy**

- We understand and take reliability concerns very seriously
- A reliability leader in ERCOT – we seek to do the right thing

# Reliability Requires PRR 830

# ◆ No System Emergencies

# PRR 830 Is Nothing New

## T Reactive Power Requirements

Protocol vetted through the stakeholder process in 2003 and 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

Additional needs identified by engineering analysis to ensure voltage stability requirements are provided by transmission

# Requirements have been in place for several years

IN FULLY AVAILABLE

Protocol Revision Request

Protocol Revision Request

Active Power

Protocol Revision Request

Proposed Protocol Language Revision

Deponent

10/1/2010

Washington University in St. Louis

10/1/2010

10/1/2010

Protocol Revision Request

General information on the subject of the protocol revision request is provided below. The purpose of this request is to update the protocol to reflect the current state of the art in the field of [redacted].

The proposed changes to the protocol are as follows: [redacted]

These changes are necessary to ensure that the protocol remains relevant and effective in the current research environment. The proposed changes are based on the latest findings in the field and are intended to improve the quality and reliability of the data collected.

The proposed changes are as follows: [redacted]

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NEW

ENTIRELY NEW

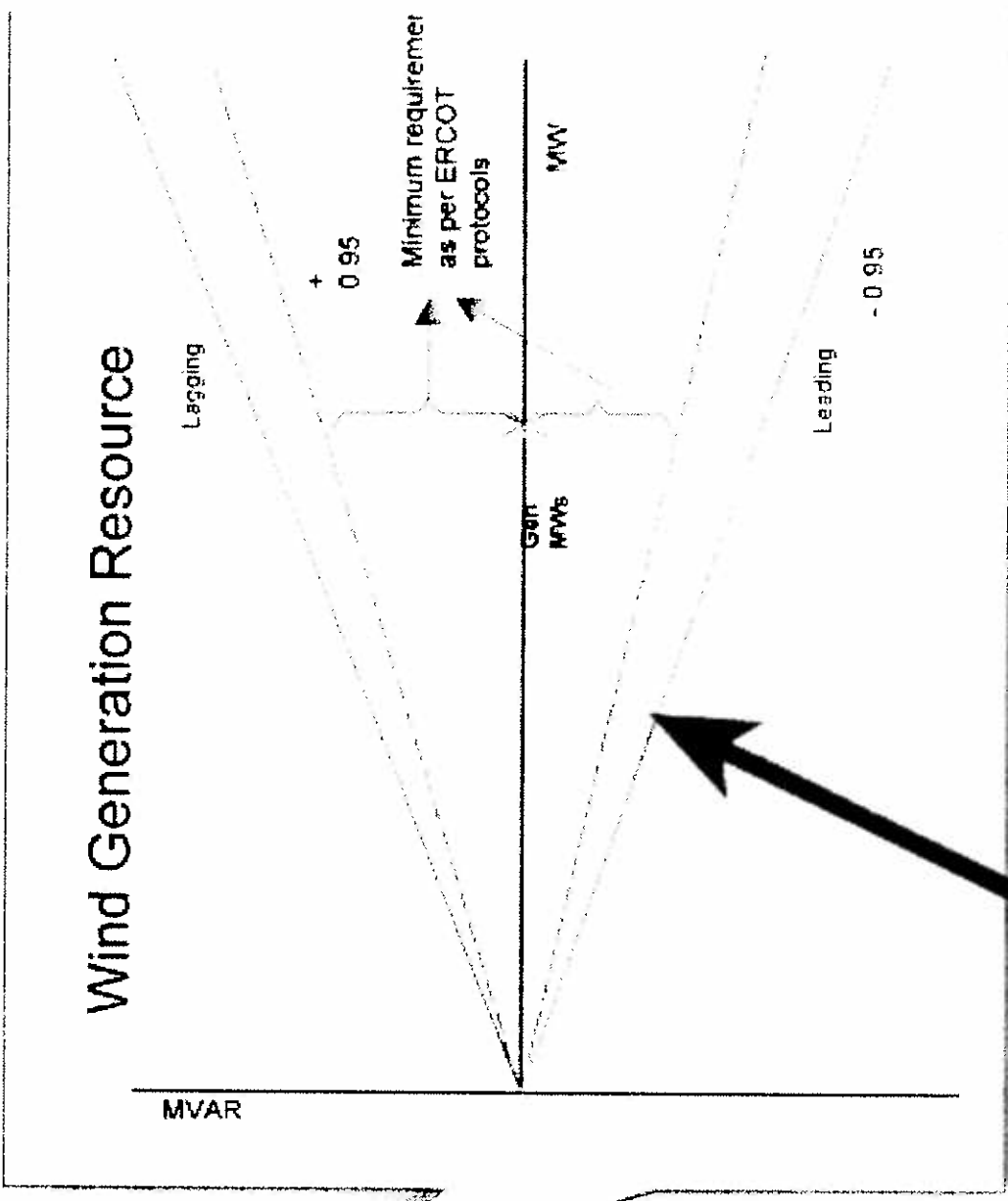
NEW

**2008**





**Voltage Control Requirement**  
 ERCOT Operations Planning  
 August 22, 2008



shown to the right are the reactive capability curves for a conventional generator and a WGR

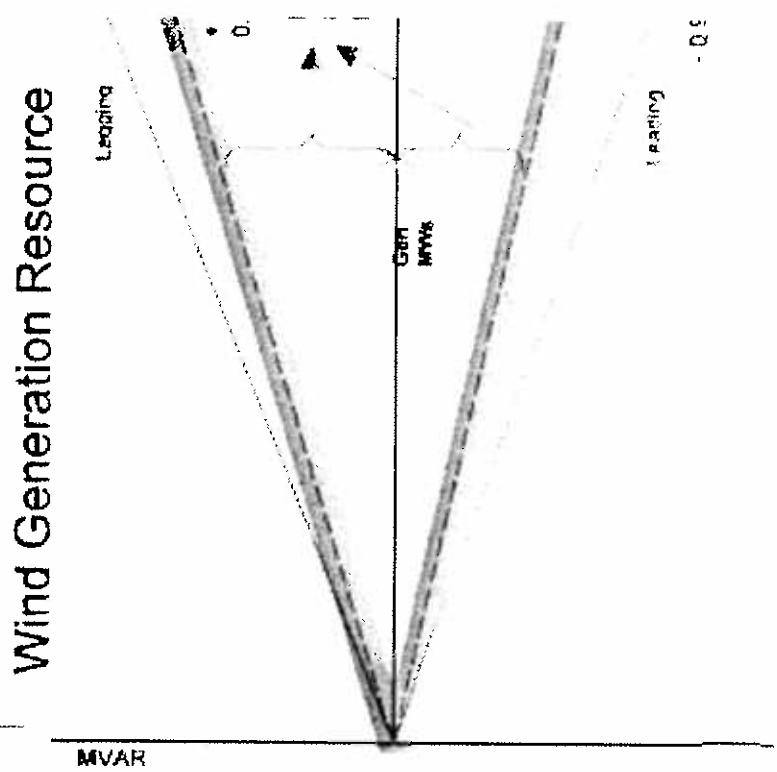
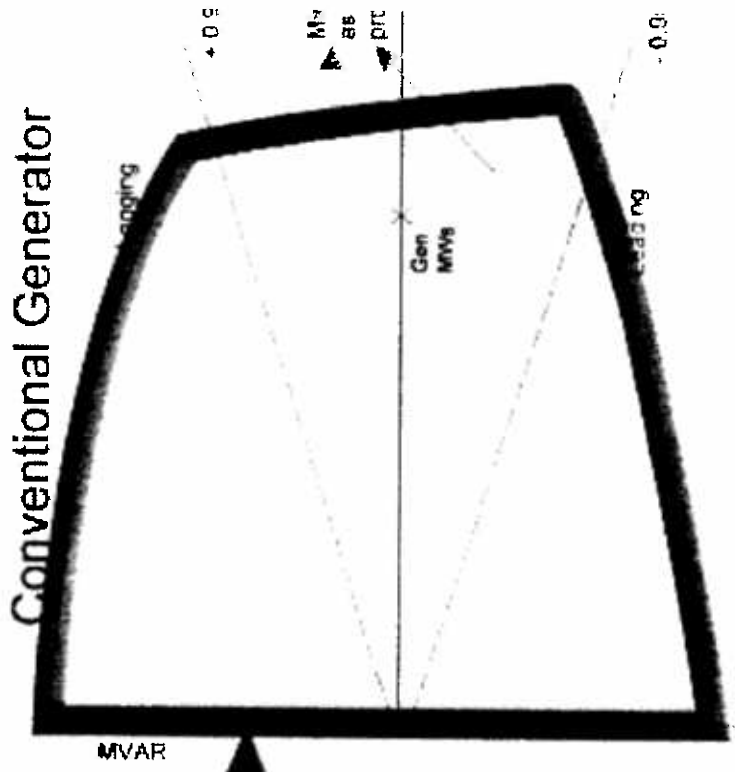
When to the right are the reactive capability curves for a conventional generator and a WGR



As seen from the figures, each generator is required to provide a + 0.95 to -0.95 pf range 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**



**ERCOT APPROVED  
Transmission  
Interconnection  
Service Provided To  
Wind Farms**



**ERCOT would Not  
Approve Anything  
That Adversely  
Affected Reliability**

**ERCOT SHALL:**

- (6) Accept and supervise all requests for interconnection**
- (9) Plan the transmission system**

**At Least 80 RARFs  
Submitted To and  
Approved By Ercot**

# ◊ RARFs Demonstrated Wind Was Not Designed To Meet The Rectangle



# Local TSPs Performed Interconnection Studies Based Upon Triangle

# ◊ No Problems With Triangle Identified

◆ **This Info, These  
Studies Available to  
ERCOT**

**◆ ERCOT Could/Should  
Have Studied**

**ERCOT SHALL:**

- (6) Accept and supervise all requests for interconnection**
- (9) Plan the transmission system**



**ERCOT Approved**  
**The Transmission**  
**Interconnection**

◆ **Retroactivity Can Be  
Imposed Upon  
*Anyone***

 **Imposes Regulatory  
Risk On Future  
Investment  
Decisions**



# Will Chill Future Investment Decisions in Texas

**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.**



**Request for Proposal:  
Analysis and Design of Series Compensation  
and other Reactive Equipment for the  
Transmission Improvements Designated to Serve  
Competitive Renewable Energy Zones**

○ **Ensure access to the transmission and distribution systems for all buyers and sellers of electricity on nondiscriminatory terms.**

○ **...act in a reasonable, nondiscriminatory manner.**

**◆ Is it Fair?**

**◆ Reasonable?**

**◆ Non-Discriminatory?**

**◆ Necessary?**

# **Dave Markarian, Esq.**

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**Managing Attorney,  
NextEra Energy Resources  
Litigation & State Regulatory**

1 TRANSCRIPT OF PROCEEDINGS  
2 BEFORE THE  
3 ELECTRIC RELIABILITY COUNCIL OF TEXAS  
4 AUSTIN, TEXAS

5  
6 BOARD OF DIRECTORS MEETING  
7 TUESDAY, NOVEMBER 17, 2009  
8

9 BE IT REMEMBERED THAT at 10:06 a.m, on  
10 Tuesday, the 17th day of November 2009, the above-  
11 entitled matter came on for hearing at the Electric  
12 Reliability Council of Texas, 7620 Metro Center Drive,  
13 Austin, Texas, before JAN NEWTON, Chairman, and MARK  
14 G. ARMENTROUT, DANNY BIVENS, BRAD COX, ANDREW J.  
15 DALTON, MIGUEL ESPINOSA, NICK FEHRENBACH, BOB HELTON,  
16 CHARLES JENKINS, TRIP DOGGETT, CLIFTON KARNEI, ALTON  
17 D. "DEE" PATTON, BARRY T. SMITHERMAN, ROBERT THOMAS  
18 and DAN WILKERSON, Members of the Board, and the  
19 following proceedings were reported by Lou Ray and Kim  
20 Pence, Certified Shorthand Reporters of:

21  
22  
23  
24  
25

2

1 TABLE OF CONTENTS  
2 PAGE

1 progress if you think about where we were a year ago  
2 and where we are today is pretty phenomenal, Mike.

3 So, Bob, thanks for your help and your  
4 committee's help. And, Mike, your team should be  
5 commended for a lot of effort this year in getting us  
6 this far. Certainly there are risks going forward,  
7 but we certainly appreciate it.

8 MR. CLEARY: Thank you.

9 CHAIRMAN NEWTON: So even though I short  
10 circuited it, please pass along our good --

11 MR. HELTON: You short circuit it here,  
12 but we don't short circuit on the subcommittee.

13 CHAIRMAN NEWTON: That's right.

14 MR. HELTON: We spend an awful lot of  
15 time and we spend time at Taylor also.

16 CHAIRMAN NEWTON: Well, thanks for  
17 getting us back on schedule. We are scheduled for an  
18 hour for lunch. I'm going to shorten that to 1:15  
19 since we've got a very long schedule this afternoon,  
20 and -- as everyone knows. I want to give, you know,  
21 parties an opportunity to discuss these critical  
22 issues, but we're going to have a long day today. So  
23 please try to be back and prompt. We will reconvene  
24 at 1:15.

25 (Recess: 12:30 p.m. to 1:18 p.m.)

1

AFTERNOON SESSION

2

TUESDAY, NOVEMBER 17, 2009



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

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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

8 through how we're going to try to approach this from  
9 this point?

10 MR. BRUCE: Yes, ma'am. Thank you. As  
11 you noted, we've got the one PRR that was not approved  
12 on the consent agenda for your discussion this month.  
13 That is PRR 830 reactive power capability requirement.  
14 The PRR clarifies the reactive power capability  
15 requirement for all generation resources, including  
16 existing WGRs who are not able to meet the 0.95  
17 lead/lag requirements with the resources -- within the  
18 resources unit reactive limit.

19 This PRR was recommended for approval  
20 by the TAC. It was a roll call vote. There was one  
21 opposing vote from the independent generator segment.  
22 There was six abstentions from the IOU, the generator,  
23 the two consumers and two independent power marketers.  
24 All the market segments were present for the vote.

25 The impact analysis shows only minor

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0  
1 changes to ERCOT databases to incorporate additional  
2 SCATA points. These impacts can be managed through  
3 the O&M budget. So the CEO determination on the PRR  
4 is no opinion and no impact to nodal.

5 So as you mentioned, there will be a  
6 presentation next by the TAC advocate. I just wanted  
7 to mention that, number one, I recused myself as Chair  
8 from selecting the advocate of the TAC position. I  
9 was the opposing vote to the PRR, and it's my client  
10 NextEra Energy Resources, that filed the appeal. So  
11 the vice chair, Shannon McClendon, who abstained from

12 the vote, selected Mr. Houston of CenterPoint Energy,  
13 who actually made the motion to recommend approval of  
14 the PRR.

15 So, Mr. Houston, if you want to come up?  
16 And he will outline for you the TAC's position on the  
17 PRR.

18 CHAIRMAN NEWTON: Thank you, Mark.

19 MR. HOUSTON: Can everyone hear me?

20 CHAIRMAN NEWTON: Yes.

21 MR. HOUSTON: Help me out here -- oh,  
22 here we go.

23 Okay. As mentioned, I'm John Houston  
24 with CenterPoint Energy. And Shannon had asked for me  
25 to present the appeal of PRR -- to be the TAC advocate

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1 for the process.

2 I'd like to start with -- let me see if  
3 I can make this work here. Just a little bit as Mark  
4 went through the history, but I just wanted to go  
5 through a couple of items here.

6 ERCOT originally proposed this to  
7 clarify reactive power requirements applicable to all  
8 generators, and to provide a framework for people who  
9 might not be compliant to be able to comply with this  
10 requirement of the protocols.

11 In September the PRS tabled this by  
12 unanimous vote to send it to ROS for review of  
13 reliability effects of this proposed revision. The  
14 ROS vote was -- recommended approval after  
15 considerable comments and discussions and  
16 presentations in its October 15th meeting.

17           It was then forwarded to the Protocol  
18 Revision Subcommittee. They considered it, again  
19 extensive discussion took place, and market  
20 participant involvement was heavy. It was recommended  
21 approval and sent forward to TAC.

22           On November 5th we again took up this --  
23 we at TAC then took up this revision. And after  
24 considerable discussion -- as Mark just mentioned, we  
25 had considerable discussion at TAC -- and it was

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1 approved. I believe the vote was 23 to 1, and Mark  
2 did recuse himself from selecting the TAC advocate.

3           Again, we're talking about ERCOT  
4 reactive power requirements required of generators.  
5 The existing protocol had been vetted through the  
6 stakeholder process I want to say back in 2003 and  
7 2004, with significant involvement of the stakeholders  
8 in development and provision of comments with regard  
9 to how reactive power would be supplied by generators.

10           Those requirements have been in place  
11 for several years. And under that approach, the  
12 requirements for both loads and generators are fixed  
13 at a set level; i.e., those requirements don't change  
14 after time passes and in the future. So loads and  
15 generators are not subjected to the topography  
16 changes, the addition of new generators to the system,  
17 new lines. Those become the responsibility of ERCOT  
18 planning and transmission providers.

19           So that adds the certainty that  
20 generators look for with regard to they can build the

21 generating plant at its location, and they can achieve  
22 meeting the requirements for their output and their  
23 interconnection, in particular in this case their  
24 reactive requirements.

25 Incremental needs that the system may

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1 need going forward are identified by engineering  
2 analysis and Mr. Woodfin's folks and others at ERCOT.  
3 All of that is to ensure voltage stability for the  
4 transmission system in ERCOT and that that can be  
5 provided by facilities and changes made by  
6 transmission providers.

7 There seems to be a lot of discussion --  
8 and I'm sure we'll have a bit here in a moment more --  
9 but PRR 830 was proposed to clarify, not change, the  
10 existing requirements. So this in -- all of these  
11 considerations at ROS and PRS and at TAC, stakeholders  
12 heard many of the arguments that you will hear this  
13 afternoon and rejected arguments that clarification of  
14 PRR 830 should not apply to certain existing  
15 generators because existing requirements were  
16 ambiguous.

17 Now, that's just not true. They were  
18 clearly understood. And, in fact, they're recognized  
19 and have been by most of the members of ERCOT for  
20 many, many years. This PRR -- and I want to be very  
21 clear here, I am not discussing at all any pending  
22 proceedings at the Commission or ADRs or -- that are  
23 applicable toward past compliance. That's not -- as  
24 the TAC advocate, I'm not discussing that this  
25 afternoon. We're talking PRR 830, if you were to vote

1 it in, would become effective upon your approval.

