P.U.C. DOCKET NO. 37823

HORIZON WIND ENERGY LLC,	§	**BEFORE THE**
SWEETWATER WIND 1, LLC,	§	
SWEETWATER WIND 2, LLC,	§	**PUBLIC UTILITY COMMISSION**
SWEETWATER WIND 3, LLC,	§	
SWEETWATER WIND 4, LLC,	§	**OF TEXAS**
SWEETWATER WIND 5, LLC, AND	§	
SILVER STAR I POWER	§	
PARTNERS, LLC'S APPEAL AND	§	
COMPLAINT CONCERNING THE	§	
ERCOT BOARD'S ADOPTION OF	§	
PRR 830, DENIAL OF NEXTERA'S	§	
APPEAL AND REQUEST FOR	§	
RELATED RELIEF	§	
	§	

ORIGINAL APPEAL AND COMPLAINT CONCERNING THE ERCOT BOARD'S ADOPTION OF PRR 830 AND DENIAL OF NEXTERA'S APPEAL AND RELATED REQUESTS FOR WAIVER OF ADR REQUIREMENTS, SUSPENSION OF PRR 830, EXPEDITED ACTION AND COMMISSION HEARING

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COMES NOW Horizon Wind Energy, LLC, Post Oak Wind LLC and Mesquite Wind LLC (collectively "Horizon"), Sweetwater Wind 1 LLC, Sweetwater Wind 2 LLC, Sweetwater Wind 3 LLC, Sweetwater Wind 4 LLC, and Sweetwater Wind 5 LLC (collectively "Sweetwater Wind"), and Silver Star I Power Partners, LLC ("Silver Star I") (Horizon, Sweetwater Wind, and Silver Star I are collectively are referred to as "Appellants" in this pleading) and respectfully file this complaint and appeal of the November 17, 2009 actions of the Board of Directors of the Electric Reliability Council of Texas, Inc. ("ERCOT") adopting Protocol Revision Request ("PRR") 830 and denying the appeal filed by NextEra Energy Resources, LLC ("NextEra"). Appellants also seek a suspension of PRR 830, request an evidentiary hearing, and request expedited relief on this matter. Appellants respectfully show as follows:

I. INTRODUCTION

On November 17, 2009, the ERCOT Board erroneously approved PRR 830 which radically changed the existing ERCOT Protocol requirements for reactive power provided by generators and requires that wind generators, like Appellants. The adoption of PRR 830 by the ERCOT Board if not reversed, will require wind generators in the ERCOT market to spend tens of millions of dollars to retrofit existing, operating wind generation units to meet these new requirements, despite the absence of any evidence to indicate that such expenditures are necessary to address reliability concerns. The ERCOT Board also rejected an appeal filed by NextEra that would have provided reasonable revisions to PRR 830 that lessened or eliminated the objectionable portions of PRR 830. The ERCOT action is arbitrary and capricious and subjects Appellants, and other similarly-situated wind generators, to unreasonable discrimination in a manner that is unlawful and inconsistent with ERCOT's duties under the Public Utility Regulatory Act ("PURA")[1], the Public Utility Commission's ("PUCT" or "Commission") rules, and precedent and decisions of regulatory bodies, including the Commission and the Federal Energy Regulatory Commission ("FERC"). Appellants request that the Commission expeditiously act to reverse ERCOT's actions and require the adoption of Protocols that comply with all legal and policy requirements and move to suspend PRR 830 during the course of this proceeding.

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[1] TEX. UTIL. CODE ANN. §§11.001 – 66.017 (Vernon 2009)

Appellants emphasize that they are not opposed to the requirement that wind generation resources provide reactive power in accordance with PURA §39.904(l). Appellants provide reactive power on their projects, and are even providing more reactive power than the Protocols require where an interconnection study has indicated that additional reactive power is required for reliability at their locations. However, the effect of PRR 830 is to impose expensive and unnecessary retrofit requirements on *all* existing wind generation units installed after February 17, 2004. It is the imposition of this retrofit requirement, *more than five years after* the prior version of the Protocols was adopted, that is the primary focus of Appellants' complaint. Consistent with NextEra's appeal, Horizon offered a compromise at the Board meeting, indicating that it would not oppose the imposition of the new "rectangle" reactive power requirements contained in PRR 830, provided they are applied on a prospective basis only, *i.e.*, applied to a generator that signs an interconnection agreement after the date of the adoption of the PRR - December 1, 2009. Additionally, Appellants were willing to retrofit their pre-December 1, 2009 wind generation units to meet the new reactive power requirements, but only if a System Impact Study demonstrates that reactive power in that amount is required from that unit at that location to assure system reliability. Appellants are willing to contribute their portion of any needed reactive power, but they cannot agree to retroactive changes that impose unnecessary costs well after they have constructed generation resources in reliance upon the then-existing requirements contained in the ERCOT Protocols. Such retroactive cost increases are detrimental to Appellants and they also undermine the regulatory certainty provided by the Protocols, interfere with the investment-backed expectations of developers based upon Protocol language, discriminate against Appellants in that other generators interconnected prior to 2004 are not required to retrofit, and lessen the investment incentives for wind generation and other location-constrained renewable generation in Texas.

II. APPELLANTS' AUTHORIZED REPRESENTATIVE

Appellants request that all correspondence in regard to this matter be sent to their authorized representatives and counsel of record:

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III. RESPONDENT

Respondent, ERCOT, manages the regional power grid located wholly within Texas covering roughly 85% of the geographic area of Texas. ERCOT's legal representative is:

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IV. SUMMARY OF THE CASE

ERCOT's initial submission of PRR 830 noted that ERCOT had previously issued a Protocol Interpretation on November 13, 2008, which was subsequently withdrawn on procedural grounds, regarding the reactive power requirements applicable to generators under Sections 6.5.7.1 and Section 6.7.6 of the Protocols. The Protocol Interpretation announced that ERCOT Staff interpreted the existing Protocol language as requiring 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." In other words, all generation resources would be required to provide reactive power at the highest level they could produce at maximum operating capability regardless of the real-time output of the unit. For simplicity in this pleading, this interpretation of the Protocol requirement shall be labeled the "rectangle" requirement.

The Protocol Interpretation was the first official notification that Appellants received that ERCOT Staff interpreted the Protocols as requiring that reactive power be provided in the rectangle configuration.[2] Prior to this time, Appellants and other wind generators had reason to believe that ERCOT would continue to interpret the Protocol language as written, requiring that reactive power be provided in a "triangle" configuration, *i.e.*, the reactive power obligation would increase or decrease proportionately as output increased or decreased. Appellants' interpretation of the reactive power requirements was based upon Protocol language, Operating Guide standards, and prior ERCOT action, as well as industry standards related to the calculation of power factor capability and reactive power requirements applicable to wind generation units. ERCOT's new interpretation created enormous technical and economic challenges for Appellants and other wind generators who had previously invested in the Texas market installing wind generation units that provided reactive power consistent with the prevailing triangle configuration.

On December 12, 2008, Horizon and other wind generators (collectively referred to as the "Competitive Wind Generators") filed a complaint against ERCOT concerning ERCOT Staff's new interpretation and the matter was docketed by the Commission as Docket No. 36482.[3] While Docket No. 36482 was pending, the wind generators and ERCOT attempted to negotiate an agreed resolution of the issues in the docket, but they were unsuccessful. Also while the docket was pending, in early June 2009, ERCOT withdrew its official Protocol Interpretation but sent letters to Horizon, Sweetwater Wind, and Silver Star I as well as other wind generators asserting that the wind generators' "Generation Resource(s) are not able to comply with the 0.95 Lead/Lag requirement mandated by Protocol Section 6.5.2.1(2)." Horizon and other wind developers responded to ERCOT's letter, pointing out the errors in its interpretation of the reactive power Protocols and providing evidence that the resources in question complied with the +/- 0.95 lead/lag power factor requirement contained in the Protocols. On November 17, 2009, Horizon submitted a request for alternative dispute resolution ("ADR") concerning ERCOT's June 5, 2009 letter, but has not yet received any communication from ERCOT scheduling an initial ADR senior representative meeting on this matter.

While Docket No. 36482 was pending before the Commission, PRR 830 was proposed by ERCOT Staff on September 8, 2009 in order to "clarif[y] the Reactive Power capability

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[2] The matter had been discussed at an August, 2008 wind workshop, but no formal ERCOT action was taken.

[3] *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).

requirement for all Generation Resources, including existing WGRs [Wind-powered Generation Resources] who are not able to meet the 0.95 lead/lag requirement with the Generation Resource's Unit Reactive Limit (URL)." ERCOT Staff represented that:

> ERCOT files this Protocol Revision Request (PRR) to seek a prospective outcome that maintains reliability while attempting to lessen the costs and burdens of compliance with respect to the Reactive Power capability requirements in the ERCOT Protocols, and that offers a path to compliance for certain Wind-powered Generation Resources (WGRs) that are presently not able to meet 0.95 lead/lag requirement at the Point of Interconnection based solely on the unit's Reactive Power capability.

To Appellants' knowledge, no formal studies or reports by ERCOT or findings of fact in any proceeding indicate that the ERCOT grid has suffered from an incident in which a deficit of reactive power created the need for the new requirements of PRR 830. There also were no studies that demonstrated a reliability need for wind generators to provide reactive power in accordance with the rectangular configuration or that established that conformance to the rectangular configuration would eliminate any actual reliability problems.

Horizon participated in the ERCOT process related to PRR 830 by filing comments on September 15, October 8, November 3, and November 10, 2009. Additionally, Appellants participated in the discussion and review of PRR 830 at meetings held by the Reliability and Operations Subcommittee ("ROS"), the Protocol Revision Subcommittee ("PRS"), the Technical Advisory Committee ("TAC") and the ERCOT Board. Appellants' comments and suggestions were not adopted during the PRR 830 adoption process.

On November 9, 2009, NextEra filed an appeal of the decision by TAC to recommend approval of PRR 830. NextEra subsequently filed documents in support of its appeal in which it made proposals for suggested changes to PRR 830 as an alternative to adoption of the version recommended by TAC. On November 10, 2009, Horizon submitted its Brief in Support of the NextEra Appeal of the Technical Advisory Committee Recommendation Report Relating to PRR 830.

At its November 17, 2009 Meeting, the ERCOT Board heard presentations from a number of interested parties, including Horizon, NextEra, and ERCOT Staff, and then voted to adopt PRR 830 as recommended by TAC, and to reject the appeal filed by NextEra. Appellants' concerns about PRR 830 are directed primarily at the significant rewriting of Protocols Sections 6.5.7.1 and 6.7.6 implemented by PRR 830 and this appeal is focused on those matters.

Appellants are also concerned that ERCOT's unsupported "reliability need" for the rectangle configuration on a going-forward basis, much like the retrofit requirement for existing generation, will result in mandated "gold-plating" of the wind generation facilities without any reliability benefit. Such requirement, like the retrofit requirement, lacks a rational basis and will cause the Appellants economic harm. Appellants also note that the definition of "Wind-powered Generation Resource (WGR)" that was adopted as part of PRR 830 raises other concerns because of the possible unintended consequences of changing the definition of a term that is used throughout the Protocols. This appeal is timely filed within 35 days of the ERCOT Board's decisions on these issues.

V. AFFECTED PARTIES

As adopted, PRR 830 imposes the burden of extensive retrofitting of existing generation on all generation resources that began operation in ERCOT after September 1, 1999. Because of both the timing of the retrofit requirement dating back only to 2004, the exemption of the majority of conventional generation, and also because of the technical operating differences between wind generation resources and conventional generation resources, the greatest impact of the new requirements is on wind generation resources. However, due to the wording of the PRR, it is also applicable to conventional generation resources that began operation after September 1, 1999. Appellants are not aware of which, if any, conventional generation resources are affected by the adoption of PRR 830, but Appellants believe that such generators should also be included within the scope of entities that would be directly affected by a decision in this proceeding.

VI. JURISDICTION

The Commission has jurisdiction over this matter under PURA §39.151; P.U.C. SUBST. R. 25.362 and P.U.C. PROC. R. 22.251. Procedural Rule 22.251(c) requires that an entity must use Section 20 of the ERCOT Protocols, concerning Alternative Dispute Resolution Procedures, or Section 21 of the Protocols, concerning Process for Protocol Revision, before it may file a formal complaint with the Commission. Appellants representatives have participated in the protocol revision process at ERCOT concerning PRR 830, which culminated in the adoption of

PRR 830 and the rejection of NextEra's appeal. ERCOT Protocol Section 21.4.11.3 specifies that any Market Participant, such as each Appellant, may appeal any decision by the ERCOT Board within the deadline prescribed by the Commission's rules. This appeal is filed within 35 days of the ERCOT action adopting PRR 830 on November 17, 2009. Accordingly, Appellants have complied with the requirements of Protocols Section 21 and have complied with the requirements of P.U.C. PROC. R. 22.251(c) prior to the filing of this appeal. Since all prerequisites to Commission consideration have been met, and this appeal has been timely filed, the Commission has jurisdiction over this matter.

In Docket No. 36482, the Commission recently voted to dismiss a complaint filed by the Competitive Wind Generators (of which Horizon was a member) ("CWG") concerning ERCOT's interpretation of the existing Protocol language that was amended by PRR 830.[4] The Commission ruled that the complaint should be dismissed because CWG failed to participate in alternative dispute resolution ("ADR") procedures under Protocols Section 20 before filing its formal complaint with the Commission. Appellants believe that such ruling is not applicable to the current appeal because P.U.C. PROC. R. 22.251 requires use of Section 20 *or* Section 21 before presenting a complaint to the Commission and Appellants have complied with Section 21 by participating in the protocol revision process for PRR 830. However, in the event the Commission determines otherwise, Appellants respectfully request a good cause waiver of the requirement under P.U.C. PROC. R. 22.251(c)(2).

Any ADR requirement should be waived in this case for a number of reasons. First, ADR with ERCOT's General Counsel, as required by the Protocols, would be fruitless because the General Counsel has no authority to overturn the decision of the ERCOT Board. Further, PRR 830 was initiated by ERCOT Staff and they have opposed the changes sought by Appellants throughout the PRR process at ERCOT. Having obtained the result they requested, it is unlikely that ERCOT Staff would be amenable to negotiations with Appellants on these matters, even if it had the authority to overturn the Board's decision. Finally, Appellants note that PRR 830 conforms, in large part, to ERCOT's interpretation of the previous version of the reactive power protocols, a matter that has been contested for more than a year; first, in Docket

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[4] D-36482 Order.

No. 36482 and now, in filed ADR requests concerning the prior Protocols.[5] Negotiations also were conducted on the reactive power issues in Docket No. 36482 over a period of months, but they did not result in an agreed resolution. Rather than delay action on the important issues raised by this appeal, Appellants request that the Commission waive any requirement for engaging in further ADR procedures related to the appeal of PRR 830.

VII. ISSUES PRESENTED FOR REVIEW

1. Whether ERCOT's adoption of PRR 830 violates the United States and Texas Constitutions by confiscating wind generators' property without compensation through a regulatory taking.
2. Whether PRR 830 violates the requirements of PURA §39.904(l) by requiring levels of reactive power that are not feasible and by failing to consider the effect on system reliability before imposing such requirements on wind generators.
3. Whether PRR 830 violates the requirements of PURA §39.001(c) because it discriminates against wind generators as participants in the competitive market.
4. Whether PRR 830 violates the requirements of PURA §39.001(d) because it is neither practical nor limited and results in a significant impact on competition.
5. Whether ERCOT's adoption of PRR 830 violates its duty under PURA §39.151(a)(1) to ensure access to the transmission and distribution system for all buyers and sellers of electricity on nondiscriminatory terms.
6. Whether PRR 830 violates PURA §35.004(e) by applying prejudicial, discriminatory and anticompetitive terms to reactive power requirements for wind generation.
7. Whether ERCOT's adoption of PRR 830 violates its duty under PURA §39.151(a)(2) and (4) to ensure the reliability and adequacy of the regional electrical network and to ensure accurate accounting among generators and wholesale buyers and sellers of electricity.
8. Whether PRR 830 was adopted in violation of PURA §39.1511 because opponents to its adoption were not provided a meaningful opportunity to comment on matters raised at the ERCOT Board Meeting.

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[5] On November 17, 2009, Horizon filed a request for ADR concerning ERCOT's attempt to apply its erroneous interpretation to Horizon. Horizon notified ERCOT of its designated representative for purposes of the informal negotiation required as the first step in the ADR process and requested that ERCOT identify its chosen representative so that a meeting could be held within 30 days. To date, Horizon has not received a response from ERCOT setting the date for the initial, ADR senior business representative meeting.

9. Whether PRR 830 violates P.U.C. SUBST. 25.501(a) by failing to reflect the physical realities of the ERCOT electric system.
10. Whether ERCOT's adoption of PRR 830 is arbitrary, capricious and discriminatory because it was adopted without sufficient factual support.
11. Whether PRR 830 violates PURA §39.151(c) and conflicts with nation-wide standards adopted by FERC concerning the reactive power requirements applicable to wind generation.
12. Whether the application of PRR 830 is consistent with Texas policy goals of encouraging the development of renewable energy resources and other generation resources.

VIII. FACTUAL ANALYSIS[6]

A. Prior Protocols

The review of ERCOT's adoption of PRR 830 must begin with an analysis of the reactive power requirements that existed prior to the ERCOT Board's action. Prior to December 1, 2009, Protocols Section 6.5.7.1(1) & (2) stated:

> (1) Generation Resources required to provide VSS [Voltage Support Service] must be capable of producing a defined quantity of Reactive Power at rated capability (MW) to maintain a Voltage Profile established by ERCOT. This quantity of Reactive Power is the Unit Reactive Limit (URL).
>
> (2) Generation Resources required to provide VSS except as noted below in items (3) or (4), shall have and maintain a URL which has an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the transmission grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the point of interconnection to the TDSP.

Protocol Section 6.7.6(5) provided as follows:

> (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

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[6] Copies of documents referenced in this appeal are contained in the record for the appeal which is filed as a separate document but incorporated herein by reference.

> 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 output to the generating unit's continuous rated active power output, and any Reactive Power available for utilization must be fully deployed to support voltage upon request by ERCOT, or a TSP.

These Protocol provisions clearly establish that reactive power is to be provided in the triangle configuration, not the rectangle configuration advocated by ERCOT Staff. Section 6.5.7.1(1) defines the URL and explains that the URL represents the quantity of reactive power a Generation Resource required to provide VSS[7] must be capable of producing at rated capability (MW) to maintain a Voltage Profile established by ERCOT. At the maximum real power output of all Generation Resources collectively forming a unit (the "rated capability"), the full volt-amperes reactive ("VARs" or "MVARs" for megavolt-amperes reactive) available constitute the URL. Anytime the term "URL" is used, it includes both parameters: full output and maximum VARs. The two cannot be separated from one another because they are part and parcel of the URL. Section 6.7.1(1) *only* identifies the reactive power requirement at the URL. It *does not* specify the level of reactive power that must be maintained *at any other operating level.*

Section 6.5.7.1(2) also addresses *only* the URL and establishes the methodology for determining the level of reactive power. It requires that the calculation be based upon a power factor of 0.95 leading/lagging and that the amount be determined by the application of that power factor "at the generating unit's maximum net power to be supplied to the transmission grid." The section also identifies the physical point at which the reactive power is required to be available, "measured at the point of interconnection to the TDSP." *Nothing* in Section 6.5.7.1(2) purports to expressly address the calculation of reactive power *at levels other than the URL.*[8]

Section 6.7.6(5), however, *does* address reactive power at both the URL and at "lower active power output levels." It requires that reactive power at the URL level must be available "at the generating unit's continuous rated active power output." For lower levels of power output, it requires that "Reactive Power *up to the unit's operating capability* must be available." By specifying a different reactive power standard for these lower levels, the Protocol language

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[7] Pursuant to Protocols Section 6.5.7 all Generation Resources with a gross generating unit rating of more than 20 MVA are required to provide VSS, except as noted in other Protocol sections.

[8] As explained infra, the use of the industry term "power factor" is consistent only with the triangle configuration for lower levels of output.

cannot be interpreted to require *the same* standard be applied to both the URL and to lower operating levels. This conclusion is confirmed in the next sentence of the Section, which further defines the separate standard for lower levels of operation. For such lower levels, the Section specifies 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." (Emphasis added.) For example, if the unit's MVAR requirement is 100 at its rated capability of 1,000 MW (its URL), when it is operating at 500 MW, its MVAR requirement is 50 [500 MW operating level ÷ 1,000 MW rated capability X 100 MVAR = 50 MVAR). The graphic depiction of this ratio calculation is two lines that start from the URL at the unit's rated capability (1,000 MW) and slope to a requirement for 0 MVARs at 0 MWs, as shown in Figure 1.[9]

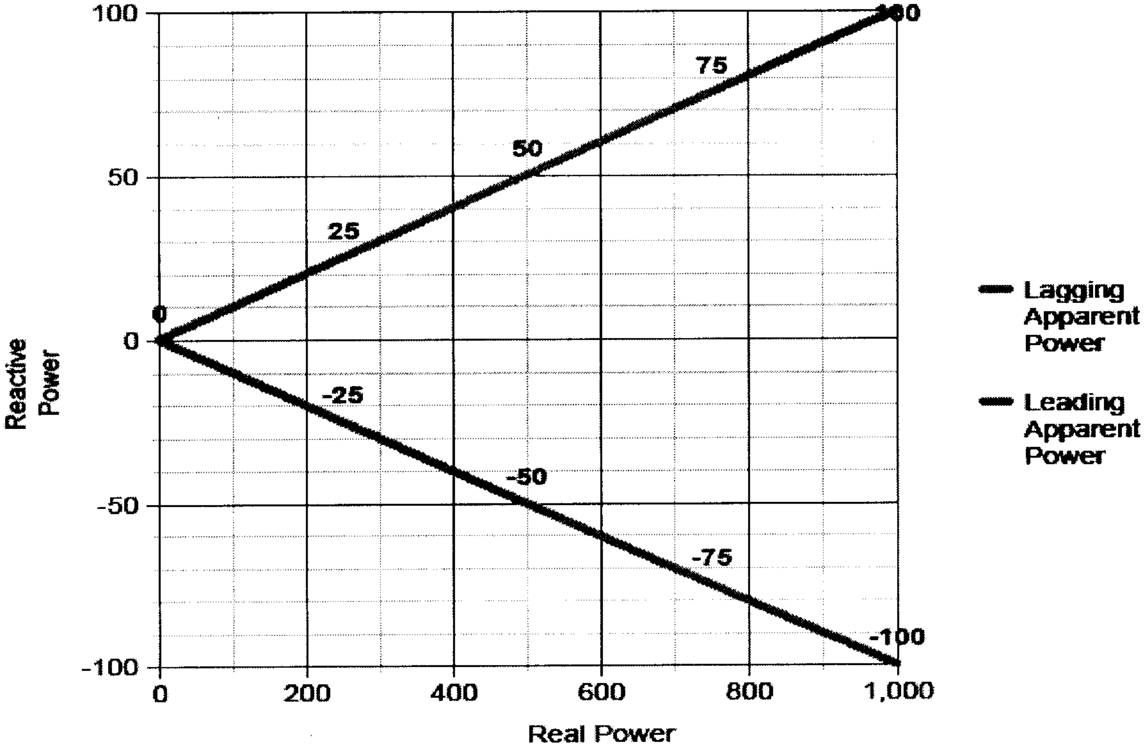

Figure 1 – Example Ratio Reduction under Section 6.7.6(5)

The triangle shape is the natural consequence of the application of the ratio calculation required by Section 6.7.6(5). It is also the shape of the power factor required by Section 6.5.7.1(2), increasing or decreasing with output on a ratio basis.

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[9] This is a simplified example to illustrate the ratio principle.

In describing a qualified scheduling entity's ("QSE's") responsibilities related to reactive power, Protocols Section 6.5.7.2(7) states as follows:

> (7) QSE shall advise ERCOT Operations whenever their Generation Resources are not *operating at a power factor level* as specified in the Operating Guides. Upon such notice, ERCOT Operations, in conjunction with the appropriate TSP, shall investigate the situation with the goal of *restoring the reported unit's operation to within the specified power factor range*. Actions that ERCOT may take include the addition or removal of transmission reactive devices to/from service or a request to another Generator Resource within electrical proximity for the production of leading or lagging VARs (as appropriate) so as to equitably share the need for voltage support among Generation Resources. *Requests arising within the context of this subsection may not result in the operation of a Generation Resource outside the specified reactive operating range*. Accordingly, Generation Resources are expected to voluntarily comply with these requests. Nothing in this subsection is meant to supersede ERCOT's Dispatch authority in the event of emergency operations. (Emphasis added)

The quoted language provides important indications of what level of reactive power must be maintained by generation resources. First, the language indicates that generation resources must operate within a "power factor" level. The term "power factor" is not defined in the Protocols, but it is a commonly used and understood term in the electrical industry. "Power factor" is generally defined as the *ratio* of real power to apparent power. Alternatively, it is defined as the *cosine* of the phase angle between line current and voltage. A cosine is a trigonometric function that is defined as the length of the side adjacent to an angle divided by the length of the right triangle's hypotenuse. So, whether defined as a ratio or a cosine, a "power factor" is graphically shown as a triangle. In fact, such graphs are routinely referred to as "power factor triangles" and resemble the graph shown in Figure 1. Another important aspect of the language in Section 6.5.7.2(7) is that it requires operation within a "power factor range." This is a clear indication that the reactive power requirement varies – it is not, and cannot be, a single, unchanging MVAR level equivalent to the amount available at the URL, as ERCOT contends. Finally, the language indicates that the amount of required reactive power "may not result in the operation of a Generation Resource outside of the specified reactive operating range," so "Generation Resources are expected to voluntarily comply with these requests." Requiring most existing wind generation units to supply reactive power on a rectangle basis would require them to operate outside their operating range. Even if they wanted to voluntarily comply, they would be physically unable to comply without installing additional equipment if there was not sufficient wind available to generate the requested level of reactive power—e.g. maximum wind needed to reach maximum output allowing for maximum VARs to be produced..

In contrast to these references to a "power factor," which is a triangular configuration, there is nothing in the ERCOT Protocols that refers to a "power factor rectangle." Appellants have been unable to find any reference to a "power factor rectangle" in usage in the electric industry. The construction of the rectangle requires more than just the plotting of the unit's power factor capability. The "rectangle" reactive power capability is constructed using the D curve for a turbine generating unit. An example of a D curve is shown in Figure 2, below[10]. The rectangle is constructed by first truncating the D curve with a vertical line drawn between the points where the sloping lines intersect with the D curve. Two horizontal lines are then drawn from the intersections of that vertical line and the D curve leftward to the vertical axis to create the "top" and "bottom" of the "rectangle" reactive power capability under ERCOT's interpretation of the prior Protocols. In Figure 2, the top and bottom would be horizontal lines at approximately the +90 MVARs and -90 MVARs level, respectively. As can be seen, the rectangle actually *excludes* some of the unit's reactive power capability, *i.e.*, those portions of the D curve that exceed +90 MVARs and -90 MVARs at lower power levels.

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[10] ERCOT Resource Asset Registration Guide v4.03, page 30 of 69

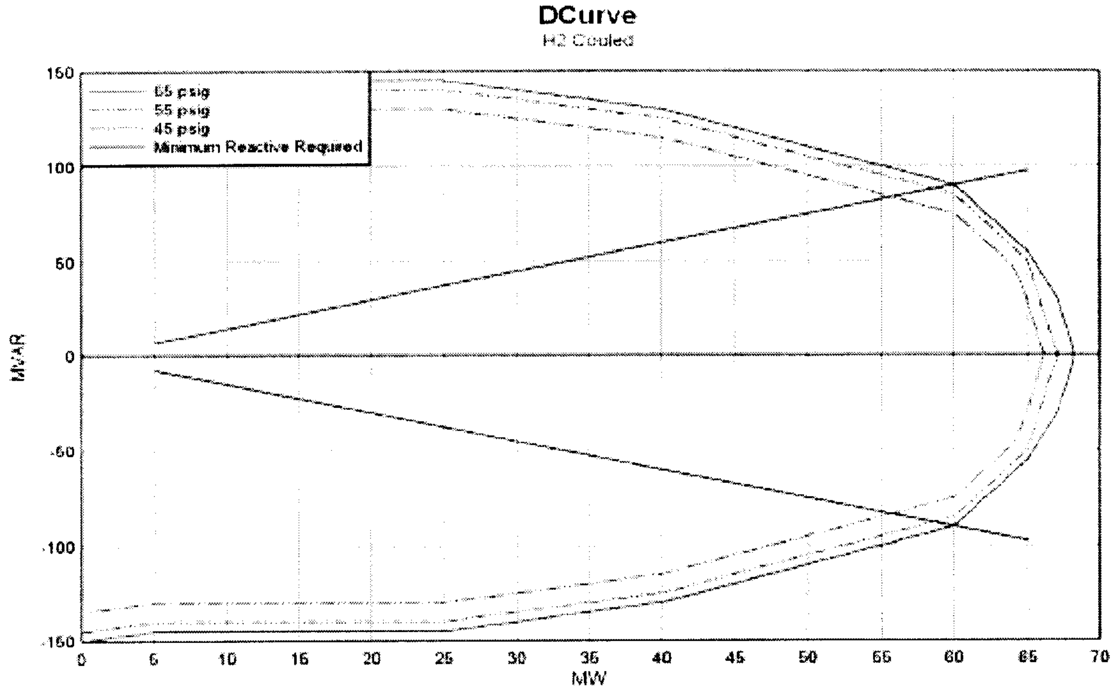

Figure 2 – Example of a D curve

If the prior Protocols had intended to require the adoption of an unusual "power factor rectangle," they should have used more explicit language to clearly express that requirement and explain it in detail instead of using commonly understood and applied terms like "power factor" and "power factor range." By using the terms "power factor" and "power factor range" ERCOT has clearly indicated that MVARs will increase or decrease in value in a ratio relationship with real power output.

B. Technical Differences From Conventional Generation

While ERCOT's new interpretation of the reactive power requirements as a rectangle may not have an impact on conventional generation units, which remain "grandfathered,"[11] it has a significant impact on wind generation units. Reactive power capability for conventional generation is often depicted graphically by a diagram known as a "D-Curve," because the generator's output can be divided between real or reactive power. For example, a generation unit that produces 250 MWs of power can deliver 250 MWs of real power, or lower levels of real power and a quantity of reactive power. If the entire output of the unit is dedicated to reactive

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[11] Board Transcript, at 138 - 139. Approximately 10,000 to 20,000 MW of conventional generation is exempted under this provision, much more than the amount of wind generation on-line at this time.

power, it has a power factor of zero. Conventional generation can produce power in this D-Curve shape because it can operate at *any level* of generation within the curve simply by burning more or less of its available fuel, which it can control through purchases from fuel suppliers. Wind generators, in contrast, rely upon an intermittent fuel over which they have no control, with the consequence that their maximum capability varies with the available fuel source. For certain types of wind turbines, including most of those installed in ERCOT, if the wind is sufficient to allow generation of 20 MWs of power, the wind generation unit physically can only provide real power at 20 MW, and reactive power climbing to the VARs produced at 20 MW, even if the unit is able to produce much higher levels of real and reactive power at its maximum capacity or URL. This significant technical difference between these two types of generators must be considered in any proceeding to interpret or revise the reactive power protocols.

Recognition of these technical differences does not create a reliability problem for ERCOT. Wind generators will provide reactive power to the extent of their technical capabilities. When Appellants' turbines are producing maximum power, they can provide the amount of reactive power at the URL, as specified in the Protocols. The ERCOT Protocols recognize that, if there is not sufficient installed reactive power capability, ERCOT "shall determine and demonstrate the need for any additional static and/or dynamic Reactive Power capability" and "shall establish responsibility for any associated Facility additions among ERCOT TSPs [transmission service providers]."[12] Therefore, if there is a *demonstrated need*, the TSPs are required to provide the additional reactive power to assure that system reliability is maintained. The Protocols do not authorize ERCOT to require wind generators to operate beyond their operating capabilities (even if that were possible) in order to provide the necessary reactive power. Although wind turbines with reactive power capability similar to that of gas turbine generators are now available, this was not the case when the prior reactive power Protocol language was adopted in 2004, and even these turbines can only achieve the rectangle at the turbine, not the point of interconnection as required by PRR 830.

C. FERC Precedent

The importance of the technical differences between wind and conventional generators has been recognized by FERC in its decision establishing national standards for reactive power.

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[12] Protocols, Section 5.2.1(6).

In Order 661,[13] FERC adopted standard procedures and technical requirements for the interconnection of wind generating plants to transmission systems. As a part of that proceeding, FERC had initially proposed that large wind plants meet the same reactive power requirements imposed upon other types of generators (that is, the triangle standard) under Order No. 2003, which required the generator to "maintain a power factor within the range of 0.95 leading to 0.95 lagging."[14] FERC also noted differences between conventional generators and wind generators, stating: "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."[15] In its final decision, FERC adopted the +/- 0.95 power factor, "triangle" standard, but with the caveat the 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."[16] As a result, the "triangle" standard applies only where there is a showing of reliability need. 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.[17]
>
> [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.[18]

As part of its decision, FERC also rejected requests to place a greater standard on wind generators;[19] clarified that "the wind generating plant, if required to provide reactive power capability as described above, *should be able to operate anywhere in the +/- 0.95 power factor range*;"[20] and noted the inclusion of language to address "the technical differences of wind plants, which cannot meet the power factor standard below certain levels of output."[21]

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[13] *Interconnection for Wind Energy*, Order No. 661, FERC Stats. & Regs. ¶31,186 (2005).

[14] Order No. 661, ¶39.

[15] Order No. 661, ¶39, fn. 27.

[16] Order No. 661, ¶50.

[17] *Id.*

[18] Order No. 661, ¶51.

[19] Order No. 661, ¶54.

[20] Order No. 661, ¶53. (Emphasis added.)

[21] Order No. 661, ¶56.

FERC re-emphasized these decisions in Order No. 661-A.[22] Regarding complaints about the case-by-case approach to imposing reactive power requirements, FERC rejected such complaints and reaffirmed its decision, stating:

> ...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.[23]

Regarding complaints that the new rule was discriminatory because it imposed different standards on wind generators and conventional generators, FERC rejected those arguments stating:

> 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.[24]

FERC also cautioned that these technical differences would be considered in any request by Transmission Providers to vary the requirements in the Rule.[25] Finally, FERC rejected requests to delete language that required entities to "tak[e] into account any limitations due to voltage level, real power output, etc.", stating:

> We stated that this language was necessary due to the technical limitations of wind generating technology. We noted that all wind generating equipment vendors cannot meet the required power factor range at all levels of output. We reiterate that these technical differences make the disputed language necessary. Furthermore, without this language, a Transmission Provider could discriminate against a wind plant by requiring it operate at the stated power factor at voltages where it is technically infeasible to do so.[26]

FERC has recently reaffirmed its policy decision to treat wind generation resources differently than traditional generation resources. In *Southwest Power Pool, Inc.*[27] FERC

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[22] *Interconnection for Wind Energy*, Order on Rehearing, Order No. 661, FERC Stats. & Regs. ¶31,198 (2005).

[23] Order 661-A, ¶41.

[24] Order 661-A, ¶45.

[25] Order 661-A, ¶50.

[26] Order 661-A, ¶52.

[27] *Southwest Power Pool, Inc.*, 127 FERC ¶ 61,283 (2009) ("SPP Order").

approved a cost allocation methodology that resulted in different costs for wind generation resources. FERC rejected complaints that the allocation was discriminatory, stating:

> We find that SPP's [Southwest Power Pool's] treatment for such wind resources is reasonable because of the "location-constrained" nature of such resources. The Commission has recognized that renewable resources, such as wind, are typically constrained as a result of their location, relative size, and the immobility of their fuel sources, and therefore, present unique challenges that are not faced by other resources. ... We find it reasonable for SPP to institute a cost allocation methodology that appropriately addresses the issues created by these location-constrained wind resources, even if it is dissimilar to the allocation methodology for other resources. Dissimilar treatment of dissimilar resources does not in and of itself constitute discrimination, and we find SPP's distinct treatment of these location-constrained resources is not unduly discriminatory given the facts and circumstances of this case.[28]

D. Prior Application of the Reactive Power Requirements

Application of the reactive power Protocols as a triangle rather than a rectangle is also consistent with past ERCOT representations. Shortly after the adoption of the pre-PRR 830 reactive power requirements in 2004, ERCOT developed a document entitled "Generation Interconnection or Change Request Procedure" (the "Procedure" dated August, 2004). The Procedure indicates that it is "intended to facilitate the interconnection of new and changes to existing generating units/plants" to the ERCOT transmission system by providing "accurate/appropriate data to help identify possible future transmission constraints, maintain reliability of the ERCOT System and propose related transmission projects." The Procedure noted ERCOT's recent adoption of reactive power standards and restated the "Installed Capability Requirements" as follows:

- 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*) (All emphasis in original.)

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[28] SPP Order, ¶29.

Note that the bolded language in the first sentence clearly indicates that the requirement is to have and maintain *a specific power factor capability*, which as discussed above results in a triangular configuration. The language referring to "the generating unit's maximum net power output" merely indicates what end point (in addition to "zero") shall be used for determining the power factor. Conspicuously absent from this description is any reference to a "URL," upon which ERCOT bases its interpretation. Also absent is any language that would suggest that the reactive power requirement is a constant value, as ERCOT assumes in its reactive power interpretation, now codified in PRR 830.

Under "Operating Requirements," the Procedure contains essentially the same language as the Protocols regarding operation of a unit at lower power levels:

> - 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.

This language, particularly the reference to a ratioed reduction in the reactive power requirement, is consistent with the prior section's emphasis on the requirement as a "power factor" requirement. As noted previously, application of this language results in a triangular configuration, which is consistent with the accepted industry definition of a power factor.

The ERCOT Operating Guides, which are intended "to supplement the Protocols,"[29] also contemplate application of a power factor range rather than a constant value MVAR. The definitions of "Capacitor" and "Generator Reactive Power Sign/Direction Terminology"[30] clearly indicate that the amount of reactive power is anticipated to vary rather than remaining at a constant level. Operating Guide Section 3.1.4.1 specifies that "ERCOT has the right and obligation to Dispatch the reactive output (VARs) of each generation Facility *within its design capability* to maintain adequate transmission voltage in ERCOT." (Emphasis added.) The reactive power design capability of typical wind generation units including those owned by

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[29] ERCOT Operating Guide, Section 1.1 (October 1, 2009).

[30] *Id*, Section 1.6.

Appellants is the triangle configuration, not the rectangular configuration that some conventional generation units are capable of maintaining. Therefore, under the Operating Guides, ERCOT can only require reactive power for wind generation based upon their triangular-shaped reactive power capabilities, although it has the ability to require reactive power in the rectangular configuration from some conventional generation due to their dissimilar "design capability."

Section 1.5 of the Operating Guides indicates that ERCOT's operating practices are "consistent with the North American Electric Reliability Corporation ("NERC") Operating Policies and standards." It also notes that "some NERC Policies must be adapted to fit the unique characteristics of the ERCOT System" and specifically lists the areas in which the ERCOT standards differ from the NERC standards. Glaringly absent from that list is any mention of an ERCOT reactive power standard that is different from the NERC standard that complies with FERC Orders No. 661 and 661-A. The only exceptions that are listed for "Reliability Criteria" are for operating reserves and responsive reserves. The only conclusions that can be reached from this omission is that the reactive power requirements for wind generation are consistent with the case-by-case triangular +/- 0.95 standard required by FERC or that the difference in reactive power standards is not considered to be related to "Reliability Criteria." Either conclusion undercuts the rationale relied upon by ERCOT in adopting PRR 830.