2 PRR 830 provides the means and the time  
3 frame for anyone who happens to be not compliant to  
4 fairly and equitably comply with the requirements of  
5 the protocol revision of the current protocols. And  
6 they can do so without necessarily having to retrofit  
7 their unit, because they could provide a payment in  
8 lieu of -- a payment of contribution or they can  
9 submit alternatives to changing their generation.

10 As far as the need for studies, this  
11 again was brought up at -- I would say at all of the  
12 considerations of this protocol revision. TAC and the  
13 other stakeholder groups heard and, in my opinion, the  
14 votes suggest rejected arguments that studies should  
15 be performed to determine whether compliance with the  
16 requirements are needed for reliability. That  
17 included presentations by NextEra and Siemens that  
18 you'll probably hear or see some of those this  
19 afternoon.

20 As previously noted, the requirements  
21 for generators are fixed. I think that's a good thing  
22 if I was a generator. I think that would be  
23 appropriate for my ability to finance projects and  
24 be -- my ability to have certainty about what my  
25 performance requirements were. They don't vary over

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1 time. Those needs for the dynamic support of the  
2 system are provided by the transmission providers

3 after significant studies.

4           So taking the fixed capability of  
5 generators and loads as input, that enables the  
6 transmission planning to take place, to assess the  
7 incremental needs as we change the topography, as we  
8 continue forward. They are then provided by the  
9 transmission owners.

10           So as to the current state of affairs,  
11 my belief -- and I think the members of TAC indicated  
12 it with their vote -- that this protocol is in  
13 existence and that these requirements are how we went  
14 about planning this transmission system. I think  
15 that's a very important part. How we got to where we  
16 are is the assumptions under this clarification or how  
17 we got to the transmission plan that we're now  
18 operating under.

19           Now, if -- that plan has resulted in us  
20 making decisions about investments in the transmission  
21 system to enable reliable operation of ERCOT, the  
22 ERCOT grid. We're about to embark on a significant  
23 study of the reactive requirements associated with the  
24 many billions of dollars associated with the CREZ  
25 investment. It's intended that if this protocol is

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1 passed that that will give certainty to those  
2 decisions that need to be made with regard to the  
3 dynamic reactive compensation that needs to be added  
4 in CREZ by the transmission providers who are  
5 constructing the transmission assets that will bring  
6 this large amount of wind power to loads.

7           So, in my opinion, this approach is fair  
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8 and workable. It adds certainty, and it provides us  
9 the path forward for doing the CREZ studies. It also  
10 enables people who might not be compliant with a path  
11 to become compliant and provide the reactive support  
12 that the ERCOT system needs.

13 And I think I would encourage this Board  
14 to consider reliability. I know you will hear a lot  
15 of comments about who has to pay what. But bear in  
16 mind that the situation that you as Board members are  
17 operating ERCOT under right now, if there are people  
18 who are non-compliant, they have basically taken some  
19 of the margin out of the reliability of the ERCOT  
20 system. That's being made up by ERCOT operations and  
21 being provided by other generators or operational  
22 constraints or considerations or decisions that are  
23 being made every day because of that noncompliance.

24 Going forward, it's essential that we  
25 understand where we are when we plan this system.

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1 when we complete the recommendations and the planned  
2 installations and investments by transmission  
3 providers to enable this 18,000 megawatts to seek  
4 loads in this state. So I would ask you, as Board  
5 members to consider your responsibility as members of  
6 the Board of the Electric Reliability Council of  
7 Texas.

8 That is basically, Madam Chairman, my  
9 comments this afternoon.

10 CHAIRMAN NEWTON: Thank you, John. Are  
11 there any questions or comments for John at this



12 point?

13 Appreciate you stepping up and providing  
14 us TAC's perspective on this.

15 My plan at this point is behind Tab  
16 12(b) of the Board material is a memo that Mike Grable  
17 was gracious enough to put together that kind of  
18 summarizes some of the companies who were wanting to  
19 make appellate positions. Before I get into that,  
20 Mark, did you have something else you wanted to add  
21 or --

22 MR. BRUCE: No, I was going to  
23 introduce, I thought, Mr. Markarian from NextEra was  
24 going to --

25 CHAIRMAN NEWTON: Well, actually what I

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1 think I'm going to do is go in alphabetical order, if  
2 that's okay. And I will just go according to the  
3 alphabetical list of companies as they're defined  
4 behind Tab 12(b).

5 So we will start out -- and then I will  
6 also ask if there are any other parties. I had  
7 understood that we potentially had one or two other  
8 parties that had desired to make comments that did not  
9 have an opportunity to get the materials to the Board  
10 packet. So I will ask for those after we go through  
11 this list of the companies who have provided  
12 materials. So I'll start with AES Corporation, Robert  
13 Sims. Is he here?

14 MR. SIMS: Yes.

15 CHAIRMAN NEWTON: Oh. Thank you.

16 And before we start the comments, if I  
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17 could, I want to be sure that everyone has an  
18 opportunity to be heard on this. The Board had put  
19 together procedures to handle appeals and so forth,  
20 and I appreciate the companies that have tried to  
21 adhere to those procedures. But we do want to provide  
22 an opportunity for the Board to hear any comments from  
23 any parties. However, in the sake of time, because  
24 this is -- could be fairly lengthy, I would ask that  
25 as the presentations are made that we not hear the

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1 same comments repeated over and over again. So I  
2 would ask that the presenters try to kind of keep that  
3 in mind as you go through your comments so that you  
4 will be presenting new ideas to the Board. And if you  
5 choose to endorse a prior-made comment, that's fine,  
6 but not to just restate the same positions over and  
7 over if possible.

8 MR. SIMS: Thank you. Good morning.  
9 Robert Sims with AES Corporation, and my presentation  
10 is a little different. I thought it might be helpful  
11 to give the Board a little perspective on the power  
12 factor issue by looking at what's been done in other  
13 regions of the United States. So I'll just briefly  
14 cover that.

15 Basically, in 2005 and 2006, a  
16 considerable amount of work was performed by a large  
17 and broad group of grid operators and stakeholders,  
18 including wind generators, and ultimately this work  
19 lead to FERC issuing Order 661A, which is included in  
20 Exhibit G to the FERC Large Generator Interconnection

21 Agreement. That's now the standard and required  
22 agreement across most of the USA. It's used by all  
23 investor-owned utilities under FERC jurisdiction, and  
24 it's been adopted by a lot of non-FERC jurisdictional  
25 entities in many regions of the country.

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1 Just a little chronology on the work  
2 that went together over that two-year period.  
3 Initially in 2003 FERC issued Order 2003, and that  
4 standardized the interconnection process requirements  
5 and agreement for all large generators over  
6 20 megawatts or 20 megawatts in aggregate.

7 In March 2004, as a result of  
8 stakeholder comments, FERC issued Order 2003A, an  
9 amendment of that. And that recognized that  
10 electrical machine technology differences affect the  
11 interconnection requirements. And with that they  
12 provided what was termed Exhibit G, which was a blank  
13 sheet of paper to be completed by stakeholders in the  
14 wind power industry, recognizing that wind energy  
15 technology was a little different.

16 So following on to that, September 2004,  
17 FERC hosted a technical conference on requirements for  
18 the interconnection of wind generators. The  
19 conference was broadly attended. It was in Denver. I  
20 was there. It went on for a full day with the FERC  
21 commissioners there hearing positions about the  
22 requirements for wind turbines. That was followed a  
23 few months later in December 2004 NERC created the  
24 Wind Generation Task Force. And they were chartered  
25 with "review the bulk electric system reliability

1 implications and concerns of wind generation." So  
2 under NERC, under the Transmission Working Group,  
3 their group looked at this issue. They looked at  
4 power factor. They looked at low voltage ride  
5 through. And they looked at other aspects of  
6 integrating large amounts of wind energy into the bulk  
7 power system. That group began a series of regular  
8 working meetings.

9 In July 2005, FERC issued Order 661,  
10 termed The Interconnection Requirements for a Wind  
11 Generator Plant. The order defined the technical  
12 requirements, including low voltage ride-through,  
13 which is now at issue coming up in ERCOT; power  
14 factor, which is relative to PRR 830. And also SCADA  
15 communication requirements for meteorological  
16 information, units availability and so forth. And  
17 those were all included in Exhibit G of the standard  
18 large generation interconnection agreement, as I  
19 mentioned, and are now law under FERC jurisdiction.

20 In 2005 NERC requested a rehearing on  
21 661 based on some continuing work with a Generator  
22 Task Force, primarily relating to finer details of the  
23 timing of low voltage ride-through, the level of  
24 voltage and the duration. There were no comments on  
25 the power factor requirement.

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1 That was finally followed in December of  
2 2005 when FERC issued Final Order 661A and the final

3 Exhibit G, the requirements for wind generator plants.  
4 Under the 661A process, there were a large number of  
5 parties that participated. I put together a list here  
6 from the FERC filing of all the parties that  
7 participated in that process. CenterPoint was the  
8 only one from the ERCOT region. Otherwise you see  
9 many of the grid operators here: ISO New York,  
10 midwest ISO, NERC themselves, New York ISO. A large  
11 working group that participatend in this project --  
12 PJM, Southern California Edison, et cetera, Xcel  
13 Energy.

14 And here's the wording that was decided  
15 upon under 616 A, which basically, "The wind  
16 generating plant shall maintain a power factor within  
17 a range of .95, leading to .55 lagging as measured at  
18 the point of interconnection". I won't go through and  
19 read this entire thing, but it's basically the  
20 triangle requirement or the cone requirement you are  
21 hearing discussed in the dialogue today.

22 Most wind turbine manufacturers then,  
23 based on the ruling in 2005, designed wind turbines  
24 for deployment in the United States based on this  
25 requirement, and that is now what's available through

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1 most of the country. So we now have a situation where  
2 ERCOT is asking for high level -- higher level of  
3 reactive support than required by FERC and NERC under  
4 the standardized large generation interconnection  
5 agreement, without really any technical basis or  
6 studies to demonstrate that need for a higher  
7 standard.

8 Thank you.

9 You want to do questions now or does  
10 that come later on?

11 CHAIRMAN NEWTON: No, I think we  
12 should -- are there any questions for Robert?

13 Dr. Patton?

14 MR. PATTON: Tell me how this is  
15 different from the proposed PRR?

16 MR. SIMS: Well, 661, that's the  
17 triangular requirement or the cone requirement where  
18 the power factor of the generator is maintained with  
19 an ability of plus or minus .95.

20 MR. PATTON: Please go back to the  
21 previous language.

22 MR. SIMS: Sure.

23 MR. PATTON: Where does it talk about a  
24 triangle?

25 MR. SIMS: It really doesn't. It

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1 doesn't say triangle.

2 MR. PATTON: Thank you.

3 MR. SIMS: Questions?

4 Thanks.

5 CHAIRMAN NEWTON: Andrew?

6 MR. DALTON: I have one quick question.  
7 This kind of relates to the 661A and how we're looking  
8 at FERC -- I mean, kind of more globally as, you know,  
9 some support for what we're doing here in ERCOT on  
10 wind. I know back when we had the LBRT discussion  
11 several months ago, I think the wind generation

12 community took the position that 661A, even though it  
13 had standards for LBRT, that didn't apply in ERCOT, it  
14 never happened in ERCOT, and now here you seem to be  
15 taking the opposite position that, well, FERC set a  
16 standard, so we should go with it.

17 And I'm trying to understand how we  
18 should be looking at the FERC precedent and are we  
19 picking and choosing when we want to rely on it or  
20 should we be doing this more systematically to be  
21 consistent with the federal standards, or should we be  
22 recognizing that ERCOT is probably unique in the  
23 country because we have a lot more wind than any other  
24 state?

25 MR. SIMS: Well, I don't think I'm

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1 taking a position on any of those points. I'm letting  
2 you know what a large body of stakeholders determined  
3 was the appropriate power factor requirement for wind  
4 generators in much of the US.

5 MR. DALTON: All right.

6 CHAIRMAN NEWTON: Mike Grable --

7 MR. GENT: On one of your previous  
8 slides I represented NERC in filing protests, and I  
9 can recall vividly -- this is prior -- just prior to  
10 my retirement -- that this was sprung on us and, I  
11 will say, given very little attention or time to  
12 respond. The FERC employee that was largely  
13 responsible for this was a former employee of AWEC,  
14 whatever that wind associate -- AWEA. Is that it?

15 Oh, yeah. And you'll notice, if you  
16 read through, which I have on my screen now, read

17 through 661A, you'll see all sorts of protests from  
18 the industry, mostly having to do with low voltage  
19 ride-through. So we never really got around to all of  
20 the issues and then FERC just went ahead and passed it  
21 anyway. So I don't think using 661A as a basis for an  
22 argument is really something that's going to gain a  
23 lot of traction within my circles.

24 MR. SIMS: Well, I do agree that most of  
25 the discussion was around the low voltage

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1 ride-through. I don't think there was much discussion  
2 at all as far as the power factor requirement.

3 CHAIRMAN NEWTON: Anything else for  
4 Robert?

5 Yes, Mike?

6 MR. GRABLE: Just a brief comment. I do  
7 agree with Dr. Patton's point that there is no  
8 triangle or rectangle mentioned in this quote.

9 Robert, would you flip to the last  
10 slide, which I think is what Mike Gent was  
11 referencing?

12 MR. SIMS: The very last?

13 MR. GRABLE: Yeah, asking for a higher  
14 level than that required by FERC and ERCOT. I think  
15 whether it's higher than that required by FERC is  
16 debatable, and 661A can be interpreted. But it's the  
17 end NERC part of this that troubles me a little bit.  
18 NERC did express grave reservations with the wind  
19 position in 661A, and Chairman Kelliher pointed that  
20 out, that NERC was troubled. So I don't think it's



21 quite right to say that NERC was signed on to your  
22 version of the approach here. But I just want to  
23 highlight that.

24 MR. SIMS: Okay. Very well.

25 CHAIRMAN NEWTON: Okay. Thank you,

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1 Robert.

2 Okay. The next company ahead is AEP,  
3 Kip Fox.

4 MR. FOX: Thank you, Madam Chairman.  
5 Let's see -- I believe you have our comments in your  
6 Board package. The only thing I would like to add to  
7 that from AEP's perspective is that one of the things  
8 that we do find -- and not to belabor on some of the  
9 points that John has brought up -- is that we fight  
10 these issues every day. The question that came up  
11 during TAC is what's the indication that we have  
12 problems in the system, and the fact is every life in  
13 the day of operations from the operations side of --  
14 as a TSP, we see the warning indicators every day. I  
15 mean, the fact that we have lot of operations going  
16 through, and the fact that we're going through  
17 different kinds of requirements, we're doing switching  
18 and all kinds of other things from an operational  
19 standpoint, tells us that this issue is becoming more  
20 and more critical.

21 And as the Board considers this  
22 alternative and this PRR, we need to understand that  
23 there are operational things out in the field that  
24 we're almost at the point that we can't handle  
25 anymore. It should be -- it's not a reliability

1 crisis right now, but it's growing. And we see this  
2 more in ERCOT than we do at AEP in some of the other  
3 RTOs that we operate where there's wind available.

4                   And I would say from an AEP perspective,  
5 we see this issue in the west more prevalent than we  
6 do in our other locations. So to us these  
7 requirements have been very clear in being a rectangle  
8 rather than a cone for many years and in our other  
9 jurisdictions, and that's all I would like to add at  
10 this point in time.

11                   CHAIRMAN NEWTON: Thank you. Any  
12 questions for AEP?

13                   Okay. Thank you very much.

14                   Again going in alphabetical order,  
15 ERCOT. Kent, are you handling ERCOT?

16                   MR. SAATHOFF: Yes. I just wanted --  
17 you know, the written comments you can read. I just  
18 want to go into a little bit of the history very  
19 briefly. As John mentioned, the PRR was passed in  
20 2004. And really the issue of compliance or  
21 non-compliance with the PRR didn't raise up until last  
22 summer. And it became an issue in a wind workshop  
23 that we had back in August.

24                   And back in August, John Dumas made a  
25 presentation where he stated the rectangle requirement

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1 was what the protocol required, which is that  
2 generators are to provide a constant source of

3 reactive power over their entire operating range,  
4 which is based on the plus or minus .95 at their  
5 maximum power level. That was followed subsequently  
6 by a market notice to that effect.

7 In the interim, it became apparent that  
8 wind generators were having -- existing wind  
9 generators were having problems with that  
10 interpretation and that requirement. So we worked  
11 with them since the end of last year to determine a  
12 way that they could comply with what we believe was in  
13 the existing protocol. Unfortunately, we couldn't  
14 reach agreement with all of them, but we felt like we  
15 should file this protocol to establish a way of  
16 compliance and, hopefully, go in that direction and  
17 get full compliance.

18 Back in June, we contacted -- we  
19 reviewed the resource asset registration forms that  
20 were filed earlier last year, and contacted those  
21 generators that, you know, appeared not to meet the  
22 reactive requirement in the protocol based on that  
23 information. And the resource asset registration  
24 forms, which is mentioned in other comments and I'm  
25 sure will be mentioned later, their purpose was really

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1 not compliance. Their purpose is for us to get  
2 accurate data on what is out there in real life so we  
3 can appropriately model it. So they weren't  
4 established for checking protocol compliance.

5 But nevertheless, we did go back and  
6 look at them and see if the information reflected  
7 there showed compliance with the rectangle, and we

8 contacted those that it appeared that they didn't meet  
9 that requirement and to get additional information --  
10 or additional reactive resources that aren't reflected  
11 in your RARF, and, you know, we got various responses.

12 But we contacted 70 wind generators. Of  
13 those 70, 16 met the requirement, the rectangle; 29  
14 met the triangle requirement, which, you know, we  
15 believe is not what the protocol requires; 9 didn't  
16 meet either the triangle or the rectangle; and 16 were  
17 pre-2004 wind generators that were exempt from the  
18 requirement.

19 So we essentially filed the protocol to  
20 establish a way for those 38 generators that don't  
21 comply to comply, and that was the primary purpose of  
22 the protocol.

23 CHAIRMAN NEWTON: Okay. Any questions  
24 for Kent?

25 Yes.

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1 MR. BIVENS: Kent, you said -- I'm  
2 trying to remember what you said -- you said that the  
3 particular requirement in this PRR, when you  
4 established it in 2004, was not necessarily for  
5 compliance but --

6 MR. SAATHOFF: No, the RARF --

7 MR. BIVENS: The RARF --

8 MR. SAATHOFF: -- the Resource Asset  
9 Registration Forms that were created last year, mainly  
10 to get a good set of data for the -- for our nodal  
11 model, yeah.

12 MR. BIVENS: So with most protocols,  
13 when you find non-compliance, what do you do?

14 MR. SAATHOFF: Well, this issue has come  
15 up before. We at ERCOT ISO do not have a compliance  
16 staff. So what we do is when we have a system  
17 incident that has occurred and we look into that  
18 incident and it looks like to us there may be some  
19 issues of protocol compliance, we will forward a  
20 report on that to the TRE.

21 MR. BIVENS: Why was there a four-year  
22 period before this became an issue?

23 MR. SAATHOFF: You know, frankly, it  
24 didn't come to our attention, and I assume everybody  
25 thought they knew what it meant. And apparently there

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1 is a difference of opinion on what it meant.

2 MR. BIVENS: Okay.

3 CHAIRMAN NEWTON: Andrew?

4 MR. DALTON: Thank you. Kent, a couple  
5 of questions. As I was reading through your memo, a  
6 couple of thoughts occurred to me on this concept of  
7 parity among the generation resources. And it seems  
8 that there are some pre-'99 units that are exempt,  
9 some pre-2004 units that are exempt. Then there's  
10 this 2004 to 2009 group of generators, and then  
11 there's another group 2009 -- December 1, 2009 going  
12 forward. I mean how many generators are in each of  
13 those buckets?

14 MR. SAATHOFF: You know, I don't have  
15 that information at hand. The 1999 for conventional  
16 generators, and February 2004 for wind generators,

17 that was established in the protocol. The -- from  
18 2004 to now and future, that's at issue right now.  
19 But the protocol just had those two groups.

20 I do know in 2004 we had about 1300  
21 megawatts of wind, and right now we have over  
22 8500 megawatts of wind.

23 MR. DALTON: Okay. How much  
24 conventional generation was on at that time that's  
25 still on today, a decade later.

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1 MR. SAATHOFF: I certainly don't have an  
2 exact number, but I would say, you know, 10, 20,000  
3 megawatts, somewhere in there. That's just a guess.

4 MR. DALTON: And I support this parity  
5 concept. I think it's a good one that we keep all the  
6 generators on the same foot. I'm just trying to kind  
7 of get a sense for what are we talking about and how  
8 does that affect the system, too? Because I'm  
9 somewhat sympathetic to making changes when the rules  
10 might not have been clear to everyone.

11 But to get to that point, as we went  
12 through the interconnection process with these  
13 generators or they were submitting their RARFs, I  
14 mean, at what point did ERCOT know that there was an  
15 issue with some of these generators, and how quickly  
16 did ERCOT react to that?

17 MR. SAATHOFF: Well, we really only  
18 became aware that there was an issue back last summer.  
19 As a result of discussions with wind generators and  
20 other parties, we did the review of the resource

21 registration -- of the RARFs last summer -- excuse me,  
22 this summer, back in June.

23 MR. DALTON: Okay. So this is -- we  
24 learned it through the RARF process because ERCOT  
25 doesn't really directly participate directly with the

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1 interconnection requests?

2 MR. SAATHOFF: That's right. Generation  
3 interconnection agreements are between the generator  
4 and the transmission provider.

5 MR. DALTON: Okay.

6 MR. SAATHOFF: ERCOT is not a party to  
7 those agreements.

8 MR. DALTON: Okay. And there's not some  
9 communication process between the TSPs and ERCOT  
10 regarding what the standards that are being imposed to  
11 the interconnection process are?

12 MR. SAATHOFF: There's -- I believe  
13 there's a standard -- fairly standard generation  
14 interconnection agreement that I believe the PUC  
15 approved. But as far as us being a party to  
16 generation interconnection agreements, no, we're not.  
17 And we have not been reviewing all those.

18 MR. DALTON: Okay. And then, I guess,  
19 if we didn't pass 830 today, what would that do to all  
20 the modeling and the studies that have been done in  
21 the CREZ docket? I mean, would that throw everything  
22 kind of into disarray, or would we be able to modify  
23 that information or -- what does it do? How does it  
24 interplay with the CREZ work that's already been done?

25 MR. GRABLE: Kent, do you mind if I  
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1 answer this one? I think it's a procedural question.

2 MR. SAATHOFF: Okay.

3 MR. GRABLE: If 830 doesn't pass,  
4 ERCOT's belief is that the protocol says what it says  
5 and we require the rectangle and we will model  
6 according to that. There is more uncertainty as to  
7 whether -- you know, in what venue and how far down  
8 the road it will reach -- other people deciding one  
9 way or the other on the issue, but that's how we'll  
10 proceed.

11 MR. DALTON: Okay. That's all I have  
12 for now. Thank you.

13 CHAIRMAN NEWTON: Mike?

14 MR. GENT: Kent, did you say that there  
15 were -- from your study that you surveyed there were  
16 28 that could meet the requirement?

17 MR. SAATHOFF: No, there were 16.

18 MR. GENT: 16 that could --

19 MR. SAATHOFF: That met the rectangle  
20 and 16 were exempt.

21 MR. GENT: All right. The question has  
22 to do with those 16, and it is how do they meet the  
23 requirement physically and is there a high voltage  
24 issue with these 16?

25 MR. SAATHOFF: Of the 16, five

1 apparently meet the requirement with the generator.

2 Apparently they have some of the newer generators that



3 can provide a full dynamic requirement. Six met it  
4 after they provided additional information that was  
5 not reflected in the their RARF. Four met it with  
6 essentially the way PRR 830 says, that you can meet it  
7 by the addition of additional static and dynamic  
8 devices in addition to the generation. And one  
9 submitted a mitigation plan committing to do that in  
10 the future.

11 MR. GENT: I guess my question would --  
12 second question only deals with those four then. It  
13 just seems to me if you put in static capacitors  
14 you're looking at a possible overvoltage situation  
15 under certain system conditions as well, unless  
16 they're operating properly.

17 MR. SAATHOFF: That's right. And we  
18 reviewed that to make that sure we were comfortable  
19 with -- that that amount of capability could be  
20 operated within the requirements.

21 CHAIRMAN NEWTON: Is that all, Mike?

22 MR. GENT: Yes. Thank you.

23 CHAIRMAN NEWTON: Bob Helton, I think  
24 you were next.

25 MR. HELTON: Just real quick question,

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1 Kent. Is there a problem then with our procedures for  
2 connecting to the grid itself? And what models -- I  
3 know whenever we turned in all of our data for our  
4 generation units we had to have every model and every  
5 test and everything we did turned in to both planning  
6 and operations. Is there a different process or did  
7 we just do that and that's -- it's not in the

8 procedure that you actually review that against the  
9 OGRs -- you know the operating guides protocol  
10 requirements? I'm trying to figure out where there  
11 may be a hole where we could catch something like  
12 this --

13 MR. GRABLE: Kent, can I jump in here,  
14 too? I mean, there are two things I think we ought to  
15 look at. One is we rely on, as you know better than  
16 anyone -- you know better than I do, Bob, the  
17 generator itself certifies that it understands and  
18 complies with all protocols. I think we need to make  
19 sure going forward that ERCOT staff and individual  
20 generation owners and operators are on the same page  
21 with respect to all those items. We probably need to  
22 go through them one by one and make sure that when a  
23 generator certifies that they're fully compliant with  
24 the protocols, they understand what that means. They  
25 understand what ERCOT staff understands that that

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1 means.

2 I think we also had some  
3 miscommunication here between the TSPs and ERCOT. And  
4 I don't want to speak for them or our staff or get  
5 into who knew what or who thought what, but you've  
6 heard from the TSPs -- you've heard from one and  
7 you'll hear from -- well, you've heard from two and  
8 you'll hear from a third today as we go through this  
9 list -- that they believe it's the rectangle, that  
10 were there interconnection agreements signed up where  
11 the generator is going to tell us they should have

12 known we were talking about the triangle here, you  
13 know, yeah. So there clearly are some communication  
14 issues we need to work on.

15 MR. HELTON: Right. And that's what I  
16 was getting at. I mean if -- because if the test  
17 data and the model data was all -- which exists for  
18 every unit, then we would be able to know that right  
19 off the bat. I was just curious to see if we do need  
20 to change some procedures on that issue.

21 MR. GRABLE: I think we ought to flag  
22 that regardless of the PRR, regardless of any NOVs and  
23 regardless of any PUC action as a separate issue to  
24 take up and make sure that we report back to the Board  
25 that we're all on the same page.

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1 Danny, I wanted to go back and make sure  
2 your RARF question -- that's a form we created for  
3 nodal readiness to make sure we understood what was  
4 out on the grid -- setting aside compliance, just what  
5 can you actually do. And, of course, the date of that  
6 form is only within the last year. It's not something  
7 that existed in 2004 or prior years, but it has a  
8 different -- you had a question about protocol  
9 compliance, and I think we've covered that. But I  
10 just wanted to make sure we had returned back to that  
11 initial question.

12 CHAIRMAN NEWTON: Did you have another  
13 question?

14 Okay. Dee?

15 MR. PATTON: Kent, you said that you  
16 became aware of this issue last year? This year?

17

MR. SAATHOFF: Last year.

18

MR. PATTON: What flagged that to you?

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MR. SAATHOFF: Well, there were a couple

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of events early last year where we had some high

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voltage in the west and we -- we called on some wind

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generators involved to deploy their reactive to lower

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the voltage, and that couldn't be done. So the

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transmission operator, to avoid equipment damage,

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opened up the line. So that was the first hint we

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1 got.

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But then as we went to the wind

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workshops and discussions on this issue, you know, we

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were certainly aware it was an issue at that point

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last summer.

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CHAIRMAN NEWTON: Danny?

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MR. BIVENS: This may be a question for

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I think every speaker, but one of the issues today is

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probably going to be whether we vote this thing up or

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down or whether it gets remanded back to TAC for

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further study or more looking at. And there's a

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statement in Mr. Houston's comments of November 10th

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and it's also on his slides. He basically says he --

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the reactive capability requirements for generators

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and load are fixed and that if there's any variance at

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all, then that's going to be done by the transmission

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owners.

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So with respect to whether studies are

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needed, he makes a statement, "Studies are performed

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to identify the variable transmission owner

21 requirements," so it's on the transmission owner. And  
22 I -- my question is -- I mean, probably everybody --  
23 do you agree that there are no -- there's no need for  
24 any further studies? And I think you said the same  
25 thing in your comments as well.

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1 MR. SAATHOFF: Yes, the whole premise is  
2 that the protocols set out the standards that  
3 generators have to meet. In other words, what they  
4 bring to the table. Under those assumptions that  
5 those requirements are being met, then the  
6 transmission operators perform the studies to  
7 determine what additional equipment they may need to  
8 put on the transmission system.

9 CHAIRMAN NEWTON: Yes, John?

10 MR. HOUSTON: Yes. In answer to your  
11 question, I think CenterPoint would again design and  
12 plan the system in conjunction with ERCOT to make all  
13 the changes, assuming that the generators are  
14 performing as per the protocols, and assuming loads of  
15 meeting their requirements. As I pointed out in some  
16 of my comments, for example, in Houston, we've just  
17 invested over 25 million in dynamic reactive because  
18 there isn't adequate dynamic reactive capability in  
19 the existing generators in the Houston area to prevent  
20 voltage collapse.

21 So, yes, we do make those, and we would  
22 not go back to the generators. That would basically  
23 be every few years, if the study indicated it, instead  
24 of building \$25 million worth of dynamic reactive I  
25 would have had to go back to the local generators and

1 say how about producing .9? How about producing .85?  
2 I wouldn't hear that millions and millions and  
3 millions of dollars comment many times over.

4 So I -- that's not how it works. This  
5 works. It's fair. It's equitable. It's how we  
6 planned the system. It's important to reliability.

7 CHAIRMAN NEWTON: Dee?

8 MR. PATTON: I would just observe  
9 that -- an observation on the actual system is the  
10 best study of all, requires no assumptions whatsoever.

11 CHAIRMAN NEWTON: Bob?

12 MR. HELTON: Just real quickly. On the  
13 study -- on the CREZ study, the effect this would have  
14 on the CREZ study -- correct me if I'm wrong, Ken --  
15 the whole situation is if it was determined that every  
16 generator needs to be in the rectangle, then the CREZ  
17 study would base on that issue that everyone was in  
18 that and then any additional stuff that needed to be  
19 done would be done by the transmission providers.  
20 Correct?

21 MR. SAATHOFF: The current CREZ reactive  
22 study is assuming the rectangle.

23 MR. HELTON: Right.

24 MR. SAATHOFF: And so anything  
25 additional to that would be, you know, provided by the

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1 transmission operator.

2 MR. HELTON: Right. So if something

3 happens and somebody decides that that's not the case,  
4 what would the actual change be, and say that somebody  
5 said it was the triangle, then you would need --  
6 knowing that, what that would change is the  
7 calculation on what the TDSPs would have to do to  
8 ensure stability. Correct?

9 MR. SAATHOFF: We would have to go back  
10 and redo the study with that changed assumption.

11 MR. HELTON: Right. Okay. Thanks.

12 CHAIRMAN NEWTON: Dee?

13 MR. PATTON: And that changed assumption  
14 would result in greater uplift to the consumer.

15 MR. SAATHOFF: Depending on what it  
16 showed. If it showed that you needed more reactive  
17 equipment because of that, yes. But you don't know  
18 until you've done it.

19 CHAIRMAN NEWTON: Okay. Any other  
20 questions for Kent?

21 Oh, Mike?

22 MR. GRABLE: Bob, if I were a thermal  
23 generator and wind were victorious in their  
24 interpretation of the protocol at whatever level,  
25 whatever finality we end up with, Kent's right that

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1 that would immediately change the transmission  
2 reactive support assumption. But if I were a thermal  
3 generator, I would want to clamber onto the deal that  
4 wind got and we would need certainty as to that  
5 outcome and then that could further affect what we  
6 need from transmission.

7 MR. HELTON: I'm not sure it being a  
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8 thermal I would agree with that aspect, because, you  
9 know, we've already designed and put up our -- we're  
10 in as a triangle -- I mean, a rectangle, so we're  
11 already there. So there's not a deal to go get, I  
12 don't believe.

13 MR. GRABLE: I understand. I've heard  
14 that from your peers.

15 CHAIRMAN NEWTON: Okay. We'll move on.  
16 I have down next in alphabetical order Brian Hayes  
17 with Horizon Wind Energy.

18 MR. HAYES: Okay. So before I get  
19 started, I just wanted to first thank you guys. I  
20 appreciate the time to come and present our side of  
21 the story on this and, you know, just to give you a  
22 little background. So horizon is active in the ERCOT  
23 market. We have a 400-megawatt plant in Albany, Texas  
24 just outside of Abilene. And it's been in operation  
25 since 2006 and 2007 is when it came on line. So it

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1 was post the 2004, you know, that we're talking about  
2 here. And, you know, I just want to let you guys  
3 know, the reason I'm here today is because reliability  
4 is, you know, paramount to us and to, I would say,  
5 almost any wind generator in the room. So it's not a  
6 thing about concern about -- so we are concerned about  
7 reliability.

8 But the concern that's been raised  
9 through this PRR is just the methodology that we're  
10 going through to require the retrofitting of  
11 facilities to have this -- to meet this rectangle for



12 the wind generators, which I'll go through and discuss  
13 why our interpretation of the protocols at the time of  
14 interconnect was not the rectangle. And it's going to  
15 be -- so it's a cost for us as a generator that will  
16 in turn get passed on to consumers. So I just want to  
17 make sure that ERCOT and the community is doing the  
18 prudent practices to make sure that we're going at  
19 this in the right way before we subject to a large  
20 investment.

21 So let me just tell you a little bit  
22 about how we interconnected just to give the story on  
23 how it worked for us. So as I said, our plant came  
24 online in 2006. We did, you know, numerous studies  
25 with the TSP to -- providing them all the information

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1 of our plant, what the generators were, what the  
2 equipment they were going to have in addition to that.

3 We even -- through this study the TSP  
4 recommended that we needed to have additional  
5 capacitor banks to provide voltage support, and we did  
6 comply and we put those capacitor banks in. But  
7 through all of this study, the requirements that we  
8 were meeting were based off this curve here. And this  
9 is the infamous triangle that we're talking about.

10 So if you read through the protocols in  
11 6 .5 .7.1 it talks about that a generator must meet  
12 the .95 lead/lag requirement. So if you take the .5  
13 lead/lag requirement, effectively what it means is as  
14 your generation goes up, you provide more voltage  
15 support as your output goes. So this is a sliding  
16 scale effectively with how much you generate. So this

17 is how our plant is designed to operate.

18 We actually provide a little bit more on  
19 the top because of the capacitor banks, but in the end  
20 this was the -- this is how we were designing the  
21 plant and how we interconnected, and this is what was  
22 approved by the TSP and ERCOT prior to any -- prior to  
23 us putting any megawatts onto the grid.

24 And, you know, I will say also that, you  
25 know, all the parties were involved with this. So as

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1 the -- after the studies were completed, we completed  
2 the GARF, which, you know, now they're on the RARF.  
3 Right? But at the time this was the GARF, the  
4 Generation Asset Resource Form, that was completed and  
5 went through and submitted and approved. And then on  
6 the day the plant was energized, there was ERCOT on  
7 the line -- I believe it was Oncor and then ourselves  
8 ensuring that the plant was interconnected and working  
9 as it was designed to do.

10 So all these things have been checked.  
11 And then, as you know, which was discussed previously,  
12 then in August of last summer, there was -- there was  
13 actually a conflicting message which I think wasn't  
14 discussed prior, that in the morning ERCOT sent out a  
15 page that basically shows that this is the -- this is  
16 how a wind generator resource provides reactive  
17 support. And you see the triangle. And then on the  
18 top is what a conventional does which is more similar  
19 to the rectangle. And I will say that this was not  
20 presented. This was sent out to all the people who

21 were going to go to the workshop in the morning. And  
22 then by the afternoon, the chart on the bottom right  
23 had changed to the rectangle.

24 But I will point out that the --  
25 actually the example did not change. And so when you

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1 can see the second bullet point it says, "wind  
2 generation output equals zero megawatts and the  
3 megavar requirement is zero megavars," which is the  
4 exact same definition that we're saying here, that  
5 it -- as your output goes down to zero, you stay at  
6 zero; whereas, the protocol change that is in  
7 discussion is effectively trying to get us to provide  
8 the reactive support at the highest levels, even when  
9 we're at zero.