These ERCOT-prepared documents clearly indicate that ERCOT has historically represented that reactive power in the triangle configuration is all that was required under the Protocols, Operating Guides and other ERCOT procedures. There is no indication in any of these documents that generation units were required to produce reactive power in an unusual, ERCOT-specific rectangle configuration.

E. Compliance with ERCOT Requirements

Prior to 2008, ERCOT required all generation resources to complete a reporting form entitled the Generation Resource Asset Registration Form ("GARF" or sometimes "GRARF"). As part of the GARF, generators were required to report on various aspects of their units' capabilities, including the unit's reactive capability. GARFs for Appellants' wind generation resources clearly showed that the amount of MVAR production capability increased with increasing levels of MW production. In short, the capability was presented as a triangle configuration, consistent with the industry-wide standards established by FERC. This representation did not result in any action by ERCOT to reject the GARFs or to question the information provided.

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.[31] 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.

RARF Guide Version 4.03, adopted February 4, 2009 through at least Version 4.06, adopted June 23, 2009 included, in Section 7.4, an example of the completed data table used to calculate the reactive capability curve of a generator. The sample showed reactive power capability (MVAR) increasing as power output (MWs) increased. At 50 MW of production, the unit is shown as having 10 MVAR lagging and -12 MVAR leading reactive power capability. At 100 MW of production, the lagging production has increased to 15 MVAR while the leading production has increased to -25 MVAR. Similar increases in MVAR capability were shown for production at 150 MW and 200 MW, ending in a maximum reactive power capability of 40 MVAR lagging and -55 MVAR leading. These example amounts are consistent with the ratioed language of Section 6.7.6(5) and result in a triangle configuration similar to Figure 1, supra. The example demonstrates that ERCOT knew that wind generation resource units produce reactive power in a triangle configuration, yet there is nothing in the RARF Guide to indicate that this result is inconsistent with the Protocols or would be a violation of the Protocols. Instead, the

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[31] This is the same illustration that is included as Figure 2, supra, in this appeal.

RARF Guide demonstrates the requirements for asset registration and that requirement is the triangle configuration for reactive power.

Moreover, reactive power is one of the items on the New Generator Interconnection Checklist, which must be reviewed and approved by ERCOT in accordance with the ERCOT Protocols before new generation is permitted to be interconnected. ERCOT approved wind generators to be interconnected, in accordance with the Protocols, knowing that they could only produce reactive power in the triangle configuration. If more was needed at a particular location, the TSPs had specifically studied the need and required the installation of additional reactive power equipment, which was then installed by the wind generator. For example, Horizon installed reactive power *based on the study* at its locations when the system had a true reliability need and the reactive equipment installed meets the criteria of the only study ever done on this issue, which was performed by the TSP prior to interconnection. These studies performed prior to interconnection showed the reactive needs and there were no discussions of any requirement for a rectangle.

Prior to the adoption of the RARF in April 2008, ERCOT held a series of workshops, conducted by ERCOT employees, to explain the new form. Each of these workshops, except the workshop for Loads, included a presentation section on reactive power. Each of the presentations contained an illustration identical to the illustration contained in the RARF, designating the "Minimum Reactive Required" in a triangle configuration.[32] Each of these presentations also contained a separate illustration showing a typical D-curve and straight lines corresponding to different power factor values. The illustrated power factor values conformed to the industry standard for power factors, shown as sloped lines that result in a triangle configuration when both leading and lagging factors are plotted.

Thus, through its presentation to industry groups in 2007 to mid-2008, ERCOT represented that the "Minimum Reactive Required" is the amount specified by the applicable power factor triangle (in this case a +/- 0.95 power factor). Throughout these presentations, there was no reference to a "power factor rectangle" and nothing to indicate that reactive power must be provided in a rectangular configuration.

Appellants, and other wind generators submitted their RARFs as required in 2008. As with the GARFs, Appellants' RARFs clearly indicated that the reactive capability increased with

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[32] This is the same illustration that is included as Figure 2, supra, in this appeal.

the increase in power generation, based upon the power factor triangle specified in the Protocols. Appellants also indicated that they were in compliance with the reactive power requirements as requested on the form. As before, the RARFs were accepted without objection from ERCOT that the reactive power capabilities did not comply with the Protocols, just as the GARFS showing the triangle configuration had been accepted by ERCOT since prior to the time of interconnection

On August 22, 2008, ERCOT Operations Planning conducted a workshop on Voltage Control Requirements. Prior to the workshop, ERCOT sent a copy of the presentation to interested persons. This presentation included a slide that showed the application of the +/- 0.95 power factor to both conventional generators and wind generators. For both types of generators, the +/- 0.95 power factor requirement was presented as a triangle configuration. The example for wind generators was accompanied by text noting the MVAR requirement as +/- 33 MVAR at 100 MWs of generation and declining to 0 MVARs at 0 MWs. About seven hours after this presentation was sent to interested persons, a second presentation was sent that "revised" the slide to reflect a reactive requirement in a rectangle configuration. This was the first indication that Appellants received that the interpretation of the reactive power Protocols was being questioned by ERCOT Staff.

As noted previously, Appellants submitted, via asset registration documents, the reactive power capabilities of their units in the triangular configuration consistently over the last several years and prior to interconnection and were never notified by ERCOT that such capability was not acceptable. Under Protocols Section 6.10.9, ERCOT is to report noncompliance with the reactive power standards to the "ERCOT Compliance Office," which will then investigate the matter and must "advise the generation Resource, its QSE, ERCOT and the TSP" of the results of such investigation. Additionally, pursuant to Protocols Section 6.5.7.3(4) it is ERCOT's *responsibility* to notify a Market Participant in writing of a failure to meet the reactive power requirements. Yet, despite these clear duties, ERCOT never notified Appellants of an alleged failure to comply with the reactive power Protocols until June 5, 2009, even though it had knowledge of the reactive power capabilities of Appellants' units since the time their individual interconnection requests were filed. ERCOT's failure to conduct any investigations or to notify Appellants of an alleged failure to comply with the Protocols is a further indication that Appellants were in compliance with the reactive power requirements throughout this time.

ERCOT's inaction also supports the conclusion that ERCOT's interpretation of the Protocols as requiring a rectangular configuration is a recent creation, not based upon Protocol language, stakeholder agreements as to the interpretation of the language, or actual ERCOT practice.

F. Basis for Changed Interpretation

The history cited above raises a question concerning what could have caused ERCOT Staff's interpretation of the reactive power Protocols in August 2008 to be drastically different from the interpretation it had been providing to market participants prior to that time. Appellants believe that the answer can be found in ERCOT's activities related to the design of the transmission plan for the competitive renewable energy zones ("CREZs") considered by the Commission in Docket No. 33672.[33] At the October 22, 2009 PRS meeting at which PRR 830 was considered, the ERCOT Independent Market Monitor asked what underlying assumptions – the triangle configuration or the rectangle configuration– were used in the CREZ Transmission Optimization study. ERCOT Staff admitted that the modeling for the CREZ Transmission Optimization study assumed that all wind generators were meeting the full dynamic rectangle standard. Apparently, ERCOT assumed that all wind generation, both new and existing, would provide reactive power in the rectangle shape. This assumption was made without any determination that there was a need for reactive power in that amount from the wind generators. This assumption was made without regard to ERCOT's actual or constructive notice that wind generators provided reactive power in a triangle configuration, not in a rectangle configuration. Rather than basing the CREZ transmission study on modeling that reflected the actual characteristics of the ERCOT transmission system, ERCOT chose to model the system using hypothetical and unrealistic characteristics for wind generators. Once it became obvious that ERCOT's modeling did not reflect the actual system, ERCOT's response has not been to change the model to match reality, but to change the requirements so that reality eventually will match ERCOT's assumptions. Such a response is not only unreasonable, it also violates North American Electric Reliability Corporation ("NERC") requirements relating to system planning.[34]

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[33] *Commission Staff's Petition for Designation of Competitive Renewable Energy Zones*, Docket No. 33672, Order on Rehearing (Oct. 7, 2008).

[34] See NERC Standard MOD-010 establishing standards for Transmission Owners regarding modeling the reliability of the transmission system and providing that Transmission Owners are out of compliance if the modeling data set forth in NERC Standard MOD-011 is incomplete. NERC Standard MOD-011 requires that: "Generating Units (including synchronous condensers, pumped storage, etc.): [provide] location, minimum and maximum Ratings (net

There is no need to adjust reality to conform to ERCOT's new interpretation of the reactive power requirements. The ERCOT system has been in operating for a number of years with wind generation units that produce reactive power in the triangle configuration or less,[35] and there has been no evidence of any reliability problems attributed to that fact. Further, there is still no study demonstrating that reactive power in the rectangle configuration is needed to meet even local reliability issues, much less that it is required for the transmission system to accommodate CREZ generation. This is partly due to the fact that reactive power does not travel very far. It primarily addresses local voltage issues and is not effective in addressing voltage issues at remote locations. In ERCOT, the wind generators are located primarily in West Texas and the Texas Panhandle, far from the load centers where the voltage control issues arise in ERCOT. Thus any reactive power produced by wind generators will not be effective in addressing those issues, regardless of the configuration required. Any concern about the assumptions ERCOT used in the CREZ transmission study will not significantly impact the results of the study or the decision to construct the CREZ transmission.

G. Recent ERCOT Actions

The discussion about the interpretation of the reactive power requirements at the August 21, 2008 workshop apparently led one market entity to request a formal interpretation of this portion of the Protocols pursuant to the procedure authorized by P.U.C. PROC. R. 22.503. CWG appealed that interpretation to the Commission in Docket No. 36482. Subsequently, on September 8, 2009, ERCOT submitted PRR 830 to essentially codify its interpretation of the reactive power Protocols. ERCOT claimed that PRR 830 was intended to "clarify" the reactive power requirements. However, a review of PRR 830 shows that it proposed numerous and significant changes—and created completely new requirements.

Assuming that it is even possible to "clarify" the Protocols without amending them, the amount of change necessary to "clarify" the Protocols, as well as the language that is used in this instance, actually demonstrate that PRR 830 is in fact a re-write, not a clarification, of the reactive power requirements. References to "rated capability" and "URL" in Section 6.5.7.1(1)

Real and Reactive Power), regulated bus and voltage set point, and equipment status. (R1.2)". NERC Standard FAC-010 also requires Planning Authorities to establish System Operating Limits by modeling all Facilities and demonstrating voltage stability.

[35] Some very early wind generation units operate at unity power factor but have been "grandfathered" from the reactive power requirements under the Protocols.

were eliminated in an attempt to broaden the application of this paragraph. Similarly, the reference to "URL" in Section 6.5.7.1(2) was eliminated and the remaining portion of this paragraph was substantially re-written and included in paragraph (1). *For the first time,* language is included in these paragraphs stating that the reactive power requirements, which previously only applied to the URL, "shall be available at all MW output levels." An expectation that reactive power is to be provided dynamically was also inserted, contradicting rather than "clarifying" the previous language that permitted the installation of static or dynamic equipment. A new Section 6.5.7.1(2) is added, specifically applicable to wind generation resources "that commenced operation on or after February 17, 2004," requiring them to comply with the new standards by December 31, 2010, unless ERCOT "in its sole discretion" chooses to grant an extension. Section 6.7.6(5), which previously addressed reactive power requirements at output levels lower than the URL, is deleted in its entirety, without any explanation. The language in Section 6.7.6(5) was added to the Protocols at the same time as the other prior Protocol language on reactive power and must have been intended to serve some function, but it is ignored. These are significant changes, not merely clarifications of Protocol language.

The fact that PRR 830 was actually a substantive change in the reactive power requirements is also evidenced by other actions taken by ERCOT. On July 24, 2009, ERCOT revised the RARF Guide to remove the illustration of a generator's D-Curve and the triangular shaped "Minimum Reactive Required" notation. On September 1, 2009, ERCOT revised Section 7.3 of the RARF Guide, which defined the data fields for information from wind generation units. ERCOT is also engaged in a rewriting of the Generation Interconnection or Change Request Procedure document (the "New Procedure"). The New Procedure has not yet been adopted and "will become effective upon approval and will apply to all future and current interconnection requests that have not yet signed an Interconnection Agreement ("IA") by the date of this approval."[36] Like the current Operating Guide, the New Procedure contains a listing of the areas in the Operating Guide that differ from the NERC Standards. Unlike the Operating Guides, discussed previously, the New Procedure specifically lists Protocol Sections 6.5.7 and 6.7.6 as procedures that apply in addition to the NERC Standards. This language was not contained in Version 4.1 of the New Procedures, dated October 10, 2008, but now appears in the current draft, Version 4.10.3, dated November 18, 2009. These actions demonstrate that ERCOT

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[36] Procedure, Section 1.3, at 2.

is attempting to rewrite the many rules and guides that are in direct conflict with its "clarification" in PRR 830, but that fit seamlessly with the triangle reactive power requirement.

H. ERCOT Board Consideration of PRR 830

PRR 830 was considered as an "urgent" item at the November 17, 2009 ERCOT Board Meeting. After hearing a presentation by a specially appointed TAC advocate supporting the TAC recommendation to approve PRR 830, the ERCOT Chair announced that comments from interested persons would be heard in alphabetical order according to the name of the company. Despite this announced order of proceeding, ERCOT Staff was allowed to continue to participate and offer its views on the proper interpretation of the Protocols, even though ERCOT's general Counsel made clear that he was acting as an advocate for the ERCOT Staff position and not as an advisor to the Board. Such characterization also applies to the presentations from other ERCOT Staff members. Throughout the proceeding, ERCOT Staff repeated assertions that PRR 830 was needed for reliability reasons but they never produced any evidence to demonstrate this alleged need. Some market participants urged that ERCOT Staff be required to perform a study to determine if their assumed reliability issues had any basis in fact and if the increased reactive power standard was the appropriate remedy to any problems that may be discovered. Rather than requiring such studies, the ERCOT Board voted to accept ERCOT's bald assertions of a reliability need for PRR 830 essentially because they believed these issues would be before the Commission anyway.. NextEra filed an appeal of the TAC decision to recommend approval of PRR 830 to the ERCOT Board and this matter was also considered at the November 17, 2009 ERCOT Board meeting. NextEra's appeal sought to remove the most burdensome requirements in PRR 830 by eliminating the retrofit obligation for existing wind generation. NextEra's proposed changes to PRR 830 reflected comments on that language from other parties, including the Lower Colorado River Authority, ERCOT and The Wind Coalition. The NextEra proposal would expressly recognize that all existing wind generators must meet the triangle requirement contained in the prior Protocols, but would allow ERCOT to impose the rectangle requirement on existing wind generators only if ERCOT or the transmission service provider demonstrates, through a System Impact Study, that such capability is required to ensure grid safety or reliability and as a compromise, also on future projects despite the lack of any showing of reliability need by ERCOT. These changes would have avoided unnecessary retrofitting of existing equipment while still allowing for retrofitting of generation where such a need is demonstrated. Appellants believe that such a revision would have been a reasonable compromise and should have been adopted by the ERCOT Board. Despite the reasonableness of this approach, the ERCOT Board rejected the appeal and the offer of compromise as part of its vote to adopt PRR 830.

IX. APPLICATION OF LAW

A. PRR 830 violates the United States and Texas Constitutions by confiscating wind generators' property without compensation through a regulatory taking.

Both the United States Constitution[37] and the Texas Constitution[38] provide that private property may not be taken for public use without the payment of just and adequate compensation. The courts have recognized that a "taking" of property may occur as the result of a regulatory action, even if the action does not completely destroy the property's value.[39] It is sufficient if the action unreasonably interferes with the owner's rights to use and enjoy his property.[40] In order to determine if a regulatory taking has occurred, the courts will review:

> (1) "the economic impact of the regulation on the claimant"; (2) "the extent to which the regulation has interfered with the distinct investment-backed expectations"; and (3) "the character of the governmental action."[41]

Applying these factors, it is clear that PRR 830 results in a regulatory taking. Compliance with the new requirement will have a significant impact on Appellants, requiring it to invest tens of millions of dollars to retrofit its existing wind generation units. As discussed above, at the time the investments in those units were made, there was no requirement that reactive power be provided based upon the rectangle configuration that PRR 830 now imposes. Appellants' "investment-backed expectations"[42] at the time the units were constructed were that the units complied with the triangle configuration required by the Protocols and Appellants entered into lease agreements and power sales agreements based upon the economic impact of those requirements. Changing those reactive power requirements at such a late date clearly

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[37] U.S. Const. Amend. V.

[38] Tex. Const. Art. I. § 17.

[39] *Hallco Texas, Inc. v. McMullen County*, 221 S.W.3d 50 (Tex. 2006), at 56.

[40] *Id.*

[41] *Id.*, citing *Sheffield Devel. Co. v. City of Glenn Heights*, 140 S.W. 3d 660, 670-672 (Tex. 2004).

[42] The Dallas Court of Appeals has recently emphasized the importance of this factor, stating: "The second factor – the investment-backed expectations of the property owner – *is critical* in evaluating the reasonableness of the government's interference." *City of Dallas v. VRC LLC*, 260 S.W.3d 60, 65 (Tex. App – Dallas 2008). (Emphasis added.)

interferes with the investment-backed expectations that underlie the existing wind generation agreements. Since there is no demonstrated reliability reason to impose the new requirement on existing generation, the regulatory action is arbitrary and unreasonable and cannot overcome the impact to private property rights. PRR 830 must be overturned to prevent the unconstitutional confiscation of private property through a regulatory taking.

B. PRR 830 violates PURA §39.904(l).

In 2005, the Texas Legislature passed Senate Bill 20, which set goals for renewable energy capacity in Texas and gave the Commission authority to take action necessary to encourage development to meet those goals. As part of that legislation, PURA §39.904(l) was enacted, directing the Commission to "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." (Emphasis added.) The Legislature clearly indicated that any action by the Commission must be technically feasible. As discussed previously, because of the technical differences between wind generation and conventional generation, wind generation cannot produce reactive power at the same levels as conventional generation. Because PRR 830 fails to recognize these differences, it violates the §39.904(l) requirement that the Commission can only require the implementation of feasible technology. Further, PURA §39.309(l) requires that reactive power requirements can only be imposed "to reduce the facilities' effects on system reliability." In order to determine the facilities' effects, ERCOT would need to do a study of the system-wide reactive power requirements and determine how much of those requirements are caused by the renewable energy developments. However, ERCOT has refused to perform any study to demonstrate a need for doubling the reactive power capability of wind powered renewable generators. Neither ERCOT nor the Commission is authorized to impose reactive power requirements based upon speculation or an assumption of reliability needs.

A study is also needed to address possible unintended consequences of the application of the rectangle requirement, which may create other reliability problems for both ERCOT and the wind generators. Applying the rectangle reactive power capability requirement on wind generation units already operating in ERCOT presents challenges regarding both the wind farm collection system and the procedures for voltage control coordination with TSPs. Both challenges require significant study before solutions could be devised, and the design problem could, at the very least, significantly increase the cost of meeting the new requirements.

For a wind farm composed of multiple wind turbines that offer the triangle reactive power capability, additional reactive equipment will have to be installed to meet the new PRR 830 requirements. ERCOT Operations staff can then call for the additional reactive power available from the new equipment whether the wind generator is producing real power or not. The coordination challenge arises from the need to maintain the voltage required by the TSP at the point of interconnection. It is possible that injecting/absorbing significant amounts of reactive power (within the rectangle) during low wind periods could move the voltage at the point of interconnection outside the TSP's acceptable range. This is an issue that can be resolved by studying the system topology and coordinating the operation of the equipment in a given region, which could require additional resources and investment in control system changes. Such a study could also reveal that some of the equipment PRR 830 would require is unnecessary, however. Either result demonstrates the need for a study before blindly applying the new reactive power requirements.

There is also an engineering design challenge that is internal to a wind generators operations. The collection system for a wind farm, which can amount to miles of lower voltage lines leading up to the point of interconnection with the ERCOT grid, was designed to maintain voltages that the individual turbines can accept. The collection system design was based on the requirements shown by the site-specific interconnection studies that involved the wind generator, the TSP and ERCOT, and assumed the triangle capability from turbines. If the voltage on the collection system exceeds that range (in order to meet the new PRR 830 requirements), the turbines will disconnect. Since voltage diminishes with the length of a conductor, the voltage that reaches each turbine needs to be considered in the overall wind farm design. Operating the new equipment required by PRR 830 to supply reactive power to the grid can negatively affect the voltage on the collector system. That impact would have to be studied to determine its degree and then any needed changes to the collector system would have to be designed to account for that impact. Even if the study shows that the necessary changes could be accomplished, they could still require considerable effort to prevent the turbines from disconnecting. A study of these impacts is also necessary to determine whether the new PRR

830 requirements actually maintain reliability or have the perverse effect of excluding wind generation from the ERCOT market.

These factors establish that until a study is done to determine the "effects on system reliability," the Commission will be unable to determine *if* reactive power control capabilities are needed, much less to determine the particular *feasible* technologies that may be needed to "*reduce*" the impact on system reliability. Because such a study has not been done, PRR 830 does not comply with PURA §39.904(l) and must be repealed.

C. PRR 830 violates the requirements of PURA §39.001(c).

PURA Chapter 39 establishes the Commission's authority and responsibilities in "protecting the public interest in the transition to and in the establishment of a fully competitive electric power industry."[43] Section 39.001(c) specifically requires that regulatory authorities, like the Commission and independent organizations like ERCOT to whom it has delegated authority:[44]

> … 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.

It is clear that PRR 830 regulates wind generators who are competitors in the wholesale electricity market in ERCOT. As explained previously, the effect of PRR 830 is to discriminate against wind generators by applying reactive power requirements that may be appropriate for conventional generation but which fail to account for the technical differences between the two dissimilar types of generation. FERC has concluded that it is appropriate to have different standards for the two types of generation to avoid the possibility of undue discrimination against wind generators to the benefit of conventional generation. By failing to make similar accommodations for wind generating units, ERCOT has discriminated against a particular type of market participant, in violation of PURA §39.001(c). Accordingly, PRR 830 must be repealed.

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[43] PURA §39.001(a).

[44] Pursuant to PURA §39.151(d) the Commission may delegate authority to ERCOT to adopt rules relating to reliability and the accounting of charges for production and delivery of electricity, but such authority is limited by the requirements of PURA. Additionally, the Commission may not delegate a duty to ERCOT that is outside the scope of the Commission's authority under PURA.

D. PRR 830 violates the requirements of PURA §39.001(d).

PURA §39.001(d) provides, in pertinent part, that regulatory authorities, like the Commission and its delegee ERCOT, "shall adopt rules and issue orders that are both practical and limited so as to impose the least impact on competition." PRR 830 meets neither criterion. Requiring existing wind generation to meet the rectangle configuration in the same manner as conventional generation is not only impractical, it requires suspension of physics. Wind can only provide reactive power during times when the source of fuel (wind) is available at that location. Even if a wind generator wanted to provide reactive power at such times, it cannot obtain its fuel by simply contacting a supplier like a conventional generator. Because it ignores this basic factor, PRR 830 must be viewed as impractical, akin to requiring a solar generator to produce power during the blackest night.

PRR 830 is also not limited in application despite requests by wind generators to assure that the regulatory "fix" actually addresses the problem. A limited rule would only require the imposition of additional reactive power where there was a demonstrated need for such power. However, to determine such need, ERCOT would need to conduct a study of reactive power needs, a step that it has steadfastly refused to take. Once a study was completed, ERCOT and other participants would know where reactive power was needed and in what amounts, and ERCOT could adopt a PRR that was specifically tailored to address such matters. Alternatively, ERCOT could have adopted a case-by-case approach, like that used by FERC, to determine the need for reactive power. Because ERCOT ignored the availability of these less intrusive alternatives, PRR 830's blanket application to all wind generation cannot be viewed as "limited" in scope as required by PURA §39.001(d).

Rather than having "the least impact on competition," PRR 830 will have significant impacts upon competition. The cost of the extensive retrofitting required by PRR 830 will increase costs to wind generators without providing any demonstrated reliability benefit. These costs may result in establishment of an economic incentive for existing generators to leave the market and decreasing the number and type of competitors in ERCOT. Although Appellants and some larger wind generators may be able to comply with some parts of PRR 830 on a prospective basis, that is for new wind generation projects, the imposition of the rectangle on new generation also has significant impact on future wind generation and may constitute a barrier to entry by new wind generators.[45] Regulatory requirements that are impractical, overbroad, and that reduce the level of competition conflict with PURA §39.001(d) and must be reversed by the Commission.

E. PRR 830 violates PURA §39.151(a)(1).

PURA §39.151 establishes the duties of an "independent organization" like ERCOT and specifies that such an entity is required to "ensure access to the transmission and distribution systems for all buyers and sellers of electricity on a nondiscriminatory basis." PRR 830 violates this requirement by discriminating against wind generators and by imposing standards that would effectively prevent them from gaining access to the ERCOT transmission system to deliver electricity to buyers of electricity. PRR 830 requires wind generators to meet the rectangle configuration for reactive power at all times that they are on-line, *i.e.* synchronously interconnected with ERCOT. Because of technical differences in technology, most existing, installed wind generation units cannot meet this requirement and would be required to disconnect from the ERCOT transmission system. As a result, these units are denied access to the ERCOT transmission system and their owners are unable to sell their power in the ERCOT market. As noted earlier, failing to account for the technical differences between wind generation units and conventional generation units constitutes discrimination against a wind unit by requiring it to "operate at the stated power factor at voltages where it is technically infeasible to do so."[46] PRR 830 therefore violates the requirement imposed by PURA §39.151(a)(1).

F. PRR 830 violates PURA §35.004(e).

PURA §35.004(e) requires that the Commission "ensure that ancillary services ... are available at reasonable prices with terms and conditions that are not unreasonably preferential, prejudicial, discriminatory, predatory, or anticompetitive." Reactive power is specifically listed as an ancillary service to which these statutory requirements apply. PRR 830 fails to comply with these requirements. As discussed previously, PRR 830 discriminates against wind generation units by applying reactive power standards that fail to account for the technical abilities of wind generation units. PRR 830's requirements are also prejudicial and preferential

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[45] See comments by Vestas- American Wind Technology submitted, at http://www.ercot.com/mktrules/issues/prr/825-849/830/index, that PRR 830 effectively excludes its turbines.

[46] FERC Order 661-A, ¶52.

to conventional generation because they were designed to be consistent with the characteristics of conventional generation units and ignored the technical capabilities of location-constrained generation like wind generation units. The ultimate effect of PRR 830 is to require wind generation units to either incur unnecessary, costly, and uneconomic retrofits or disconnect from the ERCOT transmission system. Either result effectively prevents wind generators from competing for business in the ERCOT electricity market, a clearly anticompetitive outcome. Accordingly, PRR 830 violates PURA §35.004(e) and must be repealed by the Commission.

G. PRR 830 violates PURA §39.151(a)(2) and (4).

PURA §39.151(a)(2) requires that ERCOT "ensure the reliability and adequacy of the regional electrical network," while subsection (a)(4) requires that it "ensure that electricity production and delivery are accurately accounted for among the generators and wholesale buyers and sellers in the region." ERCOT has not established that PRR 830 is necessary to ensure the reliability and adequacy of the network. Unless ERCOT can establish a reliability need for reactive power in the rectangle from specific wind generating units, the effect of PRR 830 is to require wind generators to install "costly equipment that is not necessary for reliability."[47] Because there is no justification for the imposition of these unnecessary, added costs, PRR 830 arbitrarily shifts costs to wind generators and prevents ERCOT from "accurately account[ing] for [costs] among the generators and wholesale buyers and sellers in the region," as required by PURA. Accordingly, PRR 830 violates PURA §39.151(a)(2) and (4).

H. PRR 830 was adopted in violation of PURA §39.1511.

PURA §39.1511(b) requires that ERCOT's bylaws and the Commission's rules "must ensure that a person interested in the activities of [ERCOT] has ... an opportunity to comment on matters under discussion at the meetings." At it meeting of November 17, 2009, the ERCOT Board failed to ensure that Appellants and other wind generators had an opportunity to comment on matters raised by ERCOT Staff during the course of the meeting. Despite the acknowledgement by ERCOT's General Counsel at the end of the meeting that he had been acting as an ERCOT Officer and proponent of the approval of PRR 830 and not speaking in his role as counsel to the Board, the Board continually called upon its General Counsel and other

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[47] Order 661-A, ¶41.

ERCOT Staff members without providing an opportunity for Appellants and others to respond to the comments of this interested party. As a result of this action, the Board did not receive a balanced view of the background and impact of PRR 830 from all interested parties. This was particularly problematic in regard to ERCOT's continued assertion that PRR 830 was needed for reliability reasons even though there was absolutely no evidence that a reliability problem existed in regard to reactive power or that PRR 830 was the appropriate method for resolving any reliability concern. Because of these procedural errors, Appellants and other wind developers did not receive a meaningful opportunity to comment on PRR 830 that was equivalent to the opportunity provided to ERCOT Staff, who clearly had a direct interest in the outcome of the proceeding. This unbalanced procedure does not comply with the requirement that interested persons have an opportunity to comment on matters under discussion at ERCOT meetings, as required by PURA §39.1511(b). Accordingly, PRR 830 must be repealed.

I. PRR 830 violates P.U.C. SUBST. R. 25.501(a).

P.U.C. SUBST. R. 25.501(a) establishes the principals that must be considered in the development of ERCOT Protocols. Included within these principles is the requirement that the Protocols "reflect the physical realities of the ERCOT electric system." As discussed previously, PRR 830 fails to account for the important technical differences between wind generation and conventional generation concerning the production of reactive power. The FERC has "recognized that renewable resources, such as wind, are typically constrained as a result of their location, relative size, and the immobility of their fuel sources, and therefore, present unique challenges that are not faced by other resources,"[48] and has established different standards for wind generators. PRR 830, however, fails to consider these elementary and dispositive factors that demonstrate the unique character of existing wind generation. Regardless of the language that is used, the Protocols cannot override basic physics and require these existing wind generation units to provide reactive power in the same manner as conventional generation units. By failing to consider these technical differences between dissimilar generation units, PRR 830 has violated the standards imposed by P.U.C. SUBST. R. 25.501(a) and must be repealed.

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[48] SPP Order, ¶29.

J. PRR 830 is arbitrary, capricious and discriminatory.

PRR 830 was adopted based upon representations that it was merely a "clarification" of existing requirements. As demonstrated above, that is not the case. The new rectangular reactive power requirement is not found anywhere in the previous versions of the Protocols, the Operating Guides, or the RARF Guide. It is found nowhere in previous industry standards or the nation-wide standards adopted by FERC. By basing its decision on unfounded assertions and by failing to determine the actual facts concerning the existing reactive power requirements, the ERCOT Board action was arbitrary, capricious and discriminatory in applying the standards of PRR 830 to existing wind generation. Additionally, because ERCOT has failed to produce any studies demonstrating the need for the rectangle requirement, there is no rational basis for the imposition of this requirement on existing generation or with regard to planned generation. ERCOT's action thus fails to comply with the procedural standards established by P.U.C. PROC. R. 22.251(l) and the Commission is required to make the necessary factual determinations on a *de novo* basis.

In Docket No. 23220, the Commission stated its intent to ensure fairness in the ERCOT market by retaining the ability to subject the following matters to a greater level of scrutiny:[49]

1. Matters that have major impacts on the fundamental design and competitiveness of markets;
2. Matters that have disparate impacts on particular types of market participants;
3. Matters that may unnecessarily create barriers to entry; and
4. Matters that may conflict with legislative or Commission policies.

This proceeding involves issues that merit greater scrutiny by the Commission for all of the above reasons. PRR 830 retains the exemption for generators that were in operation prior to September 1, 1999, a provision that excuses most existing conventional generation from the retrofit obligation. Imposition of the retrofit requirement of PRR 830 has a disparate impact on wind generators as opposed to conventional generators and impacts the competitiveness of the market by essentially eliminating existing wind generation from the market after December 31, 2010 to the detriment of both wind generators and retail customers who will face increased costs of electricity from conventional generators. The uncertainty created by PRR 830 also creates a

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[49] *Petition of the Electric Reliability Council of Texas for Approval of ERCOT Protocols*, Docket No. 23220, Order on Rehearing (Jun. 1, 2001).

barrier to entry by chilling the prospects for future investment in Texas, as discussed later. Finally, as discussed later, the adoption of PRR 830 conflicts with legislative policies encouraging the development of renewable energy and the legislative instruction to avoid conflicts with federal policies. For the policy reasons announced in Docket No. 23220, the adoption of PRR 830 must be repealed as being arbitrary, capricious and discriminatory.

K. PRR 830 conflicts with national standards for reactive power adopted by FERC and enforced by NERC.

As detailed above, PRR 830 is inconsistent with national standards for reactive power adopted by the FCC. The Texas Legislature has indicated that it values consistency with federal standards. PURA §39.151(c) specifically requires that, in exercising its authority to oversee and review ERCOT's actions, the Commission "shall apply the provisions of this section and Sections 39.1511, 39.1512, and 39.1515 so as to avoid conflict with a ruling of a federal regulatory body." Additionally, PURA §35.006(a)(2) directs that Commission rules related to wholesale transmission service, rates and access "may not be contrary to federal law, including any applicable decision, rule, or policy statement of a federal regulatory agency having jurisdiction." Requiring the imposition of a rectangular reactive power requirement *as a minimum* for wind generation units without first conducting a reliability standard directly conflicts with FERC's decision to impose a +/- 0.95 triangular power factor *as a maximum* reactive power requirement but only after a case-by-case study demonstrates that it is necessary for reliability reasons. Because PRR 830 conflicts with the FERC-adopted standards related to reactive power from wind generation units, it violates the requirements of PURA §39.151(c) and must be repealed.

Moreover, market participants were not put on notice either by the language in either the Protocols or in the Operating Guides in effect, that ERCOT would use a different standard for reactive power for reliability reasons. The Operating Guides in effect when existing wind generation was interconnected clearly stated which standards at FERC and ERCOT diverged for reliability reasons, and reactive power was not listed. ERCOT is now having to change the Generation Interconnection Procedure and the Operating Procedures following its change to the Protocols to make these documents consistent with the very different reactive power standard included in PRR 830.

Trade usage for the wind power industry in the United States is shaped by FERC standards, since such standards apply to all areas outside ERCOT. Consistent nation-wide standards enable generators and their investors to assess risks associated with generation development and thereby encourage development of generation in areas where it is needed.[50] The standards established by FERC become industry standards due, in part, to the greater size of the outside-ERCOT market. Unless regional standards specify differently, those standards would constitute trade usage. As noted previously, although the ERCOT Operating Guides purport to identify all areas where the local ERCOT standards are different from FERC-approved NERC standards, there is no reference to a different reactive power standard for wind generation units. A reasonable conclusion to be reached is that the nation-wide FERC standards also apply in ERCOT. This conclusion is supported by, and not contradicted by, the express language used in the ERCOT Protocols prior to the adoption of PRR 830. Because PRR 830 attempts to revise these standards and require unnecessary retrofitting of existing generation without the demonstration of a reliability need, it conflicts with the goal of consistent nation-wide standards for reactive power and must be repealed.

L. PRR 830 is inconsistent with Texas public policy goals.

PRR 830 contravenes important public policy goals established by the Texas Legislature. PURA §31.001(c) establishes the goal of creating "a more competitive marketplace" and a marketplace "that allows for increased participation by … certain nonutilities." PURA §39.904 establishes a legislative policy encouraging the development of renewable energy resources in Texas. Wind generation will play an important part in the ability of the state to meet and exceed these goals. Certainly the Commission has been very active and responsive in working to meet these public policy goals and Appellants appreciate and laud the Commission for its efforts. However, the adoption of PRR 830 threatens to thwart the ability of the Texas market to meet these legislative goals, despite the Commission's efforts.

PRR 830 requires that all existing generation come into compliance with the new reactive power requirements by December 31, 2010. If not in compliance by that date, the generation units will have to disconnect from ERCOT or face enforcement penalties. A recent ERCOT

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[50] For other examples showing the Legislative policy favoring nation-wide standards, see PURA §§ 11.009, 14.151(c), 17.158, 39.151(c) & (d).

study found that more than 70% (38 out of 54)[51] existing wind generation units to which the reactive power requirements apply[52] do not meet the standard. If these units are forced to disconnect from the ERCOT system, the amount of renewable generation in Texas will significantly decline rather than increase as the Legislature intends. Further, the removal of many wind units may change the demand calculations that the Commission relied upon in approving the construction of about $5.0 billion in CREZ transmission, resulting in a potentially stranded CREZ investment.

Most importantly, adoption of PRR 830 will significantly impact investment in new generation in Texas *by all types* of generation units, not just renewable generation units. Previously, investors could look to the ERCOT Protocols and nation-wide standards and make their investment decisions based upon the existing requirements. Prior to PRR 830, any changes to ERCOT standards were made on a prospective basis with existing generation units "grandfathered" with the standards that applied when they interconnected to the ERCOT system. This provided certainty to investors that their investment-backed expectations would not be undermined by changing regulatory requirements. Investors will be unlikely to make a major investment in Texas generation units and enter into long-term contracts for producing power when they know that the economics of their investment decision can be changed by regulatory decisions made years later. Instead, they can invest their money in projects in other states where the investment climate is more stable and certain. PRR 830 has eliminated the certainty that used to exist and has substituted increased uncertainty and risk, which will ultimately be reflected in less investment, less incentive to introduce new technology that doesn't fit the conventional generation mode, increased costs of operation, or greater expected returns before investment will occur. Each of these results is detrimental to the continued development of needed generation resources and ultimately detrimental to Texas electric customers. To avoid these consequences, PRR 830 must be repealed.

X. MOTION FOR SUSPENSION OF PRR 830

Pursuant to P.U.C. PROC. R. 22.251(d)(2) and (i), Appellants request that the requirements of PRR 830 be suspended until the Commission issues a final order in this

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[51] Transcript of November 17, 2009 ERCOT Board Meeting, at 136.

[52] An additional 16 wind generators were exempt form the requirements.

proceeding. Appellants believe that ERCOT is not willing to agree to such a suspension, so this request is included as part of this appeal. Although the retrofit obligations of PRR 830 will not be effective until after the December 31, 2010 deadline in the PRR, Appellants and other wind generators must begin to implement the needed changes to their existing generation in the near future in order to meet that deadline. A suspension of PRR 830 during this proceeding would enable the Commission to fully develop the record and reach a decision in this proceeding while avoiding the significant harm that will result from the implementation of PRR 830.

There is good cause for suspension of PRR 830 because of the significant impact its implementation will have on both Appellants' existing operations in Texas and on the public interest. Unless PRR 830 is suspended, Appellants and other wind generators will be required to incur significant costs in retrofitting existing, operational wind generation units to meet the new, unnecessary reactive power requirements imposed by PRR 830. The equipment and installation costs to make such retrofit changes to existing units is in the range of $9,600,000.00 to $11,200,000.00 for Horizon alone, which does not include the cost to Horizon for lost revenue during an indeterminate time period in which the wind projects must be shutdown to be retrofit, and Appellants anticipate that many, if not most, of the other 37 allegedly non-compliant wind generators operating in Texas would incur similar costs. Given the very recent adoption of PRR 830 and its brief review at ERCOT as an urgent PRR, Sweetwater Wind, and Silver Star I have not yet been able to determine the amount of retrofit in the millions of dollars for their wind plants. These direct costs do not include the additional cost of revenue that will be lost during the time that the wind generation units are shut down in order to retrofit changes. Before requiring wind generators to spend aggregated amounts that could exceed $100 million, the Commission should assure that such investment is (1) needed and (2) will actually address any identified reliability concerns. Otherwise such investment is simply needless "gold-plating" of facilities.