10 So these were the conflicting messages  
11 that then resulted in the interpretation that went out  
12 by ERCOT. And then this is the -- and I guess further  
13 support of that will support the cone -- or the cone  
14 or the triangle in 6.7.6, the language in red here.  
15 Basically if you read this, it says, "The required  
16 installed reactive capability multiplied by the ratio  
17 of the lower active power output to the generating  
18 unit's continuous rated active power output."

19 So if you go through and you turn that  
20 into a formula, it's effectively the triangle, and  
21 it's a sliding scale. So as your output goes up, the  
22 amount of reactive power that you have to provide  
23 increases. And so when you're at zero, it's zero. So  
24 this is how again we've operated and throughout -- you  
25 know, since the plan has been energized and why we're

1 here today to talk to you about this further.

2           So I guess, you know, taking this all in  
3 context, this is -- the issues that we have, you know,  
4 with this change that is come down and that we're  
5 discussing is that, one, since 2004 there's been 7,000  
6 megawatts that have interconnected into ERCOT. And as  
7 was described earlier, some of these meet the  
8 requirements, some of them don't.

9           We have significant concern that there's  
10 going to be a lot of money spent to get all of these  
11 generators to align with the rectangle. And there's  
12 not been one study done to determine if this  
13 reactive -- if this equipment that we're going to put  
14 in the ground is actually going be used. I mean, it  
15 could very well be the case that we could -- that all  
16 these generators could go back and retrofit, spend the  
17 money, which for our client we have looked at is in  
18 the tens of millions of dollars, put the equipment in  
19 the ground and then that equipment could sit idle and  
20 never be used. It could be a stranded cost just  
21 because maybe it wasn't in the right place or maybe  
22 because it was never needed in the first place. So  
23 there is a big concern to us that the studies not  
24 being done will end up being a poor use of dollars for  
25 the generators, which will then be, in the end result,

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1 on to the consumers.

2           And I think the other thing that I --

3 that has been somewhat frustrating is just that this  
4 has been described as a clarification. And, you know,  
5 as -- I think it's pretty clear, based on the number  
6 of generators that don't meet this requirement today,  
7 that it is much more than a clarification. And then  
8 with the dollars that are at stake and the amount of  
9 investment that's required, again it's hard to call  
10 this a clarification. It's a very significant deal,  
11 and something that we think needs to make sure that  
12 there is a prudent study to ensure that the dollars  
13 are going in the right place.

14 Then I guess the -- I guess the last  
15 issue that we have has been brought up recently, and  
16 that's just that, you know, there's this disconnect  
17 between what was planned in the transmission versus  
18 how we're actually interconnecting and operating has  
19 raised a lot of concern. It seems counterintuitive  
20 that instead of actually going back and looking at how  
21 we're actually generating and then making the right  
22 decision on what is -- where the investment were to  
23 occur, to just go back and unilaterally make us meet  
24 whatever what was modeled to begin with.

25 So anyway, those are my comments, and I

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1 appreciate any questions.

2 CHAIRMAN NEWTON: Are there any comments  
3 or questions?

4 Kent?

5 MR. SAATHOFF: Start with this, that is  
6 deployment of voltage support. Right? It's not  
7 voltage -- it's not reactive requirement, is it?

8 MR. HAYES: Yes. Yes.

9 MR. SAATHOFF: Okay. And the reactive  
10 requirement is in a different section of the protocol.

11 MR. HAYES: Right.

12 MR. SAATHOFF: In the slide that you had  
13 up before from Mr. Duma's presentation --

14 MR. HAYES: Yes.

15 MR. SAATHOFF: -- is that his entire  
16 presentation?

17 MR. HAYES: No, it is not.

18 MR. SAATHOFF: Okay. Thank you.

19 CHAIRMAN NEWTON: So it's an excerpt or  
20 has it been modified?

21 MR. SAATHOFF: Yeah. The point is  
22 there's a preceding slide that stated that we believe  
23 the requirement was a rectangle.

24 CHAIRMAN NEWTON: Okay. Mike?

25 MR. GENT: Yes. In your background

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1 material and in the material you presented here,  
2 there's an implication that this information has been  
3 made clear to ERCOT, and then I heard in Kent's  
4 explanation that the data is provided to the  
5 transmission owner. And in fact I have before me  
6 where -- if I hadn't heard this, I would make the  
7 assumption that you're doing these studies at ERCOT's  
8 request and behalf and that you presented all this to  
9 them and they signed off on it. Is that what you're  
10 trying to say here, that they signed off on your  
11 inability to provide vars as they think are necessary?

12 MR. HAYES: The transmission service  
13 provider has signed off that the studies were  
14 completed.

15 CHAIRMAN NEWTON: And maybe it's in your  
16 background material, but for my clarification are you  
17 supportive of the rectangle prospectively and only  
18 opposed to it retroactively?

19 MR. HAYES: Yes. So -- yes. So  
20 retrofitting in our view is -- it's much more costly  
21 to do retrofits than to do -- than to build when  
22 you're actually building a new plant. So the  
23 prospective we have no concerns with doing anything  
24 prospective because we can build it into the plant.  
25 And we can even make requirements from our turbine

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1 suppliers that we meet certain requirements.

2 CHAIRMAN NEWTON: Well, I guess again,  
3 just for clarification, my simple mind --

4 MR. HAYES: Yes.

5 CHAIRMAN NEWTON: -- you don't have a  
6 problem --

7 MR. HAYES: -- no problem --

8 CHAIRMAN NEWTON: -- with the  
9 requirement for reliability to be the rectangle?

10 MR. HAYES: Going forward prospectively.

11 CHAIRMAN NEWTON: Thank you.

12 Yes, Miguel.

13 MR. ESPINOSA: Explain to me then why,  
14 if you go back and retrofit, you might have stranded  
15 assets, but if you go forward and install them going  
16 on, you don't?

17 MR. HAYES: That's a fair point. So  
18 there is the risk that they could be stranded assets,  
19 even if you do it going forward. But I would say that  
20 the amount of economic impact that you're contributing  
21 is a lot less just because you're designing it into  
22 when the plant is being built. You don't have to take  
23 the plant down. There's a lot of factors that go into  
24 it that make retrofits much more -- a whole different  
25 game.

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1 CHAIRMAN NEWTON: Okay. Andrew?

2 MR. DALTON: Just one quick question,  
3 kind of a follow-up clarification. So it would be  
4 your position then essentially what we should be doing  
5 is setting up a tiered process here, prior to 2004 no  
6 reactive power for wind from 2004 until December 1,  
7 2009 or November 30th, 2009 the cone applies. From  
8 December 1, 2009 forward the rectangle applies. Is  
9 that a fair characterization?

10 MR. HAYES: That is correct.

11 MR. DALTON: Okay.

12 CHAIRMAN NEWTON: Okay. Any other  
13 comments for Brian?

14 Okay. Thank you, Brian.

15 Next we have NextEra.

16 MR. MARKARIAN: Good afternoon. We  
17 actually brought this appeal. I'm Dave Markarian,  
18 managing attorney for NextEra Resources for litigation  
19 and state regulatory, and we appear most respectfully  
20 before this body because we believe that



21 reinterpreting existing protocols and applying them  
22 retroactively is a bad idea.

23                   we believe we too are a reliability  
24 leader. And we understand and take this very  
25 seriously and we seek to do the right thing. But we

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1 also believe that we're being entirely reasonable  
2 here, and we fear that we're straying a little bit  
3 from common sense, which is why we're here.

4                   we have made a proposal or, if you will,  
5 a counterproposal that we think is entirely  
6 reasonable, which is this: If a study demonstrates  
7 that more than a triangular reactive power  
8 configuration is required, we're all in. No problem.  
9 we believe it would be appropriate to examine  
10 carefully any reliability events. I'm going to come  
11 back and tell you about what we have been told,  
12 because we have been asking about this for a long  
13 time, nearly six months.

14                   But clearly, as of last night, we were  
15 told -- and today you were today -- that 21 and 17  
16 months ago there were two events. There's been no  
17 study done as to those two events, and yet those  
18 events are being used to suggest that between 30 and  
19 \$100 million in investment be deployed. I just  
20 watched with respect, bewilderment and amazement at  
21 your diligent debate over \$11 million. This is a big  
22 deal, and that's why we're here. And we hope no one  
23 feels as though we're wasting your time. I know it's  
24 been up before, but we believe we can demonstrate to  
25 you that it hasn't been considered the right way or

1 quite enough.

2                   This proposal is a one size fits all  
3 proposal, when we all know that reactive power  
4 capability should be a bus-to-bus analysis. Providing  
5 reactive power far from load doesn't always make  
6 sense. Even one of the parties that got up and spoke  
7 to us in support of PRR 830 has stated embedded in its  
8 comments that if you don't quite do it this way, give  
9 us the money and we'll use it more appropriately where  
10 it should be properly located, where reactive power  
11 isn't necessary out in the hinter lands, we can tell  
12 you a better way to get this done, AEP.

13                   We essentially focus on what we believe  
14 are two myths, the first being that reliability  
15 requires it. We have been diligently questioning  
16 whether there have been any true events. As recently  
17 as July and August of this year, we were told there  
18 were no events in several meetings on several calls  
19 with numerous witnesses. There have been no system  
20 emergencies. There have been no advisories or alerts  
21 that are tied to non-compliance of 6571 or 67. And  
22 the first mention of any of that, ladies and  
23 gentlemen, was at the TAC meeting on November 5th.

24                   So we began to ask a lot of questions.  
25 We couldn't get from ERCOT staff any dates, no

1 descriptions, no analysis of these events, where they  
2 were, when they were. But we did our own

3 investigation and determined that not a single event  
4 related to voltage -- not a single event related to  
5 voltage in 2009 in west Texas was reported in the  
6 system operations reports to reliability and  
7 operations subcommittee or the Board of Directors or  
8 in ERCOT public operations reports. We asked about  
9 any events and were told as recently as two days ago  
10 that there has been no technical analysis that's been  
11 fully performed by ERCOT staff as to these events. No  
12 analysis as to the cause of events, no study. Most  
13 importantly, that the procedures you're being urged to  
14 adopt today would be the proper action to take and  
15 would avoid these events.

16 The second myth, respectfully, is that  
17 PRR 830 is nothing new. How can you possibly explain  
18 ERCOT's report to you today that far more than half of  
19 the wind farms have been deployed with something less  
20 than the rectangle configuration of reactive power?

21 The TAC advocate in its presentation  
22 told you that this requirement has been in place for  
23 several years. But if you look at PRR, it has been  
24 entirely rewritten. The red in the center of this  
25 document reflects everything new. The red on the

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1 outside of these documents reflects everything  
2 deleted, striking entire existing paragraphs,  
3 inserting entirely new paragraphs, inserting new  
4 technical standards and inserting new compliance  
5 deadlines and plan approval processes. These are  
6 clearly not the same thing. Moreover, as we just went  
7 over, ERCOT has produced documents -- I think someone

8 said it best this afternoon, there might be a  
9 communication problem. I think that's probably the  
10 best you can say about it.

11 ERCOT itself has produced documents that  
12 demonstrate different requirements for wind than what  
13 the current PRR 830 requirements would provide. And  
14 that's the document you focused on. This is clearly  
15 an ERCOT document. It's not been doctored. It's from  
16 2008. It talks about a requirement. It talks about a  
17 triangle.

18 And on the page that you were focused on  
19 earlier, look at this. Shown to the right are the  
20 reactive capability curves for a conventional  
21 generator and a wind turbine. It points you to this D  
22 curve, and it points the wind generator to what we  
23 have commonly called the triangle. Despite what ERCOT  
24 might be saying today, just last year they were not  
25 saying the triangle was bad. They were not saying it

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1 had to be applied retroactively. They called it, in  
2 this document, the requirement.

3 So regardless of whether you call this  
4 confusion or a communication issue, one thing it is  
5 not is clear. We knew that because wind farms don't  
6 just spring up. Wind farms are built and  
7 interconnected in conjunction with the very best  
8 engineering minds in this state and from outside of  
9 the state that operate in this state. That is the  
10 TSPs play a key role. And even though we've heard  
11 some of them come up today and say they approve of PRR

12 830, they in fact have approved interconnection of  
13 wind farms with something less than a rectangular  
14 configuration and have taken a slightly different  
15 position today.

16 what I think we've all overlooked is  
17 that ERCOT has a statutory obligation to stay on top  
18 of -- in fact, to be the ultimate in providing  
19 supervision and responsibility as it relates to  
20 transmission interconnection service. It is  
21 absolutely in the statute that governs this body -- I  
22 should say PUCT Substantive Rule 25.361.

23 And I know very well that ERCOT would  
24 not approved anything that adversely affected  
25 reliability either implicitly or tacitly and allow it

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1 to continue for three or four years and only discover  
2 17 or 20 months earlier that there was some  
3 reliability event and, therefore, a problem, and then  
4 failed to study it, failed to bring that study before  
5 you, but urge action on a matter that would be so  
6 costly, ultimately those costs being borne by those  
7 we're here to protect.

8 25.361 says shall, "ERCOT shall accept  
9 and supervise all requests for interconnection, shall  
10 plan the transmission system." We've heard excuses,  
11 or at least explanations, to be a little more polite,  
12 but clearly what was known to ERCOT was that at least  
13 80 RARFs were submitted to -- I should say this, it's  
14 been set forth by the opponents of this protocol  
15 revision review -- at least 80 RARFs have been  
16 submitted to and approved by ERCOT. I think the

17 explanation was given to us today that ERCOT has  
18 these, but they don't use them for the particular  
19 purpose the statute suggests is their obligation.

20           These RARFs demonstrate, if you examine  
21 them and use them, look at them, that wind was not  
22 designed to meet the rectangle, the rectangle at least  
23 in many, many instances. Local TSPs, some of the best  
24 minds in the business, performed interconnection  
25 studies based upon the triangle. No problems with the

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1 triangle have been identified. And probably most  
2 significantly, where there was an additional reactive  
3 component necessary, it was imposed upon the wind  
4 generators. They put those components in, and did so  
5 based upon the studies.

6           This information, these studies, as is  
7 appropriate pursuant to Substantive Rule 25.361, is  
8 available to ERCOT. Those were available for study  
9 and for compliance with ERCOT's obligations under  
10 25.361. So we contend that not only were these  
11 things known to the TSPs and studied by the TSPs, but  
12 ultimately, pursuant to the operation of 25.361,  
13 approved by ERCOT.

14           The real question we have with regard to  
15 this proposal is retroactivity because it sets bad  
16 precedent. It can be imposed on anyone literally  
17 under any situation. It imposes huge regulatory risk  
18 on future business decisions, affecting again anyone.  
19 And if you look at the long view, a matter that should  
20 be of grave concern and something we shouldn't rush to

21 judgment on. Again, the NextEra position is if a  
22 study justifies something beyond the triangular  
23 configuration, we'll step up, pay for it and implement  
24 it.

25 And third, we have to look at the long

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1 view of how this decision will affect investment  
2 decisions in Texas. Here we believe that the Board  
3 has only imposed retroactive application of technical  
4 requirements where there was compelling evidence  
5 supporting it. I think we've emphasized the point  
6 enough that there hasn't been a study. And the one  
7 study that's underway -- that could be used to answer  
8 some of these questions is underway. We heard about  
9 it this morning. And it probably won't be done until  
10 the end of this year or early in the next.

11 what we would respectfully ask you to  
12 consider is that under Protocol 1.2, whatever you do,  
13 and whatever you decide is governed by ensuring access  
14 to the transmission and distribution systems on  
15 non-discriminatory -- excuse me, non-discriminatory  
16 terms, and to act in a manner that's reasonable.

17 And ask yourselves and guide yourselves  
18 by whether what we're asking be done is fair, whether  
19 it's reasonable, whether it's non-discriminatory,  
20 whether it's necessary. Because clearly if you have a  
21 system in which ERCOT tells you that more than half  
22 the wind farms it polled cannot state that they're in  
23 compliance with what is now being read as consistent  
24 with 830, then we are asking for something new to be  
25 imposed.

1           ERCOT did publish the triangle under the  
2     guise of it's a, quote, unquote, "requirement" and  
3     there's a sea of wind farms conforming to something  
4     other than a rectangular configuration of reactive  
5     power configurations. And, you know, the definition  
6     of good utility practice, if you look at the statute,  
7     is any practice, method or act engaged in or approved  
8     by a significant portion of the electric utility  
9     industry during a relevant time period.

10           In our case alone LCRA, Brazos, AEP,  
11     took the wind farms in question that we have built and  
12     operate, looked at our reactive capabilities and  
13     approved us for interconnection. All interpreting the  
14     protocol essentially the way most if not all of the  
15     wind generators have been interpreting it.

16           There shouldn't be any real question  
17     that this didn't exist as a requirement or it just  
18     doesn't make sense that so much of the system would be  
19     out of compliance. I don't think ERCOT would allow  
20     that to happen. This is new. It's being applied  
21     retroactively. There's no study confirming that it is  
22     necessary, and as soon as there is one that confirms  
23     it's necessary, we'll be the first people to sign on  
24     and support it.

25           More importantly, there's no study that

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1     suggests that what's being proposed here will fix the  
2     problem. And although it's been stated that there was



3 a lot of analysis of this, we really believe that  
4 there was a rush to judgment. This was not assigned  
5 to a working group. There was no task force assigned  
6 to it. There were several amendments, even some  
7 supported by ERCOT staff, that were never voted on.

8 And so in closing, before we rush to  
9 spend huge dollars, tens to hundreds of millions of  
10 dollars that is retroactively applied, that will chill  
11 investment and result essentially in what is  
12 consumer-friendly pricing, that keeps electricity  
13 prices low for consumers, and we'll just wipe that  
14 out. Especially we believe this is unwise when there  
15 have been no reliability events triggered by  
16 non-compliance -- that is by non-compliance with what  
17 the proponents state is the proper application of the  
18 protocol. And no study of the reliability benefits  
19 that 830 would trigger. Thank you.

20 CHAIRMAN NEWTON: I'm going to ask you  
21 the same question, and based upon a couple of your  
22 comments, I just want to be clear of my understanding  
23 of NextEra's position: without a study you would not  
24 support the rectangle prospectively? Or you would?

25 MR. MARKARIAN: I think we stated that

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1 we would support it going forward.

2 CHAIRMAN NEWTON: Well, that's what I  
3 was wanting to clarify based upon the comments you  
4 made because --

5 MR. MARKARIAN: I really meant to say  
6 both things. If the study demonstrates -- well, I  
7 guess we're actually saying exactly the same thing.

8                   CHAIRMAN NEWTON: Okay. well, but, no,  
9 I guess my question is are you saying you would not --  
10 will you support prospective rectangle without a  
11 study?

12                   MR. MARKARIAN: I think we're taking  
13 that position, yes, ma'am.

14                   CHAIRMAN NEWTON: It's only the  
15 retroactive piece that's at question.

16                   MR. MARKARIAN: That's correct.

17                   CHAIRMAN NEWTON: Okay. Thank you. Any  
18 other questions?

19                   Yes, Clifton?

20                   MR. KARNEI: Did I hear you throw out a  
21 number of the estimated capital cost to be in the  
22 range of 30 million to 130? And where does that come  
23 from?

24                   MR. MARKARIAN: Our estimated number for  
25 our system would be about \$27 million. And I think

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1 some of our competitors are -- if you will, sister  
2 wind companies -- have indicated that in addition to  
3 our expenditures it would total industry-wide \$100  
4 million.

5                   MR. KARNEI: How much?

6                   MR. MARKARIAN: 100.

7                   MR. KARNEI: Okay. Thank you.

8                   CHAIRMAN NEWTON: Charles?

9                   MR. JENKINS: I'd like to understand a  
10 little bit more about your offer. You said if a study  
11 shows that something else is needed, you would be glad

12 to go back and install that on your existing farms --

13 MR. MARKARIAN: We absolutely have taken  
14 that position.

15 MR. JENKINS: How far into the future  
16 hold? If we study it next year and we figure out you  
17 need \$5 million worth, and then 10 years after that we  
18 discover it needs 60 million. Are you okay with that?

19 MR. MARKARIAN: That's right. There's  
20 no limit, and it would be an indefinite commitment.

21 CHAIRMAN NEWTON: Is that all, Charles?

22 MR. JENKINS: Yes. Sorry.

23 CHAIRMAN NEWTON: Dee.

24 MR. PATTON: Why would you agree to  
25 without a study comply proactively ---

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1 CHAIRMAN NEWTON: Prospectively.

2 MR. PATTON: -- period, I guess?

3 MR. MARKARIAN: Doctor, would you mind  
4 if I ask Peter WYBIERALA to answer that. He's much  
5 more technically astute and can perhaps --

6 MR. PATTON: No, it's -- it doesn't  
7 require an engineering analysis. Please answer the  
8 question.

9 CHAIRMAN NEWTON: Whichever one y'all  
10 want to is fine.

11 MR. MARKARIAN: Got it. Doctor, I'm  
12 sorry, I actually knew that and I had to get it  
13 whispered back in my ear. We could easily have made a  
14 decision prospectively to rely more heavily on the  
15 Siemens technology, which would have taken these  
16 concerns off the table.

17 MR. PATTON: But you're perfectly  
18 willing to go forward into it in infinity without a  
19 study. Correct?

20 MR. MARKARIAN: I think it's preferable  
21 to know that everything we do has a purpose and makes  
22 sense. But so much of this -- I mean, I know that  
23 ERCOT is a quasi-public body. But so much of this is  
24 compromise. And although we might from an engineering  
25 perspective have one view, we also recognize that the

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1 reality is we all have to work together to try and do  
2 the very best we can. And I think what you see in  
3 that position is not some sort of hypocrisy but a  
4 recognition that we all have to work together and  
5 sometimes make compromises.

6 MR. PATTON: Thank you.

7 CHAIRMAN NEWTON: Andrew?

8 MR. DALTON: I'm going to hold back.

9 CHAIRMAN NEWTON: Okay. Mike?

10 MR. GENT: You may have heard earlier  
11 Kent Saathoff said that they had done a survey of 70  
12 wind farm owners, and that 16 of the 70 they surveyed  
13 let -- were able to meet the requirements that they  
14 feel is put out in the original version of this  
15 standard?

16 MR. MARKARIAN: Yes, sir, I heard that.

17 MR. GENT: Would you suggest to us that  
18 they should no longer be required to be held to that  
19 as well?

20 MR. MARKARIAN: No, what I'm guessing --

21 and it's purely a guess -- is that those are probably  
22 units that opted for a particular technology. And as  
23 technology marched forward -- you probably know that  
24 in and around 2000 I don't think there was a wind  
25 turbine capable of producing reactive power, and as

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1 technology evolved there were options. And although I  
2 don't know the specifics of what the gentleman spoke  
3 of, that would be my guess.

4 MR. GENT: So how would you feel about  
5 if we exempted wind generators from this requirement  
6 in those installed after 2004 and before 2009? What  
7 about the combustion turbines and all the other units  
8 that are installed? Would we not also hold them to  
9 the same requirement?

10 MR. MARKARIAN: You're at the edge of my  
11 technological knowledge, but I don't know that that  
12 would be an applicable concern for us for anybody.

13 MR. GENT: Okay. You're not concerned?

14 CHAIRMAN NEWTON: Bob?

15 MR. HELTON: One quick question, because  
16 I'm a little confused about Charles' question and your  
17 answer. We were talking about doing the triangle  
18 prospectively and then you're talking about doing  
19 another study later for \$60 million and you're  
20 agreeing to that --

21 CHAIRMAN NEWTON: Bob, can you get a  
22 little closer to the mic?

23 MR. HELTON: -- I'm not sure what that  
24 question meant and what that answer meant. Because if  
25 we're looking at prospectively saying we're going to

1 do the triangle, then that is what would be from that  
2 point forward. So I'm not sure what you were asking  
3 and I'm not sure what your answer meant.

4 MR. JENKINS: I'll clarify what I  
5 thought I was asking.

6 MR. HELTON: Okay.

7 MR. JENKINS: And that was -- I was  
8 assuming that discussion was leading toward there  
9 would be some time frame of units between 2004 and  
10 2009 perhaps that would be held initially as a minimum  
11 to the triangle standard and be subject to further  
12 modifications in order to meet whatever a study showed  
13 actually was necessary for reliability. And say a  
14 year into it we figured out through study that a  
15 certain amount of stuff was needed, and then over a  
16 period of time conditions change in that part of the  
17 grid and it turns out more is needed, would they be  
18 willing to continue to hold open the requirement that  
19 they -- that they do retrofit when a study showed it  
20 was necessary indefinitely, and they said they would.

21 MR. HELTON: Were -- okay. So just to  
22 clarify because I'm just trying to make sure we're all  
23 listening, because I'm not sure he got that.

24 MR. MARKARIAN: That's absolutely what I  
25 intended to say.

1 MR. HELTON: Okay. So in other words,  
2 what you're saying if he -- you're not -- if you do

3 agree to go with the triangle and not the rectangle,  
4 then you're basically saying that they need to take  
5 over -- the question was would you take over the  
6 responsibility the TDSPs generally take over after the  
7 original interconnection is done?

8 MR. JENKINS: That was the thrust of my  
9 question, and I'm quite surprised by their answer,  
10 quite frankly.

11 MR. MARKARIAN: I don't think that's  
12 exactly --

13 MR. HELTON: That's why I'm --

14 MR. MARKARIAN: Sir, I'm sorry, maybe I  
15 misunderstood. I don't think anyone suggested we take  
16 over the job of TDSPs. I thought the suggestion was  
17 that we do what studies demonstrate is appropriate to  
18 ensure system reliability. And that I did agree with.

19 MR. HELTON: Yeah, see what the question  
20 was is, like today -- and this is one of the things  
21 that John Houston talked about and some of the  
22 others -- is when a generator connects, he's on the --  
23 the rectangle, then anything that changes in the  
24 system around that generator that creates an issue  
25 with voltage is taken care of through the TDSP adding

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1 reactive or dynamic stability components on the  
2 system.

3 what Charles is talking about is saying  
4 if you agree to do a triangle, are you also agreeing  
5 that any upgrades that happen after that point, which  
6 traditionally would be taken care of and paid for  
7 through TCOS, that you're going accept that

8 responsibility was what I understood. And I  
9 understood that you agreed with that? Isn't that  
10 right, Charles?

11 MR. JENKINS: Yeah.

12 MR. HELTON: I'm just trying to make  
13 sure that you fully understand what you answered  
14 there.

15 MR. MARKARIAN: Would you kindly mind  
16 repeating the question for us? Thank you.

17 MR. HELTON: Well, it wasn't my  
18 question. I'm just trying to figure out what you  
19 agreed to. But what -- the way traditionally things  
20 are done is whenever I hook up one of my units and  
21 it's hooked up through the typical rectangle  
22 situation, I'm on the system. As topology changes and  
23 things happen on the system that create different  
24 needs for voltage support and studies are done by the  
25 TDSP and/or ERCOT, and they have to -- and they say,

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1 oh, we've got a stability problem here and so they  
2 will go to the TDSP. The TDSP will put in whatever  
3 dynamic or static devices need to go in to ensure  
4 voltage control in that area. And what Charles'  
5 question was, was if you're going to do -- or would  
6 you agree that if you're doing the triangle, that any  
7 changes therefore that came about on the system for  
8 whatever reason around those assets, that you would  
9 take the cost of upgrading those devices.

10 MR. SCHAFER: Sir, the answer to that  
11 question is no.



12 MR. HELTON: That's what I'm trying to  
13 get to. Okay?

14 MR. MARKARIAN: Yeah. I understood the  
15 original question to mean if there was some issue that  
16 was directly related to the reactive capability  
17 limitations of the wind turbine, we would stand up for  
18 that.

19 THE REPORTER: I'm sorry, I don't know  
20 who the gentleman was walking across the room.

21 MR. SCHAFER: Matt Schafer.

22 CHAIRMAN NEWTON: Are you with NextEra?

23 MR. SCHAFER: Yes.

24 CHAIRMAN NEWTON: Okay. Andrew?

25 MR. DALTON: I think this question --

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1 MR. GRABLE: Let me interrupt for just a  
2 second. I apologize. This is Mike.

3 If anybody who speaks who isn't on the  
4 agenda or they don't have your information, please  
5 give them a business card. Thanks.

6 MR. DALTON: I think this question will  
7 be more simple. If -- I want to try to recharacterize  
8 your position a little bit similar to what I did with  
9 AES. It would be your position that prior to  
10 February 17th of 2004, no reactive power applies.  
11 From February 17th, 2004 until December 1, 2009, the  
12 cone or triangle should apply, unless a study shows  
13 something more is necessary? And prospectively, after  
14 December 1st, 2009, the rectangle should apply. Is  
15 that fair?

16 MR. MARKARIAN: Essentially, yes.

17 MR. DALTON: Okay. Another point -- and  
18 this kind of gets into the retroactivity issue that --

19 MR. MARKARIAN: Remember we sort of  
20 positioned ourselves in the alternative as you  
21 probably know from reading the submission. So -- but,  
22 yes. Essentially yes.

23 MR. DALTON: Okay. With regard to this  
24 retroactivity issue that you're raising, I mean, am I  
25 correct to read the PRR that the standard doesn't kick

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1 in until December of 2010, December 31st, 2010?

2 MR. MARKARIAN: I think the concern is  
3 it would require us -- when we use the term  
4 retroactivity, we simply mean it would require us to  
5 go back and retrofit existing wind farms and spend  
6 significant sums of money to do so.

7 MR. SCHAFER: Yeah, the standard is  
8 compliance by that date.

9 MR. DALTON: Yes. But what I would  
10 suggest is I think throwing this term retroactivity  
11 into the debate I think is disingenuous and really  
12 unhelpful at this point, because everybody who's in  
13 the business, whether it's refining, generating power,  
14 chemical plants, you get changed regulations that  
15 affect your business all the time. And they happen  
16 and you have to make adjustments to your business  
17 going forward.

18 This is a proposed adjustment to your  
19 business going forward. You may not agree with it,  
20 but it's not in any case I think retroactive. And I

21 think that's an unhelpful path to discuss. I think  
22 there are other realistic points that we need to  
23 debate and consider as a Board. I know I too am  
24 concerned about having any group of parties in the  
25 market have to pay \$100 million that may or may not

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1 have significant benefits, but the idea that this is  
2 retroactive I think is unhelpful.

3 MR. MARKARIAN: Sir, if I could just  
4 clarify a bit, respecting what you said about the use  
5 of the term, I think our concern is a little bit  
6 different and a little more nuanced. It is not  
7 retroactivity alone and in a vacuum. It's  
8 retroactivity without any sort of precise study.

9 CHAIRMAN NEWTON: I think we've got it.  
10 Okay.

11 MR. DALTON: And what I'm suggesting is  
12 it's not retroactive in either event.

13 CHAIRMAN NEWTON: Yeah. I think we've  
14 got it.

15 Mike, did you have something else?

16 MR. GRABLE: I did very briefly. I  
17 don't want to debate points. I do want to say I love  
18 your slide about entirely new on the PRR, and Christy  
19 you should keep that for future stakeholder meetings.  
20 If we limit the amount of revisions as a PRR goes  
21 through the process, Mark, I think you'd love that,  
22 too. So let's definitely hang onto that one.

23 There were two comments related to ERCOT  
24 staff and either their nonresponsiveness or their  
25 statements against interest, and I just want to

1 respond to those very briefly. Regarding the two  
2 reliability events, Dave, sometimes as you know events  
3 can happen that -- for example, a nuclear event in  
4 South Florida can ripple the frequency through the  
5 entire Eastern Interconnect. That's going to be  
6 public. Other times events are more confidential and  
7 they may be referred to Texas Regional Entity here,  
8 for example. So there may be reasons that staff is  
9 not communicating with a party who wasn't involved in  
10 those events. I don't want to dispute your  
11 conclusion, but I did want to respond to that point.

12                   You made a lot about the August 2008 ROS  
13 slide, slide 3 that John Dumas sent out. And I think  
14 you kind of acknowledged that there were -- you know,  
15 there's been some wind comments that said, "Oh, there  
16 are multiple versions. We don't know what to  
17 believe." I think it's important to note for the  
18 record that that slide did go out as you highlighted  
19 it in the morning. And at 5:10 on the same day John  
20 Dumas revised it and sent it out again and told  
21 everyone on the ROS list, "The presentation that I  
22 sent out on voltage control covers an example of  
23 reactive capabilities of a wind farm. The example  
24 does not meet the protocols."

25                   And I'm not going to go through his

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1 whole email, but, you know, there is not exactly  
2 confusion on that point. We did send out an incorrect

3 slide and it did refer to the triangle as the  
4 requirement. But that mistake was corrected hours  
5 later the same day, and I don't think there can be  
6 confusion 5:10 p.m. last August 21st as to what at  
7 least ERCOT staff believes is required. So I just  
8 wanted to clarify those two points and thank you for  
9 joining us.

10 MR. MARKARIAN: And, Mr. Grable, if  
11 anything I said led you to believe that we believe  
12 that our working relationship with ERCOT is anything  
13 other than --

14 MR. GRABLE: You don't need to -- I  
15 don't have any concerns personally on that score  
16 whatsoever.

17 MR. MARKARIAN: My only point was we've  
18 been very concerned about finding out about these  
19 reliability events and trying to dig in.

20 CHAIRMAN NEWTON: Okay. Thank you,  
21 gentlemen, very much. We appreciate it. We have two  
22 more that I'm aware of, and then I'll open it for any  
23 others who may be in the audience. Next would be  
24 Oncor, Ken Donohoo.

25 MR. JENKINS: Yeah, Ken's not here and

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1 didn't intend to make a presentation. We'll just  
2 stand by the comments. I will observe that I've  
3 interviewed our transmission planners and I've  
4 interviewed our staff that does the work on generation  
5 interconnection, and there's been no uncertainty in  
6 their mind that they've been planning for the wind  
7 farms to have a rectangular-type configuration since

8 2004.

9 CHAIRMAN NEWTON: Thank you, Charles.  
10 The Wind Coalition, Walter Reid?

11 MR. REID: And in your Board packets you  
12 should have found a brief slide presentation called  
13 PRR 830 issues, and I will try to find it on here. If  
14 anybody can -- there it is. Right there.

15 Okay. Got it. That's me.

16 Y'all have been handling some pretty  
17 weighty matters up to this point -- oh, by the way,  
18 just to introduce myself briefly, I've been with ERCOT  
19 since -- in ERCOT working for -- since 1970. And  
20 about 15 years ago I went into independent consulting  
21 and five years ago started consulting with the wind  
22 coalition that represents over 30 members and, I'd  
23 say, roughly two-thirds of the wind that's on ground  
24 in ERCOT.

25 The issues you've -- you know, hit are,

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1 of course, what do the protocols say and what do they  
2 really mean as they're written today? And we've got  
3 many thousands of megawatts that believe that, you  
4 know, it says something different than what ERCOT is  
5 saying. And, of course, that's a major issue that  
6 needs to be resolved and, I suppose, is fundamentally  
7 a legal matter.

8 But I guess the point I'd like to make  
9 here is that we do need clarification. Because we've  
10 got so many folks that have already apparently  
11 interpreted it one way, we can't allow the next 8,000

12 megawatts that are about to sign up relative to CREZ  
13 to not have some clear direction of what it is that we  
14 really intended to say. So we may not have meant what  
15 is in those protocols. Maybe we meant something  
16 different. And if that's true, we need to make it  
17 clear.

18 what I'm about to talk about is going to  
19 be a very technical issue. It's partly coming up to  
20 you -- and I apologize that I'm having to bring it to  
21 the Board level because we've had such a rapid  
22 development of this issue. The first time that this  
23 was discussed at the ROS meeting to today it's 30  
24 days. So in 30 days we've taken a very weighty, major  
25 issue, with a lot of concerns by a lot of people, and

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1 we've brought it to the Board in 30 days.

2 One of the issues is that ERCOT has  
3 intended to do a better modeling job. And as I  
4 understand primarily focused on their realtime systems  
5 so that they can reflect what the actual reactive  
6 capability of wind generators is. And in doing that,  
7 in coming up with that, they are coming up with a  
8 redefinition of this thing called a WGR. And a WGR  
9 has been -- that term has been in the protocols for I  
10 don't know how long, but years. And it fundamentally  
11 applies to the whole wind turbine ranch facility.

12 The new definition that ERCOT is putting  
13 forward creates fictitious subunits. We have great  
14 support for the idea of the modeling. We needed to do  
15 that years ago. So I'm thrilled with us doing this.  
16 But the problem that we're running into is WGR, as

17 written today, before 830 is adopted, WGR applies to  
18 that interconnect point, that big red rectangle up  
19 there. And all of these wind turbines -- there's 70  
20 wind turbines in this diagram -- are feeding in via  
21 some transformers up to that interconnect point, maybe  
22 a transmission line between the substation for the  
23 wind generator and the interconnect point with the  
24 transmission service provider.