In addition to the generator costs, consumers in Texas will face higher charges for electric service in Texas as a result of PRR 830. The increased costs to customers will occur for two reasons. First, during the time wind generators are performing the retrofit changes, their units will be off-line and ERCOT will have to rely on only conventional generation to meet system needs; low-cost wind generation will not be available to lower the market clearing price in ERCOT. Secondly, rather than making the retrofits, some generators may find it is more rational to simply scale back or discontinue operations in Texas. This would not only reduce the availability of inexpensive generation resources to Texas consumers, but would also impact the local economies of the Texas communities where the assets are located.

ERCOT will probably argue that the implementation of PRR 830 is needed for reliability reasons. However, as discussed previously, ERCOT has not produced a single study demonstrating that reactive power in the rectangle configuration is needed from location-constrained wind generation resources located in areas far from ERCOT's load centers. Despite requests by Horizon, NextEra and other wind generators, ERCOT has thus far refused to conduct any study of the issue. Further, ERCOT has not identified a single instance in which a wind generator's inability to provide reactive power in a rectangle configuration has led to a reliability incident in ERCOT. The lack of any such demonstrated events indicates the lack of a reliability problem because ERCOT has been operating for many years with wind developers generally only providing reactive power in the triangle configuration. Appellants agree that reliability is an issue of utmost importance, but it cannot be used as a "red flag" that is waved anytime ERCOT disagrees with a market participant. Instead, there must be some demonstration of a reliability impact before ERCOT can impose unnecessary costs on a group of market participants. Without some indication of a need, which is lacking in this case, the requirement is simply an improper intrusion on the competitiveness of the market rather than the solution to a reliability problem. The inclusion in the PRR 830 amendments of a trigger date of July 31, 2010 for a determination that retrofits may be delayed also suggests that a suspension would not negatively affect reliability in the interim.

Suspension is also necessary because the proposed implementation date of December 31, 2010 is not feasible. As with other aspects of PRR 830, this date was arbitrarily selected by ERCOT without any study or analysis of the actions that would be required by wind generators to comply with the retrofit requirements. Subsequent to the adoption of PRR 830, Appellants have contacted suppliers of the equipment that would need to be installed to meet the rectangle requirement. Appellants have discovered that there is a growing demand for the equipment and a shortage of supply. The result is not just an increase in costs of compliance but, more importantly, notification from some suppliers that they simply will not have a sufficient supply of the necessary equipment to assure that Appellants and other wind generators can meet this arbitrary deadline. Because of this shortage situation, compliance with the December 31, 2010 deadline in PRR 830 is not technically feasible as required by PURA §39.904(l).

For the reasons set out above, Appellants respectfully request that the Commission suspend the application of PRR 830 until after the issuance of a final order in this proceeding. If the Commission ultimately upholds PRR 830, Appellants further request that the Commission extend the compliance deadline to at least one year after the Commission's decision to allow time for implementation of the standard.

XI. EVIDENTIARY HEARING

In order to assure that this matter is finally determined by May 31, 2010, Appellants hereby request that the Commission schedule this matter for an evidentiary hearing to resolve factual disputes between the parties. Pursuant to P.U.C. PROC. R. 22.251(l), the Commission is required to resolve these factual determinations on a *de novo* basis, without any deference to the action taken by the ERCOT Board. Because this proceeding involves important policy issues for the Commission and is not an enforcement matter, the Commissioners have discretion to hear this matter themselves rather than referring the case to the State Office of Administrative Hearings and Appellants request that the Commission hear the case. Even though it is requesting an evidentiary hearing at this point, Appellants are willing to attempt to negotiate an agreed stipulation of facts with ERCOT so that this matter can be resolved without the need for an evidentiary hearing, but the prospects of reaching such an agreement appear remote.

In addition to the facts necessary for suspension of PRR 830, an evidentiary hearing is needed to address at least the following issues:

1. Did ERCOT permit wind generation resources to interconnect to the ERCOT grid knowing that they provided the triangle reactive power configuration?

2. What information and documentation does ERCOT have discussing the interpretation of the rectangle requirement prior to 2008?

3. Were any ERCOT personnel on ERCOT Staff at the time advising that the triangle configuration was the requirement?

4. Did ERCOT perform a study to identify reliability issues, if any, with wind generation providing reactive power in the triangle configuration?

5. Did ERCOT Staff perform a study or develop data showing that requiring additional reactive power capability from existing wind generators would improve system reliability?
6. Is the "rectangle" considered the industry norm for wind generators outside of ERCOT's Protocol Interpretation and adoption of PRR 830?
7. Do ERCOT's, TSPs' and wind generators' conduct since 2004 support ERCOT's Protocol Interpretation and position that PRR 830 clarified the Protocols?
8. What harm would existing generators face from implementation of PRR 830?
9. What is the cost and feasibility retrofitting existing wind generators to meet the PRR 830 requirements?
10. Is the rectangle requirement the most efficient way to address any reliability issue with the triangle, if any, identified as part of a reactive power study?

XII. REQUEST FOR EXPEDITED RELIEF

By its own terms, the retrofit requirement does not become effective until December 31, 2010. While that may seem a long time, Appellants and other wind generators will need a significant amount of time to bring their existing facilities into compliance with the new reactive power requirements. Additionally, during the time the facilities are being retrofitted, the generating units will need to be shut down and will be unable to provide electricity to the ERCOT market. Shutting down the units would cause them to be unavailable during the prime wind generating months of the year, which would likely lead to increased prices in the ERCOT market. Accordingly, Appellants request that the Commission expedite its decision in this matter so that wind developers will have sufficient time within which to comply with the Commission's decision.

XIII. MOTION FOR CONSOLIDATION

Appellants reasonably believe that other wind generators are intending to file appeals of PRR 830. Appellants anticipate that such appeals largely will involve common questions of law and fact and that consolidation of all such appeals would serve the interest of efficiency by allowing the Commission to address all issues related to PRR 830 in a single proceeding rather than in multiple proceedings. Any issues that may be related only to particular generators or to particular claims could be addressed in separate, detailed findings and conclusions as part of the overall decision. Accordingly, Appellants request that all other appeals concerning PRR 830 be consolidated with this docket pursuant to P.U.C. PROC. R. 22.34(a).

XIV. REQUEST FOR GOOD CAUSE WAIVER OF PAGE LIMITATIONS FOR FILING PURSUANT TO P.U.C. PROC. R. 22.72(F)

Appellants respectfully request a waiver of the fifty page limitation for filing as set forth in P.U.C. Proc. R. 22.72(f). P.U.C. Proc. R. 22.251(d)(1)(H) requires that a sworn record be filed consisting of the evidence complained of which may also contain other items pertinent to the issues or points presented for review along with affidavits or other evidence on which Appellants rely. The record of these issues is quite extensive. The transcript from the ERCOT Board meeting alone exceeds the fifty page limitation contemplated in P.U.C. Proc. R. 22.72(f) and coupled with the appeal itself as set forth herein and the other documents that meet the standard required by P.U.C. Proc. R. 22.251(d)(1)(H), well exceed the page limitation. In order to meet the standard set forth in P.U.C. Proc. R. 22.251(d)(1)(H), Appellants request a good cause waiver of P.U.C. Proc. R. 22.72(f).

XV. RELIEF REQUESTED

Appellants respectfully request that the Commission suspend the application of PRR 830 during this proceeding; conduct an expedited hearing to consider this appeal; and, following the hearing, enter an order repealing PRR 830.

WHEREFORE, PREMISES CONSIDERED, Appellants respectfully request that the Commission issue an order granting the relief sought in this Appeal, and that Appellants be awarded all other and further relief to which it is entitled.

Respectfully Submitted,

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ATTORNEYS FOR
APPELLANTS

Certificate of Service

I hereby certify that on the 22nd day of December, 2009, a true and correct copy of the above and foregoing was delivered by first-class mail or fax to the entities identified in this pleading.

Patrick J. Sullivan

PUC DOCKET NO. ____

HORIZON WIND ENERGY LLC,	§	**BEFORE THE**
SWEETWATER WIND 1, LLC,	§	
SWEETWATER WIND 2, LLC,	§	**PUBLIC UTILITY COMMISSION**
SWEETWATER WIND 3, LLC,	§	
SWEETWATER WIND 4, LLC,	§	**OF TEXAS**
SWEETWATER WIND 5, LLC,	§	
	§	
AND SILVER STAR I POWER PARTNERS, LLC'S APPEAL AND COMPLAINT CONCERNING THE ERCOT BOARD'S ADOPTION OF PRR 830, DENIAL OF NEXTERA'S APPEAL AND REQUEST FOR EXPEDITEDRELATED RELIEF	§ § § § § § §	

AFFIDAVIT OF BRIAN HAYES

1. My name is Brian Hayes. I am the Director of Asset Management for Horizon Wind Energy ("Horizon"), 808 Travis Street, Suite 700, Houston, Texas 77002. I am testifying in this proceeding on behalf of Horizon.

2. This Appendix A is attached to the above-styled appeal and is made a part thereof for all purposes.

3. I hereby swear and affirm that the information contained in the above-styled appeal is are true and correct to the best of my knowledge and belief. I am also sponsoring the Exhibits attached thereto.

Brian Hayes

Subscribed and sworn before me this 21st day of December, 2009.

EXPIRES JAN. 12, 2

Notary Public

PUC DOCKET NO. _____

HORIZON WIND ENERGY LLC,	§	**BEFORE THE**
SWEETWATER WIND 1, LLC,	§	
SWEETWATER WIND 2, LLC,	§	**PUBLIC UTILITY COMMISSION**
SWEETWATER WIND 3, LLC,	§	
SWEETWATER WIND 4, LLC,	§	**OF TEXAS**
SWEETWATER WIND 5, LLC,	§	
	§	
AND SILVER STAR I POWER PARTNERS, LLC'S APPEAL AND COMPLAINT CONCERNING THE ERCOT BOARD'S ADOPTION OF PRR 830, DENIAL OF NEXTERA'S APPEAL AND REQUEST FOR EXPEDITEDRELATED RELIEF	§ § § § § § §	

AFFIDAVIT OF LANE ROBINSON

1. My name is Lane Robinson. I am the Regulatory Manager for Sweetwater Wind 1, LLC, Sweetwater Wind 2, LLC, Sweetwater Wind 3, LLC, Sweetwater Wind 4, LLC, and Sweetwater Wind 5, LLC (the "Sweetwater Projects"), 5307 Mockingbird Lane, 7th Floor, Dallas, Texas 75206. I am testifying in this proceeding on behalf of the Sweetwater Projects.

2. This Appendix A is attached to the above-styled appeal and is made a part thereof for all purposes.

3. I hereby swear and affirm that the information contained in the above-styled appeal is true and correct to the best of my knowledge and belief.

Lane Robinson

Lane Robinson

Subscribed and sworn before me this 21st day of December, 2009.

SUSAN C. LIEN
MY COMMISSION EXPIRES
February 19, 2010

Notary Public

PUC DOCKET NO. ________

HORIZON WIND ENERGY LLC,	§	**BEFORE THE**
SWEETWATER WIND 1, LLC,	§	
SWEETWATER WIND 2, LLC,	§	**PUBLIC UTILITY COMMISSION**
SWEETWATER WIND 3, LLC,	§	
SWEETWATER WIND 4, LLC,	§	**OF TEXAS**
SWEETWATER WIND 5, LLC AND	§	
SILVER STAR I POWER	§	
PARTNERS, LLC'S APPEAL AND	§	
COMPLAINT CONCERNING THE	§	
ERCOT BOARD'S ADOPTION OF	§	
PRR 830, DENIAL OF NEXTERA'S	§	
APPEAL AND REQUEST FOR	§	
EXPEDITEDRELATED RELIEF	§	
	§	

AFFIDAVIT OF JAMES C. HOLLY

1. My name is James C. Holly. I am the President of Silver Star I Power Partners, LLC ("Silver Star I"), 700 Louisiana, 33rd Floor, Houston, Texas 77002. I am testifying in this proceeding on behalf of Silver Star I.

2. This Appendix A is attached to the above-styled appeal and is made a part thereof for all purposes.

3. I hereby swear and affirm that the information contained in the above-styled appeal as related to Silver Star I is true and correct to the best of my knowledge and belief.

James C. Holly

Subscribed and sworn before me this 22nd day of December, 2009.

PAULINE TATTERSFIELD
Notary Public, State of Texas
My Commission Expires
February 08, 2012

Notary Public

P.U.C. DOCKET NO. 37823

HORIZON WIND ENERGY LLC,	§	**BEFORE THE**
SWEETWATER WIND 1, LLC,	§	
SWEETWATER WIND 2, LLC,	§	**PUBLIC UTILITY COMMISSION**
SWEETWATER WIND 3, LLC,	§	
SWEETWATER WIND 4, LLC,	§	**OF TEXAS**
SWEETWATER WIND 5, LLC, AND	§	
SILVER STAR I POWER	§	
PARTNERS, LLC'S APPEAL AND	§	
COMPLAINT CONCERNING THE	§	
ERCOT BOARD'S ADOPTION OF	§	
PRR 830, DENIAL OF NEXTERA'S	§	
APPEAL AND REQUEST FOR	§	
RELATED RELIEF	§	

RECORD FOR ORIGINAL APPEAL AND COMPLAINT CONCERNING THE ERCOT BOARD'S ADOPTION OF PRR 830 AND DENIAL OF NEXTERA'S APPEAL AND RELATED REQUESTS FOR WAIVER OF ADR REQUIREMENTS, SUSPENSION OF PRR 830, EXPEDITED ACTION AND COMMISSION HEARING

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AFFIDAVIT OF PATRICK SULLIVAN IN SUPPORT OF CERTAIN EVIDENCE

Before me, the undersigned authority, appeared Patrick J. Sullivan who upon his oath did depose and state as follows:

1. Background and Qualification. My name is Patrick J. Sullivan. I am over the age of twenty one, of sound mind and am fully competent to testify. I have never been convicted of a crime of moral turpitude. I am currently counsel for Horizon Wind Energy ("Horizon"), 808 Travis Street, Suite 700, Houston, Texas 77002. I have personal knowledge of how the materials contained in this record were obtained (the "Materials").
2. The Materials are from Appropriate Sources. I have reviewed the attached Materials. I hereby swear and affirm that these materials are true and correct copies of the relevant portions of the underlying documents and were obtained from appropriate sources as follows:

Material	**Source of Material**
Public Utility Regulatory Act Provisions	TEX. UTIL. CODE ANN. §§11.001 – 66.017 (Vernon 2009)
Public Utility Commission of Texas ("PUCT") Substantive Rules	http://www.puc.state.tx.us/rules/subrules/electric/index.cfm
PUCT Procedural Rules	http://www.puc.state.tx.us/rules/procrules/index.cfm
Federal Energy Regulatory Commission ("FERC") Order 661 and 661A	*Interconnection for Wind Energy*, Order No. 661, FERC Stats. & Regs. ¶ 31,186 (2005), *order on reh'g*, Order No. 661-A, FERC Stats. & Regs. ¶ 31, 198 (2005).
Documents prepared by the Electric Reliability Council of Texas, Inc. ("ERCOT") or provided to ERCOT as part of an ERCOT proceeding	Obtained from ERCOT's website, http://www.ercot.com/ or from e-mails from ERCOT employees.
Transcript of the November 5, 2009 ERCOT Board Meeting	Kennedy Reporting Service, Inc., Cambridge Tower, 1801 Lavaca Street, Suite 115, Austin, Texas 78701.

FURTHER, AFFIANT SAYETH NOT.

Dated this 22nd day of December, 2009.

Patrick J. Sullivan
Texas State Bar No. 19488600
Haynes and Boone, L.L.P.
600 Congress Ave., Suite 1300
Austin, Texas 78701-3285

SUBSCRIBED AND SWORN to before me on this 22nd day of December, 2009.

SUSAN C. LIEN
MY COMMISSION EXPIRES
February 19, 2010

NOTARY PUBLIC FOR THE STATE OF TEXAS

Certificate of Service

I hereby certify that on the 22nd day of December, 2009, a true and correct copy of the above and foregoing was delivered by first-class mail or fax to the entities identified in this pleading.

Patrick J. Sullivan

PRR 830 as presented to the ERCOT Board

Board Action Report

PRR Number	830	**PRR Title**	**Reactive Power Capability Requirement**
Timeline	Urgent	**Action**	Approved
Date of Decision	November 17, 2009		
Effective Date	December 1, 2009		
Priority and Rank Assigned	Not applicable.		
Protocol Section(s) Requiring Revision	2.1, Definitions 2.2, Acronyms 6.5.7, Voltage Support Service 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability 6.7.6, Deployment of Voltage Support Service		
Revision Description	This Protocol Revision Request (PRR) clarifies the Reactive Power capability requirement for all Generation Resources, including existing Wind-powered Generation Resources (WGRs) who are not able to meet the 0.95 lead/lag requirement with the Generation Resource's Unit Reactive Limit (URL). WGRs that commenced operation on or after February 17, 2004, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before December 1, 2009 may meet the Reactive Power requirements through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices.		
Reason for Revision	Clarification of Reactive Power capability requirements on a going-forward basis and path to compliance for certain WGRs that are not able to meet the 0.95 lead/lag requirement at the Point of Interconnection (POI) based on the Generation Resource's URL.		
Overall Market Benefit	Provides additional clarity to the reactive requirements for wind generation.		
Overall Market Impact	Unknown.		
Consumer Impact	None.		
Credit Impacts	ERCOT Credit Staff and the Credit Work Group (Credit WG) have reviewed PRR830 and do not believe that it requires changes to credit monitoring activity or the calculation of liability.		
Relevance to Nodal Market	Yes. The Reactive Power capability requirements exist in Nodal as well.		

Board Action Report

Nodal Protocol Sections Requiring Revision	2.1, Definitions 2.2, Acronyms and Abbreviations 3.15, Voltage Support 6.5.7.7, Voltage Support Service
Procedural History	➢ On 9/08/09, PRR830, a preliminary Impact Analysis, and CEO Revision Request Review were posted. ➢ On 9/10/09, PRR830 was granted Urgent status via a PRS e-mail vote. ➢ On 9/15/09, Horizon Wind Energy LLC comments were posted. ➢ On 9/17/09, PRS considered PRR830. ➢ On 9/28/09, Calpine comments were posted. ➢ On 10/7/09, Iberdrola Renewables comments were posted. ➢ On 10/8/09, a second set of Horizon Wind Energy LLC comments were posted. ➢ On 10/8/09, LCRA comments were posted. ➢ On 10/19/09, ROS comments were posted. ➢ On 10/21/09, Wind Coalition comments were posted. ➢ On 10/22/09, Vestas comments were posted. ➢ On 10/22/09, PRS again considered PRR830. ➢ On 10/22/09, NextEra Energy Resources comments were posted. ➢ On 10/26/09, the Impact Analysis was posted. ➢ On 10/28/09, a second set of Calpine comments were posted. ➢ On 10/29/09, Oncor comments were posted. ➢ On 10/29/09, ERCOT comments were posted. ➢ On 10/30/09, AEP comments were posted. ➢ On 11/2/09, Invenergy comments were posted. ➢ On 11/3/09, a second set NextEra Energy Resources comments were posted. ➢ On 11/3/09, a third set of Horizon Wind Energy LLC comments were posted. ➢ On 11/4/09, a second set of Vestas comments were posted. ➢ On 11/5/09, TAC considered PRR830. ➢ On 11/6/09, the NextEra Energy Resources appeal was posted. ➢ On 11/10/09, the NextEra Energy Resources appeal supporting documents were posted. ➢ On 11/10/09, a second set of AEP comments were posted. ➢ On 11/10/09, AES comments were posted. ➢ On 11/10/09, the Horizon position statement was posted. ➢ On 11/10/09, a second set of ONCOR comments were posted. ➢ On 11/10/09, the TAC Advocate position statement was posted. ➢ On 11/10/09, an ERCOT ISO position statement was posted. ➢ On 11/10/09, the TAC Advocate supporting document was posted. ➢ On 11/10/09, a second set of Wind Coalition comments were

	posted. ➢ On 11/17/09, RES America Developments comments were posted. ➢ On 11/17/09, a second set of AES comments were posted. ➢ On 11/17/09, the ERCOT Board considered PRR830. ➢ On 11/20/09, the NextEra Energy Resources ERCOT Board presentation was posted.
PRS Decision	On 9/17/09, PRS unanimously voted to table PRR830 for one month and to encourage ROS to provide comments on PRR830. All Market Segments were present for the vote. On 10/22/09, PRS voted to recommend approval of PRR830 as endorsed by ROS. The motion passed via roll call vote. All Market Segments were present for the vote.
Summary of PRS Discussion	On 9/17/09, there was discussion regarding the appeal currently at the Public Utility Commission of Texas (PUCT) which stemmed from an ERCOT interpretation of the current Protocols regarding Reactive Power. It was debated whether or not the proposed content of PRR830 was being addressed in the contested case. On 10/22/09, ERCOT Staff explained that PRR830 is not intended to change the philosophy of the Protocols. ERCOT Staff also provided clarification of the proposed change to the WGR definition, and noted that dynamic devices will be required going forward, but that existing WGRs can meet the requirement with static devices. There was also discussion regarding the use of the "cone" versus the "rectangle" for Reactive Power capability and that having differing requirements makes planning difficult and may pose fairness and grid stability issues. Some Market Participants expressed concerns that requirements of PRR830 would impose costs to retrofit existing units and that studies should be performed to demonstrate need.
TAC Decision	On 11/5/09, TAC voted to recommend approval of PRR830 as recommended by PRS in the 10/22/09 PRS Recommendation Report and as amended by the 10/29/09 ERCOT comments. All Market Segments were present for the vote.
Summary of TAC Discussion	On 11/5/09, TAC reviewed PRR830 comments. A Market Participant proposed including language that allowed a hybrid solution to meet Reactive Power capability requirements. ERCOT Staff explained that paragraph (6) of Section 6.5.7.1 allows Market Participants to submit alternative proposals to ERCOT for meeting the requirement, which could include a hybrid solution. Some Market Participants opined that changing the definition of WGR would have repercussions not only where "WGR" is used in the Protocols or market guides, but could also create complications in instances where the terms "generator," "Resource," or "unit" are

	used. ERCOT Staff contended that the definition change is needed in order to ensure that ERCOT has an accurate representation of each WGR's Reactive Power capability. Questions were raised regarding ERCOT's acceptance of the "triangle" that was provided in the Resource Asset Registration Forms (RARFs). ERCOT Staff explained that the RARFs should provide an accurate representation of what a unit is physically capable of doing and should not be taken as a substitute for the requirements in the Protocols, which require the "rectangle". Some Market Participants expressed concern regarding retrofits to existing units. It was stated that in the past, most rules that would impose cost on existing units were implemented on a prospective basis unless there was a demonstrated need, and it was argued that at this point, there has been no evidence provided indicating that there is a need to retrofit. Others countered that if generators are not operating in the "rectangle" as the current system was designed that it is a reliability issue versus a cost issue since the risk of a voltage collapse increases as you increase capacity not operating within the "rectangle."
Board Decision	On 11/17/09, the ERCOT Board approved PRR830 as recommended by TAC in the 11/5/09 TAC Recommendation Report and rejected the NextEra Energy Resources appeal.

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

	4	

Sponsor	
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Market Segment	N/A

Market Rules Staff Contact	
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Comments Received

Comment Author	Comment Summary
Horizon Wind Energy LLC 091509	Recommended that PRR830 be rejected as submitted.
Calpine 092809	Supported approval of PRR830.
Iberdrola Renewables 100709	Suggested existing Protocol language is clear. Proposed additional revisions only as an alternative to the ERCOT proposed changes.
Horizon Wind Energy LLC 100809	Opined that PRR830 is contrary to existing Protocols, and is proposed without demonstration of need. Commented that PRR830 re-defines Reactive Power capability requirements for Generation Resources interconnected with the ERCOT Transmission Grid, imposing new requirements on WGRs and requiring retrofits to the majority of operating WGRs.
LCRA 100809	Proposed clarifying language which would allow Resources to start at lower voltage levels. Also proposed changes related to establishing Reactive Power requirements.
ROS 101909	Endorsed PRR830 as submitted.
Wind Coalition 102109	Provided alternative language to the definition of a WGR and the subsequent changes that are intended to improve the modeling of wind-powered generation reactive capabilities.
Vestas 102209	Stated that if PRR830 is adopted as proposed, it may unnecessarily increase the costs of WGRs in Texas with no improvements in reliability. Suggested that hybrid systems that have the effective

	performance of a fully dynamic system should be allowed.
NextEra Energy Resources102209	Recommended that PRS reject PRR830 and instead recommended that PRR835 be approved.
Calpine 102809	Responded to NextEra's 10/22/09 comments and supported ERCOT's efforts to maintain system reliability and the fairness found in PRR830.
Oncor 102909	Supported ERCOT's efforts to maintain system reliability with PRR830.
ERCOT 102909	Provided comments to support the need for the WGR definition change. Also proposed additional language changes which revised the effective date in both the Revision Description and in paragraph (2) of Section 6.5.7.1 to December 1, 2009 and provided administrative edits and clarification to proposed language revisions.
AEP 103009	Supported the passage of PRR830.
Invenergy 110209	Proposed the addition of paragraph (12) to Section 6.5.7.1 to clarify the requirements and approximated the treatment afforded to other types of Generation Resources that have multiple turbines behind the same POI such as combined cycle units
NextEra Energy Resources 110309	Incorporated concepts and specific amendments proposed in comments submitted by LCRA (10/08/09), The Wind Coalition (10/21/09), ERCOT (10/29/09), and Invenergy (11/02/09). Also proposed additional language changes that utilized the "rectangle" requirement for all technologies as proposed by ERCOT.
Horizon Wind Energy 110309	Recommended that PRR830 be rejected.
Vestas 110409	Provided additional language changes so that dynamic VAR capable devices would include hybrid devices and would be considered as an acceptable alternative to meet ERCOT's Reactive Power interconnection requirement.
NextEra Energy Resources 110609	Appealed the TAC action of recommending approval of PRR830. Opined that TAC erred in its decision with respect to technical concerns raised but not resolved in the proposed language and that PRR830 contradicts previous ERCOT Board policy on imposing new technical capabilities on existing Resources.
NextEra Energy Resources 111009	Opined that PRR830 does not meet the ERCOT policy standard for retroactive application of technical capabilities; that further examination of technical issues is needed; that PRR830 does not maximize Consumer benefit; that Protocols can only be revised and not clarified; that the Alternative Dispute Resolution (ADR) process should not be circumvented; and that the NextEra proposal would address issues prospectively while allowing the PUCT to interpret Protocols retrospectively. Provided additional supporting documents for position.
AEP 111009	Stated support for TAC recommendation and provided examples for AEP's belief that the ERCOT Transmission Grid has significant Reactive Power deficiency that is directly correlated to WGRs.

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

Resources 112009	retroactively is bad policy and a bad precedent. Suggested the following were myths: 1) reliability requires PRR830 and 2) PRR830 is nothing new.

Revised Proposed Protocol Language

2.1 Definitions

Point of Interconnection (POI)
The location(s) where a Generation Entity's interconnection Facilities connect~~s~~ 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~~Generator Step Up (GSU) ~~T~~transformer~~ (GSU)~~.

2.2 Acronyms

POI	Point of Interconnection
GSU	~~Generation~~Generator 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 ~~to~~ at the same ~~transmission bus~~Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

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

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

~~(2)~~ Generation Resources ~~required to provide VSS except as noted below in items (3) or (4),~~ shall ~~have and maintain a URL which~~ comply with the following Reactive Power requirements: ~~has~~ an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ERCOT ~~t~~Transmission ~~g~~Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the ~~point of interconnection~~POI ~~to the TDSP~~. The Reactive Power requirements shall be available at all MW output levels and may be met through a combination of the Generation Resource's Unit Reactive Limit (URL), which is the generating unit's dynamic leading and lagging operating capability, and/or dynamic VAR capable devices. For Wind-powered Generation Resources (WGRs), the Reactive Power requirements shall be available at all MW output levels at or above 10 percent (10%) of the WGR's nameplate capacity. When a WGR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT may require a WGR to 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~~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 ~~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, 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~~Reactive Power requirements established in paragraph (1) above, will be required to maintain a ~~URL~~ Reactive Power requirement as defined by the Generation Resource's URL that was submitted to ERCOT and

established per the ~~is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and~~ criteria ~~described~~ in the Operating Guides.

(5) ~~Upon request to, and with the approval of ERCOT, multiple generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these URL requirements only.~~For purposes of meeting the Reactive Power requirements in paragraphs (1) and (2) above, multiple generation units including wind turbines shall, at a Generation Entity's option, be treated as a single Generation Resource or WGR if the units are connected to the same transmission bus.

(6) ~~Upon submission by a~~ Generation ~~Resource~~ Entities ~~required to provide VSS~~may submit to ERCOT ~~of a~~ specific proposals ~~for requirements~~ to ~~substitute for these URL~~meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices.~~,~~ ERCOT ~~shall~~ may, at its sole discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall ~~such alternative requirements or~~ provide the submitter an explanation of its ~~objections to the proposal~~decision. ~~Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements.~~

(7) ~~An induction generator may elect to make a contribution in aide of construction in lieu of meeting the installed capacity VSS requirements contained herein. In order to comply with the VSS requirements under this paragraph (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to that used to collect payments for the direct assignment of interconnection Facilities under applicable Public Utility Commission of Texas (PUCT) rules. The level of payment shall reflect the cost to the TDSP of procuring, installing, operating, and maintaining any Reactive Power equipment required to replace the Reactive Power capability that otherwise would be necessary for the interconnection of the generator. In order for this paragraph (7) to be effective for VSS compliance, the TDSP shall certify to ERCOT that the induction generator has complied with these requirements.~~ A Generation Resource and 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) ~~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 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 th~~ese~~ requirements of paragraph (10) by no later than ~~six (6) months after the effective date of this paragraph~~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 M~~m~~egavolt-A~~a~~mperes R~~r~~eactive (MVAR), nor will they be requested to operate on a voltage schedule outside the ~~Unit Reactive Limits (~~URL~~)~~ specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

(2) ERCOT and ~~Transmission and/or Distribution Service Providers (~~TDSPs~~)~~ shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, ~~step-up~~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 ~~r~~Reactive Power capability requirements.

(4) All Generation Resources required to provide VSS shall ~~maintain~~support the transmission voltage at the ~~point of interconnection~~POI to the ERCOT ~~t~~Transmission ~~g~~Grid, or at the

transmission bus in accordance with paragraph (5) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

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

(~~6~~5) The QSEs providing V~~oltage Support Servic~~SSe shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

Reactive Power Protocol provisions pre-PRR 830

ERCOT Protocols
Section 6: Ancillary Services

November 1, 2009

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

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

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

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

(a) Each Resource receiving an RPRS Dispatch Instruction;

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

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

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

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

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

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

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

(a) Local Congestion;

(b) Zonal Congestion; and

(c) System capacity.

6.5.7 Voltage Support Service

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

6.5.7.1 Generation Resources Required to Provide VSS Installed Reactive Capability

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

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

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

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

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

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

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

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

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

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

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

6.5.7.2 QSE Responsibilities

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

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

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

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

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

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

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

Resources. Requests arising within the context of this subsection may not result in the operation of a Generation Resource outside of the specified reactive operating range. Accordingly, Generation Resources are expected to voluntarily comply with these requests. Nothing in this subsection is meant to supersede ERCOT's Dispatch authority in the event of emergency operations.

6.5.7.3 ERCOT Responsibilities

(1) ERCOT, in coordination with the TDSPs, shall establish, and update as necessary, Voltage Profiles at points of interconnection of Generation Resources required to provide VSS to maintain system voltages within established limits.

(2) ERCOT shall communicate to the QSE and the TDSPs the desired voltage at the point of generation interconnection by providing Voltage Profiles.

(3) ERCOT, in coordination with the TDSPs, shall deploy static Reactive Power Resources as required to continuously maintain dynamic Reactive Reserves from QSEs, both leading and lagging, adequate to meet ERCOT System requirements.

(4) For any Market Participant's failure to meet the Reactive Power voltage control requirements of these Protocols, ERCOT shall notify the Market Participant in writing of such failure and, upon a request from the Market Participant, explain whether and why the failure must be corrected.

(5) ERCOT shall notify all affected TDSPs of any alternative requirements it approves pursuant to Section 5.2.1, Standards and Practices.

6.5.8 Black Start Service

(1) Providers of Black Start Service shall meet the requirements specified in NERC policy and Operating Guides.

(2) Each Resource providing Black Start Service must meet technical requirements specified in Section 6.10, Ancillary Service Qualification, Testing and Performance Standards.

(3) Beginning in 2009, ERCOT will request bids from Generation Resource Entities for the provision of Black Start Service. Such bids shall be due on or before June 1 of each two (2) year period. Bids will be evaluated based on evaluation criteria attached as an appendix to the request for bids and contracted by December 31 for the following two (2) year period. ERCOT shall ensure Black Start Services are arranged, provided, and deployed as necessary to reenergize the ERCOT System following a total or partial system blackout.

(4) ERCOT shall schedule random testing or simulation, or both, to verify Black Start Service is operable according to the ERCOT System restoration plan. Testing and verification will be in accordance with established qualification criteria.

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

6.7.5 Deployment of Replacement Reserve Service

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

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

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

6.7.6 Deployment of Voltage Support Service

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

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

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

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

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

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

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

6.7.7 Deployment of Out-of-Merit Energy Service

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

6.7.7.1 Deployment of Fleet/Zonal OOME

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

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

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

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

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

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

ERCOT's Protocol Interpretation

Seely, Chad

From: ERCOT Client Relations
Sent: Thursday, November 13, 2008 5:36 PM
To: 'notice_legal@lists.ercot.com'
Cc: 1 ERCOT Client Service Reps
Subject: M-D111308-01 Protocol Interpretation Request on Reactive Power Capability Requirements

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), <u>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</u>, 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.

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

Attachment A

Seely, Chad

From: ERCOT Client Relations
Sent: Monday, June 01, 2009 4:37 PM
To: notice_legal@lists.ercot.com
Cc: 1 ERCOT Client Service Reps; 'notice_general@lists.ercot.com'
Subject: M-D111308-02 Withdrawal of November 13, 2008 Protocol Clarification/Interpretation on Reactive Power Capability Requirements Due to Procedural Deficiency
Attachments: M-D111308-01 Protocol Interpretation Request on Reactive Power Capability Requirements

NOTICE DATE: June 1, 2009

NOTICE TYPE: M-D111308-02 Legal Notification

SHORT DESCRIPTION: Withdrawal of November 13, 2008 Protocol Clarification/Interpretation on Reactive Power Capability Requirements Due to Procedural Deficiency

INTENDED AUDIENCE: ERCOT Market Participants

DAY AFFECTED: Not Applicable

LONG DESCRIPTION: On November 13, 2008, ERCOT issued a Protocol Clarification/Interpretation (attached) 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, surrounding Reactive Power capability requirements.

Since that time, ERCOT has discovered that it failed to follow the full procedural requirements in P.U.C. Substantive Rule 25.503(i), Official Interpretation and Clarification Regarding the Protocols, before issuing its November 13, 2008 Protocol Clarification/Interpretation on Reactive Power capability requirements. Specifically, P.U.C. Substantive Rule 25.503(i)(3) requires that ERCOT consult with Public Utility Commission of Texas (PUCT) Staff before issuing an official Protocol Clarification/Interpretation. ERCOT Staff neglected to consult with PUCT Staff prior to the issuance of the Protocol Clarification/Interpretation. As such, ERCOT withdraws the November 13, 2008 Protocol Clarification/Interpretation on this ***limited procedural issue***. ERCOT's opinion of the ERCOT Protocol Reactive Power capability requirements is unchanged.

ERCOT has informed the submitter of the Protocol Clarification/Interpretation Request (PIR) of the procedural deficiency in the November 13, 2008 Protocol Clarification/Interpretation. If the submitter continues to request an official Protocol Clarification/Interpretation, then ERCOT will follow the full procedural requirements in P.U.C. Substantive Rule 25.503(i) before issuing any further Protocol Clarification/Interpretation on this issue.

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.

ad

FERC Orders 661 and 661-A

111 FERC ¶ 61,353
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

18 CFR Part 35

(Docket No. RM05-4-000 – Order No. 661)

Interconnection for Wind Energy

(Issued June 2, 2005)

AGENCY: Federal Energy Regulatory Commission.

ACTION: Final Rule

SUMMARY: The Federal Energy Regulatory Commission (Commission) is amending its regulations to require public utilities to append to their standard large generator interconnection procedures and large generator interconnection agreements in their open access transmission tariffs (OATTs) standard procedures and technical requirements for the interconnection of large wind generation.

EFFECTIVE DATE: This final rule will become effective **[INSERT DATE 60 DAYS FROM THE DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

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SUPPLEMENTARY INFORMATION

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

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

ORDER NO. 661

FINAL RULE

(Issued June 2, 2005)

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111 FERC ¶ 61,353
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

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

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

ORDER NO. 661

FINAL RULE

(Issued June 2, 2005)

1. In this Final Rule, to meet our responsibility under sections 205 and 206 of the Federal Power Act (FPA)[1] to remedy undue discrimination, the Commission adopts standard procedures and technical requirements for the interconnection of large wind plants. The Commission requires all public utilities that own, control, or operate facilities for transmitting electric energy in interstate commerce to append to the Large Generator Interconnection Procedures (LGIPs) and Large Generator Interconnection Agreements (LGIAs) in their Open Access Transmission Tariffs (OATTs) the Final Rule Appendix G adopted here. These standard technical requirements provide just and reasonable terms for the interconnection of wind plants.[2] The rule recognizes the technical differences of

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[1] 16 U.S.C. §§ 824d-e (2000).

[2] As discussed in greater detail below, the Final Rule Appendix G applies only to wind plants, due to the unique characteristics of wind generating technology.

standard proposed in that figure and adopted here is close to the standard used in other countries and was presented to the Commission by representatives of the wind industry as an achievable requirement. Several commenters, including Transmission Providers, support the standard as one that would safeguard reliability. The Western Electricity Coordinating Council (WECC), a regional reliability council, has approved a similar low voltage ride-through standard. The standard we adopt in this Final Rule is an international standard that has been accepted for use by the Alberta Electric System Operator and Germany, and was developed following detailed study. We do not believe it would be appropriate to deviate from such a widely-accepted and achievable standard in this rulemaking.

37. We are not convinced of a need for a separate high voltage ride-through standard for wind generators. The record developed here does not indicate that this is a general concern across the country. Parties that believe a high voltage ride-through standard is required should ask NERC or the regional reliability councils to address this need. A Transmission Provider may seek to justify variations from Appendix G to establish these requirements under the variation provisions of Order No. 2003 and its rehearing order, as briefly summarized below in section III.G, "Variations from the Final Rule."

B. Power Factor Design Criteria (Reactive Power)

38. The Commission stated in the NOPR that until recently, Transmission Providers did not require wind generators to have the capability to provide reactive power because the generators were generally small and had little effect on the transmission grid.

However, because of the larger size of many of the wind plants being built and the increased presence of wind energy on various transmission systems, the Commission proposed to require wind plants to operate within a specified power factor range to help balance the reactive power needs of the transmission system.