25 The new definition of WGR says that

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1 below each transformer -- so in this particular  
2 diagram -- let's see, I think I can use this somehow.

3 In this diagram there is one transformer  
4 shown that is bringing all of these wind generators up  
5 to transmission voltages. If there were connections  
6 over here, there might be two transformers, which by  
7 the way is pretty common in ERCOT, lots of  
8 two-transformer installations for a number of reasons.

9 what ERCOT is asking is that we identify  
10 generators of a same type. So this might be -- just  
11 to pull some names out of a hat -- these might be GE  
12 wind generators. These red ones over here and here,  
13 they might be Siemens. And the rest of these might be  
14 Mitsubishi. And they all have different reactive  
15 characteristics, and what ERCOT wants to know is how  
16 many of them are operating today and, as a result,  
17 they can then calculate and model what is it that my  
18 reactive capability today is for this particular wind  
19 range.

20 By taking the WGR definition and moving



21 it from there and saying all of these blue -- these  
22 six blue ones -- are now WGR No. 1, these three red  
23 ones are WGR No. 2. And, of course, the rest are WGR  
24 No. 3. We have all of a sudden created fictitious  
25 things that don't have meter points. And, as a

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1 result, we're going to treat them just like units.  
2 And if you look in the protocols, the word resource  
3 and units occurs in the protocols and the guides over  
4 2,000 times. Now all of those don't apply to WGR no  
5 matter how you define them. But all of a sudden what  
6 we've been using and interpreting at this interconnect  
7 points has now got to be applied here.

8 And so, for instance, we're going to  
9 have to treat them like any other generator would  
10 treat their units, and there's a lot of things that  
11 don't make sense because of that. I'll be happy to  
12 get into the details of why it doesn't make sense, but  
13 what we proposed -- and you'll see it in the wind  
14 Coalition comments -- is alternative wording that, in  
15 our opinion, provides 100 percent of the data that  
16 ERCOT needs to do its modeling without changing the  
17 definition of WGR.

18 So this is a very, very simple thing,  
19 and I apologize that we're having to bring it up to  
20 the Board, but we just haven't had the opportunity to  
21 vet this yet. This whole 830 has not been discussed  
22 in any working group or in any task force where we can  
23 have the kind of give and take that it takes for us to  
24 understand the problems that ERCOT is going to have  
25 with this modeling and the ones that we're going to

1 have.

2 In addition, I did want to point out on  
3 kind of the issues that were raised by some other  
4 speakers, if I'm permitted.

5 CHAIRMAN NEWTON: Very quickly.

6 MR. DALTON: Walter, one second. Could  
7 you hold off for one second on that? I wanted to  
8 follow up with John or Kent.

9 Is there a reason why we're going back  
10 behind the point of interconnect in PRR 830 as opposed  
11 to just characterizing the wind farm as a whole?

12 MR. DUMAS: Yes.

13 MR. DALTON: Could you explain that to  
14 me?

15 MR. DUMAS: Sure. First of all, wind,  
16 as Walter said, wind turbines have been aggregated  
17 together to form a unit. In some cases it may be, you  
18 know, one unit or multiple units. The concern is if  
19 you've got turbines that are very different in  
20 characteristics -- reactive capability for instance.  
21 You've got maybe a group -- say you've got 20 turbines  
22 that have great reactive performance, and then you  
23 have -- a lot with that, another 20 turbines that  
24 doesn't have any.

25 If you lump those together in 40

1 turbines to form one unit, our models require one  
2 reactive curve. So how are you going to design or

3 draw one reactive curve that represents 40 units with  
4 very dissimilar capability?

5 So what we've proposed in PRR 830 is,  
6 well, you can aggregate turbines, but you need to  
7 aggregate turbines that are the same model, same size,  
8 have the same characteristic. So when we're running a  
9 power flow analysis or running realtime contingency  
10 analysis with one reactive curve for that unit, that  
11 that reactive curve is representative of the  
12 capability of those turbines that it represents.  
13 Because you can run into -- not only would you have  
14 difficulty creating a reactive curve to represent 20  
15 dissimilar capabilities. What happens when you have  
16 all -- say 10 of your good performing turbines down  
17 for maintenance? Then you've got little to no  
18 reactive capability, but yet you've got a curve that  
19 shows that you have more than you need to.

20 Now, a couple of points I want to make  
21 here. The point of interconnect, where that meter --  
22 that red meter that Walter has drawn -- is talking  
23 about -- I assume he's referring to the EPS meter, the  
24 poll settlement meter, it's very common on  
25 conventional units that we may have -- I can think of

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1 one case where we've got five different power lines  
2 coming into a power plant and there's an EPS meter for  
3 those five lines, but the individual units have  
4 realtime telemetry provided from an RTU of their  
5 individual megawatt output, their individual limits  
6 provided through SCADA. So, I mean, that's a common  
7 practice and that's how it's done with, you know,

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8 almost all of our units with -- providing telemetry  
9 that's from -- either from our control system or from  
10 a transducer that's out at the field.

11 The other thing I wanted to point out,  
12 Walter made a comment earlier that this PRR has only  
13 been out there a month. We've been dealing with this  
14 issue for a long time now as we've been talking about,  
15 and we've had quite a few discussions. This PRR was  
16 actually submitted, I believe, September 8th date. It  
17 was tabled -- it was presented at ROS to cover what's  
18 in the PRR, what we're trying to do. Then that went  
19 to the PRS. PRS tabled it for a month for ROS to have  
20 a discussion, and John Houston covered the history of  
21 those discussions.

22 MR. DALTON: Just follow up on that --

23 MR. REID: If I could follow up on  
24 that -- oh, I'm sorry.

25 MR. DALTON: I'm okay with the concept

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1 of the telemetry and why you want the telemetry on the  
2 units. But it would seem to me that from a grid  
3 reliability perspective, what you really want is  
4 wherever they're connected to the grid to know what  
5 capability they're expected to deliver at that point  
6 of interconnection -- I mean, if the generators, for  
7 whatever reason, can't deliver because there are some  
8 units down, that should be on them. And if they  
9 create a violation or if they create a grid problem,  
10 you know, the TRE or someone is going to come calling  
11 on them for that. That's for them to deal with as

12 opposed to trying to -- I'm worried that creating  
13 these little subunits inside of a single  
14 interconnection potentially creates more reliability  
15 issues for the grid than it solves, or am I wrong in  
16 that assumption?

17 MR. DUMAS: No, sir. Let me trot it out  
18 a little deeper and see if I can answer your  
19 questions.

20 MR. DALTON: Okay.

21 MR. DUMAS: You've got to have a  
22 reactive curve that represents the capability of that  
23 unit, where it can go to. At the point of  
24 interconnect, each unit has a -- what's called a  
25 voltage schedule where they're trying to hold the

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1 voltage. And the way they hold the voltage is they  
2 supply either more vars or absorb vars if the voltage  
3 is high.

4 we also run realtime contingency  
5 analysis where we simulate taking lines out of  
6 service, and we look to see what the voltage would go  
7 to if we took that line out of service.

8 well, the way the software is going to  
9 calculate where the voltage can go to is based on a  
10 capability curve supply. And it's going to look at  
11 that capability curve and say, okay, well how many  
12 vars can you produce or how many vars can you take in?  
13 So it's very important that that capability curve is  
14 representative of what that unit can do.

15 You also -- if you have any devices in  
16 the substation such as cap banks, reactors, stack

17 house, whatever the device is, you model those  
18 separately. So they all contribute, but it's very  
19 important that you know what the capability of that  
20 units is. It's not just the realtime output of the  
21 unit. It's what it can do when you simulate these  
22 contingencies.

23 MR. DALTON: Are you aggregating all of  
24 that at the point of interconnection or are you  
25 aggregating at some other point on the grid?

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1 MR. DUMAS: It's aggregated however they  
2 submit it in a resource plan. So as Walter pointed  
3 out, in a lot of cases it may be all the units at the  
4 farm, whether it's -- you know, no matter what type  
5 they are, whether it's a mixture of different  
6 turbines.

7 MR. DALTON: So say for example they had  
8 these three sets of turbines, all different sizes, and  
9 they had two capacitor banks and they aggregated that  
10 and they said at the point of interconnection we can  
11 deliver you "x" reactive power. Is that sufficient  
12 for this or do you need more detail and granularity  
13 than that?

14 MR. DUMAS: It's not sufficient because  
15 what you need is to be able to hold the voltage. And  
16 you may need varying amounts of vars to be able to do  
17 that. So the var varies. What you're trying to do is  
18 hold the voltage. And what the requirement is with  
19 the .95 rectangle from a hundred megawatt unit, you've  
20 got to be able to deliver up to 33 megavars. That's

21 the requirement.

22 So if the voltage goes low -- say it's a  
23 345 bus -- and the voltage goes low to 340, and the  
24 unit is putting out 33 megavars but it can't get the  
25 voltage up past 340, then it met the requirement.

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1 But it could be that it could go -- depending on the  
2 conditions of the grid -- it could be it could go to  
3 345 and only put out 10 megavars. So you need to know  
4 how that capability is going to vary based upon your  
5 curve when you run your study and the need of the  
6 simulation that you're doing.

7 CHAIRMAN NEWTON: Okay, gentlemen, if I  
8 could --

9 MR. DALTON: I'll yield.

10 CHAIRMAN NEWTON: Well, we really need  
11 to get going here. Did you have a couple more  
12 comments, things that haven't been said by the other  
13 parties?

14 MR. REID: A response to a couple of  
15 things. First of all, to this reactive -- this  
16 discussion on the modeling. I 100 percent agree with  
17 everything John has just said in terms of the need to  
18 do the modeling and that it needs to be the extra  
19 detail. You really need to get to the low side of the  
20 transformer and show the pieces. If you look at my  
21 wording, it does that. It just doesn't redefine WGR  
22 in the process.

23 So we're totally supportive of this.  
24 I've been on about this for over a year, maybe even  
25 two years, that we need this kind of detail in load

1 flow and operations, totally supportive, just don't  
2 redefine WGR in the process.

3 I would footnote that we've taken more  
4 time here at the Board to discuss this one issue than  
5 at all the committees or subcommittees that have  
6 discussed this PRR to date. And I can discuss the  
7 flow of this. It's 30 days since this was first  
8 discussed that it came to here.

9 The other things that I'd like to  
10 mention and be a little cutesy on it, but what we have  
11 here is a failure to communicate. We've got a whole  
12 bunch of folks out there that I think were trying to  
13 do the best job they could, whether they were  
14 transmission service providers or wind generators or  
15 ERCOT.

16 And my analysis of this over now -- over  
17 a year of being involved in it, is we've just had  
18 people talking in conventional generator terms and  
19 people talking in wind generator terms. If you look  
20 at the forms that they were asked to fill out, if they  
21 didn't fill them out, they weren't going to get  
22 interconnected. If they did fill them out, they had  
23 to use a lot of engineering judgment, because what  
24 they were asked to respond to doesn't fit their  
25 hardware and their systems. So you've got a lot of

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1 issues that were just very difficult, and we're all  
2 learning on this.



3           The voltage issues that we've had, the  
4 one that I'm aware of, that I think was -- highlighted  
5 here was a communication issue, as I recall it, where  
6 various parties were trying to make something happen.  
7 This was, what, over a year ago -- in fact more than a  
8 year ago. And as a result of that in some of the  
9 workshops we had a lot of discussion. I applaud AEP  
10 and Oncor. Oncor sent their operators, every single  
11 shift operator from Oncor went to a wind ranch to  
12 understand what they're doing, how they're built, how  
13 they operate. I believe Ross Phillips gave them a  
14 questionnaire to go get answered when you go out to  
15 the field so that all those operators understood.

16           We've got a history in ERCOT of all the  
17 folks really working well together. And when they get  
18 on the phone or they see a typed message or an  
19 automatic display on their computer, they've all had a  
20 lot of communication together. They all understand  
21 what we're saying. We tend to speak in short words,  
22 take shortcuts on our communication.

23           We've got a new industry that's trying  
24 to integrate. I think everybody has been working real  
25 hard to do it. We're all running together. I really

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1 encourage you to please do what we need to make it  
2 clear for the new generators. And the generators that  
3 are there, they're there today, they're there  
4 tomorrow, they're there next month. Let's take the  
5 time it takes to figure out how we're going to handle  
6 that. And I don't want to get into discussing from my  
7 point of view what the right way to do that is. It's

8 certainly not in this forum. Thank you for your time.

9 CHAIRMAN NEWTON: Okay. Thank you. Did  
10 the wind Coalition take a position about this  
11 prospective and retroactive piece?

12 MR. REID: Yes. And I say the wind  
13 Coalition, we have not had a vote on it. And, as I  
14 say, we have 30 members. And I think someone when  
15 they were speaking from -- one of the wind Coalition  
16 members -- used the word competitor. So getting all  
17 these guys in the same boat much less paddling in the  
18 same direction is a challenge --

19 CHAIRMAN NEWTON: That's okay. If the  
20 answer is just no, that's fine.

21 MR. REID: So most of those guys have  
22 all agreed that this rectangle is definitely where we  
23 need to go, and I know of no one that is going to  
24 oppose it.

25 CHAIRMAN NEWTON: On a prospective

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1 basis?

2 MR. REID: On a prospective basis.

3 CHAIRMAN NEWTON: Okay. Thank you very  
4 much.

5 Okay. Do we have any other comments or  
6 people who would like to make any comments?

7 Okay. Please identify yourself and who  
8 you're representing.

9 MR. R. JONES: Thank you, Madam  
10 Chairman. My name is Randy Jones. I'm with Calpine  
11 Corporation, and we're in the independent generator

12 segment. I have the unique privilege of serving this  
13 year on ROS, WMS, PRS and TAC. And I can certify to  
14 you that you have not met longer today than all those  
15 groups have on this issue. Trust me on that.

16 I come at this issue with a fairly deep  
17 background in system operations, although I'm not an  
18 engineer. I worked in realtime operations and managed  
19 realtime operations for TNP for 13 years, both on a  
20 control air generation side as well as the wire side,  
21 managing voltage support and reactive compensation.

22 Our view at Calpine is that voltage  
23 support is a community service. No one gets paid for  
24 it. And as you're all aware, in the area of  
25 discipline of market design, the biggest enemy to any

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1 community service is a free rider. It always creates  
2 problematic areas.

3 we view voltage support as an  
4 obligation, one that we all share as generating  
5 resources. And we believe that there have been enough  
6 provisions made in the protocols that everybody can  
7 carry their fair share.

8 As I look around the room, I can also  
9 tell you that I'm probably the only person here who  
10 participated in the Interim Voltage and Reactive  
11 Standards Task Force many years ago that ROS put  
12 together. And in at least one of those meetings at  
13 the old HL&P building, I asked the question not once  
14 but twice: Does this mean that generators can provide  
15 a proportional amount of reactive output at lower real  
16 power levels? And the resounding answer I got both

17 times was no. I think maybe one time it was hell  
18 no -- excuse my French.

19 But I was disabused of the idea of a  
20 system, particularly one operating in the shoulder  
21 months at very low loads, where generators would only  
22 provide the triangular reactive capability. I still  
23 to this day believe that the folks who participated in  
24 that group understood very clearly what the  
25 requirements had to be. And if developers of wind

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1 facilities would have asked any of us, I'm certain  
2 they would have gotten the same answer. It's a  
3 rectangle, folks.

4 We believe that PRR 830 has been fully  
5 vetted. The debate has been beyond vigorous at times.  
6 Despite what you've heard, we think that the time that  
7 the stakeholders have had to evaluate this PRR has  
8 been more than adequate.

9 It's a fundamental component of system  
10 reliability and security. And the idea that you can  
11 take a snapshot and do a study today and that's good  
12 enough to determine what a generator ought to provide  
13 we believe is a huge myth. Over the life cycle of a  
14 unit you just can't continue to perform studies. And  
15 I think you saw the fallacy in that kind of approach  
16 when Charles Jenkins asked that question. There was a  
17 lot of trepidation about how you would approach that.  
18 That's why we believe there's a standard; that all  
19 resources ought to meet it. And once they meet it  
20 going forward, there's no question about where the

21 rest of the reactive compensation has to come from.

22 we would ask that you affirm the work of  
23 the stakeholders, recognize the overwhelming votes for  
24 PRR 830 through the stakeholder community, and affirm  
25 the work of TAC in denying the appeal of NextEra and

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1 approving PRR 830. Thank you.

2 CHAIRMAN NEWTON: Any questions?  
3 Comments?

4 Okay. I think where that takes us --  
5 oh, I'm sorry. I didn't see her. We do need need to  
6 take a very brief break after this presentation  
7 because we've got our court reporters here that her  
8 fingers are probably about to fall off. I tried to  
9 assure them I would try not to go more than two hours  
10 and we are already past it, both this morning and this  
11 afternoon. So after this presentation, we are going  
12 to take just a two- or three-minute break.

13 I would ask for people not to go real  
14 far -- I'll say five minutes, but be back. Okay? So  
15 that's a forewarning ahead of time.

16 Excuse me. Now you can go ahead.

17 MS. DIFFEN: That's okay. I'm going to  
18 make this really short. I'm Becky Diffen representing  
19 Duke Energy. In the interest of time and as requested  
20 I'm not going to repeat any of the comments made  
21 today. But Duke owns several hundred megawatts of  
22 wind generation in ERCOT, and we would just like the  
23 Board to know we support the comments made today and  
24 filed previously by Horizon, NextEra, AESCS and the  
25 Wind Coalition. That's all.

1                   CHAIRMAN NEWTON: That was very brief.  
2 Thank you.  
3                   Anyone else?  
4                   I'm not trying to cut anyone off. We'll  
5 come back and take further comments. I would just  
6 like a hands up or notification.  
7                   Okay. Five minutes and we'll come back.  
8                   (Recess: 3:20 p.m. to 3:27 p.m.)  
9                   CHAIRMAN NEWTON: Okay. I'm going to go  
10 ahead and get started. I think we've got enough Board  
11 members in the room, at least, and hopefully they will  
12 be in their seat shortly.  
13                   I think what I'd like to do right now is  
14 before we actually discuss the path forward for the  
15 board, there has been some nuances and discussions  
16 regarding some of the other activities relative to  
17 this issue that have been at the Commission. So,  
18 Mike, can you touch on those?  
19                   MR. GRABLE: Yeah, I'll be real brief  
20 and try to be neutral. John Dumas touched on that  
21 there have been a lot of staff and wind generator and  
22 TSP interactions, that this wasn't a blank slate that  
23 began with PRR 830. One of the things that's been  
24 occurring is we actually got an interpretation  
25 request, which is a little known protocol where you

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1 can ask ERCOT legal to issue an interpretation of the  
2 protocols, came from an interested party who was

3 looking at building generation, and we replied to it  
4 and published an interpretation, and it said this is  
5 what we think the PRR -- the protocols existing  
6 protocols mean.

7 wind generators took that, appealed it  
8 to the PUC, requested relief, essentially stating that  
9 the triangle was the appropriate -- or the cone was  
10 the appropriate interpretation, and we kind of went  
11 back and forth on that. We both mutually updated it,  
12 tried to resolve the issues. We were unable to do so.

13 That docket has been dismissed, and the  
14 dismissal was upheld by the Commissioners. On a  
15 procedural basis, you know, I can't discuss any  
16 pending ADRs or whether there will be a future  
17 commission action. I also can't discuss any referrals  
18 to Texas Regional Entity and whether or not there is  
19 or may ever be an enforcement action related to any of  
20 this, but there's nothing public at this point in time  
21 on those fronts.

22 CHAIRMAN NEWTON: I appreciate that. I  
23 think it's important for the Board to understand kind  
24 of all of the activities that are going on relative to  
25 these issues.

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1 Okay. We've had a lot of discussion.  
2 What I'll do at this point is bring up the  
3 recommendation by TAC for approval of PRR 830 and see  
4 if we have any further discussion among the Board  
5 members, and then I will see whether there will be a  
6 motion for approval.

7 So, Bob, do you want to start?

8 MR. HELTON: Yeah, I can start. I'm  
9 sure cards are going to come up all over here in a  
10 minute.

11 From listening to all this -- and I know  
12 there's been a lot of confusion, there's been a lot of  
13 miscommunications, and a lot of what I was sitting  
14 here and watching and saw what we had going on was it  
15 was basically -- I felt like I was an appellate Judge  
16 there for a while on making a decision, and that's  
17 kind of the way I felt about it. Are the protocols  
18 right or wrong is really a lot of what I heard today.

19 So what I see is in 830, so I'll talk  
20 about that first. 830 sits out there and says here  
21 is -- as John and Kent have said, "Here is what the  
22 requirement was, and here is a way to comply," and  
23 says there's people out there that do not comply.

24 My problem with that is, if we have  
25 people out there that aren't complying with the

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1 protocols, as written, as you guys define them, you  
2 need to be filing notices of violations. Okay? That  
3 needs to be done, referred to -- or not ERCOT do that.  
4 They are referred to the TRE for that. I'll get the  
5 procedure correct, and the TRE takes that.

6 As part of the NOV process, you figure  
7 out who is right, who is wrong, what those are. And  
8 then if there's mitigation that needs to take place,  
9 that's done through that process to get people to  
10 where the protocols are -- or tell you you have to be,  
11 and if that's retrofit, that's retrofit.



12                   What I think that 830 does for the  
13 retrofit piece is circumventing that process. I  
14 understand what it was trying to do. It was trying to  
15 give people an avenue out there in the protocols to do  
16 that, but it also looks like ERCOT is changing the  
17 rules and trying to make entities retrofit, and I  
18 think doing this process takes that away. Let that be  
19 thought out through the NOV process, who is right, who  
20 is wrong and then what has to take place. That would  
21 be my suggestion, let the process work instead of  
22 circumventing it with a 30 on the retrofit.

23                   The other side going forward, if we feel  
24 the need, which I think we might want to ensure that  
25 from this point forward it needs to be clarified to

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1 say it is the rectangle, then we can do that. But,  
2 you know, my first thought when I first saw this whole  
3 thing was 830 isn't needed. If you say that this is  
4 what the protocols say, that's what they say.  
5 Everybody has to comply, period. And then if there's  
6 a disagreement with that, there are processes to take  
7 care of that. You don't have to -- you would not need  
8 this at all for retro or moving forward. But I can  
9 see with everything going on we might want to go ahead  
10 and push 830 back to do -- make sure that it addresses  
11 only the going forward part and letting the NOV ADR  
12 processes take their place and let the process work  
13 rather than circumventing it. So that's kind of where  
14 I would kind of throw out right now.

15                   CHAIRMAN NEWTON: So can I put that in  
16 other words? I think what you're saying is you're

17 recommending that the Board remand back the  
18 prospective decision, that the rectangle applies to  
19 everyone, all generation types, but remand it back  
20 from some period of time so it can come back to be  
21 explicit about the prospective piece --

22 MR. HELTON: Be prospective, right.

23 CHAIRMAN NEWTON: -- but not to address  
24 the retroactive piece, let that go through the NOV  
25 process?

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1 MR. HELTON: We've already heard from  
2 ERCOT staff, from the TAC representative that that's  
3 what they believe the requirements were, were  
4 rectangle. So protocols in their eyes and what they  
5 said are there. There are processes to get that taken  
6 care of, which is, you turn it over to the TRE, the  
7 TRE makes a determination, and then they fight it out  
8 wherever -- in whatever venues that is, and whoever  
9 wins, wins. If there's retrofit, then retrofit takes  
10 place through mitigation plans that are done through  
11 that process. It takes us from being looking like  
12 that we are turning around and changing the rules and  
13 making retrofits. It allows the process to work, and  
14 I think this circumvents it the way it's written.

15 CHAIRMAN NEWTON: Okay. Brad?

16 MR. COX: Yeah, I think, you know, we've  
17 seen the split into the two pieces obviously, the  
18 prospective piece and what do we do with the existing  
19 system and the existing wind farms, and I'm fine  
20 with -- and it seems like everyone that's spoke is

21 fine with having this requirement on a prospective  
22 basis for new facilities, I guess.

23 So the question is, what do we do with  
24 the system as it exists today, and the thing that  
25 concerns me is I would -- you know, I would really

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1 like to see some type of a study that says, "Here are  
2 the problem areas, and here is the most cost-effective  
3 way to deal with those." And I don't -- I don't think  
4 we have that, at least I haven't heard or seen  
5 anything about that, that type of an analysis.

6 You know, I think Bob makes a good point  
7 about letting the ADR process play itself out. I  
8 don't have a problem with that, but I would -- you  
9 know, if we decide to go down that path, let's go  
10 ahead and figure out what the circumstances are and  
11 what needs to be done and what's the most  
12 cost-effective way to -- you know, if there are  
13 changes that need to be made so that we don't, you  
14 know, lose time, you know, in respect to that.  
15 That's -- you know, after listening to all the  
16 discussion and reading the materials, that's where --  
17 it seems to me the most reasonable approach.

18 CHAIRMAN NEWTON: Charles?

19 MR. JENKINS: I was going to talk on a  
20 slightly different issue, and that was the WGR  
21 definition issue that Walter Reid brought up. And if  
22 we do end up sending this back to TAC, I guess I would  
23 encourage them to address the point he made. I think  
24 it was a pretty valid one.

25 If we go the direction Bob is suggesting

1 of just letting the ADR process -- those that are  
2 appealing 830 are sort of rolling the dice. Right now  
3 they've been offered somewhat of an "It's okay," and  
4 you've just got to get in compliance by this date out,  
5 and so the mitigation is sort of already worked out  
6 and it's known.

7                   If we just let it go, what does the  
8 existing rule require, and if it's determined that it  
9 does require something different than what they can  
10 deliver today, you know, I don't know what the  
11 mitigation is going to be. It may be worse or better  
12 than what's in 830 today.

13                   So I sort of don't know how -- how to  
14 deal with that. I don't like the position that the  
15 Board is in on this matter. I think we need to remand  
16 at least on the issue that Walter raised. I'm  
17 still -- I'm still not sure where I am on the broader  
18 issue.

19                   CHAIRMAN NEWTON: Okay. Mark?

20                   MR. ARMENTROUT: I'd just like to point  
21 out that Chairman Smitherman is not in the room for a  
22 reason, and that reason is that the Commission will  
23 rule on the retroactive issues, so just to put a  
24 leveling agent and how much time we want to put in to  
25 voting that piece.

1                   The second point I wanted to make -- and  
2 Charles has made some comments that made me rethink

3 this, but I'll say it anyway. We could do what you  
4 said, Bob, here in this meeting right now without  
5 remanding it to TAC. I'm not recommending it. I'm  
6 just pointing it out.

7 CHAIRMAN NEWTON: John?

8 MR. DUMAS: Just one comment on the --  
9 something that Brad said about studies. Obviously I  
10 think John Houston made the point earlier that we have  
11 standards that apply to generators and apply to loads,  
12 and we've studied the transmission system to determine  
13 what variability, what variable equipment we need  
14 there.

15 I think we don't want to get in the  
16 position where in the future -- you know, the system  
17 is dynamic, the system changes, the needs change all  
18 the time. I think Charles alluded to that earlier.  
19 Needs are constantly changing. We don't want to be in  
20 a position where the standard gets challenged and  
21 we're asked, "well, okay, show me a study where I have  
22 to put this in or I have to meet this standard."  
23 That's a bad position for ERCOT to be in, number one.

24 Number two, we are making some  
25 assumptions. We have been making some assumptions

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1 about the capability of resources in all our planning  
2 studies going forward. We will be doing the CREZ  
3 reactive study, and we will be making assumptions in  
4 that study as to what the capabilities are of  
5 generators moving forward. So it's important that,  
6 you know, we make the right assumptions and don't have  
7 to go back and redo some of those analysis.

8 CHAIRMAN NEWTON: Mike?

9 MR. GRABLE: Yeah, I first want to say  
10 something real quick that I should have said at the  
11 beginning, and that is I think you-all know I wear two  
12 hats when I sit here, one is as counsel to the  
13 corporation and this Board, and the another is an  
14 officer of ERCOT similar to the other officers sitting  
15 at the table. I think you understand I've spoken  
16 today as an ERCOT staff member and on behalf of the  
17 ERCOT staff a proponent of PRR 830, but I just want to  
18 be absolutely clear on that, except for asking people  
19 to give a business card to the court reporters.

20 Bob, I want to go back to why we filed  
21 this PRR and explain why, from a staff perspective, we  
22 would have concerns with sending this back to TAC to  
23 be rewritten to be prospective. I'm certainly glad  
24 the wind generators are okay with prospective for new  
25 units rather.

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1 But I kind of had three thoughts in  
2 mind. One was create a grace period for compliance  
3 for the generators that we know today are not  
4 compliant with our version of how things should be,  
5 and we understand there are major capital investments  
6 that would be facing them to get compliant.

7 The second was to clarify and increase  
8 the flexibility that we already have, but to kind of  
9 spell it out a little better, to help wind generators  
10 who can't do fuel dynamic with a mix of dynamic and  
11 static or other alternatives to more better explain

12 the process by which we will be open to negotiations  
13 on alternative compliance.

14 And third, do our best, as John Dumas  
15 just said, to avoid erroneous assumptions flowing into  
16 the CREZ studies, fully understanding that the  
17 Commission and possibly beyond the Commission are the  
18 ultimate decisionmakers on all of these points. We do  
19 want to try to get it right, if we can.

20 To do any of those three things, we have  
21 to understand what the protocols require today. If  
22 the protocols do not support -- you know, if the Board  
23 does not share our sense of the protocols, we can't  
24 accomplish any of the goals for which this PRR was  
25 filed. So that would be my concern with that

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1 approach, and obviously NOVs from TRE or PUC  
2 enforcement, there are none that I know of today and  
3 PUC appeals on this or other matters, ADRs and the  
4 like are certainly not precluded.

5 CHAIRMAN NEWTON: Bob, do you want to  
6 address that?

7 MR. HELTON: Yeah, I do actually because  
8 there's actually something you said there that  
9 concerns me greatly, and I'll address just 2 and 3  
10 first.

11 I think that it's great to increase --  
12 part of what 830 and looking forward, I think it's  
13 great to increase that flexibility of the mix of what  
14 they could do to comply with the protocols, and you're  
15 absolutely right, you need to avoid. And I think  
16 you're looking at this wrong. I think that if -- if

17 the Board says, "Let the NOV process work," we're not  
18 disagreeing with you. We're saying, "You said the  
19 protocols are that, go file and put that over to the  
20 TRE and do what the protocols say."

21 My problem with No. 1 is, is I don't  
22 believe ERCOT has the leeway on any compliance issue  
23 to create a grace period. You find a protocol  
24 violation, you file and turn it in, and then you let  
25 the TRE and the process work. I'm really concerned

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1 about the grace period piece because then you're  
2 making it to where I'm saying, "Well, you, I'm going  
3 to give you a grace period." "You, no, I'm not giving  
4 you a grace period on this assumption," and I have a  
5 real issue with that.

6 That's why I'm saying -- for right now I  
7 could say I agree with your interpretation even though  
8 I know that's going to be challenged. I could say it  
9 right now if I wanted to. I agree with where you're  
10 at. Go file with the TRE and say you have protocol  
11 violations. Let that process work. That's why I'm  
12 saying that 830 -- and I understand what you're trying  
13 to do. You're trying to help.

14 The wind -- you know, talking about what  
15 Charles was talking about, this is -- there's a roll  
16 of the dice. The winds are -- the wind group says  
17 "we're right, they are wrong." Let them have their  
18 day in court, go through the process.

19 By doing this, I think you're trying to  
20 help it with them, but you're boxing them in and



21 circumventing that NOV process. I think we need to  
22 let the process work, and there is no grace period, as  
23 far as I'm concerned. That's the only reason I was  
24 trying to push that out there.

25 MR. GRABLE: Yeah, respectfully I think

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1 you misunderstood --

2 MR. HELTON: I was hoping I did.

3 MR. GRABLE: -- what my intent was and  
4 really what I said. If this protocol revision request  
5 passes today and creates a 12-month, or whatever the  
6 time period is, timeline for compliance could -- you  
7 know, was the protocol what it was in November,  
8 October, September? Yes. Could Texas Regional Entity  
9 or PUC enforcement and oversight bring an action based  
10 on noncompliance in October of 2009, you know, if they  
11 agree with ERCOT staff's position? Yes. Does it  
12 color their evaluation of whether to do so if we have  
13 a plan for compliance and ERCOT operations have signed  
14 off on it as acceptable down the road? Yes.

15 So don't misunderstand. I'm not  
16 offering on behalf of staff or anyone else carte  
17 blanche for interpretation of the existing protocol.  
18 I'm just suggesting that it would -- that's our plan,  
19 is to develop a path to meet them over time, granted  
20 with our interpretation, and I think that that would  
21 color any enforcement decision. I don't think it's a  
22 given that NOV's must come first.

23 CHAIRMAN NEWTON: Okay. Danny?

24 MR. BIVENS: This may have been covered  
25 already, but I just -- you know, to the extent that

1 there's been a circumvention of a process that's  
2 already in place, you know, I kind of thought the same  
3 thing at first, but as many of you in the room -- my  
4 background comes from a lot of years of just being in  
5 the regulatory world, and that world, to try these  
6 things on a case-by-case basis instead of coming up  
7 with a rule, and in this case protocol, that would  
8 apply to all so that everyone applies with the same  
9 rules of the road, I think is always superior.

10 And I don't know what ERCOT's thinking  
11 was in coming up with this protocol, but, you know,  
12 when you go to doing the NOV process and start taking  
13 each one of these -- and how many of those generators  
14 are noncompliant? What was the number? You know, you  
15 start doing that, you know, everyone is going to be  
16 done on a different timeline. You're going to expend  
17 a lot of resources, and December 2010 gets here, which  
18 is the date that's in the protocol, you're not even  
19 going to be close. So I don't know, for whatever  
20 that's worth. I don't prefer piecemeal or a  
21 piece-by-piece approach to a rule.

22 CHAIRMAN NEWTON: Andrew?

23 MR. DALTON: Yeah, Kent, I have kind of  
24 a question for you or for John. We're talking about  
25 potentially having the wind folks spend a nontrivial

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1 sum of money. We already have the LVRT study  
2 underway. Would it be even possible to add the

3 reactive power issues to the LVRT study without  
4 delaying the LVRT study? Is that a possibility, or is  
5 that not a possibility?

6 MR. SAATHOFF: Let me get Dan up here.  
7 He's more familiar with the LVRT study.

8 MR. WOODFIN: Yeah, I think at this  
9 point we've made a lot of the assumptions about what  
10 the characteristics of the units are and those kinds  
11 of things. As a part of that process, they are  
12 gathering the information. It's going to be a dynamic  
13 study. So it's going to include -- essentially it's  
14 looking at the actual requirements, the actual  
15 capabilities, I believe, in that study from a dynamic  
16 perspective, so -- and it's only studying the  
17 timeframe. It's studying a topology that's pre-CREZ,  
18 and that was specified in how the study was set up.

19 So it may study kind of the in between  
20 now and CREZ requirements. I don't think it would be  
21 that difficult to actually address that issue in the  
22 LVRT study for that timeframe. It will not cover the  
23 ongoing needs of the system post-CREZ. We'd have to  
24 include that in as an additional work item somehow to  
25 the CREZ reactive study to look at kind of the

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1 incremental needs if the -- that generation doesn't --  
2 isn't able to meet the protocol requirements.

3 MR. DALTON: What's the timeframe for  
4 the CREZ study, the reactive study?

5 MR. WOODFIN: The current scope of it is  
6 intended to be completed mid July of next year.

7 MR. DALTON: July 2010?

8 MR. WOODFIN: Yes.

9 MR. DALTON: So it's basically on a  
10 similar timeframe as the LVRT study.

11 MR. WOODFIN: A little longer, yes.

12 MR. DALTON: A little longer, okay.

13 CHAIRMAN NEWTON: Okay. Nick?

14 MR. WOODFIN: Okay. Thank you.

15 MR. FEHRENBACH: And this has indeed  
16 been a nice, long discussion, and it's always good to  
17 see energetic discussion on an issue. And, you know,  
18 I listened to all the presentations, and the one thing  
19 I was looking for is really an explanation from the  
20 wind resources on why they thought this triangle or  
21 cone applied. When you get down to it and you read  
22 the actual existing protocol language that's been  
23 there since 2004, I concur with ERCOT that it's a  
24 rectangle, and it's always been a rectangle.