39. Specifically, the NOPR proposed to require that large wind plants maintain a power factor within the range of 0.95 leading to 0.95 lagging (as required by Order No. 2003), to be measured at the high voltage side of the wind plant substation transformer.[26] In Appendix G of the NOPR, we further proposed to allow wind plants flexibility in how they meet the power factor requirement; for example, using either power electronics designed to supply this level of reactive capability, fixed and switched capacitors if agreed to by the Transmission Provider, or a combination of the two.[27] Additionally, the NOPR proposed to allow the Transmission Provider to waive the power factor requirement for wind plants where it is not needed at that location or for a generating facility of that size, provided that such waiver is not unduly discriminatory (that is, is offered on a comparable basis to similarly situated wind plants). The NOPR stated, however, that if the Transmission Provider waived the power factor requirement, the

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[26] This proposed measurement point is different from Order No. 2003, which measures the power factor at the Point of Interconnection.

[27] 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.

interconnection agreement would be considered a non-conforming agreement under section 11.3 of the LGIP and thus would have to be filed with the Commission. The NOPR also proposed to require that wind plants have the capability to provide sufficient dynamic (as opposed to static) voltage support to interconnect to the transmission system, if the System Impact Study shows that dynamic capability is necessary for system reliability.[28]

40. The NOPR sought comments about whether the proposed power factor range should be increased or decreased for wind generating plants. It also sought comments as to whether any dynamic (i.e., controllable) reactive capability should be required of wind plants, and if so, how much. Finally, the NOPR sought comments on the proposed waiver provision.

41. The comments received fall into several categories, including the general application of a power factor requirement to wind plants and the waiver provisions, the power factor range and operation within that range, measurement of the power factor requirement at the point of interconnection, and whether dynamic reactive power capability should be a requirement. These subcategories are separately addressed below.

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[28] NOPR at P 18.

1. Comments – Power Factor Range and General Application of the Requirement

42. Western, NERC, BPA and Great River support the proposed power factor range of 0.95 leading to 0.95 lagging (hereinafter stated as +/- 0.95). Southern California Edison agrees that the proposed power factor range is appropriate unless it is waived by the Transmission Provider.

43. Numerous other commenters state that they support the standard, but that the Transmission Provider should be allowed to impose a wider power factor range on a wind generating plant to maintain the reliability of the transmission system. American Superconductor, for instance, believes that the +/- 0.95 power factor range should be adopted as a standard except in cases where the Transmission Provider's System Impact Study indicates that additional reactive support is needed. Similarly, EEI asserts that the wind plant should operate within the +/- 0.95 power factor range unless the Transmission Provider has established a different standard that applies to all generators in its control area. New York PSC agrees with the NOPR power factor range, but argues that the Transmission Provider should be able to require a power factor of 0.90 lagging if the System Impact Study indicates it is needed for system reliability. FirstEnergy and American Transmission believe that to ensure a greater level of reliability, the Commission should adopt a power factor range of 0.90 lagging to 0.95 leading. NRECA-APPA maintains that while most Transmission Providers impose the +/- 0.95 power factor requirement on conventional generators, some impose a larger range, such

as 0.90 lagging to 0.95 leading, to meet reliability criteria. In that situation, they contend that the Transmission Provider should be allowed to impose that same wider power factor range on wind generating plants. In similar comments, NYISO urges the Commission to (1) consider the power factor standard a minimum requirement, as opposed to a maximum, and (2) find that the large wind farms should not be able to depend on the transmission system interconnection for the plants' excitation power.

44. NRECA-APPA and Xcel also state that the standard is unclear about whether the wind generator can operate anywhere in the +/- 0.95 range. Xcel asks that the Commission clarify whether the wind generator is expected to operate over the entire +/- 0.95 power factor range or at a specified point within that range.

45. Several commenters assert that the adherence to the Transmission Provider's voltage schedule is more important than merely maintaining a power factor within the specified range. NRECA-APPA asks that the wind plant be required to comply with the Transmission Provider’s voltage schedule directives. PacifiCorp/PPM Energy asks the Commission to revise the proposed power factor standard to require the Transmission provider to specify a power factor or voltage control set point within the 0.95 leading to 0.95 lagging range. PacifCorp/PPM Energy also contends that the parenthetical in the proposed Appendix G (stating “taking into account any limitations due to voltage level, real power output, etc.”) is ambiguous and should be eliminated.

46. AWEA argues that we should specify the minimum real power output of the wind facility at which the +/- 0.95 power factor range would apply. It states that to be clear

about the limits of this standard, the reactive power output criteria should use a minimum real power output set at greater than 10 percent of the rated output of the generator. FPL Energy states that General Electric wind turbines cannot meet the proposed power factor standard over the full range of real power output, and that dynamic VAR control (DVAR) banks or static capacitors would have to be installed at an additional expense to meet the proposed power factor over the entire range. FPL Energy asserts that such costs would provide limited reliability benefits.

47. Zilkha, FirstEnergy, NorthWestern Energy, and BPA indicate that the Transmission Provider should be allowed to waive the power factor requirement where it is not required. NUSCo, ISO New England and Midwest ISO TOs oppose allowing such a waiver. Midwest ISO TOs argue that if the Commission allows waiver, it should require that, where the Transmission Provider granting the waiver is not also the owner, the Transmission Owner approve the waiver. AWEA asserts that the proposed requirement that an interconnection agreement be filed with the Commission as a non-conforming agreement if the Transmission Provider has waived the reactive power requirement is inappropriate and inconsistent with Order No. 2003-A.

48. AWEA and FPL Energy ask that the +/- 0.95 power factor standard not be required of a wind plant unless the Transmission Provider shows that it is needed for system safety or reliability. FPL Energy states that the Transmission Provider should have the burden of demonstrating that the reactive power standard is needed. It suggests that the Commission use the same test it used in the NOPR for dynamic voltage support,

which requires that the Transmission Provider, before requiring such capability, must show that it is necessary for system reliability. The CPUC recommends a "least cost, best fit" approach to dealing with the reactive power requirement needs of wind farms.

49. Southern California Edison states that because reactive power at wind generating plants may be produced from devices external to the generator, a time delay may be necessary to allow for switching of reactive resources to enable the wind generator to operate at the appropriate power factor within the +/- 0.95 power factor range. It states, however, that exempting the wind generating plant altogether from the power factor requirement is inappropriate.

2. Commission Conclusion - Power Factor Range and General Application of the Requirement

50. We adopt the power factor range of +/- 0.95 for large wind generating plants. We modify other parts of the proposed requirements. First, this Final Rule requires the wind plant to maintain the required power factor range only if the Transmission Provider shows, through the System Impact Study, that such capability is required of that plant to ensure safety or reliability. This differs from the NOPR, which required the wind plant to maintain the required power factor in all cases, except if the Transmission Provider waived or deferred compliance with the reactive power standard. 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 a lack of standards, and thus will limit opportunities

for undue discrimination. This uniform standard ensures that wind developers, when they seek to interconnect, are not faced with widely varying standards in different areas, or for different wind technologies, manufacturers, or plant owners. This should remove unnecessary obstacles to the increased growth of wind generation. Furthermore, ensuring that a large wind plant provides reactive support to the transmission grid if needed will ensure that safety and reliability is protected.

51. Specifically, the Commission revises the proposed power factor standard to require that the wind plant maintain the required power factor only on a case-by-case basis if the Transmission Provider, in the System Impact Study, shows that it is necessary to ensure safety or reliability. The reactive power standard adopted here properly requires the Transmission Provider to show that reactive power capability is needed for each wind plant Interconnection Customer. As we noted with regard to low voltage ride-through capability, because the Transmission Provider is responsible for the safe and reliable operation of its transmission system (pursuant to NERC and regional reliability council standards), it is in the best position to establish if reactive power is needed in individual circumstances. The System Impact Study is the appropriate study for assessing the need for reactive power capability, and this study should determine if there is a need for a wind plant to have reactive power capability to ensure that the safety or reliability of the system is maintained. Also, as we reasoned above with regard to low voltage ride-through, requiring wind plants to maintain the required power factor only if the System Impact Study shows it to be necessary ensures that the increased reliance on

wind plants does not degrade system safety or reliability. It 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. Should a wind plant Interconnection Customer disagree with the Transmission Provider that the System Impact Study shows that the power factor requirement is needed, it may challenge the Transmission Provider's conclusion through dispute resolution or appeal to the Commission.

52. Given our decision to require that a wind plant maintain the power factor standard only on a case-by-case basis where the Transmission Provider shows, through the System Impact Study, that reactive power is needed to ensure reliability, there is no need to retain the waiver provisions proposed in the NOPR. As a result, issues raised by commenters regarding the waiver provisions are moot.

53. We clarify that the wind generating plant, if required to provide reactive power capability as described above, should be able to operate anywhere in the +/- 0.95 power factor range.

54. We reject proposals to change the power factor range standard in Appendix G to 0.90 lagging to 0.95 leading. Adopting such a standard would make the power factor requirement more onerous for wind plants than for conventional generators. Concerning

NYISO's request that the Commission consider the standard as a minimum requirement as opposed to a maximum, as we declined to do so in Order No. 2003, we decline to do so here for the same reasons.

55. In response to those who assert that adherence to the voltage schedule is more important than merely maintaining a power factor within the specified range, we note that article 9.6.2 of the LGIA already requires that the "Interconnection Customer . . . . operate the Large Generating Facility to maintain the specified output voltage or power factor at the Point of Interconnection." This language applies to wind plants and addresses this concern.

56. We disagree with PacifiCorp/PPM Energy that the parenthetical statement in the NOPR, "taking into account any limitations due to voltage level, real power output ...," is ambiguous and unnecessary. AWEA explains that the stated power factor range cannot be accomplished by all equipment vendors at all levels of output, and asks that the wind plant be held to the +/- 0.95 power factor range only when it is generating above 10 percent of its rated output. The parenthetical statement is necessary due to the technical differences of wind plants, which cannot meet the power factor standard below certain levels of output, and addresses the concern raised by the wind industry.

57. We disagree with the CPUC's recommendation of a "least cost, best fit" approach. Such a "standard" is not a standard at all. Adopting such a least cost approach would result in widely varying "standards" for wind turbines and related equipment. This would not only open the door further for the undue discrimination that this rule is designed to

eliminate, but also would lead to high cost individualized generator designs by equipment manufacturers that would not serve the long-term needs of the wind industry.

3. Comments - Point of Interconnection

58. In the NOPR, the Commission proposed to measure the required power factor at the high side of the wind plant substation transformers, as opposed to the Point of Interconnection measurement point used in Order No. 2003. Numerous commenters, including NUSCo, Southern, National Grid, PacifiCorp/PPM Energy, and Southern California Edison request that the power factor be measured at the Point of Interconnection, as opposed to at the high voltage side of the wind plant substation transformer. FPL Energy notes that while meeting the power factor requirement at the Point of Interconnection may be more costly for wind plants that have long generation tie lines, reliability requirements will not be met by measuring the power factor at a different point. AWEA states that the appropriate point of measurement is either at the Point of Interconnection or at the high side of the wind plant's transformer, depending upon the particular electrical circumstances. It adds that the point of measurement should be determined based on the Transmission Provider's System Impact Study.

4. Commission Conclusion - Point of Interconnection

59. We adopt the Point of Interconnection as the appropriate measurement point for the power factor standard. We agree that adopting the Point of Interconnection as the measurement point will better protect system reliability because it is closer to the bulk electrical power system, and will be consistent with Order No. 2003. In addition,

numerous Transmission Providers and wind energy developers including PPM Energy and FPL Energy endorse establishing the point of measurement at the Point of Interconnection, instead of the high side of the substation transformers, as proposed in the NOPR. Moreover, FPL Energy supports this measurement point, even though it may be more costly for plants with long generation tie lines, because it is necessary for system safety and reliability.

5. Comments - Dynamic Reactive Power Capability

60. The Commission proposed in the NOPR to require wind plants to be able to provide sufficient dynamic voltage support if the System Impact Study shows that it is needed to maintain system reliability. Several commenters assert that wind generators should have dynamic reactive capability for the entire power factor range, and that dynamic reactive capability must be required in every instance. Midwest ISO TOs assert that the System Impact Study may show that no such capability is needed at the time of the study, but the need may arise later. They contend that at a minimum, a wind plant should not degrade the transient under-voltage performance of the transmission system at the Point of Interconnection.

61. Midwest ISO points to language from NERC standards[29] and argues that the need for dynamic reactive power capability cannot be determined by the System Impact Study because it is almost impossible to conceive of every possible disturbance scenario ahead of time. AEP argues that dynamic reactive capability must be required and that the specific level of dynamic capability should be determined on a need basis. ISO New England states that the wind plant's rate of response for dynamic voltage control should be comparable to that provided by a conventional synchronous generator using an automatic voltage regulator.

62. FirstEnergy and FPL Energy ask the Commission to clarify what it meant by the term "sufficient dynamic voltage support." It claims that the term "sufficient" is vague and requires clarification. Similarly, FPL Energy contends that the term "sufficient" is ambiguous, and should be clarified or removed from the Final Rule.

63. Further, FPL Energy notes that only one wind turbine manufacturer currently holds the patent for the variable speed wind turbine electronics that allow the turbine to produce dynamic reactive power. According to FPL Energy, the Commission, as a

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[29] Specifically, Midwest ISO cites the following language: "Dynamic reactive power support and voltage control are essential during power system disturbances. Synchronous generators, synchronous condensers, and static var compensators (SVCs and STATCOMs) can provide dynamic support." See Comments of Midwest ISO at 5-6, citing NERC Planning Standard I. D., System Adequacy and Security – Voltage Support and Reactive Power, approved by the NERC Board of Trustees on September 16, 1997.

matter of public policy, should consider whether it is appropriate to set a power factor standard that will give one turbine manufacturer a significant competitive advantage.

64. American Superconductor argues that based on its experience of integrating wind generating plants into transmission systems, it is not always necessary to install dynamic capability for all of the reactive compensation required at a wind generating plant. It reports that all eight of the reactive compensation systems it has provided to wind generating plants used a combination of dynamic and static reactive capability. These hybrid systems consist of a small STATCOM device (with full dynamic capability)[30] that controls a number of switched shunt capacitors or reactors. They have proven to be very sound technically, as well as good economic choices, according to American Superconductor. It asks the Commission to recognize that the benefits of dynamic reactive capability can be achieved, often at substantially lower cost, by such systems.

65. NorthWestern Energy argues that dynamic reactive capability should not be required if the wind developer demonstrates that the wind generating plant will not cause voltage fluctuations greater than the "Border Line of Irritation," as identified in Section 10.5.1 of the IEEE's Standard 519, measured at the Point of Interconnection. The wind developer should also demonstrate that its addition will not diminish the rating of an

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[30] A Static Compensator (STATCOM) provides voltage support to the electric system in a manner similar to a synchronous condenser and therefore is superior to Static VAR compensators or switched capacitor banks. Hybrid systems consist of a small STATCOM device and a number of switched capacitors or reactors.

existing transmission line by reducing reactive voltage support, according to NorthWestern Energy. It agrees that wind generators should be allowed to use a combination of fixed and/or switched capacitors and reactors in combination with dynamic capability to control the voltage. It states that dynamic capability would allow for the smooth switching of these devices, as well as the energizing and de-energizing of the wind turbines, without affecting the quality of power delivered to customers.

6. Commission Conclusion – Dynamic Reactive Power Capability

66. The Commission adopts the language in the NOPR regarding dynamic reactive power capability. The Final Rule Appendix G, as explained above, requires that a wind plant have reactive power capability if the Transmission Provider shows, in the System Impact Study, that it is needed for safety or reliability. The Final Rule does not require that the reactive power capability installed by the wind plant be dynamic unless the System Impact Study also shows that this type of capability is needed for system reliability. We are not convinced that dynamic reactive capability is needed in every case, and we permit the Transmission Provider to make that determination on a case-by-case basis through the System Impact Study. We believe that the Transmission Provider is best situated to determine in the first instance whether dynamic reactive capability is needed, and what level of dynamic capability is necessary. We emphasize, however, that Transmission Providers must assess the need for dynamic reactive power capability on a comparable and not unduly discriminatory basis.

67. We reject requests that the Final Rule require that the reactive capability possessed by the wind plant be dynamic in every case. We conclude that the Transmission Provider's System Impact Study should show that dynamic reactive capability is needed in a particular case. If the wind plant Interconnection Customer disagrees with the Transmission Provider that the System Impact Study shows that dynamic reactive power capability is needed, it may challenge the Transmission Provider's conclusion through dispute resolution or appeal to the Commission. We disagree with Midwest ISO TOs that a System Impact Study can account only for the need of the dynamic reactive capability on the day of the study; the study should be able to make reasonable assumptions about future days.

68. We disagree with FirstEnergy and FPL Energy that the term "sufficient" requires clarification. The Final Rule allows the Transmission Provider to determine the sufficient level of dynamic reactive capability on a case-by-case basis through the System Impact Study. As noted above, if the wind plant Interconnection Customer disagrees with the Transmission Provider's determination, it may challenge the Transmission Provider's conclusion through dispute resolution or appeal to the Commission.

69. We acknowledge that dynamic reactive capability can be achieved, often at substantially lower cost, by systems with a combination of true dynamic capability plus switched shunt capacitors and reactors. The Final Rule Appendix G gives wind plants the flexibility to use a variety of combinations to provide the reactive capability necessary.

70. In response to FPL Energy's concern regarding wind turbine supply competition, we note that the wind turbine industry is highly competitive and that manufacturers are continually improving their designs. Although one manufacturer may have a competitive advantage right now, other manufacturers have indicated that they can rapidly improve their designs as required. Also, no manufacturer took exception to the Commission's proposed requirements. Furthermore, as described in detail below, there will be a transition period before the Appendix G standards will apply.

C. Supervisory Control and Data Acquisition Capability

71. We noted in the NOPR that in the past, Transmission Providers generally did not require wind generators to have remote supervisory control and data acquisition (SCADA) capability because of their small size and minimal effects on the transmission system. Many Transmission Providers now argue that with the increasing number of large wind plants connecting to transmission systems, SCADA capability is needed to acquire wind facility operating data and ensure the safety and reliability of the transmission system during normal, system emergency, and system contingency conditions.

72. The NOPR proposed to require that a large wind plant seeking to interconnect to the transmission grid possess SCADA capability to transmit data and receive instructions from the Transmission Provider. Additionally, Appendix G would have required that the Transmission Provider and the wind plant owner determine the type of SCADA information and equipment that is essential for the proposed wind plant, taking into

of section 251 of the Small Business Regulatory Enforcement Fairness Act of 1996.[54] The Commission will submit the Final Rule to both houses of Congress and the General Accountability Office.[55]

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

Electric power rates; Electric utilities.

By the Commission.

Linda Mitry,
Deputy Secretary.

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[54] See 5 U.S.C. 804(2) (2000).

[55] See 5 U.S.C. 801(a) (1) (A) (2000).

113 FERC ¶ 61,254
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

18 CFR Part 35

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

Interconnection for Wind Energy

(Issued December 12, 2005)

AGENCY: Federal Energy Regulatory Commission

ACTION: Order on Rehearing and Clarification

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

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

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SUPPLEMENTARY INFORMATION:

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

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

Interconnection for Wind Energy Docket No. RM05-4-001

ORDER NO. 661-A

ORDER ON REHEARING AND CLARIFICATION

(Issued December 12, 2005)

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

I. Background

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

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

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

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

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

B. Power Factor (Reactive Power) Provisions

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

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

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

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

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

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

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

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

Commission Conclusion

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

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[24] Final Rule at P 51.

[25] Id.

[26] Id.

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

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

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

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

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

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

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

2. Specific Power Factor Standard

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

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

49. NRECA/APPA also expresses concern that the phrase "taking into account any limitations due to voltage level, real power output, etc." in the power factor requirements section of Appendix G could create operational problems for Transmission Providers

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

with wind plants on their systems. Specifically, it is concerned that this language could exempt wind plants from their reactive power requirements during startup and low output periods, which could degrade reliability during a system contingency.

Commission Conclusion

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

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[28] Final Rule at P 109.

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

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

3. Point of Measurement of Power Factor

53. National Grid asks that if the Commission adopts the recommended revisions to the low voltage ride-through provisions filed jointly by AWEA and NERC, it clarify that

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[29] Id. at P 55.

[30] Id. at P 56.

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

Electric power rates; Electric utilities.

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

(S E A L)

Magalie R. Salas,
Secretary.

Generation Interconnection or Change Request Procedure provisions

ERCOT
TEXAS CONNECTION

GENERATION INTERCONNECTION OR CHANGE REQUEST PROCEDURE

August, 2004

ERCOT
System Planning, Transmission Services
2705 West Lake Drive
Taylor, Texas 76574-2136
Main Office Phone (512) 248-3000

PURPOSE

The primary purpose of this procedure is to facilitate the interconnection of new and changes to existing generating units/plants to/in the Electric Reliability Council of Texas, Inc. (ERCOT) transmission system. Through the review of all interconnection or change requests, the following objectives will be accomplished:

- **a) Identify electric system security concerns with interconnecting new or changed generation**
- **b) Increase communications between the Generating Entity (GE), Power Generation Company (PGC), Transmission Service Providers (TSP) and ERCOT**
- **c) Provide information on future capacity additions for use in reviewing projected total ERCOT capability, demand and reserve**
- **d) Provide accurate/appropriate data to help identify possible future transmission constraints, maintain reliability of the ERCOT System and propose related transmission projects**

INTRODUCTION

A GE or PGC requesting transmission interconnection for new generation, adding additional generating capacity (more than 10 MW within a year) at an existing plant or changing the connection of an existing plant must submit an application to ERCOT. The application shall include information necessary to allow timely development, design, and implementation of electric system enhancements needed to serve the generation entity requirements. The information must include sufficient detail for use in establishing transfer capabilities, operating limits (including stability) and planning margins to provide both reliability and operating efficiency, designing future system facility additions, and facilitating coordinated planning. Applicable ERCOT and North American Electric Reliability Council (NERC) standards, protocols, guides and/or procedures for accurate system representation and modeling shall be followed.

The Public Utility Commission of Texas (PUCT) Substantive Rules (§25.191) require a TSP to build facilities to interconnect a new generating plant. The rules indicate that the interconnection planning will include transmission line interconnection and grid upgrades. The TSPs shall provide transmission service including the construction of the transmission line and upgrading the transmission grid within reasonable efforts considering economics and good utility practice.

The building of interconnection facilities and/or grid upgrades may or may not require a Certificate of Convenience and Necessity (CCN), depending upon the circumstances specific to the individual project, and are addressed in the appropriate sections of the PUCT rules. The generation owner should identify expected markets, and ERCOT along with the TSPs would identify known transmission constraints that impair the generator's ability to reach those markets (without employing the congestion management system). In many instances, additional transmission lines may be needed to enable the generator to reach the desired markets. When ERCOT identifies specific transmission expansions that will facilitate the competitive market while mitigating constraints, ERCOT will develop proposed transmission additions using the ERCOT Power System Planning Charter and Processes. ERCOT's evaluation of need in the regional planning process is important, but the PUCT (via the CCN process) will ultimately decide whether the transmission line should be built.

Both new transmission line construction and some line reconstruction require the approval of the PUCT, granted in the form of a CCN. The present PUCT rules allow the PUCT up to 12 months for processing a CCN. The need to use a consultant to route future transmission lines and the TSP to hold public meetings also adds around 12 months to the time required to certificate and build a new transmission line. In most new transmission projects, the acquisition of right-of-way and construction will take 10 to 18 months after a CCN is granted by the PUCT. Therefore, if the GE or PGC desires full transfer capability when generation is first available for transfer to the grid, **it is recommended that firm commitments be made by the GE or PGC at least three years ahead of required in-service dates for the related transmission line projects. Moreover, the GE or PGC should recognize that some projects might require commitments four to eight years in advance of system needs.**

STUDY TIME TABLE

Every interconnection may be different and unique to the particular project. A timetable for studies will be developed and included in the study scope. Major improvements to the transmission system resulting from interconnection requests should be identified early in the process so project validity can be considered before going ahead with extensive studies. Adjustments to the completion date of review may be necessary for the study scope. If adjustments are necessary for the study scope, ERCOT shall provide notice as soon as practicable to both the GE and the TSP indicating the revised expected completion date. Some of these procedures may be done in parallel with others; for example, in some cases, the Facilities Study can be initiated upon completion of the Steady State Study, although the results of the Short Circuit Study and Stability Study may change the scope of the study. The TSP and the GE are encouraged to optimize the process to reduce the time necessary for the studies. The timely completion of all studies is dependent upon the availability of relevant data and appropriate study assumptions. The GE should ensure that ERCOT and the TSPs performing the studies receive all required data in order to establish study models that provide meaningful results and recommendations for interconnection.

Sample Study Time Table (calendar days):

Security Screening Study – ERCOT Staff	
Review of Request, Fee and Acknowledgement	1 to 7 days
Performs Steady State Security Screening Study	3 to 90 days
GE or PGC Agrees to Proceed, Model Fee, Deposit and Proof of Site Control Received	**180-day time limit after completion of Security Screening Study**
Full Interconnection Study – TSPs and ERCOT Staff	
Notify and Set Up Meeting	1 to 14 days
Propose Study Scope (at or after meeting)	1 to 14 days
Complete Study Scope and Sign Study Agreement	**60-day time limit to go forward**
Perform Full Interconnection Study	
Steady State & Transfer Analysis Study	10 to 90 days
System Protection Analysis	10 to 30 days, **after Steady State Study**
Dynamics Analysis	10 to 90 days, **after System Protection**
Facilities Study	10 to 90 days
Study Report Review	5 to 15 days after completion of study
Complete Interconnection Agreement with TSP	**180-day time limit after completion of Full Interconnect Study**
Typical Time	**90 to 270 days**
Total Range of Possible Time	**52 to 440 days**

FEE SCHEDULE

ERCOT Security Screening Study and Full Interconnection Study Fees are charged to entities filing generation interconnection requests to add new or additional generation capacity to the ERCOT System. These fees are based on the total plant capacity associated with the request because the capacity determines the amount of work necessary to complete the study. The ERCOT Security Screening Study fee is a nonrefundable fee and ranges from $1,000 to $5,000 per study as shown below. Generation Interconnection Requests are for each individual interconnection location, in-service date, and total plant capacity at this interconnection location.

ERCOT Security Screening Study Fee

Total Capacity	**Fee**
10 MW to 74 MW	$1,000 Not Refundable
75 MW to 149 MW	$2,000 Not Refundable
150 MW to 249 MW	$3,000 Not Refundable
250 MW to 499 MW	$4,000 Not Refundable
500 MW and above	$5,000 Not Refundable

The ERCOT Full Interconnection Study Fee consists of two parts. The first part of the fee is a charge of $15 per megawatt of total capacity (nonrefundable) which is used to develop stability models for generation units and to continually update the current models as new equipment changes are made. Providing this modeling fee to ERCOT **does not release** the GE or PGC from the obligation to provide accurate/appropriate stability models and data (including load) for their plant.

The second part of the fee is a deposit of $15,000 or $30,000 based upon total plant capacity, from which ERCOT will fund the study. Any unused portion of the deposit will be returned. The TSP will invoice the GE or PGC for any additional work that is necessary and creates charges exceeding the amount of the deposit, and ERCOT will refund any portion of the deposit not used to perform the study.

Both fees along with proof of site control must be received at ERCOT within 180 days after completion of the security screening study before a full interconnection study is started.

ERCOT Full Interconnection Study Fees

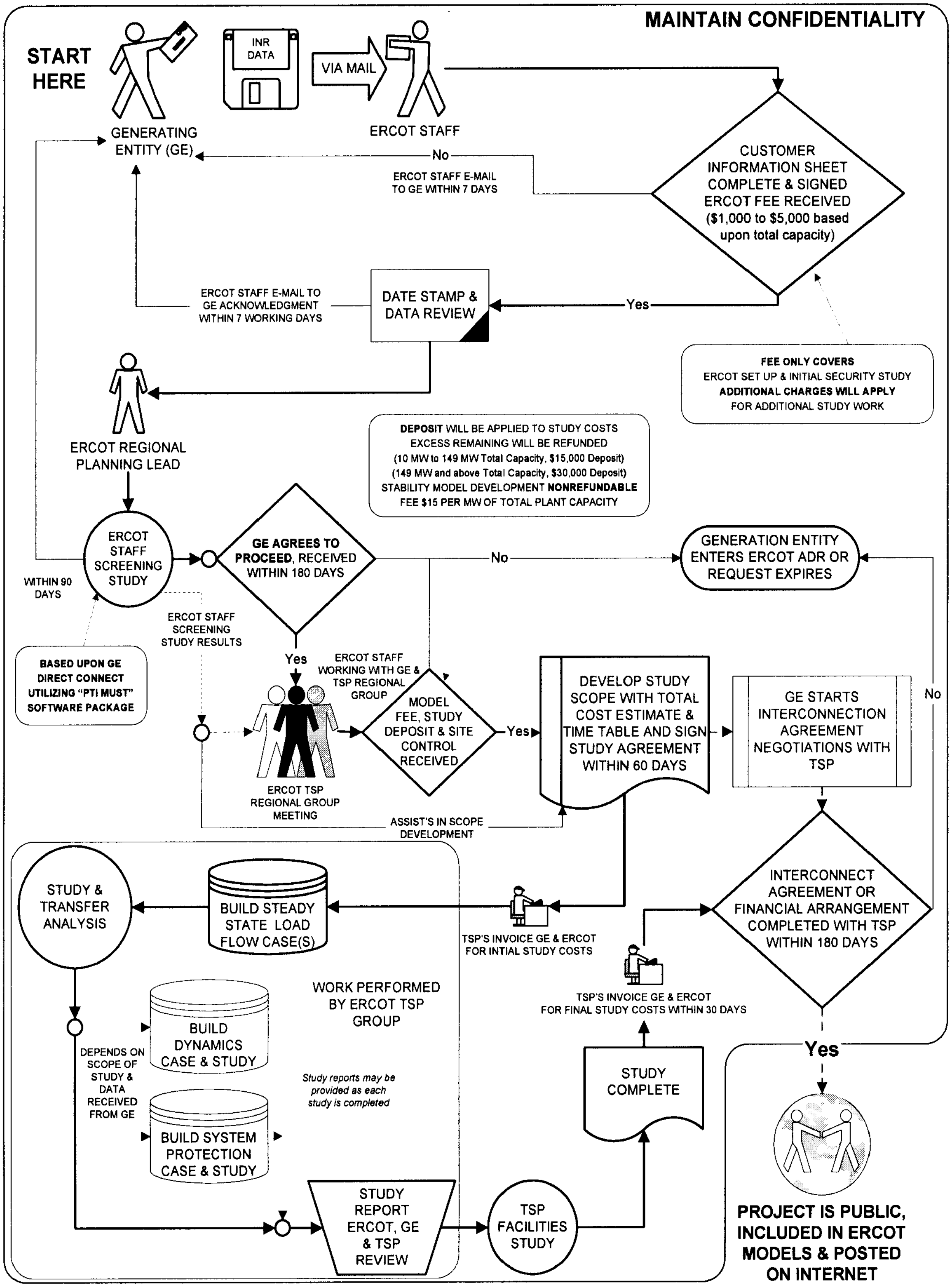
Total Capacity	**Fee**
10 MW to 149 MW	$15 per MW of total capacity, not refundable $15,000 deposit
150 MW and above	$15 per MW of total capacity, not refundable $30,000 deposit

INTERCONNECTION AGREEMENTS

ERCOT is the proper place to submit the request for generation interconnection. However, the negotiation of an interconnection agreement shall be conducted directly between the GE and TSP. ERCOT does not arrange interconnection agreements.

Municipals and/or coops developing generation projects do not require interconnection agreements to connect to their transmission systems. Generation interconnection requests will remain confidential until an interconnection agreement or financial agreement for transmission construction is completed with a transmission owner. An official letter from a municipal utility or electric cooperative will also serve as a public commitment. At that time, the generation project will be regarded as a confirmed project and will be posted on the ERCOT Internet website along with copies of generation interconnection impact studies and related proposed transmission projects.

ERCOT Generation Interconnection Process



ERCOT AND TSP PROCESS

After receiving an interconnection request and the associated security screening study fee (reference "Fee Schedule" in document) and preliminary data, ERCOT will date stamp the request. This date stamp is not a reservation of transmission capacity. ERCOT will acknowledge the request via email and notify the GE or PGC of missing data for the security screening study within seven days. ERCOT staff will then perform a steady state security screening study (including power flow and transfer studies) in the in-service year to determine the feasibility of the site for interconnection selected by the GE or PGC. This study will indicate the level at which the generator can expect to operate simultaneously with other known generation in the area before significant transmission additions may be required.

Based upon the security screening study, ERCOT will make a preliminary estimate of future transmission additions needed to effect full transfer of the new generation. This information will be presented to the GE or PGC requesting interconnection or change to the total output capability. ERCOT will also inform the GE or PGC about any basic system additions required for security and reliability. Based on this information, the GE or PGC can decide whether it wants to request interconnection or withdraw the application. If the GE or PGC decides to go forward at the named site, ERCOT will then initiate a full interconnection study in coordination with the transmission service providers in the appropriate regional planning group.

Unless ERCOT receives notice from the GE or PGC of its decision to go forward with the proposed project, ERCOT will not initiate a full interconnection study. Such notice must be received by ERCOT within 180 days after completion of the security screening study. If such notice is not received within 180 days, the request for interconnection will be considered cancelled and no longer valid. If the GE or PGC wishes to proceed after 180 days, they must begin the process again starting with a new security screening study.

When notice is received from the GE or PGC to go forward with a full interconnection study, ERCOT will schedule a meeting with the study group made up of only ERCOT Staff and TSPs in the respective Regional Planning Group. At this meeting, the project will be presented and general discussion of the study required will be proposed with general timelines. Deposit and cost requirements will also be determined at this meeting.

All TSPs within the appropriate regional planning group shall be part of the study group usually with the primary interconnecting TSP as facilitator of the study. All studies, data and related information shall be communicated to this whole group and ERCOT in performance of this work. The TSPs are most aware of the actual physical circumstances in the project area that can support or counter the interconnection or change in generation. The assistance of more than one TSP may be required in areas where transmission facilities are provided by multiple entities. ERCOT will maintain the lead role in this study and may include additional steady state, transient stability, system protection and facilities analysis.

Before a full interconnection study starts, the GE or PGC must submit to ERCOT the model fee (Reference "Fee Schedule" in document), deposit (if needed) and proof of site control. The GE or PGC must demonstrate proof of site control and maintain control of the site on which the generator is to be constructed. The applicant must demonstrate, through an affiliated company, through a trustee or directly in its name that: (a) it is the owner in fee simple of the real property to be utilized by the facilities for which new interconnection is sought; or (b) that it holds a valid written leasehold interest in the real property to be utilized by the facilities for which new interconnection is sought; or (c) that it holds a valid written option to purchase or obtain a leasehold interest in the real property to be utilized by the facilities for which new interconnection is sought; or (d) that it holds a duly executed written contract to purchase or obtain a leasehold interest in the real property to be utilized by the facilities for which new interconnection is sought. Site control must be maintained throughout the duration of the study until the establishment of an Interconnection Agreement. Otherwise, the request for interconnection will be deemed withdrawn as of the date of loss of site control, unless the applicant can show within 30 days that it has re-established site control or has established control of a new site which would not result in the material modification of any study requested under these procedures.

The model fee is $15 per megawatt of total capacity, nonrefundable, and is used to develop stability models for generation units and to continually update the current models as new equipment changes are made. Provision of this modeling fee to ERCOT **does not release** the GE or PGC from the obligation to provide accurate/appropriate stability models and data (including load) for their plant.

The deposit will be applied toward study costs. The TSP will invoice the GE or PGC for any study costs exceeding the amount of the deposit, and it will refund any remaining funds not used to perform in the study.

The GE or PGC and TSPs must complete (reach agreement on) the study scope within 60 days after the full interconnection study meeting. The agreement shall include assumptions, timetable, study cost estimate(s) and determination of requirements for interconnection. If the GE or PGC does not agree to a study scope within 60 days, the request for interconnection will be considered cancelled and no longer valid. If the GE or PGC wishes to proceed after such a cancellation, they must begin the process again starting with a new security screening study. The study scope developed may be minimal, very detailed or a phased study. The ERCOT security screening study and other preliminary studies provided by the GE or PGC shall be considered when developing the study scope. These studies may reduce the work and/or the time necessary for the full interconnection studies. The full interconnection study can be phased/separated in several sections with notice to proceed from the GE required for each section. This can limit the GE's costs if the project is not viable at the selected location.

The generation entity requesting interconnection is responsible for all costs of the full interconnection study. The study deposit (if needed) will be used to make payments to the TSPs. TSP costs greater than the deposit amount should be directly billed to the GE. A payment methodology and cancellation provision should be included in the full interconnection study agreement. If the GE or PGC cancels the generating project during the study, they are required to immediately notify ERCOT and all the TSPs in the study group. **The GE or PGC is responsible for all costs associated with any work performed or non-cancelable commitments made prior to the termination date.**

When the full interconnection study is completed, the GE and study group shall examine the results and append any comments within ten working days. The final study report shall be provided to the GE and all TSPs in the study group. When an interconnection agreement is completed or a financial arrangement with a TSP for transmission construction is effected within 180 days of completion of the full interconnection study, the project will be regarded as a confirmed project.

If the GE or PGC does not complete an interconnection agreement or a financial arrangement with a TSP for transmission construction is not completed within 180 days after the full interconnection study, the request for interconnection will be considered cancelled and no longer valid. If the GE wishes to proceed after the request has been deemed invalid, it must begin the process again starting with a new security screening study.

Generation interconnection requests will remain confidential until an interconnection agreement with a TSP or financial agreement for transmission construction is completed. An official letter from a municipal utility or electric cooperative will also serve as a public commitment. At that time, the generation project will be regarded as a confirmed project and will be posted on the ERCOT Internet website along with copies of generation interconnection impact studies and related proposed transmission projects.

GENERATION PLANT DESCRIPTION & DATA REQUIREMENTS

The acquisition of data to realistically simulate the electrical behavior of system components is a fundamental requirement for the development of a reliable interconnected transmission system, accurate studies, the prevention of outages and protection of generation equipment. Therefore, the GE or PGC is required to submit specific information regarding the electrical characteristics of their proposed facilities with their request. Failure to supply the required data will result in delay of the study, and may adversely influence reliability or result in damage to generation equipment. Ongoing data updates and reviews are necessary throughout the service life of the plant.

The most current facility data or expected performance data should be submitted to ERCOT with the initial study request. Data submitted for stability models shall be compatible with ERCOT standard models (Shaw/PTI PSS/E and Powertech Labs Inc TSAT, VSAT and SSAT). If there is no compatible model(s), the GE or PGC is required to work with a consultant and/or software vendor to develop and supply accurate/appropriate models along with associated data. It is recommended that generation owners and developers encourage manufacturers and software vendors to work together to develop/maintain these important models. ERCOT recommends wind generation owners and/or developers join the modeling efforts of the Utility Wind Interest Group (UWIG, www.uwig.org).

Prior to start of construction, the GE or PGC shall inform ERCOT and TSP of any significant design changes in the generators or main power transformers to ensure compatibility with the transmission system.

Prior to commercial operation of a facility, the GE or PGC shall supplement the initial data submissions with any and all as-built facility data or as-tested performance data which differs from the initial submissions or, alternatively, written confirmation that no such differences exist.

Subsequent to commercial operation of a new facility and during continuing operation of existing facilities, the GE shall provide ERCOT and the TSP with any data changes made appropriate by equipment replacement, repair, or adjustment. The GE shall provide such data not later than 60 days after the date of the actual change in equipment characteristics. This requirement also applies to all future owners of a project/plant throughout the service life of the plant.

Each request should include the following information or best estimate about the generating facility when submitting a request to ERCOT.