25 I have a problem if we decide to remand

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0  
1 this or pass on it or drag this out further that, you  
2 know, we have a group of entities that have  
3 essentially been in noncompliance with the protocols.  
4 And should we send an NVI? Probably. And even if we  
5 pass this PRR, we can still do the notice of violation  
6 for October or prior months, and that certainly can be  
7 done. Do they have -- if they are complying with this  
8 timeframe or window to get in compliance, that would  
9 probably be a good defense to the NVI, but it  
10 shouldn't -- it doesn't stop the process from going  
11 through.

12 But, you know, the only explanation  
13 people could say why they misinterpreted is some  
14 errant slide that may or may not have been in an ERCOT  
15 presentation that was corrected or some other language  
16 dealing with deployment rather than the actual  
17 requirement, and to me that's not compelling, and I  
18 think the protocols were clear that it should have  
19 been a rectangle. I'm sorry if that costs money to,  
20 you know, the wind generation folks to retrofit, but  
21 the protocols have been there since 2004. It  
22 shouldn't be a retrofit. It should have been stalled  
23 initially, and I think it's time to move forward. If  
24 through the ADR process or NV --

25 MR. DALTON: NOV.

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1 MR. FEHRENBACH: -- NOV process, you  
2 know, people seek to get some other mitigation, they  
3 can certainly do that, and they can do that even if we  
4 adopt this and -- just to see if we can get a second  
5 and move forward, I will move that we adopt PRR 830  
6 and reject the appeal.

7 MR. DOGGETT: I'll second.

8 CHAIRMAN NEWTON: Okay. We have a  
9 motion from Nick Fehrenbach, and we have a second from  
10 Trip Doggett. Charles?

11 MR. MANNING: I was just going to say  
12 I'm going to support that motion.

13 CHAIRMAN NEWTON: And I'm sorry to  
14 interject. Just for clarification, it was kind of a  
15 double motion. It was a motion to approve the PRR and  
16 reject the appeal. Correct?

17 MR. FEHRENBACH: which I think actually  
18 by approving the PRR we pretty much reject the appeal,  
19 but I just wanted to make it clear that we were doing  
20 both.

21 (inaudible)

22 CHAIRMAN NEWTON: I think we probably  
23 need to do both. we have them both noted for vote.

24 MR. JENKINS: I think the quickest path  
25 to resolution on this is for us to put this PRR

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1 forward. I agree with Mark the decision is going to  
2 be made down the street, and kicking it back to TAC is  
3 not going to accomplish anything other than spend more  
4 time.

5 CHAIRMAN NEWTON: Dan?

6 MR. WILKERSON: I just wanted to say I  
7 support the motion. I believe reactive capability  
8 curves are a standard, and you don't really mess with  
9 standards. If it's going to be messed with, it needs  
10 to be done down the street, and that's -- kicking it  
11 back to the technical folks who sent it to us with an  
12 overwhelming majority doesn't accomplish anything.

13 CHAIRMAN NEWTON: Okay. Trip?

14 MR. DOGGETT: I was going to clarify  
15 that I would be flexible on the -- Walter's issue of  
16 WGR if there was an interest in a friendly amendment  
17 to ask TAC to revisit that issue. I talked to Walter  
18 and John out in the hall, and I think there might be  
19 an opportunity to have further discussion on that  
20 issue.

21                   CHAIRMAN NEWTON: Okay. Before we  
22 continue with comments, Nick, you made the motion.  
23 would you be amenable to that friendly amendment?  
24                   MR. FEHRENBACH: I don't have issue with  
25 that --

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1                   CHAIRMAN NEWTON: Okay.

2                   MR. FEHRENBACH: -- if, you know, we  
3 want to fix that little piece of it.

4                   CHAIRMAN NEWTON: Okay. We'll continue.  
5 Bob?

6                   MR. HELTON: Yeah, just real quickly I  
7 agree that sending it back to TAC is not the right  
8 thing to do. It was just one of the thoughts I had.  
9 we could fix it like you had talked about, Mark, doing  
10 that prospectively here.

11                   And I understand what's trying to be  
12 done. I'm having a problem. I still believe that the  
13 retrofitting piece in this, while I understand the  
14 full thing, I think it is a circumvention of the  
15 process, and I don't think I can support it for that  
16 reason. But I also know that this is a faster way of  
17 getting it over to the Commission because no matter  
18 what we do here, it's going to get there. I was just  
19 trying to get it through a process that when they get  
20 over there it's not going to be kicked back over an  
21 appeal on a procedural issue because it didn't go  
22 through the right process, like they had on the other  
23 side whenever they tried to circumvent the process to  
24 get it over there the first time. And I'm concerned  
25 that by doing that, it could end up back again over --

1 over a procedural issue. So that's my concern with  
2 that.

3 CHAIRMAN NEWTON: Okay. Bob Thomas?

4 MR. THOMAS: Thank you. I'm going to  
5 support Nick's motion. I think the Board is good at  
6 setting policy and rules, but it's not good at  
7 resolving legal and factual disputes that we have in  
8 front of us. We need to get this out of here up to  
9 the Commission and let them apply their process to the  
10 dispute.

11 One thing I'll be listening for in that  
12 proceeding is the following: Very clear positions  
13 that the requirement has been set for a number of  
14 years, and I guess one question that hasn't been  
15 answered today that I'm going to be listening for is  
16 why would -- if it's so clear, why would anyone spend  
17 all that money knowing they were making a mistake?

18 CHAIRMAN NEWTON: Andrew?

19 MR. DALTON: Yeah, I guess I have kind  
20 of a more pragmatic concern to address. I mean, it  
21 seems any way you look at this PRR, we were going to  
22 potentially give wind until December 31, 2010 to kind  
23 of build in to compliance. We have two studies  
24 underway right now that might be able to give us a  
25 very good picture of what compliance really ought to

1 look like from a standpoint of total system  
2 reliability.



3           You know, we're going to have a lot of  
4 issues integrating more and more wind through the CREZ  
5 process, integrating the wind that's on there now as  
6 we increase our transmission capabilities to move that  
7 wind to market. In doing so, it's going to cost money  
8 to wind generators, to everybody else on the system to  
9 make that.

10           Before we would embark on spending a  
11 hundred million dollars or anything in that ballpark,  
12 I would like to know that we are spending that money  
13 in the most wise and efficient manner possible to the  
14 ultimate benefit of the grid long term. If there is a  
15 way to address this type of issue in the ongoing  
16 studies without prejudicing whatever this PRR does, I  
17 would strongly recommend to ERCOT staff to take that  
18 into consideration because I don't think whatever --  
19 when this gets over to the Commission, this isn't  
20 going to be resolved by April or May. We're going to  
21 have these studies coming out June and July. They  
22 might give us the picture of what the grid really  
23 ought to look like going forward, and we ought to be  
24 working towards that as a solution because the  
25 Commission solution isn't going to help us fix the way

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1 the grid ought to look and what wind generators ought  
2 to do going forward.

3           We've been talking about getting the  
4 right metrics and the right requirements for wind for  
5 the better part of a year now. I think we have an  
6 opportunity to work that in, regardless of what we do  
7 with this PRR, and I think we should take it.

8 CHAIRMAN NEWTON: All right. Thank you,  
9 Andrew?

10 Clifton?

11 MR. KARNEI: Yeah, I support the motion,  
12 but I guess my question is a little bit different, and  
13 it's to Grable. Since it's clear that ERCOT staff has  
14 a position in this and since Trip is technically an  
15 ERCOT staff member, I question whether he should be  
16 the second on the motion and should vote on this or  
17 possibly recuse himself. I'm just raising that as a  
18 procedural thing for the second to the motion and  
19 would like your comments on that, Mike.

20 MR. PATTON: I'll second that.

21 MR. KARNEI: If Trip withdraws his  
22 motion -- I'm not one to put Trip on the spot. I'm  
23 just saying --

24 MR. GRABLE: There's no distinction  
25 really in terms of importance between being the second

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1 and being a voting person. Let's say it were a Brazos  
2 line and you were either an affirmative vote, say, ten  
3 to five vote, and you were either the second or just  
4 an affirmative vote, it would be a problem either way.

5 I will say that the duties with which  
6 ERCOT staff are charged are public interest and  
7 reliability duties, and although Trip is an ERCOT  
8 staffer and is voting in alignment with those  
9 interests, I do not read any of our conflict rules or  
10 any general ethical dictate to require that the ERCOT  
11 CEO recuse himself because ERCOT staff is a proponent.

12 The ERCOT CEO has voted on countless ERCOT  
13 staff-sponsored PRRs, OGRRs, everything. If you were  
14 to set that precedent, you might as well just  
15 decree -- you might as well -- we've got the bylaws  
16 coming up in a bit. You might as well make the CEO a  
17 nonvoting member because any action this Board votes  
18 on almost by definition has an impact on ERCOT staff.

19 MR. KARNEI: I'll withdraw my comment.  
20 Thank you.

21 CHAIRMAN NEWTON: All right. Brad?

22 MR. COX: Yeah, I'm largely in agreement  
23 with the direction we're headed. I'll tell you the  
24 one thing that I'm hung up on, and it's similar to  
25 what Andrew discussed earlier, is, you know, it's less

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1 than certain -- I mean, if we didn't have some  
2 ambiguity here, we wouldn't be spending all this time  
3 discussing what the requirement is in the protocols as  
4 they are written today. And the concern I have is  
5 that if the -- you know, if whatever procedural route  
6 this takes after it leaves here the -- you know, if  
7 the Commission determines that, yeah, there is  
8 ambiguity or whatever, you know, it would seem to me  
9 there ought to be, again, the flexibility to deal with  
10 the existing system as opposed to imposing a blanket  
11 requirement over the existing system, so I -- because  
12 there may be more cost-effective ways to remedy, you  
13 know, whatever problems may exist.

14 I doubt that my request for that type of  
15 flexibility as a friendly amendment would be  
16 entertained. I'll throw it out and make -- make that

17 request, Nick, and see what your thoughts are. Do you  
18 understand what I'm saying? It's -- they were getting  
19 pretty complicated here, but I'm just -- the track  
20 we're on right now really will put all of these  
21 resources on a -- on this rectangle standard with a  
22 grace period. Is that -- would you agree?

23 MR. FEHRENBACH: I would concur, but, of  
24 course, I also think that under the current protocols  
25 they should already be there.

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1 MR. COX: Right. And, you know, I'm  
2 only trying to leave enough flexibility to -- you  
3 know, if circumstances are such that that flexibility  
4 is warranted to allow for a more cost-effective  
5 solution down the road, and I'm -- this would be --  
6 I'm having a difficult time communicating this  
7 perhaps, but that's the one issue I have left with  
8 where we're headed.

9 MR. FEHRENBACH: And, you know, in  
10 reading 830 the way it was written, one of the things  
11 that I thought was sort of innovative, and Bob Helton  
12 would probably say is one of those problematic things,  
13 that it allowed the wind generators to come in  
14 compliance by actually paying the T&D utility to  
15 install devices to make them compliant. And that's  
16 sort of a stretch for us because I don't think we've  
17 done that in the past, let entities pay someone else  
18 to install devices to make them compliant, but -- and  
19 I thought that was innovative, and that probably gets  
20 into a cost-effective solution for some of those

21 entities, but even that, you'll probably have people  
22 not wanting to go that route and possibly going  
23 through one of these other processes that are open to  
24 them under law.

25 CHAIRMAN NEWTON: Okay. So I'm assuming

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1 that that is not an acceptable friendly amendment.

2 MR. FEHRENBACH: And again, I'm not sure  
3 exactly what the friendly amendment would be. So I  
4 can't really accept it.

5 CHAIRMAN NEWTON: Okay. John, your card  
6 has been up -- down there for a while. I've been  
7 trying to take the Board members first.

8 MR. HOUSTON: Yes. No, and I appreciate  
9 that, madam Chairman, and I just wanted to add my view  
10 that we really need to address the issue of what is  
11 the standard. This Board needs to take a position, if  
12 nothing else, for future generators who are walking in  
13 the door asking to connect. It needs to be clear.  
14 Certainty needs to be taken, and I think our whole  
15 compliance regime of both ERCOT and participants is at  
16 risk if we do anything other than approve this going  
17 forward.

18 CHAIRMAN NEWTON: well, I've been  
19 relatively quiet here, and I'm speaking as just a  
20 Board member myself here, but after listening to the  
21 debate, that's where I fall out, is that I  
22 specifically asked most of the commenters, and  
23 everyone seems to be in agreement, that prospectively  
24 everyone getting on the same page relative to this  
25 requirement is critical. And based upon that, it

1 looks like the big issue, in my mind, is the  
2 retroactive piece.

3 I fully understand the heartburn that  
4 creates for the wind generators from an investment  
5 perspective. However, it looks like this thing is  
6 going to get resolved, and the fastest way to get that  
7 piece resolved is for us to move forward. So I will  
8 be supporting it as an independent Board member.

9 Dee?

10 MR. PATTON: Madam, I call the question.

11 CHAIRMAN NEWTON: Okay. I've got one  
12 other card, Dee. Can I -- can I just get Miguel's?  
13 He's been pretty quiet, too.

14 MR. PATTON: I call the question.

15 CHAIRMAN NEWTON: Okay.

16 (Laughter)

17 MR. GRABLE: That's a motion that  
18 requires a second and would have to be voted on to  
19 determine if Miguel is heard or not. So is there a  
20 second for the calling?

21 CHAIRMAN NEWTON: Miguel --

22 MR. ESPINOSA: Thank you.

23 CHAIRMAN NEWTON: -- real quickly

24 lets --

25 MR. ESPINOSA: I support the motion as

1 proposed. A, it seems to me like we should have been  
2 there already, and we're not. I'm heartened by the

3 fact that nobody has gotten up and spoken against the  
4 prospective issues for us. And if the looking back  
5 the issue has to be resolved at 17th and Congress,  
6 sobeit.

7 CHAIRMAN NEWTON: Okay. We have a  
8 motion. We have a second. Everyone clear on the  
9 motion?

10 (No response)

11 CHAIRMAN NEWTON: And with the friendly  
12 amendment. Okay?

13 MR. GRABLE: And, Madam Chair, let me --  
14 was there a second friendly amendment?

15 CHAIRMAN NEWTON: No, just -- no, he's  
16 talking about the motion included --

17 (Simultaneous discussion)

18 MR. GRABLE: Oh, I see, right. The two  
19 pieces being approval under Item 12(a) of the protocol  
20 revision request and rejection of the appeal under  
21 12(b). And I want to ask Mr. Doggett so we're  
22 perfectly clear, his friendly amendment was to clarify  
23 that the PRR 830 would be approved "as is" but a  
24 separate instruction given to TAC to revisit the WGR  
25 issue.

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1 MR. DOGGETT: That's affirmative.

2 CHAIRMAN NEWTON: Okay. I won't repeat  
3 that. We now have a motion and a second for approval  
4 of PRR 830 and rejection of the appeal to that PRR.

5 MR. ESPINOSA: And I accept Dr. Patton's  
6 calling of the order.

7 (Laughter)

8 CHAIRMAN NEWTON: All in favor?  
9 (All those in favor of the motion so  
10 responded)

11 CHAIRMAN NEWTON: Opposed? We have  
12 one -- two oppositions, one from Andrew Dalton and one  
13 from Bob Helton.

14 Abstentions?  
15 (No response)

16 CHAIRMAN NEWTON: The motion passes.  
17 Andrew?

18 MR. DALTON: One final point. I would  
19 sincerely hope that no one who is a generator comes  
20 forward after this meeting today and expresses any  
21 confusion or concern that everyone expects the  
22 rectangle will be implemented on a going-forward  
23 basis.

24 (Laughter)

25 MR. DALTON: And if it comes up, we're

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1 going to pull this transcript out.

2 MR. HELTON: Yes.

3 CHAIRMAN NEWTON: Okay. Thank you very  
4 much.

5 All right. Mr. Bruce, it's back to you.

6 MR. BRUCE: Thank you, Madam Chairman.  
7 That completes all of the PRRs for Board discussion  
8 today.

9 12(c). LOAD PROFILING GUIDE REVISION REQUEST 035

10 MR. BRUCE: That leaves us with a Load  
11 Profile Guide Revision Request No. 35. This guide



12 revision request is on the agenda for Board approval  
13 because it does have system impacts. This load  
14 profile guide revision request will allow the addition  
15 of time of use schedules to profiles for IDR  
16 meter-type data codes for the advanced meter  
17 implementation project.

18 The impact analysis has minor impact --  
19 cost impacts to be managed under the O&M budgets of  
20 the affected departments. It's a low impact, but  
21 there is an update to the Loadstar table that's  
22 required. It does not have any code changes, though.  
23 This is proposed to be effective upon Board approval,  
24 but there is a 150-day market notice that's required.  
25 So that notice would expire in mid April of next year,

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1 and it was unanimously recommended by TAC.

2 MR. KARNEI: Move for approval.

3 CHAIRMAN NEWTON: Okay. Do we have  
4 any -- do we have a second? A second from Andrew --  
5 well, I'm sorry -- motion by Clifton Karnei, second by  
6 Andrew Dalton. Any further discussion or comments?

7 (No response)

8 CHAIRMAN NEWTON: Seeing none, all in  
9 favor?

10 (All those in favor of the motion so  
11 responded)

12 CHAIRMAN NEWTON: Opposed?

13 (No response)

14 CHAIRMAN NEWTON: Abstentions?

15 (No response)

16 CHAIRMAN NEWTON: Thank you. The motion  
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AFFIDAVIT

STATE OF TEXAS           §  
  §  
COUNTY OF DALLAS       §

BEFORE ME, BEFORE ME, the undersigned notary public, this day personally appeared Patrick R. Cowlshaw, duly sworn according to law, who deposes and says:

“My name is Patrick R. Cowlshaw. I am of legal age and a resident of the State of Texas. I am an attorney representing RES America Developments, Inc., Whirlwind Energy, Inc., and Hackberry Wind, Inc. in their Appeal And Complaint Of ERCOT Decision To Approve PRR 830. Appendix A accompanying that Appeal and Complaint was prepared under my supervision and direction, and is to the best of my knowledge and belief a true and correct copy of the 42 documents posted by the Electric Reliability Council of Texas associated with the processing of PRR 830, plus a true and correct copy of the transcript of the discussion of PRR 830 at the ERCOT Board of Directors meeting November 17, 2009.”

Patrick R. Cowlshaw

SUBSCRIBED AND SWORN before me on this 22<sup>nd</sup> day of December, 2009.

Michele S. Lindsey  
Notary Public in and for the State of Texas

My commission expires:

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