- ✓ REQUIRED FOR SECURITY SCREENING STUDY
  - Signed Generation Entity Information Sheet (included with procedure)
  - Generation Summary (MS Excel Workbook)
- ✓ REQUIRED FOR FULL INTERCONNECTION STUDY
  - Any and All Updates to the Data Above
  - Detailed Generation Information - By Unit For Each Unit
  - Generator Data For Transient Stability Studies – By Unit For Each Unit
  - Electrical network drawing including all transformers, capacitors and electrical equipment
  - Generator Step-Up Or Unit Main Power Transformer(s) Data

- ✓ REQUIRED BY COMMERCIAL OPERATION DATE AND WHENEVER CHANGES ARE MADE
    - 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.

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: ______________________________

Operating Guide provisions

ERCOT OPERATING GUIDES

Section 1: Introduction

Market Overview, Change Control, Relationships and Definitions

June 1, 2004

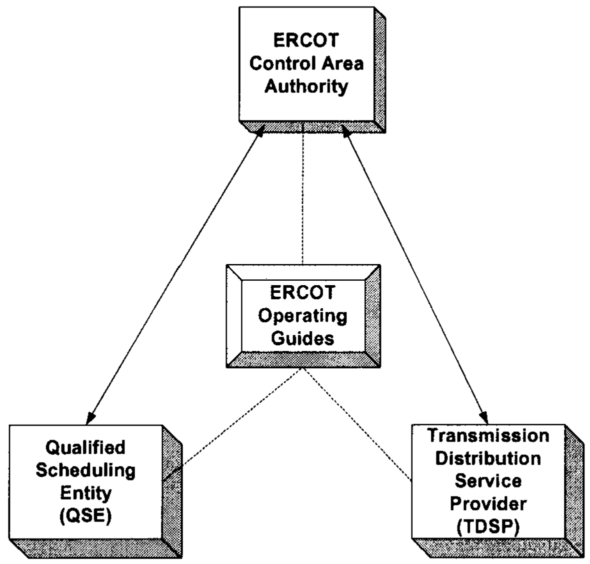
Contents

Protocol References

1. Introduction

1.1 Document Purpose

These Electric Reliability Council of Texas (ERCOT) Operating Guides supplement the Protocols and describe the working relationship between the ERCOT Control Area Authority and entities within the ERCOT System that interact with the ERCOT Control Area Authority on a minute-to-minute basis to ensure the reliability and security of the ERCOT System, as shown in the following diagram:



System Operating Guide Relationship

Specific practices described in these Guides for the ERCOT System are consistent with the North American Electric Reliability Council Operating Policies and the ERCOT Protocols and consist of the following Guides:

Section 1 - Introduction

Section 2 - System Operations

Section 3 - Operational Interfaces

Section 4 - Emergency Operation

Section 5 - Planning

Section 6 - Reports and Forms

Section 7 - Disturbance Monitoring and System Protection

Section 8 – Operational Metering and Communication

REFERENCE: Protocols Section 5.2.1

> *ERCOT and TDSPs shall operate the ERCOT System in compliance with Good Utility Practice and NERC and ERCOT standards, policies, guidelines and operating procedures. These Protocols shall control to the extent of any inconsistency between the Protocols and any of the following documents:*
>
> *1. Any reliability guides applicable to ERCOT, including the Operating Guides;*

2. *The NERC Operating Manual and ERCOT procedures manual, supplied by NERC and ERCOT, respectively, as references for dispatchers to use during normal and emergency operations of the ERCOT Transmission Grid;*

3. *Specific operating procedures, submitted to ERCOT by individual transmission Facility owners or operators to address operating problems on their respective grids that could affect operation of the interconnected ERCOT Transmission Grid; and*

4. *Guidelines established by the ERCOT Board, which may be more stringent than those established by NERC for the secure operation of the ERCOT System.*

1.5 Conformance to NERC Policies and Procedures

The Electric Reliability Council of Texas Operating Guides are for the purpose of outlining specific practices for the ERCOT System. These practices are consistent with the North American Electric Reliability Council Operating Policies. For application in ERCOT, some NERC Policies must be adapted to fit the unique characteristics of the ERCOT System. Specific necessary adaptations are listed below:

NERC Policy	ERCOT Adaptation
Time and Frequency Control	Sustained frequency deviations from 60 Hz result in time error.
Time Error Monitoring	ERCOT will monitor accumulated time error and initiate time corrections. The instantaneous time error is available to all ERCOT QSEs in the ERCOT website. When time error is equal to or greater than ±3 seconds, ERCOT may initiate a time correction. The correction will be ended when the error is less than ±0.5 seconds. The time correction may be postponed if it is determined that load patterns in the immediate future will result in the desired time correction; however, at no time should the accumulated time error be allowed to exceed five (5) seconds.
Time Error Correction	When a time correction is necessary, ERCOT will adjust scheduled frequency in the following manner. ERCOT will arrange for more or less resources. Information to be passed along will include the correction frequency (59.98 Hz for fast and 60.02 Hz for slow) and the start time. A time correction may be terminated after five (5) hours, after any hour without a one-half (0.5) second error reduction. The Control Area Authority will provide adequate notice of ending the time correction.
Inadvertent Interchange Management	The only Inadvertent Energy will be between ERCOT and SPP and/or CFE. Accounting / payback will be handled according to NERC policy. The hourly difference between a Control Area's actual net interchange and a Control Area's scheduled net interchange is classified as inadvertent energy. All inadvertent energy is placed in an Inadvertent Payback Account to be paid back in kind.
Control Surveys	Not all of the surveys defined by NERC apply to a system the size of ERCOT and /or a single Control Area interconnection such as ERCOT.
Load Shedding and System Restoration	Automatic firm load shedding will be initiated as follows: Frequency % Load Relief

NERC Policy	ERCOT Adaptation
	59.3 Hz 5% 58.9 Hz 10% 58.5 Hz 10% Load shedding will be widely dispersed in each TDSP, with no regard for the REP, and will be accomplished by using high-speed under-frequency relays with no more than 30 cycles fixed time delay. If the frequency drops below 58.5 Hz, each TDSP must determine additional steps it will take to survive. Under-frequency relays may be installed on transmission facilities under the direction of ERCOT, provided the relays are set at 58.0 cycles or below, are not directional, and have at least 2.0 seconds time delay. Load restoration will be under the direction of the ERCOT Control Area Authority. A TDSP may by mutual agreement, with the approval of the TAC, arrange to have all or part of its automatic load shedding obligation carried by another TDSP. ERCOT will be notified and provided with the details of any such arrangement prior to implementation
Information Exchange – Disturbance Reporting	ERCOT will record the following data from the ERCOT System for frequency deviations of .175 Hz or greater and will use this information to generate the ERCOT initial Disturbance Report: ➢ ERCOT and individual QSE control biases. ➢ Net MW Capability (including any capability lost) at the time of the disturbance. ➢ Net System Load (MW) for the hour ending closest to the time of the disturbance. ➢ Scheduled Net Interchange (MW) at the time of the disturbance. ➢ Amount of interruptible load (MW) tripped. *REFERENCE: Protocols Section 6.10.5.4* *For all frequency deviations exceeding 0.175 Hz, ERCOT shall measure and record each two (2) second scan rate values of real power output for each QSE Resource providing Responsive Reserve. ERCOT shall measure and record the MW data beginning one (1) minute prior to the start of the frequency excursion event until ten (10) minutes after the start of the frequency excursion event.*
Reliability Criteria	ERCOT operating reserve requirements are more restrictive than the concepts in the NERC Operating Manual. The ERCOT Responsive Reserve Obligation is 2300 MW.

1.6 Operating Definitions

A complete list of definitions is contained within the Protocols, Section 2, Definitions and Acronyms. The following definitions apply specifically to reliability and security operation.

It is essential to the reliability of the ERCOT system that all appropriate personnel use and understand the same terms in their daily operations. The definitions in this section are intended to enable the ERCOT Control Area Authority, Qualified Scheduling Entities and Transmission and Distribution Service Provider operators to effectively communicate on an ongoing basis.

Capacitor	Produces reactive power (VAR source) for voltage control and causes the system power factor to move towards a leading condition.
Designated Agent	Any entity that is authorized to perform actions or functions on behalf of another entity.
Generator Reactive Power Sign/Direction Terminology	(1) Lagging power factor operating condition is when VAR flow is out of the generating unit (overexcited generator) and into the transmission system and is considered to be positive (+) flow, i.e., in the same direction as MW power flow. The generator is producing MVARs (2) Leading power factor operating condition is when VAR flow is into the generating unit (underexcited generator) and out of the transmission system and is considered to be negative (-) flow, i.e., in the opposite direction as MW power flow. The generator is absorbing MVARs.
Inadvertent Energy	The difference between a Control Area's actual net interchange and a Control Area's scheduled net interchange.
Interchange	a. Net Interchange The algebraic sum of the power flows of the ERCOT Control Area's interconnections with other Control Areas. Sign convention is that net interchange out of an area is positive while net interchange into an area is negative. b. Scheduled Net Interchange The mutually prearranged intended net power flow on the ERCOT Control Area's interconnections with other Control Areas.
Remedial Action Plan (RAP)	Predetermined operator actions to maintain ERCOT Transmission Grid reliability during a defined adverse operating condition.

Special Protection System (SPS)	A protective relay system specially designed to detect abnormal system conditions and take pre-planned corrective action (other than the isolation of faulted elements) to provide acceptable system performance.
Telemetry	Equipment for measuring a quantity (e.g., amps, volts, MW, MVAR, MVA) and transmitting the result to a remote location for indication or recording.
Time Error	An accumulated time difference between ERCOT system time and the time standard. Time error is caused by a deviation in ERCOT average frequency from 60.0 Hz.
Transmission Service Provider (TSP)	An Entity that owns or operates for compensation in this state, equipment or Facilities rated at 60kV or higher used to transmit electricity, and whose rates for Transmission Service are set by the PUCT.
Transmission Line Terminal Sign/Direction Terminology	(1) MW or VAR flow out of the bus and into the line is considered to be positive (+) flow. (2) MW or VAR flow into the bus and out of the line is considered to be negative (-) flow.

ERCOT OPERATING GUIDES

Section 1: Introduction

Market Overview, Change Control, Relationships and Definitions

October 1, 2009

Contents

Protocol References

1. Introduction

1.1 Document Purpose

These Electric Reliability Council of Texas (ERCOT) Operating Guides supplement the Protocols and describe the working relationship between the ERCOT Control Area Authority and entities within the ERCOT System that interact with the ERCOT Control Area Authority on a minute-to-minute basis to ensure the reliability and security of the ERCOT System, as shown in the following diagram:

Specific practices described in these Guides for the ERCOT System are consistent with the North American Electric Reliability Corporation (NERC) Operating Policies and Reliability Standards, the ERCOT Protocols and consist of the following Guides:

Section 1 - Introduction

Section 2 - System Operations

Section 3 - Operational Interfaces

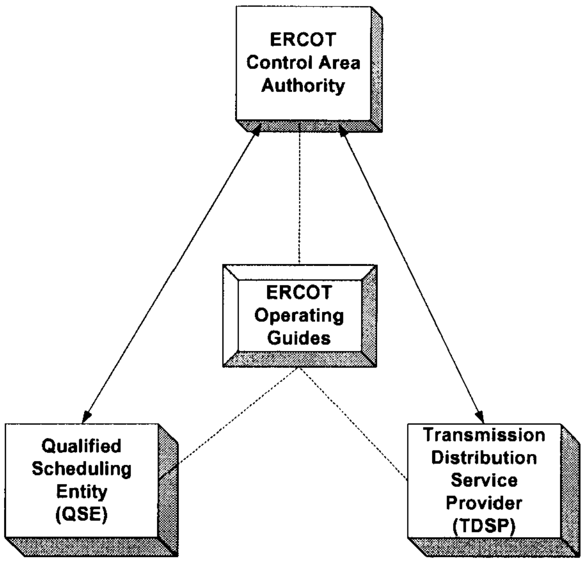
Section 4 - Emergency Operation

Section 5 - Planning

Section 6 - Reports and Forms

Section 7 - Disturbance Monitoring and System Protection

Section 8 – Operational Metering and Communication



System Operating Guide Relationship

REFERENCE: PROTOCOL SECTION 5.2.2, OPERATING STANDARDS

ERCOT and TDSPs shall operate the ERCOT System in compliance with Good Utility Practice and NERC and ERCOT standards, policies, guidelines and operating procedures. These Protocols shall control to the extent of any inconsistency between the Protocols and any of the following documents:

(1) Any reliability guides applicable to ERCOT, including the Operating Guides;

(2) *The NERC Operating Manual and ERCOT procedures manual, supplied by NERC and ERCOT, respectively, as references for dispatchers to use during normal and emergency operations of the ERCOT Transmission Grid;*

(3) *Specific operating procedures, submitted to ERCOT by individual transmission Facility owners or operators to address operating problems on their respective grids that could affect operation of the interconnected ERCOT Transmission Grid; and*

(4) *Guidelines established by the ERCOT Board, which may be more stringent than those established by NERC for the secure operation of the ERCOT System.*

1.5 Conformance to NERC Policies, Procedures, and Reliability Standards

The Electric Reliability Council of Texas (ERCOT) Operating Guides are for the purpose of outlining specific practices for the ERCOT System. These practices are consistent with the North American Electric Reliability Corporation (NERC) Operating Policies and standards. For application in ERCOT, some NERC Policies must be adapted to fit the unique characteristics of the ERCOT System. Specific necessary adaptations are listed below:

NERC Policy	ERCOT Adaptation
Time and Frequency Control	Sustained frequency deviations from 60 Hz result in time error.
Time Error Monitoring	ERCOT will monitor accumulated time error and initiate time corrections. The instantaneous time error is available to all ERCOT Qualified Scheduling Entities (QSEs) on the ERCOT website. When time error is equal to or greater than ±3 seconds, ERCOT may initiate a time correction. The correction will be ended when the error is less than ±0.5 seconds. The time correction may be postponed if it is determined that Load patterns in the immediate future will result in the desired time correction.
Time Error Correction	When a time correction is necessary, ERCOT will adjust scheduled frequency in the following manner. ERCOT will arrange for more or less Resources. Information to be passed along will include the correction frequency (59.98 Hz for fast and 60.02 Hz for slow) and the start time. A time correction may be terminated after five (5) hours, after any hour without a one-half (0.5) second error reduction. The Control Area Authority will provide adequate notice of ending the time correction.
Inadvertent Interchange Management	The only Inadvertent Energy will be between ERCOT and Southwest Power Pool (SPP) and/or Comision Federal de Electricidad (CFE). Accounting / payback will be handled according to NERC policy. The hourly difference between a Control Area's actual net interchange and a Control Area's scheduled net interchange is classified as inadvertent energy. All inadvertent energy is placed in an Inadvertent Payback Account to be paid back in kind.
Control Surveys	Not all of the surveys defined by NERC apply to a system the size of ERCOT and /or a single Control Area interconnection such as ERCOT.

<table>
<tr><th>NERC Policy</th><th>ERCOT Adaptation</th></tr>
<tr><td>Load Shedding and System Restoration</td><td>Automatic firm Load shedding will be initiated as follows:
<table>
<tr><th>Frequency</th><th>% Load Relief</th></tr>
<tr><td>59.3 Hz</td><td>5%</td></tr>
<tr><td>58.9 Hz</td><td>10%</td></tr>
<tr><td>58.5 Hz</td><td>10%</td></tr>
</table>
Load shedding will be widely dispersed in each Transmission and/or Distribution Service Provider (TDSP), with no preference to Load Serving Entities (LSEs), and will be accomplished by using high-speed under-frequency relays. The frequency measuring relays shall have a time delay of no more than thirty (30) cycles (or one-half (0.5) seconds for relays that do not count cycles). If the frequency and time values are reached, an irretrievable trip is initiated. Total time from the time when frequency first reaches one of the values specified above to the time Load is interrupted should be no more than forty (40) cycles, including all relay and breaker operating times. Under-frequency relays may be installed on Transmission Facilities under the direction of ERCOT, provided the relays are set at 58.0 cycles or below, are not directional, and have at least 2.0 seconds time delay. Load restoration will be under the direction of the ERCOT Control Area Authority. A TDSP may by mutual agreement, with the approval of the Technical Advisory Committee (TAC), arrange to have all or part of its automatic Load shedding obligation carried by another TDSP. ERCOT will be notified and provided with the details of any such arrangement prior to implementation.</td></tr>
</table>

NERC Policy	ERCOT Adaptation
Information Exchange – Disturbance Reporting	ERCOT will record the following data from the ERCOT System for frequency deviations of 0.175 Hz or greater and will use this information to generate the ERCOT initial Disturbance Report: ➢ ERCOT and individual QSE control biases. ➢ Net MW Capability (including any capability lost) at the time of the disturbance. ➢ Net System Load (MW) for the hour ending closest to the time of the disturbance. ➢ Scheduled Net Interchange (MW) at the time of the disturbance. ➢ Amount of interruptible Load (MW) tripped. ***REFERENCE: PROTOCOL SECTION 6.10.5.4, RESPONSIVE RESERVE SERVICES DEPLOYMENT PERFORMANCE MONITORING CRITERIA (IN PART)*** *...For all frequency deviations exceeding 0.175 Hz, ERCOT shall measure and record each two (2) second scan rate values of real power output for each QSE Resource providing Responsive Reserve Service. ERCOT shall measure and record the MW data beginning one (1) minute prior to the start of the frequency excursion event or Manual / Dispatch Instruction until ten (10) minutes after the start of the frequency excursion event or Manual / Dispatch Instruction...*
Reliability Criteria	ERCOT operating reserve requirements are more restrictive than the concepts in the NERC Operating Manual. The ERCOT Responsive Reserve Obligation is a minimum of 2300 MW.

1.6 Operating Definitions

A complete list of definitions is contained within Protocol Section 2, Definitions and Acronyms. The following definitions apply specifically to reliability and security operation.

It is essential to the reliability of the ERCOT System that all appropriate personnel use and understand the same terms in their daily operations. The definitions in this section are intended to enable the ERCOT Control Area Authority (CAA), Qualified Scheduling Entities (QSEs) and Transmission and/or Distribution Service Provider (TDSP) operators to effectively communicate on an ongoing basis.

Capacitor	Produces reactive power (VAR source) for voltage control and causes the system power factor to move towards a leading condition.
Designated Agent	Any Entity that is authorized to perform actions or functions on behalf of another Entity.
Generator Reactive Power Sign/Direction Terminology	(1) Lagging power factor operating condition is when VAR flow is out of the generating unit (overexcited generator) and into the transmission system and is considered to be positive (+) flow, i.e., in the same direction as MW power flow. The generator is producing MVARs (2) Leading power factor operating condition is when VAR flow is into the generating unit (underexcited generator) and out of the transmission system and is considered to be negative (-) flow, i.e., in the opposite direction as MW power flow. The generator is absorbing MVARs.
Inadvertent Energy	The difference between a Control Area's actual net interchange and a Control Area's scheduled net interchange.
Interchange	a. Net Interchange The algebraic sum of the power flows of the ERCOT Control Area's interconnections with other Control Areas. Sign convention is that net interchange out of an area is positive while net interchange into an area is negative. b. Scheduled Net Interchange The mutually prearranged intended net power flow on the ERCOT Control Area's interconnections with other Control Areas.
Physical Responsive Capability (PRC)	A representation of the total amount of system wide On-line capability that has a high probability of being able to quickly respond to system disturbances. The PRC shall be calculated by (i) determining each Resource meeting the requirements of Section 2.5.2.3, Types of Responsive Reserve, of these Guides, (ii) determining for each Resource the lesser quantity of the latest Net

Dependable Capability, the Resource Plan High Operating Limit (HOL), or the telemetered Real Time capability, (iii) multiplying the lesser quantity of each Resource by the Reserve Discount Factor (RDF), (iv) using that result to determine the amount of Responsive Reserve capability then available on each Resource, and (v) the sum, for all Resources, of the Responsive Reserve capability as determined for each Resource. The PRC shall be used by ERCOT to determine the appropriate Emergency Notification and Energy Emergency Alert (EEA) levels.

Remedial Action Plan (RAP)	Predetermined operator actions to maintain ERCOT Transmission Grid reliability during a defined adverse operating condition.
Reserve Discount Factor (RDF)	A representation of the average amount of system wide capability that, for whatever reason, is historically undeliverable during periods of high system demand. The RDF will be verified by ERCOT and then approved by the Reliability and Operations Subcommittee (ROS).
Special Protection System (SPS)	A protective relay system specially designed to detect abnormal system conditions and take pre-planned corrective action (other than the isolation of faulted elements) to provide acceptable system performance.
Telemetry	Equipment for measuring a quantity (e.g., amps, volts, MW, MVAR, MVA) and transmitting the result to a remote location for indication or recording.
Time Error	An accumulated time difference between ERCOT system time and the time standard. Time Error is caused by a deviation in ERCOT average frequency from 60.0 Hz.
Transmission Service Provider (TSP)	An Entity that owns or operates for compensation in this state, equipment or Facilities rated at 60 kV or higher used to transmit electricity, and whose rates for Transmission Service are set by the Public Utility Commission of Texas (PUCT).
Transmission Line Terminal Sign/Direction Terminology	(1) MW or VAR flow out of the bus and into the line is considered to be positive (+) flow. (2) MW or VAR flow into the bus and out of the line is considered to be negative (-) flow.

ERCOT OPERATING GUIDES

Section 3: Operational Interfaces

QSE and TDSP Interface with ERCOT

July 1, 2009

Contents

Protocol References

3.1.4.1 PGC Data Reporting

The PGC's reporting QSE shall provide the following information to ERCOT Control Area Authority at the times specified:

TIME	INFORMATION
Every ten (10) seconds	➢ Generation net MW output, ➢ Generation net MVAR, ➢ Status of switching devices in switchyard, ➢ Generating unit breaker status, ➢ Generating unit High Operating Limit (HOL), ➢ Generating unit Low Operating Limit (LOL).
Daily	➢ Planned unit status, ➢ Planned unit capability (both hourly and daily), ➢ Fuel limitations. The reporting Entity will promptly report this condition to ERCOT Control Area Authority.
Annually	➢ Seasonal capability where applicable, ➢ Planned maintenance schedules. This information shall be updated when it changes.
Upon request	➢ Fuel capability as described in Section 6.2.7, Unit Alternative Fuel Capability, in conjunction with an Operating Condition Notice (OCN), Watch, Advisory, or Emergency Notice.

Each generator at a generation Facility shall have its turbine's automatic speed governor in service when the generator is in normal operation. Testing and regulation performance of the speed governor shall be in accordance with Section 2.2.5, Turbine Speed Governors, of these Operating Guides. The generator operator is required to notify the ERCOT Control Area Authority, through its QSE, if the operation of speed governors is impaired.

Each generation Facility providing an Ancillary Service shall provide output consistent with the requirements of that Ancillary Service and ERCOT instructions.

In the event of an ERCOT declared emergency, ERCOT may require the QSE to notify the generation Facility through the reporting Entity and require it to increase or decrease generation or change voltage and reactive requirements in accordance with the Protocols. The generation Facility shall use its best efforts in meeting these required output levels in order that the ERCOT System can maintain safe and reliable operation.

It is the responsibility of all generators to carry an operational share of reactive support to insure adequate and safe Voltage Profiles are maintained in all areas of ERCOT. To accomplish this, the following requirements shall apply to each generation Facility.

- Each generation Facility shall have Automatic Voltage Regulators (AVRs) and power system stabilizers in service as defined in Section 3.1.4.5, Automatic Voltage Regulators and Power System Stabilizers, below.

- The generation Facility shall be designed and operated consistent with its Obligations to supply Voltage Support Service (VSS) as required in the ERCOT Protocols and ERCOT Control Area Authority Procedures.
- ERCOT has the right and obligation to Dispatch the reactive output (VARs) of each generation Facility within its design capability to maintain adequate transmission voltage in ERCOT.
- ERCOT and the Transmission Service Provider (TSP) shall be notified of any equipment changes that affect the reactive capability of an operating generating unit no less than sixty (60) days prior to implementation. Changes that decrease the reactive capability of the generating unit below the required level and changes that decrease the Voltage Ride-Through (VRT) capability of the plant must be approved by ERCOT prior to implementation. "Voltage Ride-Through" is defined as the ability of a generation plant to remain connected to the transmission system for specified high voltage and low voltage conditions.
- High reactive loading or reactive oscillations on generation units should be communicated to the QSE, the Transmission Operator (TO), and ERCOT as soon as practicable.
- The tripping Off-line of a generating unit due to voltage or reactive problems should be reported to ERCOT, the TO, and the QSE as soon as practicable.

REFERENCE: PROTOCOL SECTION 6.10.2, GENERAL CAPACITY TESTING REQUIREMENTS

Within the first fifteen (15) days of each Season, each QSE shall provide ERCOT a seasonal High Sustainable Limit (HSL) for any Generation Resource with a capacity greater than ten (10) MW that will be operated during that Season. ERCOT shall provide an appropriate form for QSEs to submit their seasonal HSL data. The seasonal HSL shall take into account auxiliary Load and gross and net real power capability of the Generation Resource. Each QSE shall update its Resource Plan and telemetry, as necessary, to reflect the HSL of each of its Generation Resources in a given operating interval, as well as other operational limitations.

To verify that the HSL reported in the Resource Plan is achievable, ERCOT may, at its discretion, conduct an unannounced Generation Resource test. At a time determined solely by ERCOT, ERCOT will issue a verbal Dispatch Instruction to the QSE to operate the designated Generation Resource at its HSL as shown in the QSE's Resource Plan at the time the test is initiated. The QSE shall not be required to start the designated Generation Resource if it is not already On-line when ERCOT announces its intent to test the Resource. If the designated Generation Resource is operating at its Low Sustainable Limit (LSL) when ERCOT sends the verbal Dispatch Instruction to begin the test, the QSE shall have up to sixty (60) minutes to allow the Resource to reach ninety percent (90%) of its HSL and up to an additional twenty (20) minutes for the Resource to reach the HSL shown in the Resource Plan at the time the test is initiated. This time requirement does not apply to nuclear-fueled Generation Resources. If the designated Generation Resource is operating between its LSL and fifty percent (50%) of its HSL when ERCOT begins the test, the QSE shall have sixty (60) minutes for the Resource to reach its HSL. If the Resource is operating at or above fifty percent (50%) of its HSL when ERCOT begins the test, the QSE shall have thirty (30) minutes for the Resource to reach its HSL. Once the designated Generation Resource reaches its HSL, the QSE shall hold it at that output level for a minimum of thirty (30) minutes. The HSL for the designated Generation Resource shall be

GARF

Network Model / System Planning / Data Aggregation / Settlements

Asset Registration / Resource Data Form

New___ Revised___ Add___ Delete___

Authorized Representative	
Signature:	
Printed Name:	Rick Winsor
Title:	Chief Operating Officer
Phone Number:	713 265 0244
E-mail Address:	[illegible]
Fax Number:	713 265 0365

Date Form Completed	May 14, 2007
Company Submitting Form	Post Oak Wind, LLC
Company Submitting Form DUNS #	79-1082162

Primary Contact	
Printed Name:	Kent Thornqvist
Title:	Operations Manager
Phone Number:	325 762 2438
E-mail Address:	[illegible]
Fax Number:	325 762 3145

Common

A. Generator Site Info	
Generator Site Name	Post Oak Wind, LLC
Generator Site Code	LNCRK
Address	4800 Ackers Road
State	Texas
County	Shackelford
Site In-Service Date	7/31/2007
Site Stop Service Date	
Is generation behind a NOIE Settlement Meter Point? (Y,N)	N
TDSP Providing Service To Gen Site	TXU Electric Delivery Company (Interconnect Agreement) ; Taylor Electric is the retail service provider
TDSP DUNS Number	00-793-4425-4000 (Taylor Electric)
ESI-ID if D22 above is "No"	1027369POAKWF79602
ERCOT Read (Y or N)	Y
Number of EPS Primary meters	1
Gen. Load Splitting (Y or N)	N

Common / Network Modeling / Planning

B. Generator Unit Info	Unit #1	Unit #2	Unit #3	Unit #4	Unit #5	Unit #6
Unit Name	G87					
Unit Code	LNCRK_G87					
Unit Start Date	07/31/2007					
Unit End Date						
Ramp Rate						
Name Plate Rating (MW)	200					
Technology Type	W					
Name Plate Rating (MVA)	210					
Direct Axis Subtransient reactance: X"di	15.2					
Direct Axis Transient reactance: X'di	21.4					
Max MW Output	200					
Max MVAR Output	40.6 (ind - cap)					
Min MW Output	6.67					
Min MVAR Output	0					
Max Summer Capability (MW)	200					
Max Winter Capacity (MW)	200					
Initial Economic High Limit (HiMW Ctrl)						
Initial Economic Low Limit (Lo MW Ctrl)						
Net High Capability Limit (MW) - Summer	200					
Net High Capability Limit (MVAR) - Summer	41 MVARs up to 40 degrees Celsius, above 40 degrees Celsius the turbines will shut off					
Net High Capability Limit (MW) - Winter	200					
Net High Capability Limit (MVAR) - Winter	41 MVARs down to -20 degrees Celsius, below -20 degrees Celsius the turbines will shut off					
Net Low Capability Limit (MW)	0					
Scheduled Voltage at Max Load						
Scheduled Voltage at Min Load						
Unit KV	34.5 ***					
Unit Commitment Flag (Y or N)	N					
Physical Unit Type	WT					
Primary Fuel Type	WND					
Secondary Fuel Type	N/A					
Fuel Transportation Type	N/A					
Renewable (Y/N)	Y					
Renewable/Offset	RN					
If Wind, Number of Turbines	100					
Private Network / Cogen (Y or N)	N/A					
Amount of Self Serve for Cogen (MW)	N/A					
Private Network Net Interchange (MW)	N/A					
Private Network Gross Unit (MW)	N/A					
Private Network Gross Unit (MVAR)	N/A					
Ancillary Service Capability						
Generic Fuel Category	8					
Generic Start-up / Operating Category	5					
Regulating voltage	345					
Minimum Desire Kv	328					
Maximum Desire Kv	362					
Average Heat Rate	N/A					
Reactive Capability Curve						
MW1 (Minimum MW)	0					
Min MVAR1	0					
Max MVAR1	10					
MW2	66					
Min MVAR2	-20					
Max MVAR2	20					
MW3	133					
Min MVAR3	-37					
Max MVAR3	37					
MW4 (Maximum MW)	200					
Min MVAR4	-65					
Max MVAR4	65					
If MW output is greater then or equal to 10 MW or wind farm, submit the following PSSE Model Forms:						
Generator Form (Y or N)	Y					
Compensator Form (Y or N)	Y					
Stabilizer Form (Y or N)	N					
Excitation Form (Y or N)	N					
Turbine-Governor Form (Y or N)	Y					

C. Transformer Data

Network Model / System Planning / Data Aggregation / Settlements

Asset Registration / Resource Data Form

New__ Revised__ Add__ Delete__

Authorized Representative	
Signature:	
Printed Name:	Rick Winsor
Title:	Chief Operating Officer
Phone Number:	713 265 0244
E-mail Address:	[illegible]
Fax Number	713 265 0365

Date Form Completed	May 14, 2007
Company Submitting Form	Post Oak Wind, LLC
Company Submitting Form DUNS #	79-1082162

Network Modeling	Transformer Name	Main Xf MR T1					
	High Voltage	345 kV					
	Low Voltage	138 kV ***					
	Winding Par (% on a 100 MVA base)						
Network Modeling	Resistance	8.5% @ 100 MVA					
	Reactance	8.5% @ 100 MVA					
	Susceptance	3.812 (nom pos @ 100 MVA)					
	Normal Rating MVA	141 MVA					
	Emergency Rating MVA	188 MVA					
	Loadshed Rating MVA	235 MVA					
	Voltage Regulation						
Network Modeling	Regulating side	HV					
	Desire Voltage	345 kV					
	Minimum Reg. Volt	310.5 kV (pos 16L)					
	Maximum Reg. Volt	379.5 kV (pos 16R)					
	D. Transformer Tap Data						
Network Modeling	LTC (Y,N)	Yes					
	LTC Group Kv	345 kV					
	Low Side Tap Setting						
Network Modeling	Nominal Voltage	138 kV					
	Normal Tap Position	N/A					
	Lowest Tap Position	N/A					
	Highest Tap Position	N/A					
	Nominal Tap Position	N/A					
	Step Size in Percent	N/A					
	High Side Tap Setting						
Network Modeling	Nominal Voltage	345 kV					
	Normal Tap Position	345 kV					
	Lowest Tap Position	-16					
	Highest Tap Position	+16					
	Nominal Tap Position	0					
	Step Size in Percent	0.625%					
	Other Documents						
Network Modeling	One Line Diagram (Y/N)	N					
	Capability Curve (Y/N)	N					

Complete this section if a single RESOURCE owns 100% of all units.

Resource Owner Data	**Owner 1**
Resource Name	Post Oak Wind, LLC
Resource Duns Number	79-1082162

*** (Note: The voltage out of each wind turbine is 34.5 kV. The wind farm has a project substation where the voltage is stepped up from 34.5 kV to 138 kV). From the 34.5/138 project substation the project then transports the energy via a 7 mile overhead 138 kV line to the 138/345 Interconnection Substation which is directly connected to the TXU Electric Delivery Company Long Creek Switching Station).

Complete this section if splitting netted gensite load among multiple ESIIDs

Gen Load Splitting	**ESIID 1**	**ESIID 2**	**ESIID 3**	**ESIID 4**	**ESIID 5**	**ESIID 6**
Fixed Load Splitting %						
Competitive Retailer						
Competitive Retailer DUNS #						

Complete the following sections only if Units are Joint-Owned

Unit 1 Data

Sub Generator Data	**Owner 1**	**Owner 2**	**Owner 3**	**Owner 4**	**Owner 5**	**Owner 6**
Market Participant (Resource) Name						
Market Participant (Resource) Duns Number						
Fixed Ownership %						
Master Owner (Y or N)						

Unit 2 Data

Sub Generator Data	**Owner 1**	**Owner 2**	**Owner 3**	**Owner 4**	**Owner 5**	**Owner 6**
Market Participant (Resource) Name						
Market Participant (Resource) Duns Number						
Fixed Ownership %						
Master Owner (Y or N)						

Unit 3 Data

Sub Generator Data	**Owner 1**	**Owner 2**	**Owner 3**	**Owner 4**	**Owner 5**	**Owner 6**
Market Participant (Resource) Name						
Market Participant (Resource) Duns Number						
Fixed Ownership %						
Master Owner (Y or N)						

Unit 4 Data

Sub Generator Data	**Owner 1**	**Owner 2**	**Owner 3**	**Owner 4**	**Owner 5**	**Owner 6**
Market Participant (Resource) Name						
Market Participant (Resource) Duns Number						
Fixed Ownership %						
Master Owner (Y or N)						

Unit 5 Data

Sub Generator Data	**Owner 1**	**Owner 2**	**Owner 3**	**Owner 4**	**Owner 5**	**Owner 6**
Market Participant (Resource) Name						
Market Participant (Resource) Duns Number						
Fixed Ownership %						

Network Model / System Planning / Data Aggregation / Settlements

Asset Registration / Resource Data Form

New Revised Edit Delete

Authorized Representative	
Signature	
Printed Name	Rick Winsor
Title	Chief Operating Officer
Phone Number	713 265 0244
E-mail Address	[illegible]
Fax Number	713 265 0365

Date Form Completed	May 14, 2007
Company Submitting Form	Post Oak Wind, LLC
Company Submitting Form DUNS #	79-1082162

Master Owner (Y or N)						

Unit 6 Data

Sub Generator Data	Owner 1	Owner 2	Owner 3	Owner 4	Owner 5	Owner 6
Market Participant (Resource) Name						
Market Participant (Resource) Duns Number						
Fixed Ownership %						
Master Owner (Y or N)						

Physical UnitType (Description)

CA (Combined cycle steam part (includes steam part of integrated coal gasification combined cycle)
CC (Combined cycle total unit (use only for plants/generators that are in planning stage, for which specific generator details cannot be provided)
CE (Compressed air energy storage
CS (Combined cycle single shaft (combustion turbine and steam turbine share a single generator)
CT (Combined cycle combustion turbine part (includes comb. turbine part of integrated coal gasification combined cycle)
FC (Fuel Cell
GT (Combustion (gas) turbine, includes jet engine design
HY (Hydraulic turbine (includes turbines associated with delivery of water by pipeline)
IC (Internal combustion (diesel, piston) engine)
NA (Unknown at this time (planned units only)
OT (Other
PS (Hydraulic Turbine - Reversible (pumped storage)
PV (Photovoltaic
ST (Steam Turbine including nuclear, geothermal and solar. Does not include combined cycle
WT (Wind Turbine

Primary Fuel Type (Description)

AB (Agriculture byproducts, bagasse, straw, energy crops)
BFG (Blast Furnace Gas)
BIT (Bituminous Coal)
BL (Black liquor)
DFO (Distillate Fuel Oil (Diesel, No1 Fuel Oil, No 2 Fuel Oil, No 4 Fuel Oil)
GEO (Geothermal)
JF (Jet Fuel)
KER (Kerosene)
LFG (Landfill gas)
LIG (Lignite)
MSW (Municipal solid waste (refuse))
NA (Not available)
NG (Natural Gas)
NUC (Nuclear (uranium, plutonium, thorium))
OBG (Other biomass gases (methane, digester gas))
OBL (Other biomass liquids (ethanol, fish oil, waste alcohol, other gases))
OBS (Other biomass solids (animal manure/waster, medical waste, paper pellets, paper derived fuel))
OG (Other Gas (Butane, Coal Processes, Coke-oven coal, Methanol, Refinery gas,)
OO (Other Oil (butane, crude, liquid byproducts, oil waste, propane)
OTH (Other (batteries, chemicals, hudrogen pitch sulfur, misc technologies))
PC (Petroleum Coke)
PG (Propane)
RFO (Residual fuel Oil (No 5 and No 6 Fuel Oil))
SLW (Sludge waste)
SUB (Subbituminous Coal)
SUN (Solar (photovoltaic, thermal))
TDF (Tires)
WAT (Water (conventional, pumped storage))
WDL (Wood/wood waste liquids (red liquor, sludge wood spent sulfite liquor, other liquors))
WDS (Wood/wood waste solids (peat, railroad ties, utility poles, wood chips, other solids))
WH (Waste heat)
WND (Wind)
WOC (Waste/other coal)

RARF Guides

ERCOT

EDS
DRAFT Resource Registration Guide for Transitioning to the Nodal Market
v0.08

Revision History

Date	Version	Description	Author
10/10/2007	0.03	Draft for Internal Review	D. Showalter
10/10/2007	0.04	Second draft for Internal Review	D. Showalter
10/10/2007	0.05	Draft for Posting	D. Showalter
10/11/2007	0.06	Revised Draft for Posting	D. Showalter
10/16/2007	0.07	Revised with Market Comments	D. Showalter
12/13/2007	0.08	Revised for Planning Submittal	D. Showalter

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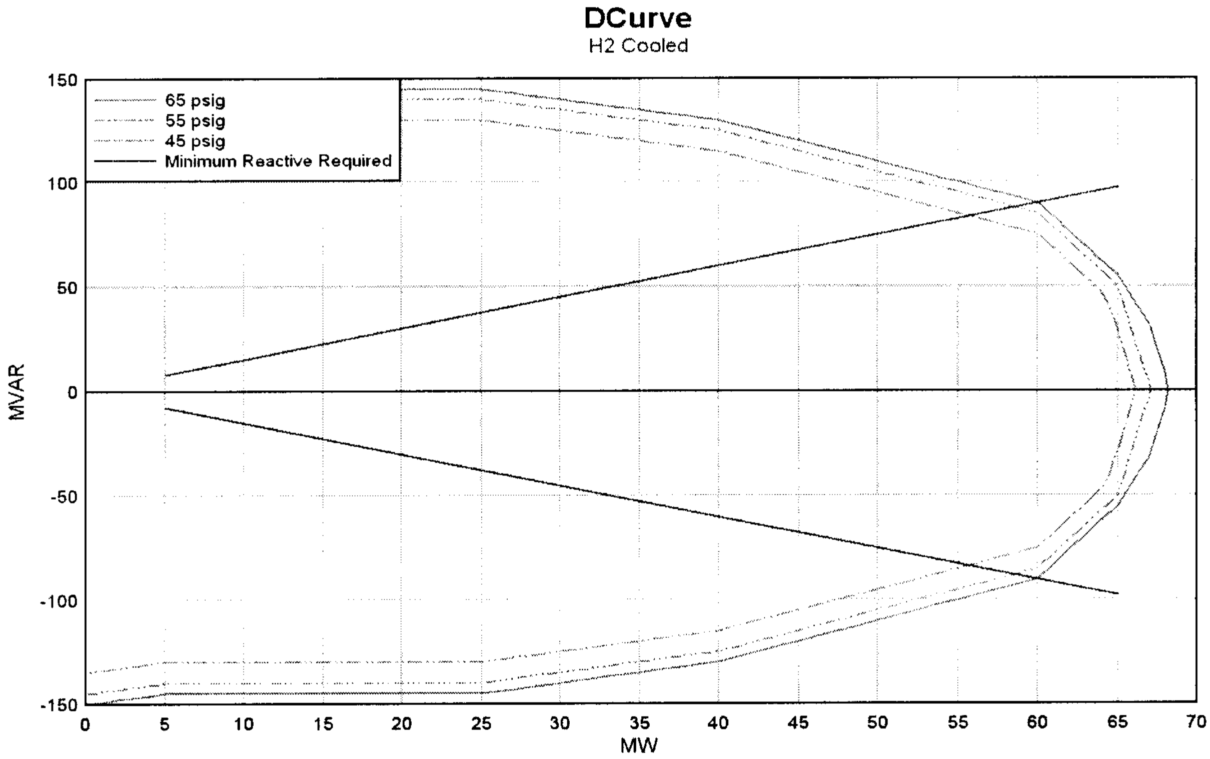
11.0 D-Curve

The Reactive Capability Curve, also known as the D-curve, represents the operating limits of the generator. ERCOT is asking for nine points of information, as well as copies of the curves, in order to recreate the curve. Figure 11-1 contains a sample of a D-curve. Figure 11-2 contains a possible entry into the RARF from this D-curve.

Please note: the positive VARs are "lagging" and the negative VARs are "leading". When entering this information in the RARF, please use positive and negative numbers as shown in the example in Figure 11-2.

Figure 11-1: Sample D-curve



EDS
DRAFT Resource Registration Guide for the Nodal Market
v4.00

Revision History

Date	Version	Description	Author
10/10/2007	0.03	Draft for Internal Review	D. Showalter
10/10/2007	0.04	Second draft for Internal Review	D. Showalter
10/10/2007	0.05	Draft for Posting	D. Showalter
10/11/2007	0.06	Revised Draft for Posting	D. Showalter
10/16/2007	0.07	Revised with Market Comments	D. Showalter
12/13/2007	0.08	Revised for Planning Submittal	D. Showalter
4/01/2008	3.99	Draft -Reorganized and reformatted for RARF Ver 4	D. Showalter
4/08/2008	4.00	Released with RARF Ver 4 (Official RARF)	D. Showalter

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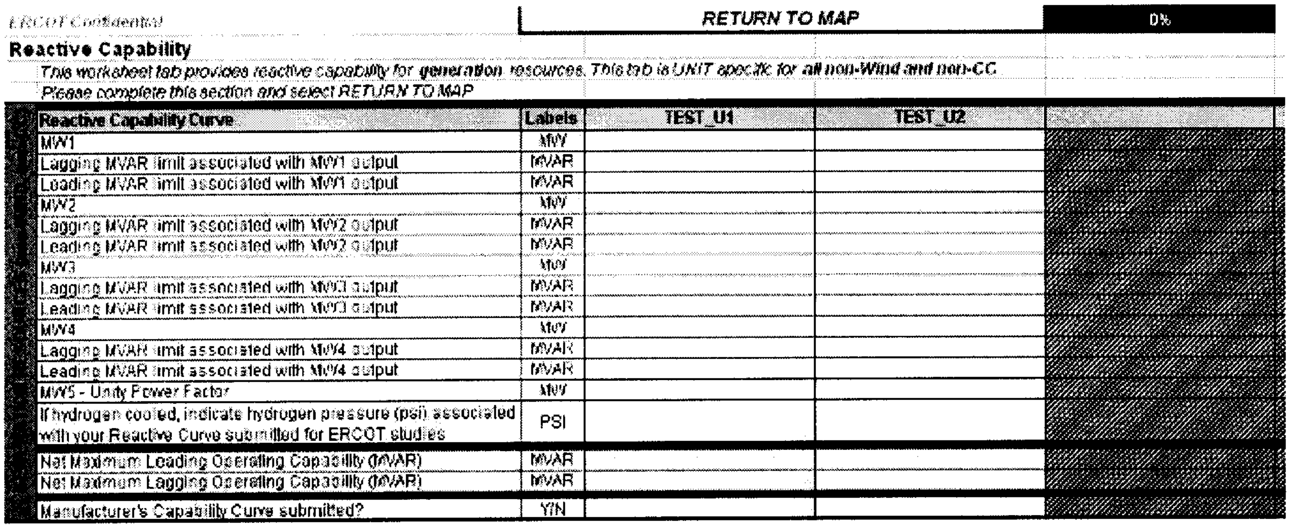
8.0 Reactive Capability

The Reactive Capability section requires the submittal of the Reactive Capability curve as well as submitting a 9-point curve in the RARF. This information will be used to validate test data. This information 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.

8.1 Reactive Capability – non-Wind, non-CC Generation Units



ERCOT Confidential

RETURN TO MAP

0%

Reactive Capability

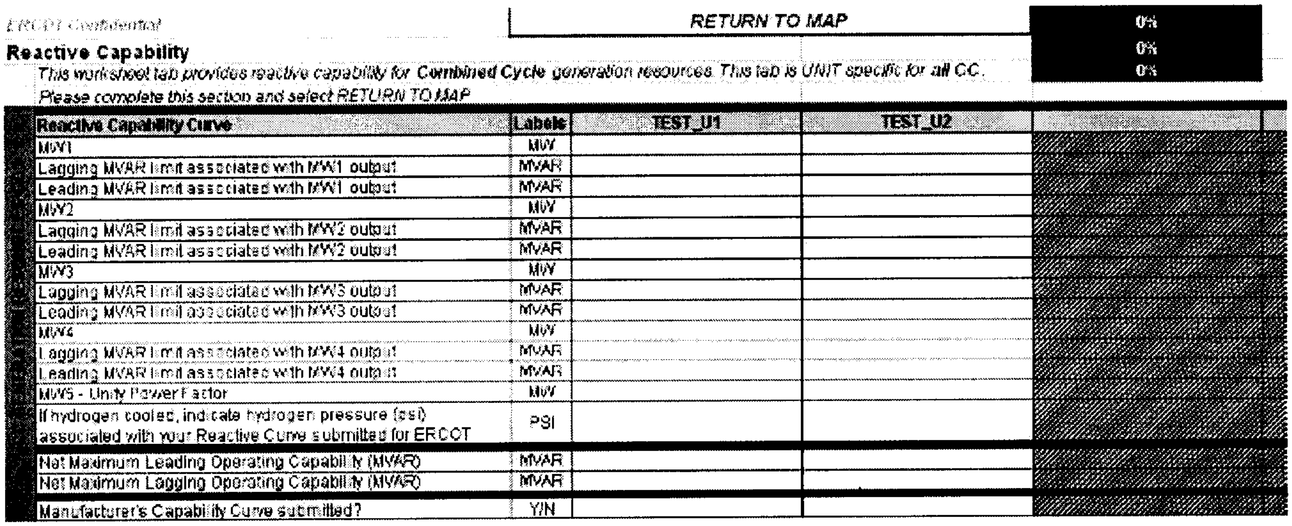
This worksheet tab provides reactive capability for generation resources. This tab is UNIT specific for all non-Wind and non-CC

Please complete this section and select RETURN TO MAP

Reactive Capability Curve	Labels	TEST_U1	TEST_U2	
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 studies	PSI			
Net Maximum Leading Operating Capability (MVAR)	MVAR			
Net Maximum Lagging Operating Capability (MVAR)	MVAR			
Manufacturer's Capability Curve submitted?	Y/N			

8.2 Reactive Capability – Combined-Cycle Units

This tab contains three parts – for registering up to three trains at one site. This information is required for Units.



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RETURN TO MAP

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Reactive Capability

This worksheet tab provides reactive capability for Combined Cycle generation resources. This tab is UNIT specific for all CC.

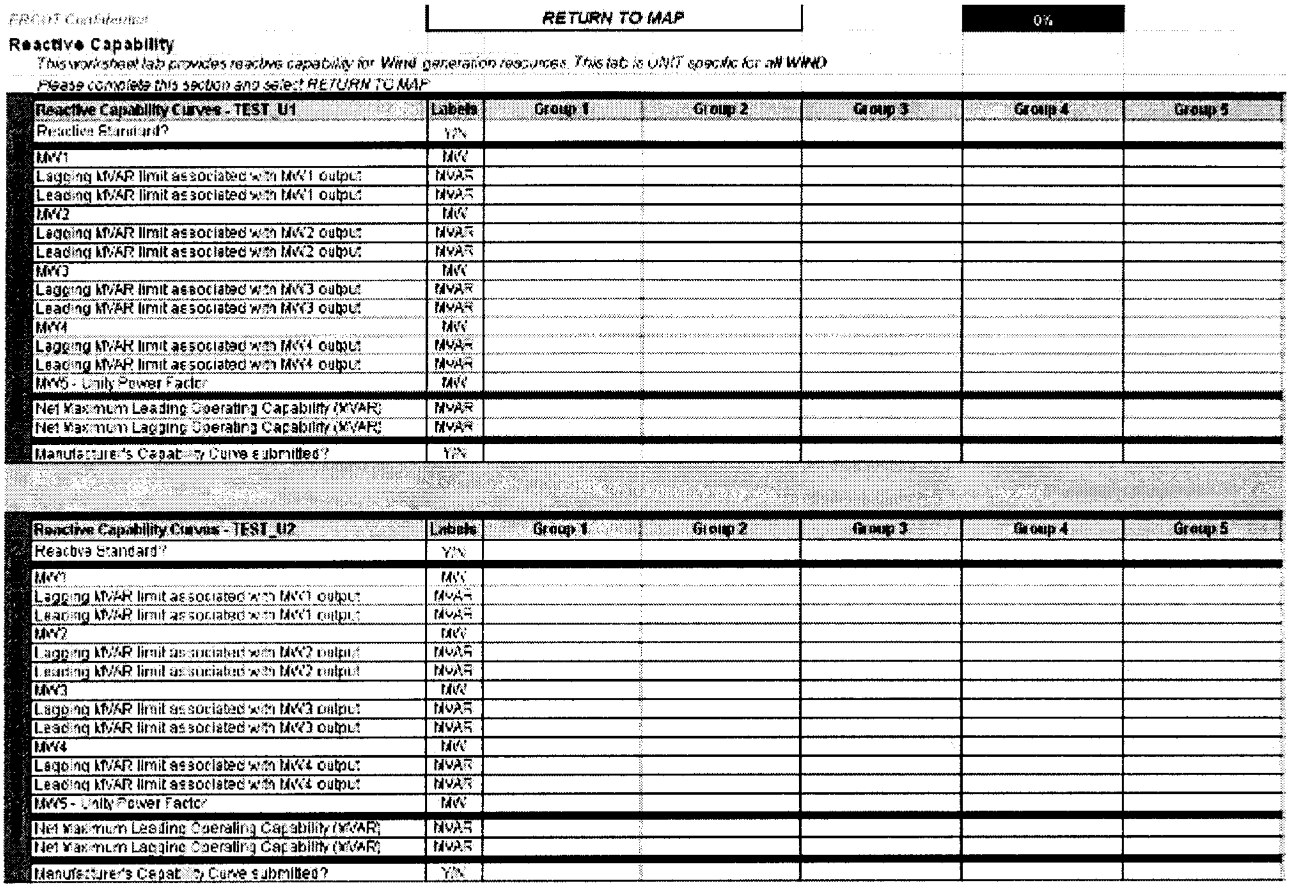
Please complete this section and select RETURN TO MAP

Reactive Capability Curve	Labels	TEST_U1	TEST_U2	
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			
Net Maximum Leading Operating Capability (MVAR)	MVAR			
Net Maximum Lagging Operating Capability (MVAR)	MVAR			
Manufacturer's Capability Curve submitted?	Y/N			

8.3 Reactive Capability – Wind Units

On previous RARFs, there was a requirement to identify each type/group of turbines that make up a unit, but no space to identify the reactive capability of each group. Now for each unit, a reactive capability curve can be submitted. The units are vertical – the RARF allows up to five. The groups are horizontal. The picture below shows the reactive capability section for two of the five units.

Reactive capability should be complete for each group of each unit.



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RETURN TO MAP

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Reactive Capability

This worksheet tab provides reactive capability for Wind generation resources. This tab is UNIT specific for all WIND

Please complete this section and select RETURN TO MAP

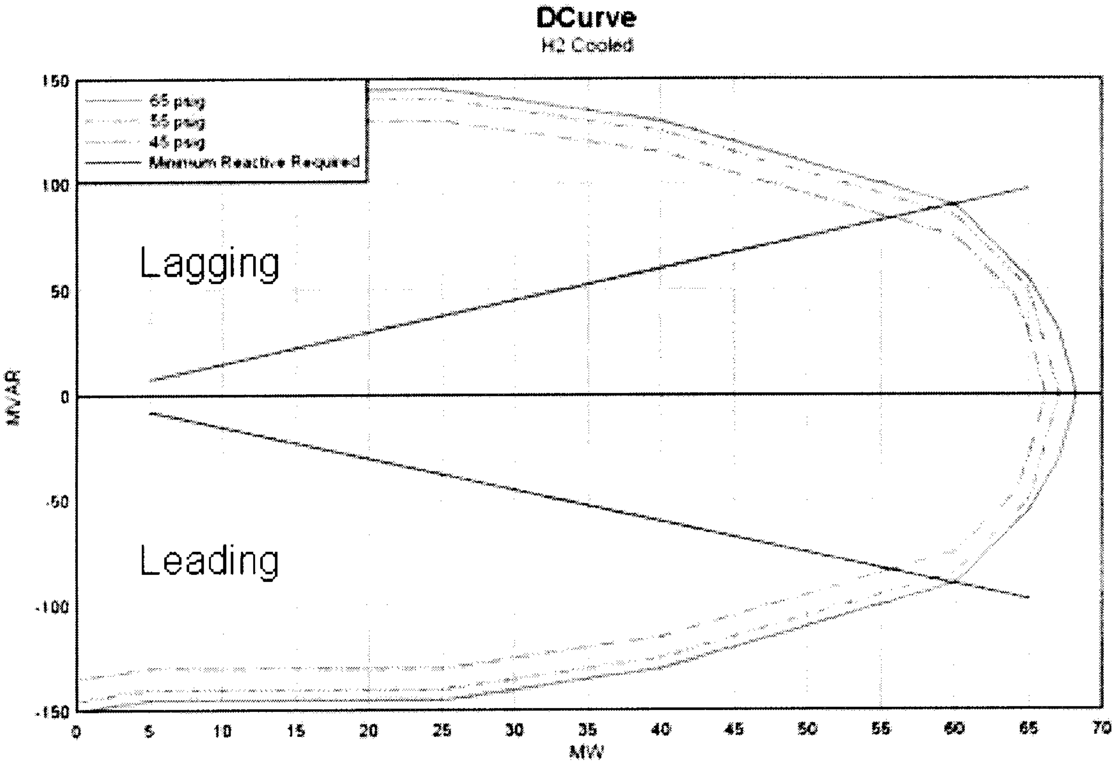
Reactive Capability Curves - TEST_U1	Labels	Group 1	Group 2	Group 3	Group 4	Group 5
Reactive Standard?	Y/N					
MW1	MW					
Lagging MVAR limit associated with MW1 output	MVAR					
Leading MVAR limit associated with MW1 output	MVAR					
MW2	MW					
Lagging MVAR limit associated with MW2 output	MVAR					
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					
Net Maximum Leading Operating Capability (MVAR)	MVAR					
Net Maximum Lagging Operating Capability (MVAR)	MVAR					
Manufacturer's Capability Curve submitted?	Y/N					

Reactive Capability Curves - TEST_U2	Labels	Group 1	Group 2	Group 3	Group 4	Group 5
Reactive Standard?	Y/N					
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					
Net Maximum Leading Operating Capability (MVAR)	MVAR					
Net Maximum Lagging Operating Capability (MVAR)	MVAR					
Manufacturer's Capability Curve submitted?	Y/N					

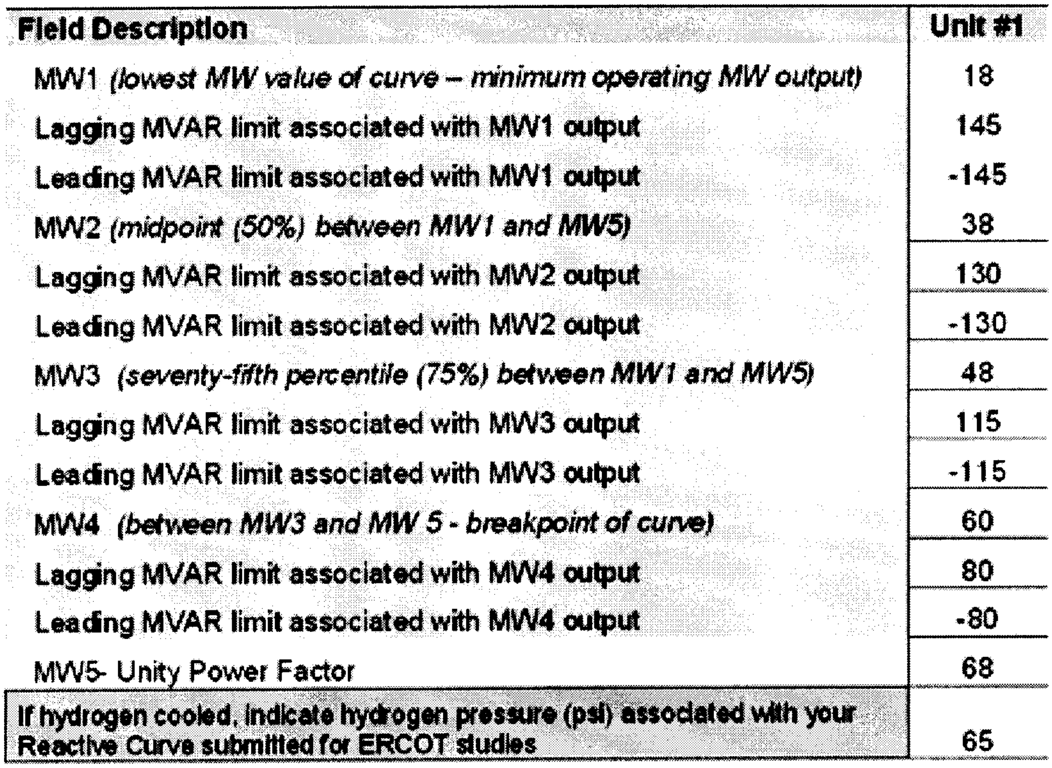
8.4 D-Curve / REACTIVE CAPABILITY CURVES

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 voltages under normal and emergency situations in order to prevent voltage collapse of the grid. ERCOT requires Resources to conduct reactive capacity qualification tests to verify maximum leading and lagging reactive capability of all Generation Resources that are required to provide voltage support service.

The Reactive Capability Curve, also known as the D-curve, represents the operating limits of the generator. The picture below shows a typical (somewhat surreal) Reactive Capability Curve or D-Curve of a Generator unit where the X-axis is MW and the Y-axis is MVAR. Values above the x-axis (positive VARs) are "LAGGING" MVARs and values below the x-axis (negative VARs) are "LEADING" MVARs.

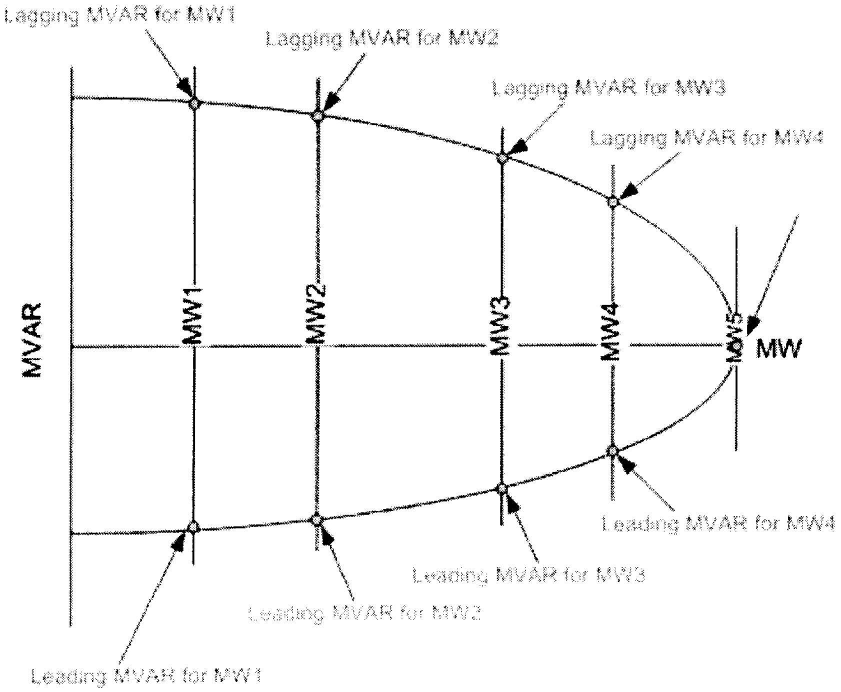


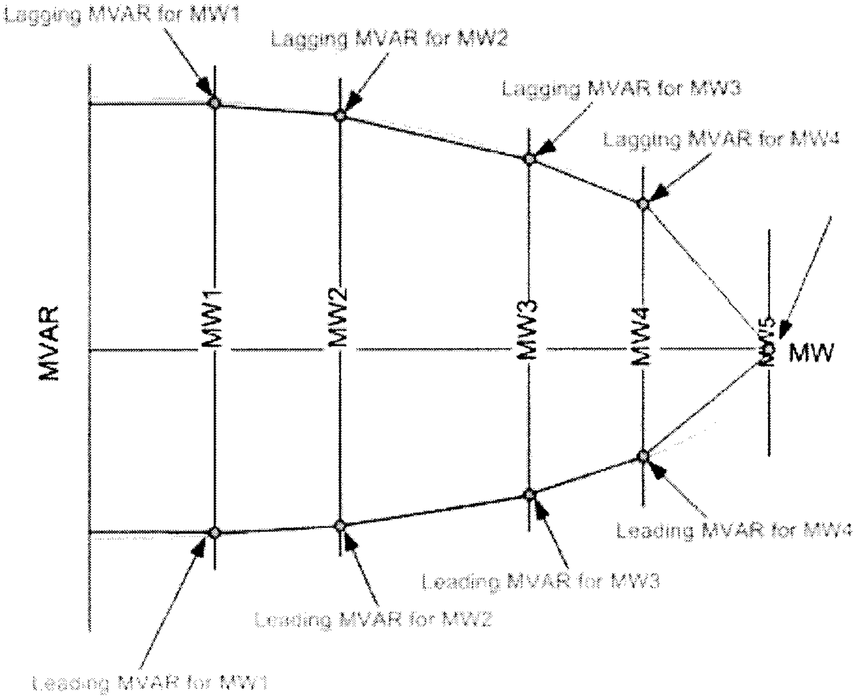
To establish the curve in the RARF, ERCOT is asking for nine points of data. When entering data on the RARF, use positive numbers to represent the lagging MVARs and negative values to represent leading MVARs. If the unit is hydrogen cooled, indicate pressure of hydrogen in psi. Supply 5 increasing MW 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.



Field Description	**Unit #1**
MW1 *(lowest MW value of curve – minimum operating MW output)*	18
Lagging MVAR limit associated with MW1 output	145
Leading MVAR limit associated with MW1 output	-145
MW2 *(midpoint (50%) between MW1 and MW5)*	38
Lagging MVAR limit associated with MW2 output	130
Leading MVAR limit associated with MW2 output	-130
MW3 *(seventy-fifth percentile (75%) between MW1 and MW5)*	48
Lagging MVAR limit associated with MW3 output	115
Leading MVAR limit associated with MW3 output	-115
MW4 *(between MW3 and MW 5 - breakpoint of curve)*	60
Lagging MVAR limit associated with MW4 output	80
Leading MVAR limit associated with MW4 output	-80
MW5- Unity Power Factor	68
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT studies	65

The following is an example of a D-curve and the selection of points. The first picture shows five MW points and the corresponding MVARs. After entering these values in the form, the end curve is shown in the second picture. This implies that the MW selection points should move closer to the unity end to more accurately depict my curve and reactive capability. The percentiles are just recommended starting points – but each generator will be different. Please submit the curve as accurately as 9 points will allow.





Resource Asset Registration Guide
v4.02

Revision History

Date	Version	Description	Author
10/10/2007	0.03	Draft for Internal Review	D. Showalter
10/10/2007	0.04	Second draft for Internal Review	D. Showalter
10/10/2007	0.05	Draft for Posting	D. Showalter
10/11/2007	0.06	Revised Draft for Posting	D. Showalter
10/16/2007	0.07	Revised with Market Comments	D. Showalter
12/13/2007	0.08	Revised for Planning Submittal	D. Showalter
4/01/2008	3.99	Draft -Reorganized and reformatted for RARF Ver 4	D. Showalter
4/08/2008	4.00	Released with RARF Ver 4 (Official RARF)	D. Showalter
12/16/08	4.01	Updated RARF Guide V4.01	A. Moy
2/4/2009	4.02	Updated and re-wrote transmission and load data tabs	S. Middleton

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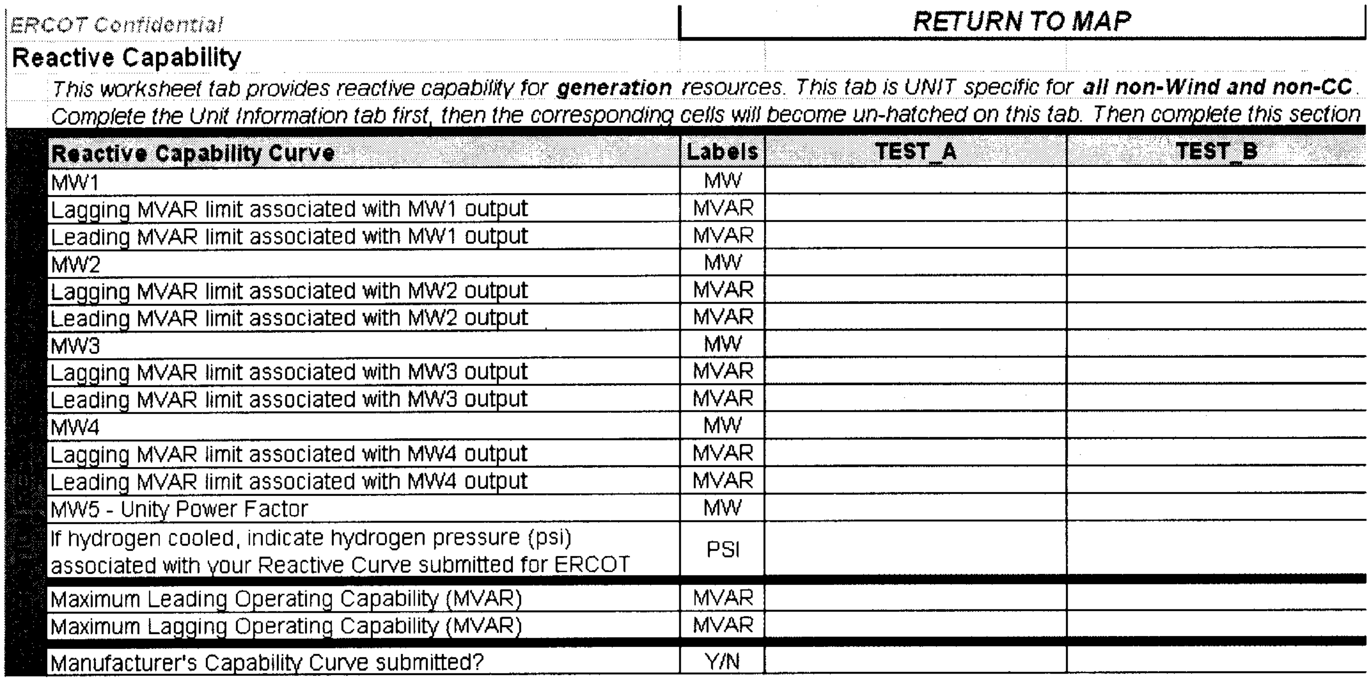
7.0 Reactive Capability

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



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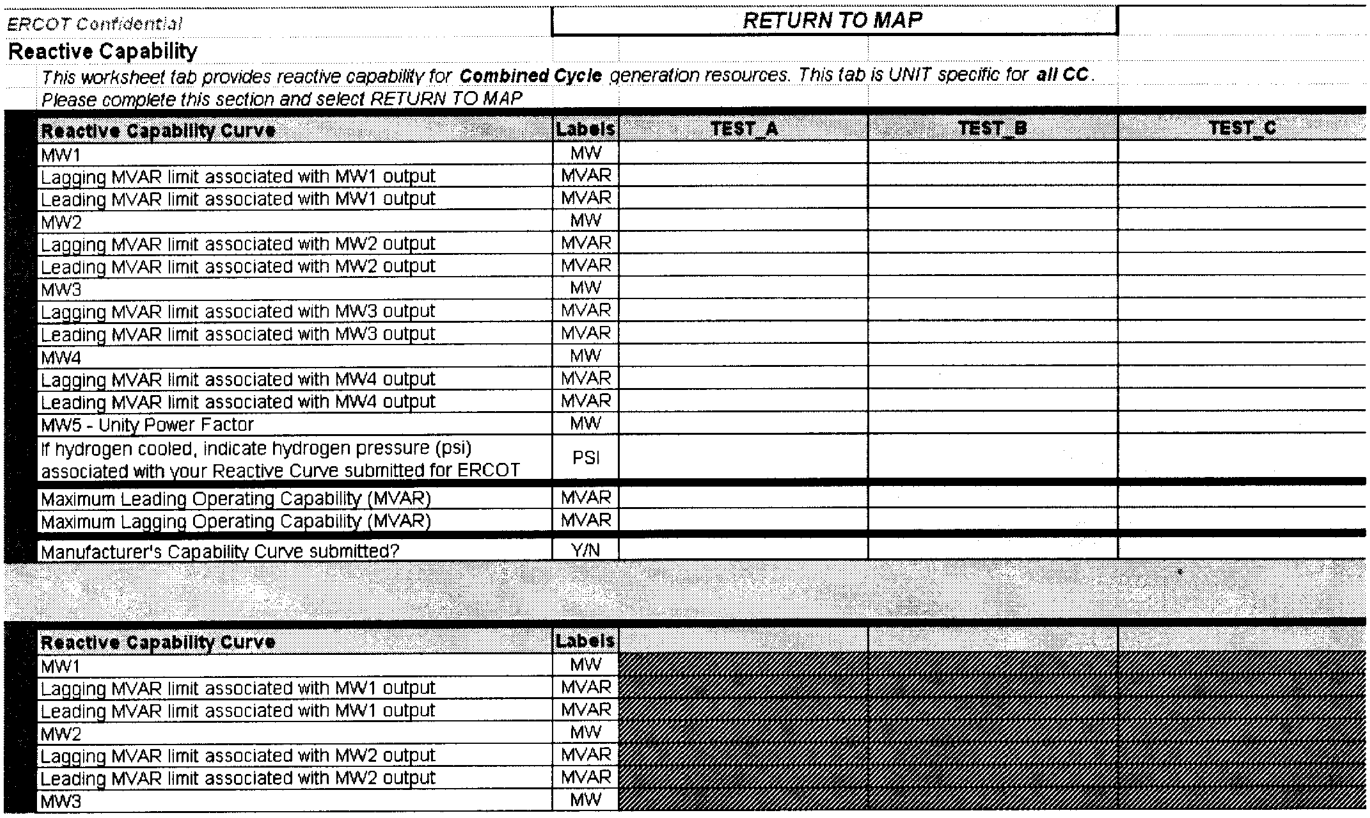
Reactive Capability

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

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.



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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

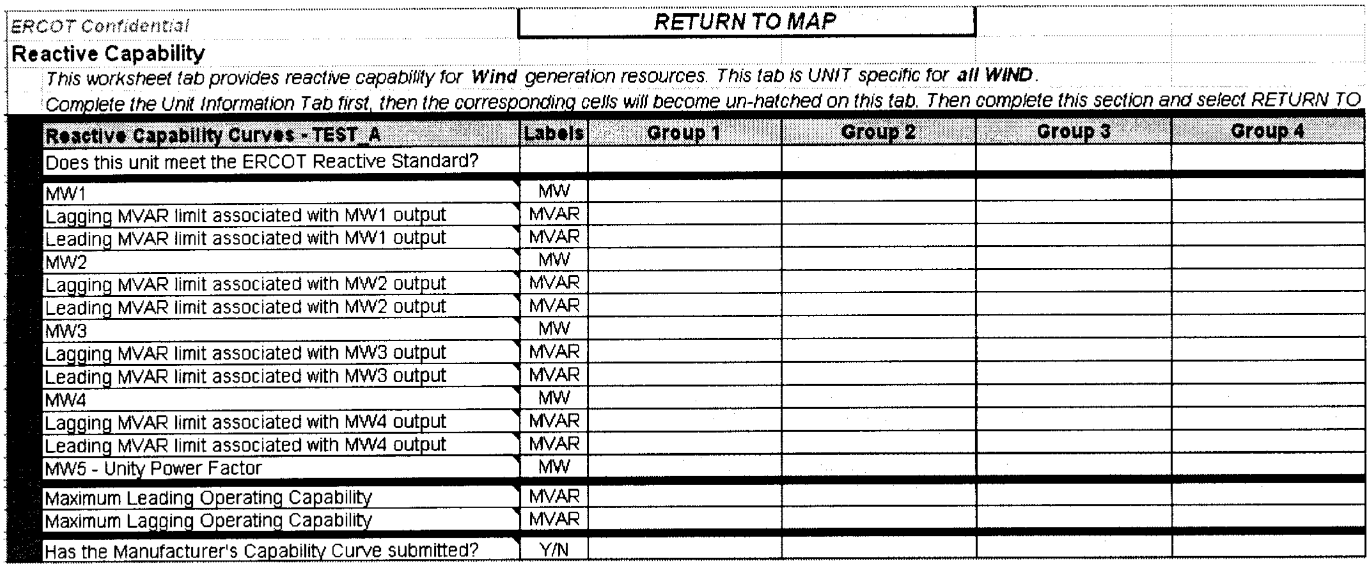
Reactive Capability Curve	**Labels**	**TEST_A**	**TEST_B**	**TEST_C**
MW1	MW			
Lagging MVAR limit associated with MW1 output	MVAR			
Leading MVAR limit associated with MW1 output	MVAR			
MW2	MW			
Lagging MVAR limit associated with MW2 output	MVAR			
Leading MVAR limit associated with MW2 output	MVAR			
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			

Reactive Capability Curve	**Labels**			
MW1	MW			
Lagging MVAR limit associated with MW1 output	MVAR			
Leading MVAR limit associated with MW1 output	MVAR			
MW2	MW			
Lagging MVAR limit associated with MW2 output	MVAR			
Leading MVAR limit associated with MW2 output	MVAR			
MW3	MW			

7.3 Reactive Capability – Wind Units

The 9 point reactive curve data points must be submitted for each unit, as well as the manufacturer's capability curve. The units are listed in the vertical columns – the RARF allows up to five. The groups are horizontal.

Reactive capability must be completed for each group of each unit.



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RETURN TO MAP

Reactive Capability

This worksheet tab provides reactive capability for ***Wind*** *generation resources. This tab is UNIT specific for* ***all WIND****.*

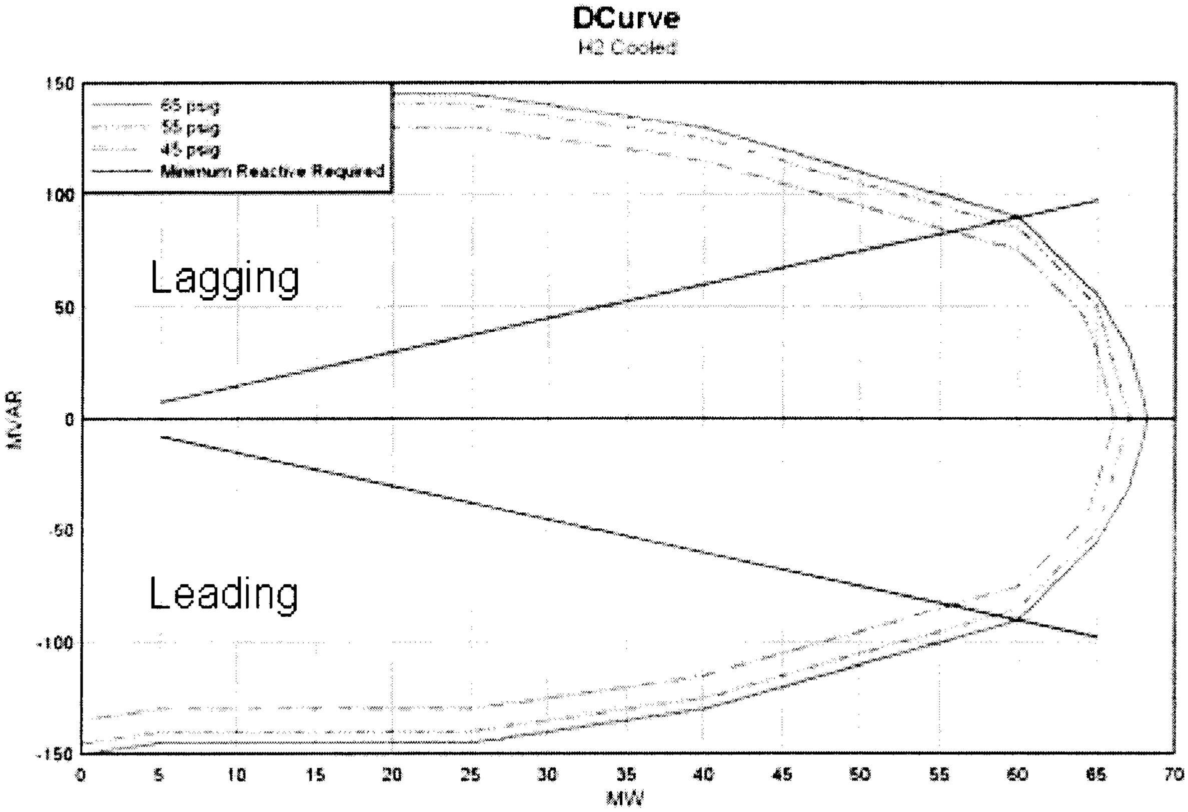
Complete the Unit Information Tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section and select RETURN TO

Reactive Capability Curves - TEST_A	Labels	Group 1	Group 2	Group 3	Group 4
Does this unit meet the ERCOT Reactive Standard?					
MW1	MW				
Lagging MVAR limit associated with MW1 output	MVAR				
Leading MVAR limit associated with MW1 output	MVAR				
MW2	MW				
Lagging MVAR limit associated with MW2 output	MVAR				
Leading MVAR limit associated with MW2 output	MVAR				
MW3	MW				
Lagging MVAR limit associated with MW3 output	MVAR				
Leading MVAR limit associated with MW3 output	MVAR				
MW4	MW				
Lagging MVAR limit associated with MW4 output	MVAR				
Leading MVAR limit associated with MW4 output	MVAR				
MW5 - Unity Power Factor	MW				
Maximum Leading Operating Capability	MVAR				
Maximum Lagging Operating Capability	MVAR				
Has the Manufacturer's Capability Curve submitted?	Y/N				

7.4 D-Curve / REACTIVE CAPABILITY CURVES

Reactive capability is the ability of a generator unit to supply/absorb reactive power (MVAR) to the grid continuously for a given MW operating value without damaging the unit. Reactive power is required to control voltage under normal and emergency situations in order to prevent voltage collapse of the grid. Reactive capability qualification testing is required by ERCOT for verification of maximum leading and lagging capability of all generation resources required to provide voltage support service.

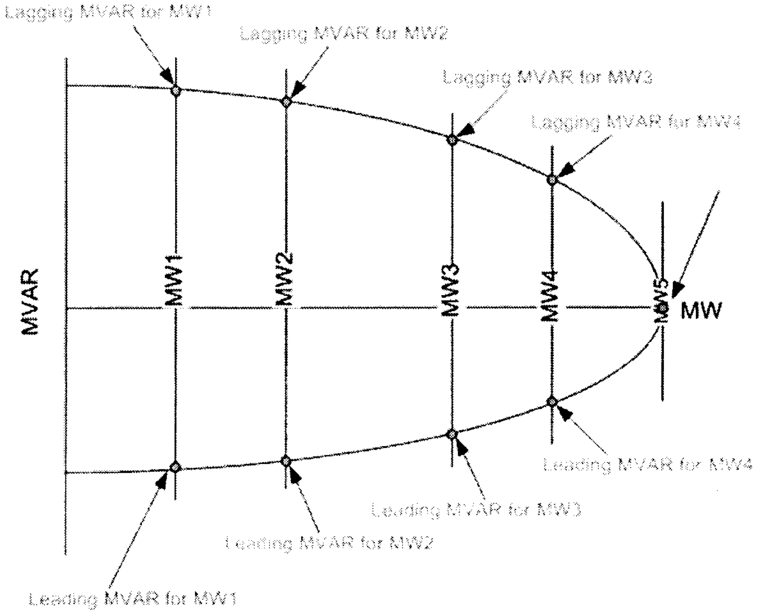
The Reactive Capability Curve, also known as the D-curve, represents the operating limits of the generator. The example Reactive Capability Curve pictured below shows the Reactive Capability Curve or D-Curve of a generator unit where the X-axis is MW and the Y-axis is MVAR, and is intended for illustrative purposes only. Values above the x-axis (positive VARs) are "LAGGING" MVARs and values below the x-axis (negative VARs) are "LEADING" MVARs.


DCurve
H2 Cooled
65 psig
55 psig
45 psig
Minimum Reactive Required
Lagging
Leading
MVAR
MW
150
100
50
0
-50
-100
-150
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70

To establish the curve in the RARF, ERCOT requests nine points of data. When entering data on the RARF, use POSITIVE values to represent the lagging MVARs and NEGATIVE values to represent leading MVARs. If the unit is hydrogen cooled, indicate pressure of hydrogen in psi; otherwise leave the cell blank. Supply 5 increasing MW values of operating real power - MW1 at the lowest operation MW through MW 5 at unity power factor. An example of this entry is shown below.

Reactive Capability Curve	Labels	TEST_UNIT1
MW1	MW	50.00
Lagging MVAR limit associated with MW1 output	MVAR	10.00
Leading MVAR limit associated with MW1 output	MVAR	-12.00
MW2	MW	100.00
Lagging MVAR limit associated with MW2 output	MVAR	15.00
Leading MVAR limit associated with MW2 output	MVAR	-25.00
MW3	MW	150.00
Lagging MVAR limit associated with MW3 output	MVAR	20.00
Leading MVAR limit associated with MW3 output	MVAR	-35.00
MW4	MW	200.00
Lagging MVAR limit associated with MW4 output	MVAR	30.00
Leading MVAR limit associated with MW4 output	MVAR	-50.00
MW5 - Unity Power Factor	MW	250.00
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT studies	PSI	65.0
Maximum Lagging Operating Capability (MVAR)	MVAR	40.00
Maximum Leading Operating Capability (MVAR)	MVAR	-55.00
Manufacturer's Capability Curve submitted?	Y/N	Y

The following is an example of a D-curve and the selection of points. The graph below shows five MW points and corresponding MVARs. After entering these values in the form, the end curve is shown. This implies that the MW selection points should move closer to the unity end to more accurately depict the curve and reactive capability of the resource.



Resource Asset Registration Guide
v4.03

Revision History

Date	Version	Description	Author
10/10/2007	0.03	Draft for Internal Review	D. Showalter
10/10/2007	0.04	Second draft for Internal Review	D. Showalter
10/10/2007	0.05	Draft for Posting	D. Showalter
10/11/2007	0.06	Revised Draft for Posting	D. Showalter
10/16/2007	0.07	Revised with Market Comments	D. Showalter
12/13/2007	0.08	Revised for Planning Submittal	D. Showalter
4/01/2008	3.99	Draft -Reorganized and reformatted for RARF Ver 4	D. Showalter
4/08/2008	4.00	Released with RARF Ver 4 (Official RARF)	D. Showalter
12/16/08	4.01	Updated RARF Guide V4.01	A. Moy
2/4/2009	4.02	Updated and re-wrote transmission and load data tabs	S. Middleton
3/10/2009	4.03	Corrected / Modified business rules for transformer tab	S. Middleton

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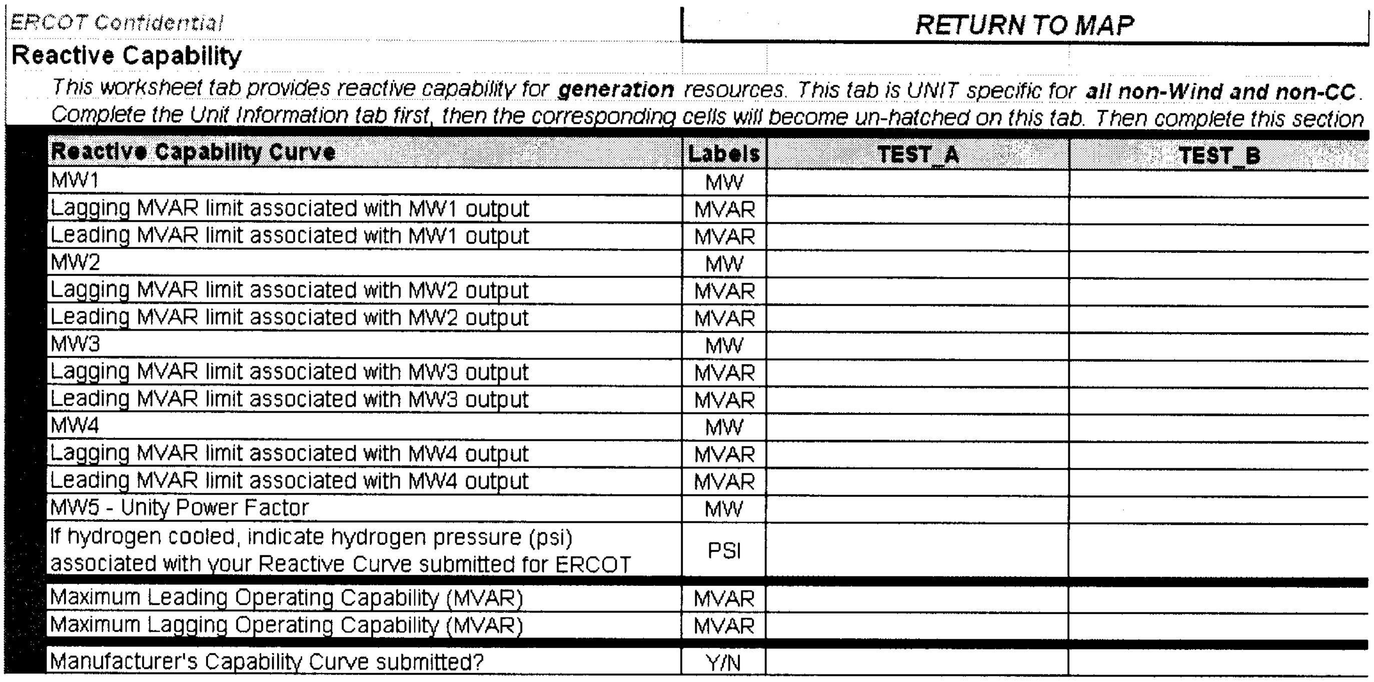
7.0 Reactive Capability

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



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RETURN TO MAP

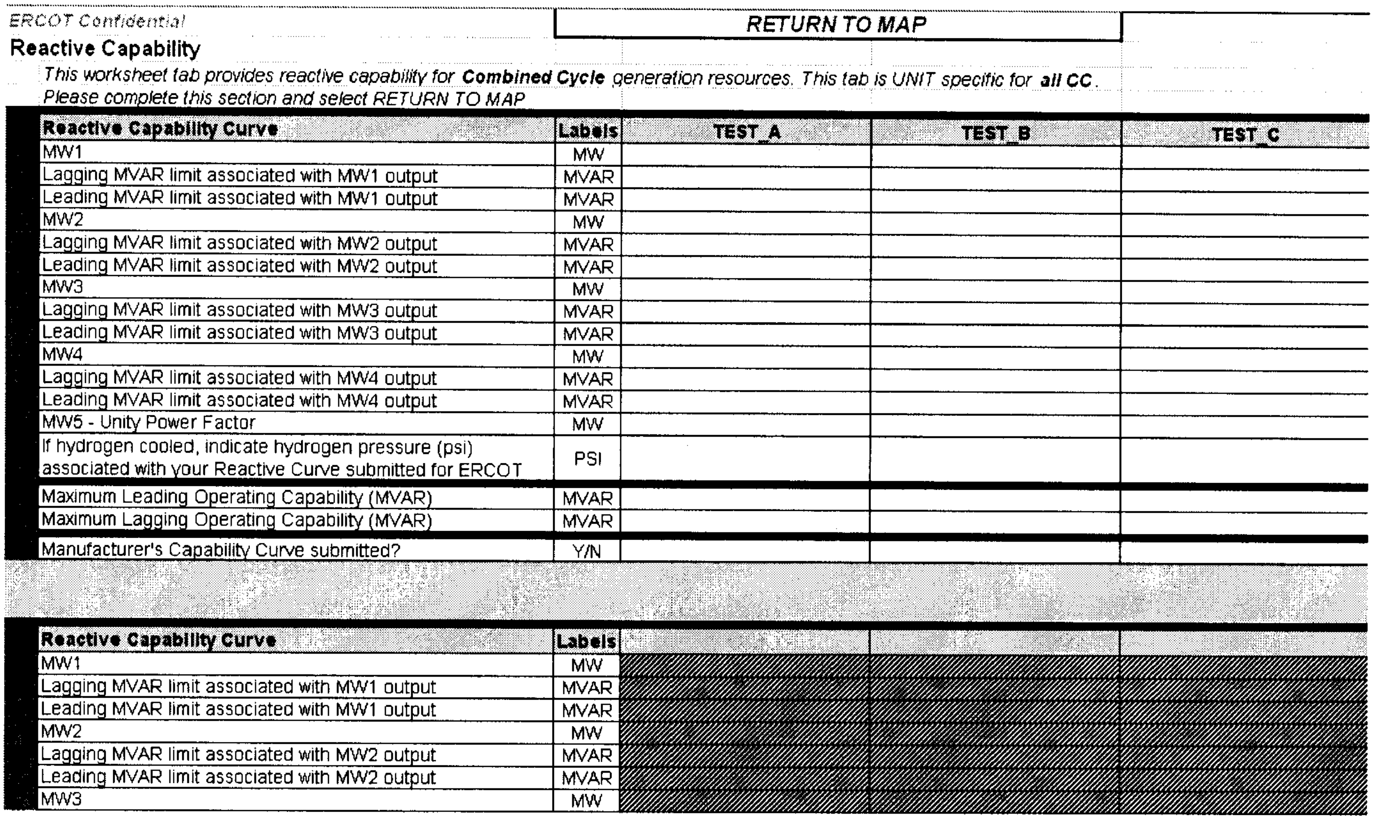
Reactive Capability

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

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.



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RETURN TO MAP

Reactive Capability

*This worksheet tab provides reactive capability for **Combined Cycle** generation resources. This tab is UNIT specific for **all CC**.*

Please complete this section and select RETURN TO MAP

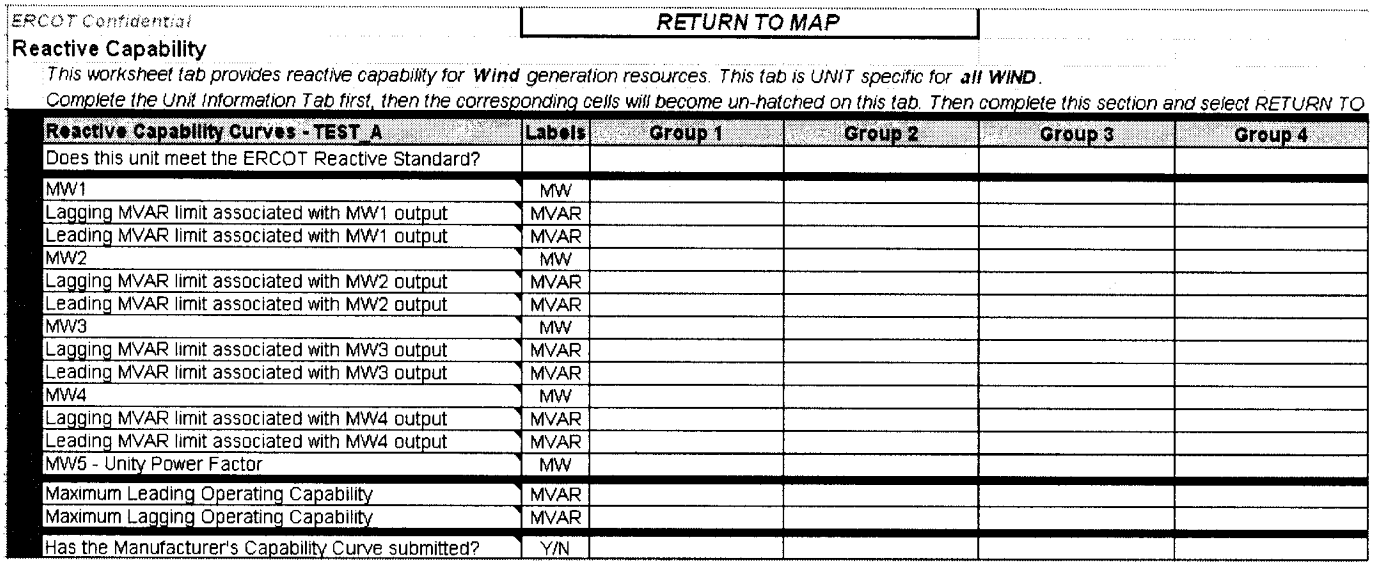
Reactive Capability Curve	Labels	TEST_A	TEST_B	TEST_C
MW1	MW			
Lagging MVAR limit associated with MW1 output	MVAR			
Leading MVAR limit associated with MW1 output	MVAR			
MW2	MW			
Lagging MVAR limit associated with MW2 output	MVAR			
Leading MVAR limit associated with MW2 output	MVAR			
MW3	MW			
Lagging MVAR limit associated with MW3 output	MVAR			
Leading MVAR limit associated with MW3 output	MVAR			
MW4	MW			
Lagging MVAR limit associated with MW4 output	MVAR			
Leading MVAR limit associated with MW4 output	MVAR			
MW5 - Unity Power Factor	MW			
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT	PSI			
Maximum Leading Operating Capability (MVAR)	MVAR			
Maximum Lagging Operating Capability (MVAR)	MVAR			
Manufacturer's Capability Curve submitted?	Y/N			

Reactive Capability Curve	Labels			
MW1	MW			
Lagging MVAR limit associated with MW1 output	MVAR			
Leading MVAR limit associated with MW1 output	MVAR			
MW2	MW			
Lagging MVAR limit associated with MW2 output	MVAR			
Leading MVAR limit associated with MW2 output	MVAR			
MW3	MW			

7.3 Reactive Capability – Wind Units

The 9 point reactive curve data points must be submitted for each unit, as well as the manufacturer's capability curve. The units are listed in the vertical columns – the RARF allows up to five. The groups are horizontal.

Reactive capability must be completed for each group of each unit.



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RETURN TO MAP

Reactive Capability

*This worksheet tab provides reactive capability for **Wind** generation resources. This tab is UNIT specific for **all WIND**.*

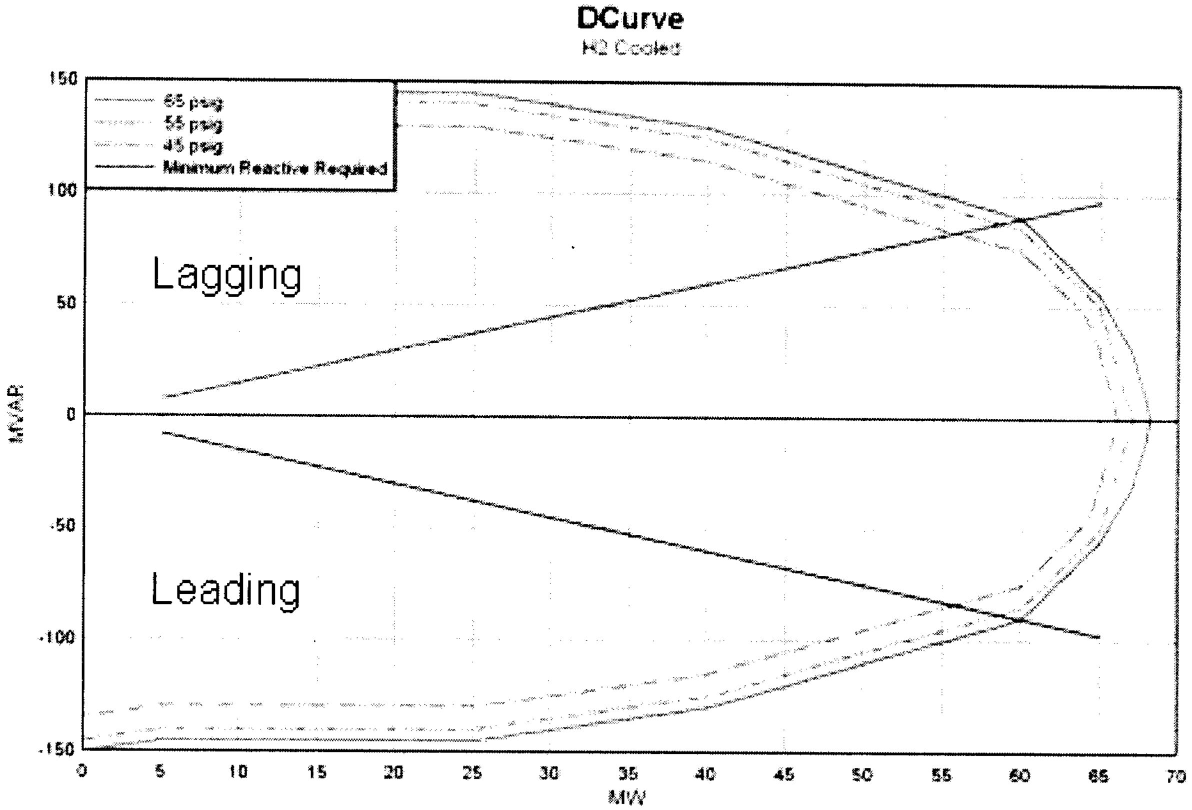
Complete the Unit Information Tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section and select RETURN TO

Reactive Capability Curves - TEST_A	**Labels**	**Group 1**	**Group 2**	**Group 3**	**Group 4**
Does this unit meet the ERCOT Reactive Standard?					
MW1	MW				
Lagging MVAR limit associated with MW1 output	MVAR				
Leading MVAR limit associated with MW1 output	MVAR				
MW2	MW				
Lagging MVAR limit associated with MW2 output	MVAR				
Leading MVAR limit associated with MW2 output	MVAR				
MW3	MW				
Lagging MVAR limit associated with MW3 output	MVAR				
Leading MVAR limit associated with MW3 output	MVAR				
MW4	MW				
Lagging MVAR limit associated with MW4 output	MVAR				
Leading MVAR limit associated with MW4 output	MVAR				
MW5 - Unity Power Factor	MW				
Maximum Leading Operating Capability	MVAR				
Maximum Lagging Operating Capability	MVAR				
Has the Manufacturer's Capability Curve submitted?	Y/N				

7.4 D-Curve / REACTIVE CAPABILITY CURVES

Reactive capability is the ability of a generator unit to supply/absorb reactive power (MVAR) to the grid continuously for a given MW operating value without damaging the unit. Reactive power is required to control voltage under normal and emergency situations in order to prevent voltage collapse of the grid. Reactive capability qualification testing is required by ERCOT for verification of maximum leading and lagging capability of all generation resources required to provide voltage support service.

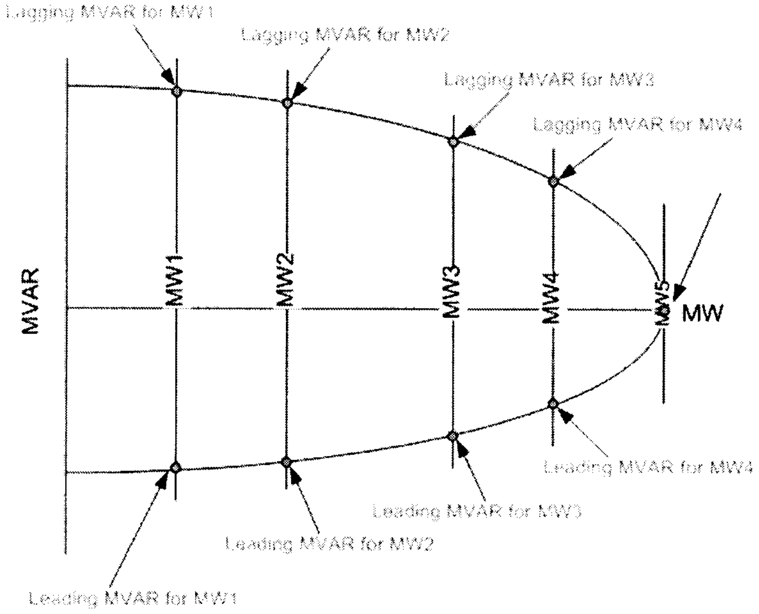
The Reactive Capability Curve, also known as the D-curve, represents the operating limits of the generator. The example Reactive Capability Curve pictured below shows the Reactive Capability Curve or D-Curve of a generator unit where the X-axis is MW and the Y-axis is MVAR, and is intended for illustrative purposes only. Values above the x-axis (positive VARs) are "LAGGING" MVARs and values below the x-axis (negative VARs) are "LEADING" MVARs.


DCurve
H2 Cooled
65 psig
55 psig
45 psig
Minimum Reactive Required
Lagging
Leading
MVAR
MW
150
100
50
0
-50
-100
-150
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70

To establish the curve in the RARF, ERCOT requests nine points of data. When entering data on the RARF, use POSITIVE values to represent the lagging MVARs and NEGATIVE values to represent leading MVARs. If the unit is hydrogen cooled, indicate pressure of hydrogen in psi; otherwise leave the cell blank. Supply 5 increasing MW values of operating real power - MW1 at the lowest operation MW through MW 5 at unity power factor. An example of this entry is shown below.

Reactive Capability Curve	**Labels**	**TEST_UNIT1**
MW1	MW	50.00
Lagging MVAR limit associated with MW1 output	MVAR	10.00
Leading MVAR limit associated with MW1 output	MVAR	-12.00
MW2	MW	100.00
Lagging MVAR limit associated with MW2 output	MVAR	15.00
Leading MVAR limit associated with MW2 output	MVAR	-25.00
MW3	MW	150.00
Lagging MVAR limit associated with MW3 output	MVAR	20.00
Leading MVAR limit associated with MW3 output	MVAR	-35.00
MW4	MW	200.00
Lagging MVAR limit associated with MW4 output	MVAR	30.00
Leading MVAR limit associated with MW4 output	MVAR	-50.00
MW5 - Unity Power Factor	MW	250.00
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT studies	PSI	65.0
Maximum Lagging Operating Capability (MVAR)	MVAR	40.00
Maximum Leading Operating Capability (MVAR)	MVAR	-55.00
Manufacturer's Capability Curve submitted?	Y/N	Y

The following is an example of a D-curve and the selection of points. The graph below shows five MW points and corresponding MVARs. After entering these values in the form, the end curve is shown. This implies that the MW selection points should move closer to the unity end to more accurately depict the curve and reactive capability of the resource.



Resource Asset Registration Guide
v4.06

Revision History

Date	Version	Description	Author
10/10/2007	0.03	Draft for Internal Review	D. Showalter
10/10/2007	0.04	Second draft for Internal Review	D. Showalter
10/10/2007	0.05	Draft for Posting	D. Showalter
10/11/2007	0.06	Revised Draft for Posting	D. Showalter
10/16/2007	0.07	Revised with Market Comments	D. Showalter
12/13/2007	0.08	Revised for Planning Submittal	D. Showalter
4/01/2008	3.99	Draft –Reorganized and reformatted for RARF Ver 4	D. Showalter
4/08/2008	4.00	Released with RARF Ver 4 (Official RARF)	D. Showalter
12/16/08	4.01	Updated RARF Guide V4.01	A. Moy
2/4/2009	4.02	Updated and re-wrote transmission and load data tabs	S. Middleton
3/10/2009	4.03	Corrected / Modified business rules for transformer tab	S. Middleton
6/5/2009	4.04	Added Business Rules for Planning / Protection	S. Middleton
6/10/2009	4.05	Added Business Rules for Planning / Protection	P. Nellutla
6/23/2009	4.06	Added Business Rules for Planning / Protection	P. Nellutla

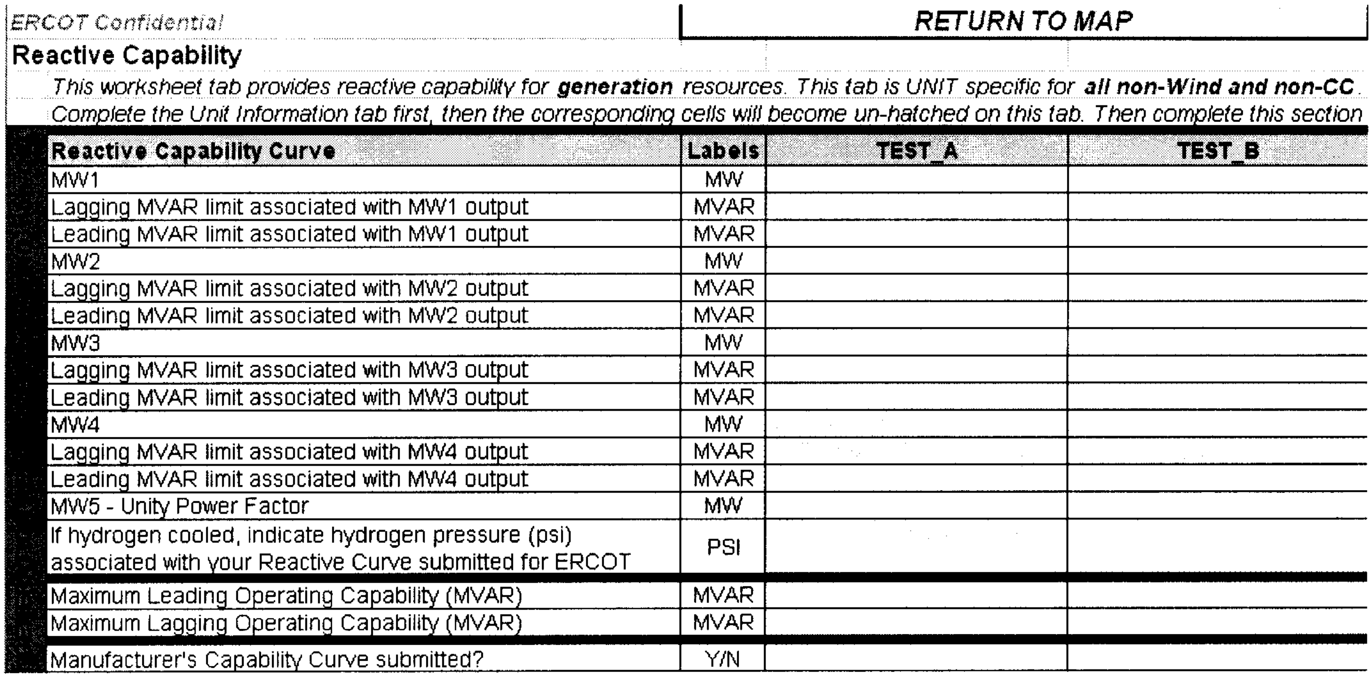
Table of Contents

7.0 Reactive Capability

The Reactive Capability section requires the submittal of the manufacturer's capability curve as well as the 9-point curve values in the RARF. This information will be used to validate test data and should be the best design information available – including all reactive limitations. ERCOT will continue to require bi-annual testing, and this data will be used operationally.

With the exception of Wind, all values on this tab should be filled in.

7.1 Reactive Capability – non-Wind, non-CC Generation Units



ERCOT Confidential

RETURN TO MAP

Reactive Capability

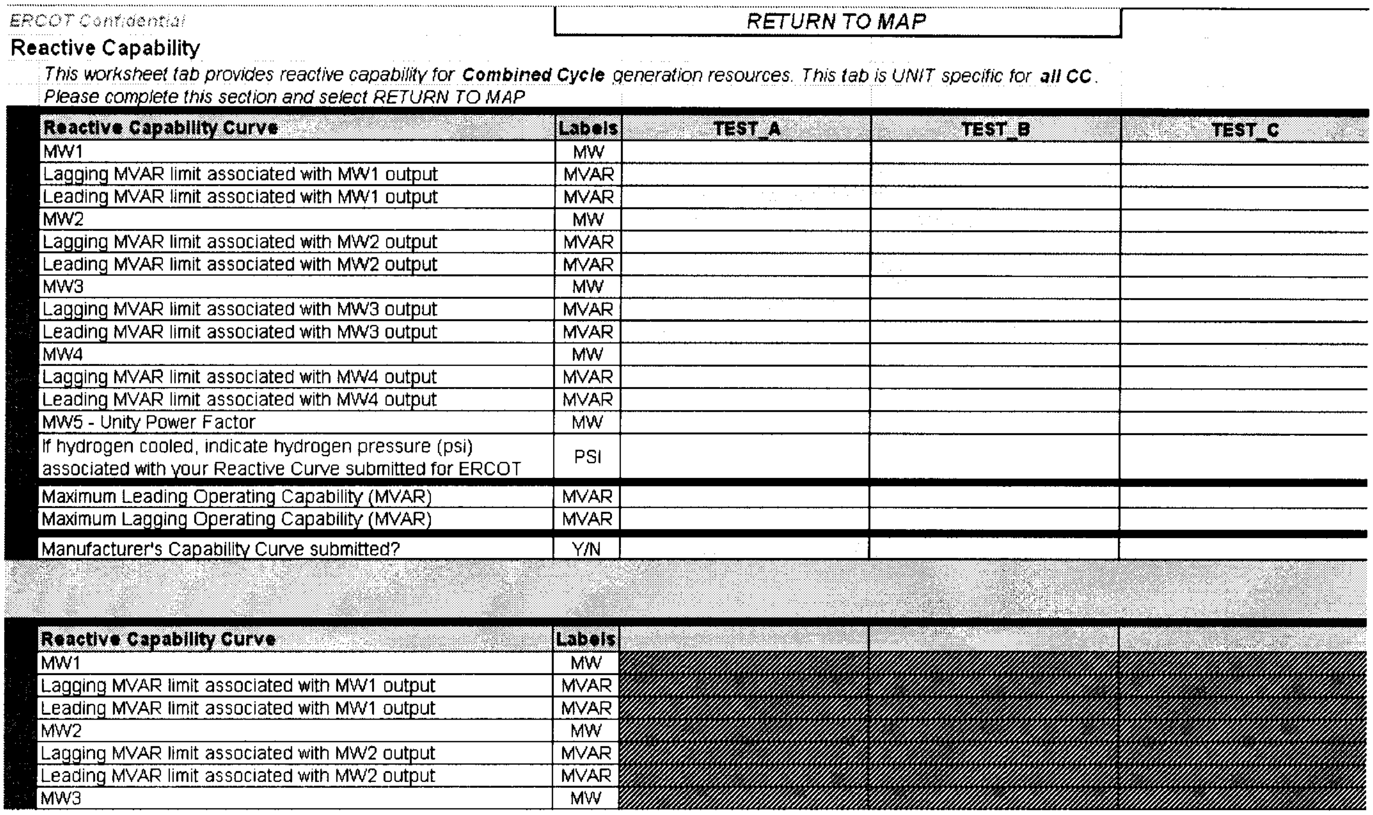
This worksheet tab provides reactive capability for ***generation*** *resources. This tab is UNIT specific for* ***all non-Wind and non-CC***.

Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section

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 Confidential

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

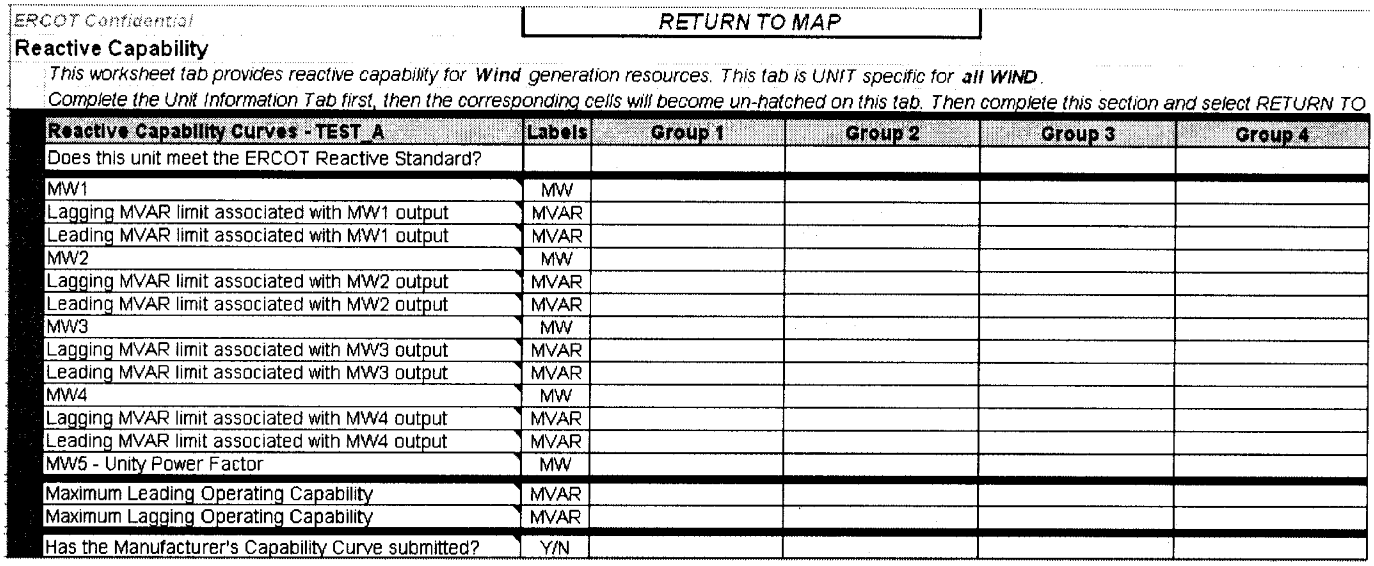
Reactive Capability Curve	**Labels**	**TEST_A**	**TEST_B**	**TEST_C**
MW1	MW			
Lagging MVAR limit associated with MW1 output	MVAR			
Leading MVAR limit associated with MW1 output	MVAR			
MW2	MW			
Lagging MVAR limit associated with MW2 output	MVAR			
Leading MVAR limit associated with MW2 output	MVAR			
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			

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

*This worksheet tab provides reactive capability for **Wind** generation resources. This tab is UNIT specific for **all WIND**.*

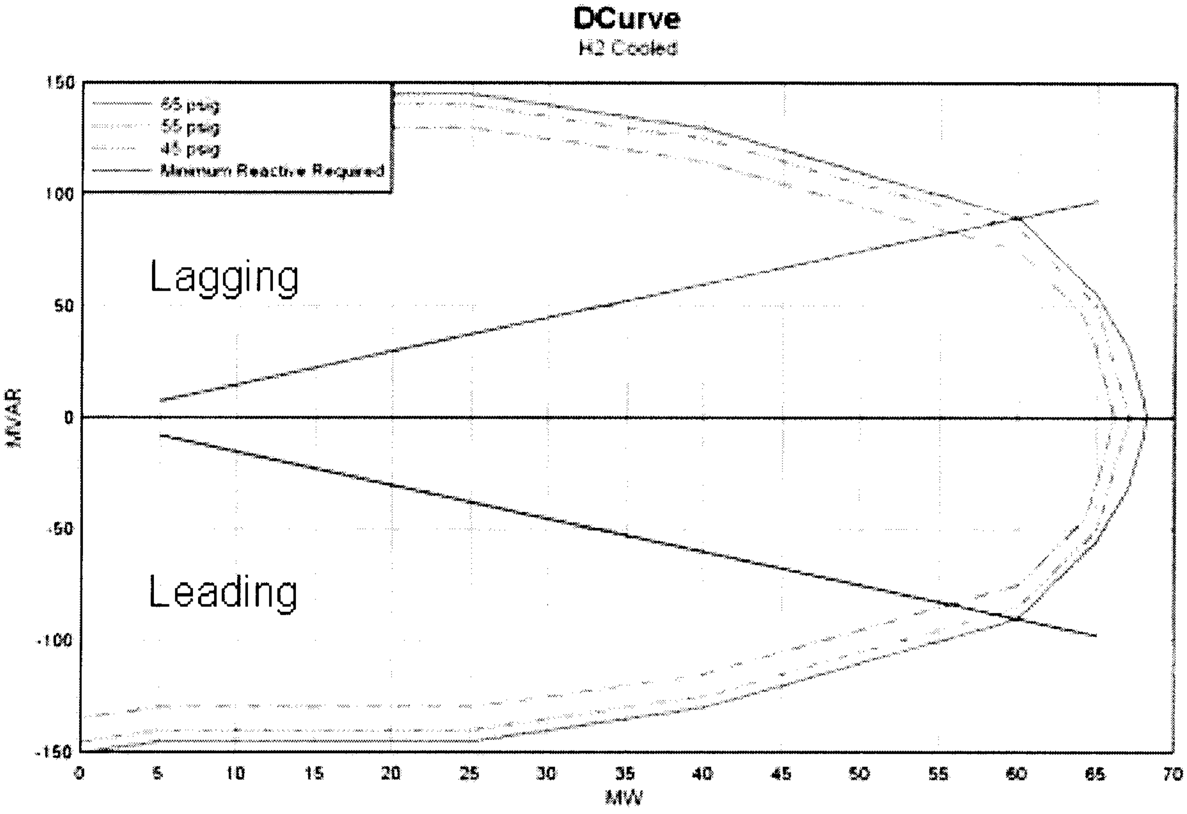
Complete the Unit Information Tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section and select RETURN TO

Reactive Capability Curves - TEST_A	**Labels**	**Group 1**	**Group 2**	**Group 3**	**Group 4**
Does this unit meet the ERCOT Reactive Standard?					
MW1	MW				
Lagging MVAR limit associated with MW1 output	MVAR				
Leading MVAR limit associated with MW1 output	MVAR				
MW2	MW				
Lagging MVAR limit associated with MW2 output	MVAR				
Leading MVAR limit associated with MW2 output	MVAR				
MW3	MW				
Lagging MVAR limit associated with MW3 output	MVAR				
Leading MVAR limit associated with MW3 output	MVAR				
MW4	MW				
Lagging MVAR limit associated with MW4 output	MVAR				
Leading MVAR limit associated with MW4 output	MVAR				
MW5 - Unity Power Factor	MW				
Maximum Leading Operating Capability	MVAR				
Maximum Lagging Operating Capability	MVAR				
Has the Manufacturer's Capability Curve submitted?	Y/N				

7.4 D-Curve / REACTIVE CAPABILITY CURVES

Reactive capability is the ability of a generator unit to supply/absorb reactive power (MVAR) to the grid continuously for a given MW operating value without damaging the unit. Reactive power is required to control voltage under normal and emergency situations in order to prevent voltage collapse of the grid. Reactive capability qualification testing is required by ERCOT for verification of maximum leading and lagging capability of all generation resources required to provide voltage support service.

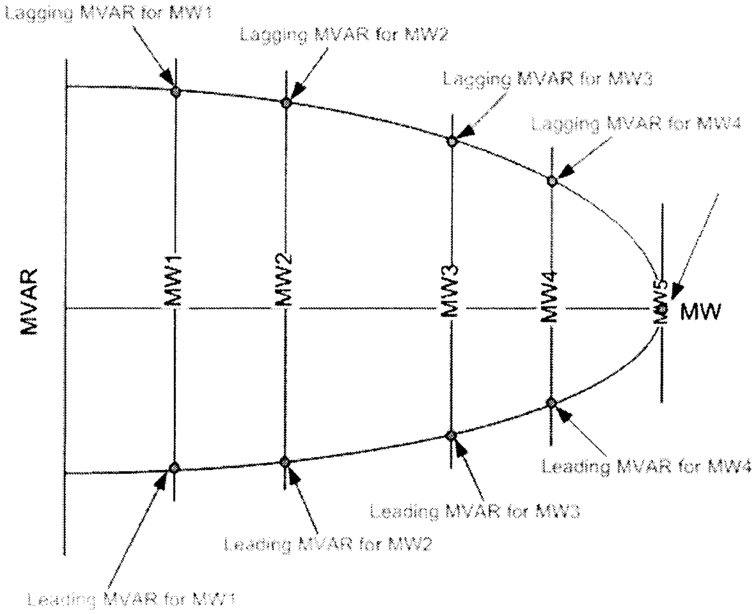
The Reactive Capability Curve, also known as the D-curve, represents the operating limits of the generator. The example Reactive Capability Curve pictured below shows the Reactive Capability Curve or D-Curve of a generator unit where the X-axis is MW and the Y-axis is MVAR, and is intended for illustrative purposes only. Values above the x-axis (positive VARs) are "LAGGING" MVARs and values below the x-axis (negative VARs) are "LEADING" MVARs.


DCurve
H2 Cooled
65 psig
55 psig
45 psig
Minimum Reactive Required
Lagging
Leading
MVAR
MW
150
100
50
0
-50
-100
-150
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70

To establish the curve in the RARF, ERCOT requests nine points of data. When entering data on the RARF, use POSITIVE values to represent the lagging MVARs and NEGATIVE values to represent leading MVARs. If the unit is hydrogen cooled, indicate pressure of hydrogen in psi; otherwise leave the cell blank. Supply 5 increasing MW values of operating real power - MW1 at the lowest operation MW through MW 5 at unity power factor. An example of this entry is shown below.

Reactive Capability Curve	**Labels**	**TEST_UNIT1**
MW1	MW	50.00
Lagging MVAR limit associated with MW1 output	MVAR	10.00
Leading MVAR limit associated with MW1 output	MVAR	-12.00
MW2	MW	100.00
Lagging MVAR limit associated with MW2 output	MVAR	15.00
Leading MVAR limit associated with MW2 output	MVAR	-25.00
MW3	MW	150.00
Lagging MVAR limit associated with MW3 output	MVAR	20.00
Leading MVAR limit associated with MW3 output	MVAR	-35.00
MW4	MW	200.00
Lagging MVAR limit associated with MW4 output	MVAR	30.00
Leading MVAR limit associated with MW4 output	MVAR	-50.00
MW5 - Unity Power Factor	MW	250.00
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT studies	PSI	65.0
Maximum Lagging Operating Capability (MVAR)	MVAR	40.00
Maximum Leading Operating Capability (MVAR)	MVAR	-55.00
Manufacturer's Capability Curve submitted?	Y/N	Y

The following is an example of a D-curve and the selection of points. The graph below shows five MW points and corresponding MVARs. After entering these values in the form, the end curve is shown. This implies that the MW selection points should move closer to the unity end to more accurately depict the curve and reactive capability of the resource.



RARF Wind Workshop

ERCOT

RESOURCE ASSET REGISTRATION FORM WORKSHOP

Wind Generation Resources

March 24, 2008

REACTIVE CAPABILITY CURVES

REACTIVE CAPABILITY CURVES

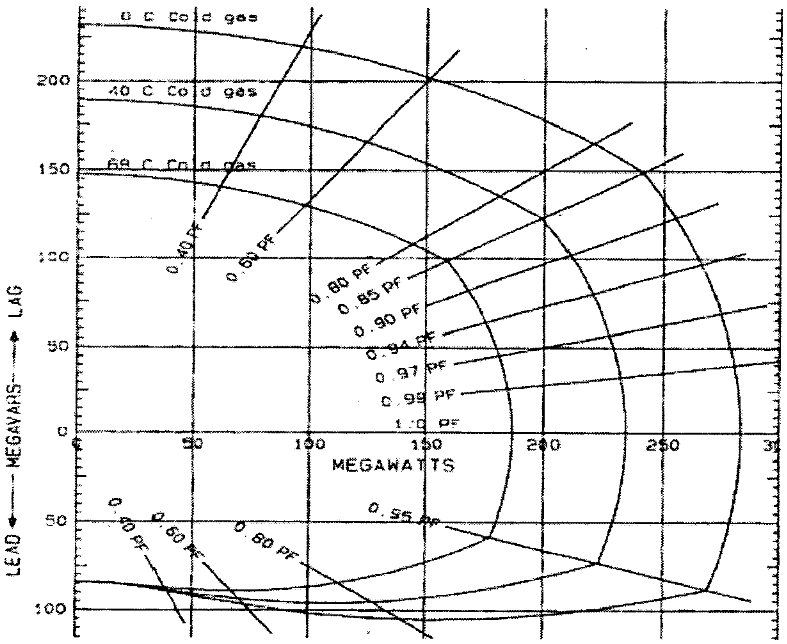
- Reactive Capability is the ability of a Generator unit to continuously supply/absorb Reactive Power (MVAR) to/from ERCOT grid for a given MW operating value without damaging the unit.

- Reactive Power is required to control voltages during normal and emergency situations in order to prevent voltage collapse of the grid.

- RE shall conduct reactive capacity qualification tests to verify maximum leading and lagging reactive capability of all Generation Resources required to provide VSS.

- Reactive Capability tests are performed on initial qualification and at a minimum of once every two years as required by ERCOT.

REACTIVE CAPABILITY CURVES



- Figure on the left shows a typical Reactive Capability Curve or D-Curve of a Generator
- X-axis is MW and Y-axis is MVAR
- Values above the x-axis (positive VARs) are “LAGGING” MVARs
- Values below the x-axis (negative VARs) are “LEADING” MVARs
- Straight lines correspond to different power factor (PF) values
- RE will submit D-Curves of all WGRs to ERCOT
- Form has been modified to allow for D-Curves for each type of turbine in a unit (i.e. each group of turbines)

REACTIVE CAPABILITY CURVES

- **The Reactive Capability Curve, also known as the D-curve, represents the operating limits of the generator**
- **ERCOT is asking for nine points of information in order to build the curve**
- **Use positive (lagging MVAR) and negative numbers (leading MVAR) as shown on the example**
- **Enter 5 increasing MW values of Operating Real Power**
  - MW1 (low operating point) through MW5 (unity)

Field Description	**Unit #1**
MW1 *(lowest MW value of curve – minimum operating MW output)*	18
Lagging MVAR limit associated with MW1 output	145
Leading MVAR limit associated with MW1 output	-145
MW2 *(midpoint (50%) between MW1 and MW5)*	38
Lagging MVAR limit associated with MW2 output	130
Leading MVAR limit associated with MW2 output	-130
MW3 *(seventy-fifth percentile (75%) between MW1 and MW5)*	48
Lagging MVAR limit associated with MW3 output	115
Leading MVAR limit associated with MW3 output	-115
MW4 *(between MW3 and MW 5 - breakpoint of curve)*	60
Lagging MVAR limit associated with MW4 output	80
Leading MVAR limit associated with MW4 output	-80
MW5- Unity Power Factor	68
If hydrogen cooled, Indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT studies	65

REACTIVE CAPABILITY CURVES

- **Lagging MVAR for MW1**
  - On the D-Curve, draw a vertical line from the x-axis (MW1 value) and extend upward until it intersects the curve. From this intersection, draw a horizontal line extending to the y-axis. This point on the y-axis is the Lagging MVAR for MW1.

- **Leading MVAR for MW1**
  - On the D-Curve, draw a vertical line from the x-axis (MW1 value) and extend downward until it intersects the curve. Then, draw a horizontal line extending to the y-axis. This point on the y-axis is the Leading MVAR for MW1.

Field Description
Unit and Group
MW1 (lowest MW value of curve)
Lagging MVAR limit associated with MW1 output
Leading MVAR limit associated with MW1 output
MW2
Lagging MVAR limit associated with MW2 output
Leading MVAR limit associated with MW2 output
MW3
Lagging MVAR limit associated with MW3 output
Leading MVAR limit associated with MW3 output
MW4
Lagging MVAR limit associated with MW4 output
Leading MVAR limit associated with MW4 output
MW5- Unity Power Factor

REACTIVE CAPABILITY CURVES

- **Lagging MVAR for MW2**
  - On the D-Curve, draw a vertical line from the x-axis (MW2 value) and extend upward until it intersects the curve. From this intersection, draw a horizontal line extending to the y-axis. This point on the y-axis is the Lagging MVAR for MW2.
- **Leading MVAR for MW2**
  - On the D-Curve, draw a vertical line from the x-axis (MW2 value) and extend downward until it intersects the curve. Then, draw a horizontal line extending to the y-axis. This point on the y-axis is the Leading MVAR for MW2.

Field Description
Unit and Group
MW1 (lowest MW value of curve)
Lagging MVAR limit associated with MW1 output
Leading MVAR limit associated with MW1 output
MW2
Lagging MVAR limit associated with MW2 output
Leading MVAR limit associated with MW2 output
MW3
Lagging MVAR limit associated with MW3 output
Leading MVAR limit associated with MW3 output
MW4
Lagging MVAR limit associated with MW4 output
Leading MVAR limit associated with MW4 output
MW5- Unity Power Factor

REACTIVE CAPABILITY CURVES

- **Lagging MVAR for MW3**
  - On the D-Curve, draw a vertical line from the x-axis (MW3 value) and extend upward until it intersects the curve. From this intersection, draw a horizontal line extending to the y-axis. This point on the y-axis is the Lagging MVAR for MW3.

- **Leading MVAR for MW3**
  - On the D-Curve, draw a vertical line from the x-axis (MW3 value) and extend downward until it intersects the curve. Then, draw a horizontal line extending to the y-axis. This point on the y-axis is the Leading MVAR for MW3.

Field Description
Unit and Group
MW1 (lowest MW value of curve)
Lagging MVAR limit associated with MW1 output
Leading MVAR limit associated with MW1 output
MW2
Lagging MVAR limit associated with MW2 output
Leading MVAR limit associated with MW2 output
MW3
Lagging MVAR limit associated with MW3 output
Leading MVAR limit associated with MW3 output
MW4
Lagging MVAR limit associated with MW4 output
Leading MVAR limit associated with MW4 output
MW5- Unity Power Factor

REACTIVE CAPABILITY CURVES

- **Lagging MVAR for MW4**
  - On the D-Curve, draw a vertical line from the x-axis (MW4 value) and extend upward until it intersects the curve. From this intersection, draw a horizontal line extending to the y-axis. This point on the y-axis is the Lagging MVAR for MW4.

- **Leading MVAR for MW4**
  - On the D-Curve, draw a vertical line from the x-axis (MW4 value) and extend downward until it intersects the curve. Then, draw a horizontal line extending to the y-axis. This point on the y-axis is the Leading MVAR for MW4.

Field Description
Unit and Group
MW1 (lowest MW value of curve)
Lagging MVAR limit associated with MW1 output
Leading MVAR limit associated with MW1 output
MW2
Lagging MVAR limit associated with MW2 output
Leading MVAR limit associated with MW2 output
MW3
Lagging MVAR limit associated with MW3 output
Leading MVAR limit associated with MW3 output
MW4
Lagging MVAR limit associated with MW4 output
Leading MVAR limit associated with MW4 output
MW5- Unity Power Factor

REACTIVE CAPABILITY CURVES

- **MW5 – Unity Power Factor**
  - Maximum value of Real Power MW at 1.0 PF. For MW5, Reactive Power (both Lagging & Leading) is zero
- **Net Maximum Leading Operating Capability (MVAR)**
  - Maximum Leading Reactive Power output of the unit independent of Real Power output
- **Net Maximum Lagging Operating Capability (MVAR)**
  - Maximum Lagging Reactive Power output of the unit independent of Real Power output

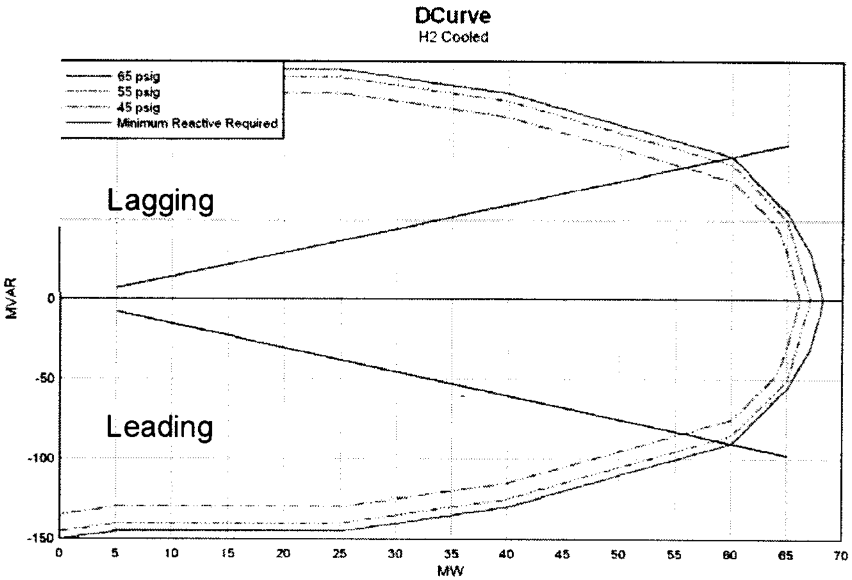
Net Maximum Leading Operating Capability (MVAR)	MVAR
Net Maximum Lagging Operating Capability (MVAR)	MVAR
Manufacturer's Capability Curve submitted?	Y/N

REACTIVE CAPABILITY CURVES

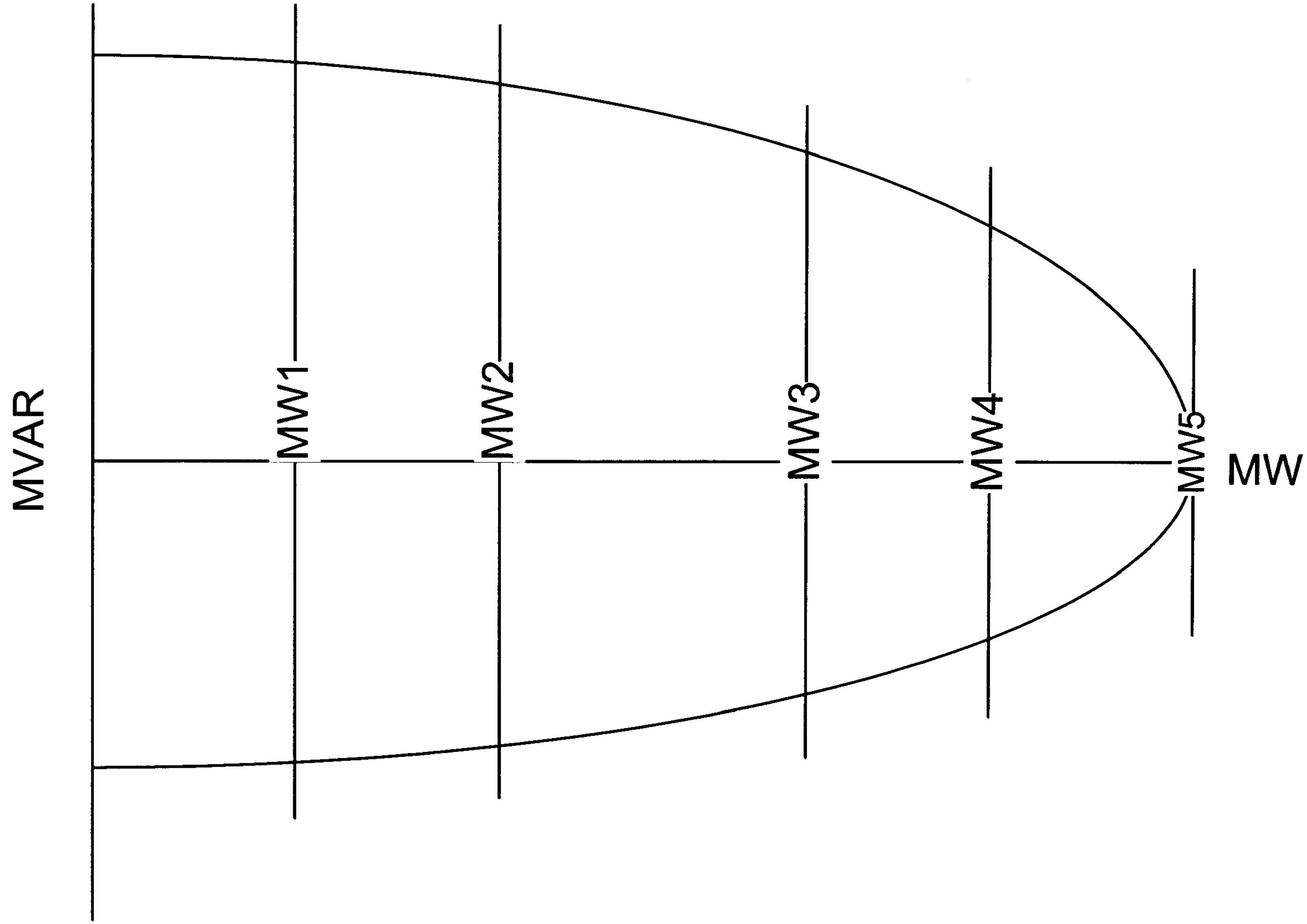
- Sample input data table

Field Description	**Unit #1**
MW1 *(lowest MW value of curve – minimum operating MW output)*	18
Lagging MVAR limit associated with MW1 output	145
Leading MVAR limit associated with MW1 output	-145
MW2 *(midpoint (50%) between MW1 and MW5)*	38
Lagging MVAR limit associated with MW2 output	130
Leading MVAR limit associated with MW2 output	-130
MW3 *(seventy-fifth percentile (75%) between MW1 and MW5)*	48
Lagging MVAR limit associated with MW3 output	115
Leading MVAR limit associated with MW3 output	-115
MW4 *(between MW3 and MW 5 - breakpoint of curve)*	60
Lagging MVAR limit associated with MW4 output	80
Leading MVAR limit associated with MW4 output	-80
MW5- Unity Power Factor	68
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT studies	65

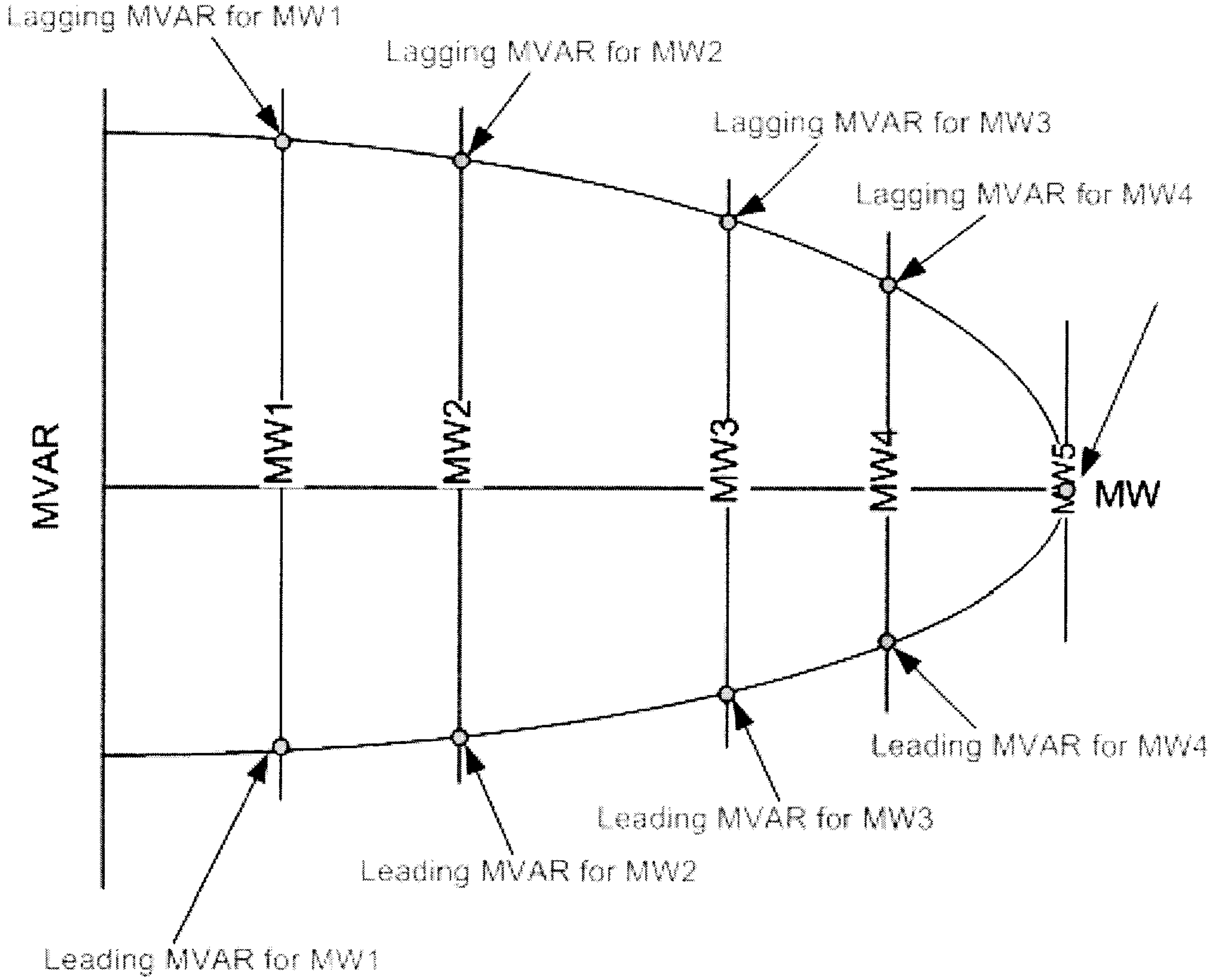
- **Sample D-Curve used to create the data used in the table on left**



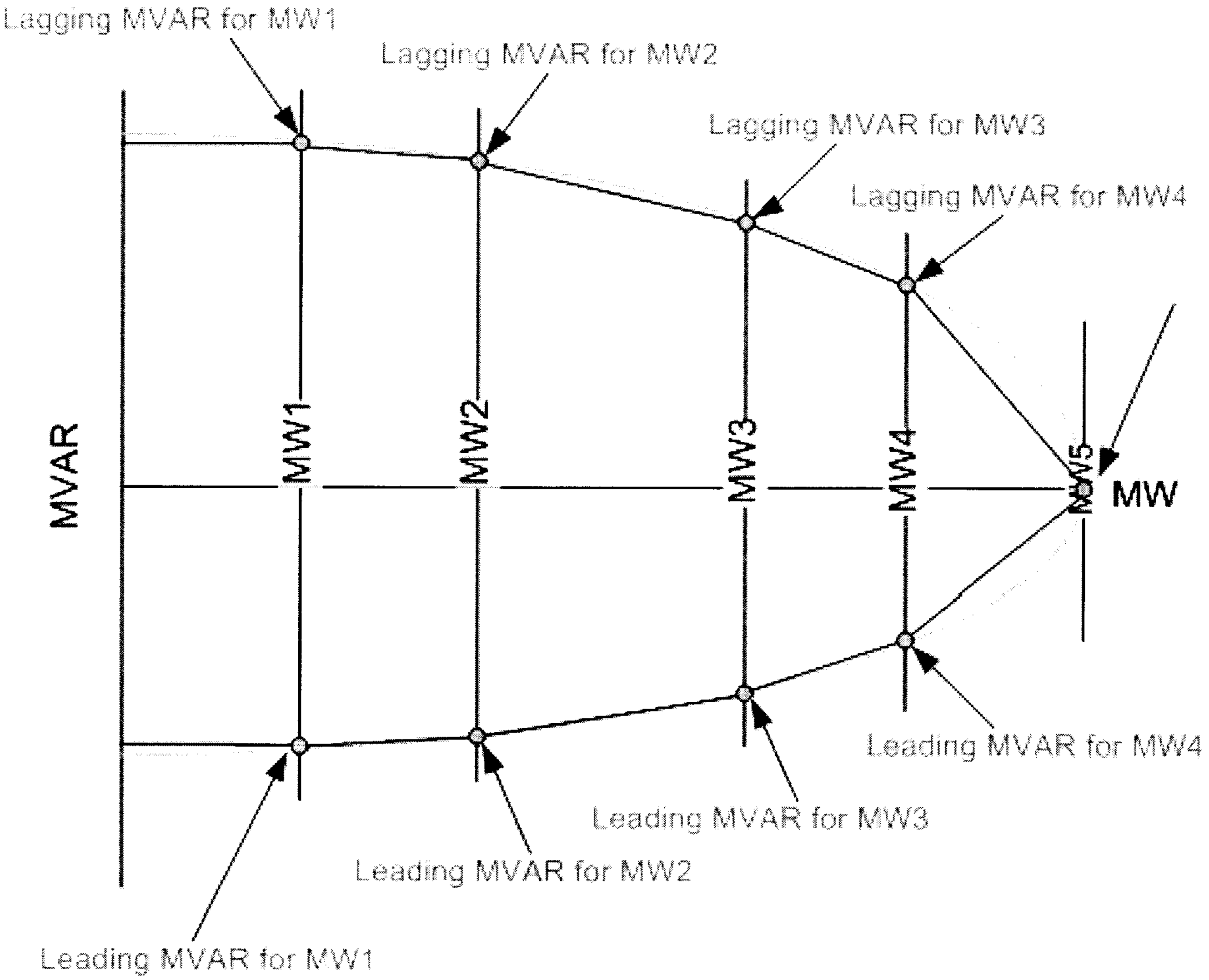
REACTIVE CAPABILITY CURVES – HOW TO BUILD



REACTIVE CAPABILITY CURVES – HOW TO BUILD



REACTIVE CAPABILITY CURVES – HOW TO BUILD



REACTIVE CAPABILITY CURVES – FAQ

- **Does ERCOT want the Manufacturer's Reactive Capability Curve added as a separate tab to this document?**
  - Please include Capability Curve as a separate document.

- **For "Net Maximum Leading Operating Capability (MVAR)" and "Net Maximum Lagging Operating Capability (MVAR)", what is "Net"?**
  - "Net" is defined as Generation less Auxiliary load.

Dumas drafts of reactive power diagram

Sullivan, Patrick

From: Reliability & Operations Subcommittee [ROS@LISTS.ERCOT.COM] on behalf of Dumas, John [jdumas@ERCOT.COM]

Sent: Thursday, August 21, 2008 9:53 AM

To: ROS@LISTS.ERCOT.COM

Subject: Wind Workshop Presentations

Attachments: Wind Generation - Operational Issues Risks.ppt; Voltage_Control_Requirements.ppt

Please find attached presentations that will be given tomorrow afternoon.

Voltage Control Requirement

ERCOT Operations Planning
August 22, 2008

Voltage Control Protocols that apply to WGRs

- **Protocol 6.5.7.1-**

  Generation Resources Required to Provide VSS Installed Reactive Capability

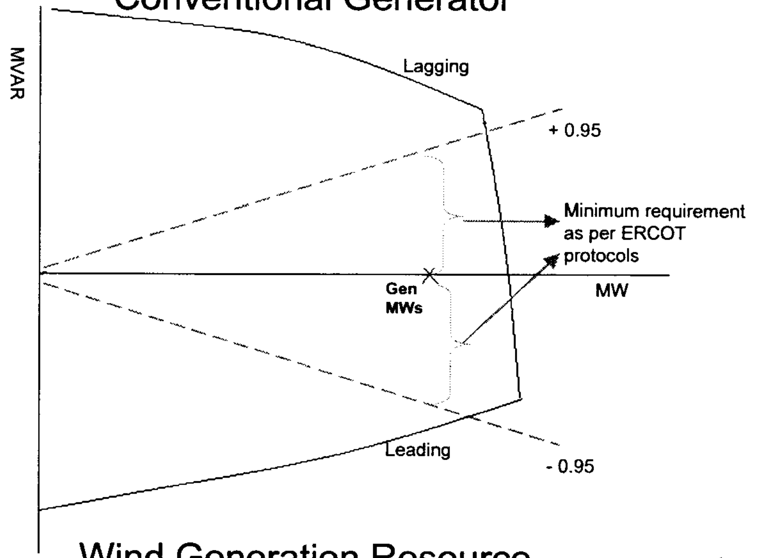
  - (2) Generation Resources required to provide VSS except as noted below in items (3) or (4), shall have and maintain a Unit Reactive Limit (URL) which has an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability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

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

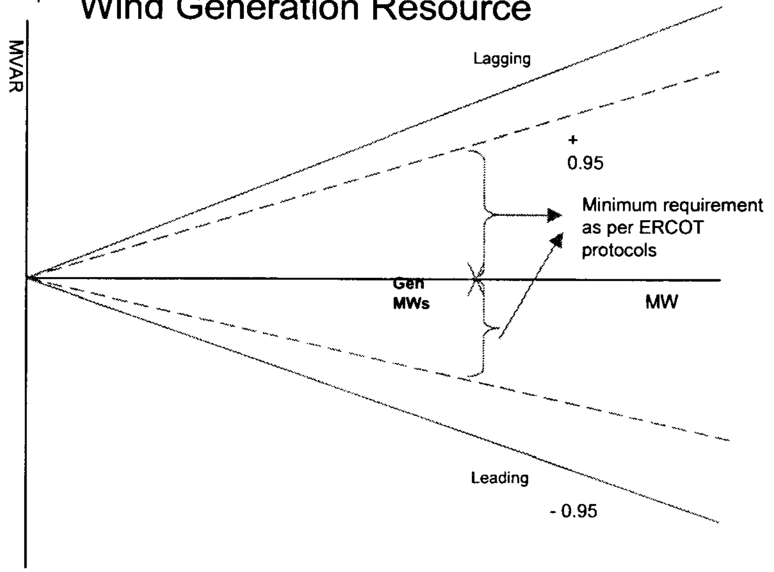
0.95 PF requirement for generators

- Shown to the right are the reactive capability curves for a conventional generator and a WGR
- As seen from the figures, each generator is required to provide a + 0.95 to -0.95 pf voltage support
- Example:
  - **Wind generation output equals 100 MW; MVAR requirement = +/- 33 MVAR at Point of Interconnect**
  - **Wind generation output equals 0 MW; MVAR requirement = 0 MVAR at Point of Interconnect**

Conventional Generator



Wind Generation Resource



Sullivan, Patrick

From:	Reliability & Operations Subcommittee [ROS@LISTS.ERCOT.COM] on behalf of Dumas, John [jdumas@ERCOT.COM]
Sent:	Thursday, August 21, 2008 5:10 PM
To:	ROS@LISTS.ERCOT.COM
Subject:	Voltage Control
Attachments:	Voltage_Control_Requirements.ppt

The presentation that I sent out on voltage control covers an example of reactive capabilities of a wind farm. The example does not meet the protocols. The protocols require a generator to be capable of producing the amount of MVARs required at maximum output through the entire operating range. The attached drawings have been modified to show the max capability points for both the conventional generator and the wind generator.

Voltage Control Requirement

ERCOT Operations Planning
August 22, 2008

Voltage Control Protocols that apply to WGRs

- **Protocol 6.5.7.1-**

  Generation Resources Required to Provide VSS Installed Reactive Capability

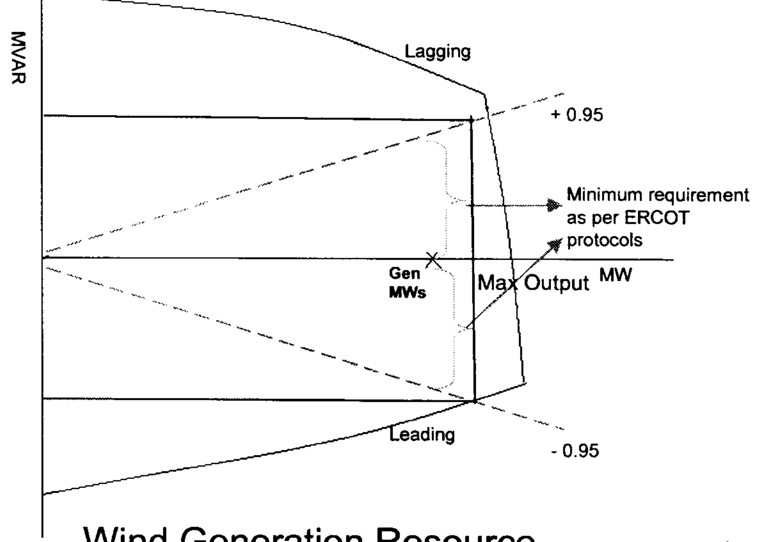
  - (2) Generation Resources required to provide VSS except as noted below in items (3) or (4), shall have and maintain a Unit Reactive Limit (URL) which has an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability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

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

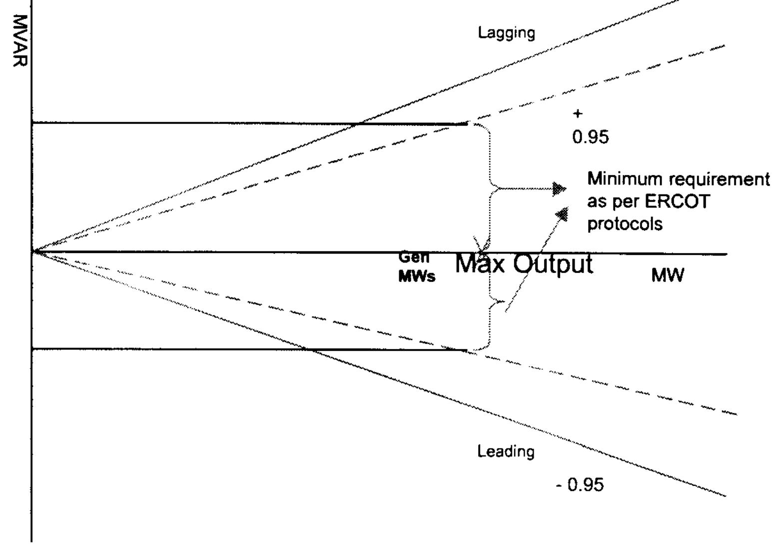
0.95 PF requirement for generators

- Shown to the right are the reactive capability curves for a conventional generator and a WGR
- As seen from the figures, each generator is required to provide a + 0.95 to -0.95 pf voltage support
- Example:
  - **Wind generation output equals 100 MW; MVAR requirement = +/- 33 MVAR at Point of Interconnect**
  - **Wind generation output equals 0 MW; MVAR requirement = 0 MVAR at Point of Interconnect**

Conventional Generator



Wind Generation Resource



Standard Generation Interconnection Agreement

ERCOT STANDARD GENERATION INTERCONNECTION AGREEMENT

EXHIBIT
A

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ERCOT STANDARD GENERATION INTERCONNECTION AGREEMENT

This Standard Generation Interconnection Agreement is made and entered into this ______ day of ________, _____, between ________________ ("Transmission Service Provider") and ________________ ("Generator"), hereinafter individually referred to as "Party," and collectively referred to as "Parties." In consideration of the mutual covenants and agreements herein contained, the Parties hereto agree as follows:

Transmission Service Provider represents that it is a public utility that owns and operates facilities for the transmission and distribution of electricity. Generator represents that it will own and operate the Plant. Pursuant to the terms and conditions of this Agreement, Transmission Service Provider shall interconnect Generator's Plant with Transmission Service Provider's System consistent with the Facilities Study Agreement executed between the Parties on ________________.

This Agreement applies only to the Plant and the Parties' interconnection facilities as identified in Exhibit "C."

This Agreement shall become effective on ____________________, subject to Governmental Authority approval, if required, and shall continue in full force and effect until terminated in accordance with Exhibit "A."

This Agreement will be subject to the following, all of which are incorporated herein:

A. The "Terms and Conditions of the ERCOT Standard Generation Interconnection Agreement" attached hereto as Exhibit "A";
B. The ERCOT Requirements (unless expressly stated herein, where the ERCOT Requirements are in conflict with this Agreement, the ERCOT Requirements shall prevail);
C. The PUCT Rules (where the PUCT Rules are in conflict with this Agreement, the PUCT Rules shall prevail);
D. The Time Schedule attached hereto as Exhibit "B";
E. The Interconnection Details attached hereto as Exhibit "C";
F. The notice requirements attached hereto as Exhibit "D"; and
G. The Security Arrangement Details attached hereto as Exhibit "E."

IN WITNESS WHEREOF, the Parties have executed this Agreement in duplicate originals, each of which shall constitute and be an original effective Agreement between the Parties.

[Name]	[Name]
By:____________________	By:____________________
Title:____________________	Title:____________________
Date:____________________	Date:____________________

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Exhibit "A"

Terms and Conditions of the ERCOT Standard Generation Interconnection Agreement

ARTICLE 1. DEFINITIONS

Capitalized terms shall have the meanings as set forth below, except as otherwise specified in the Agreement:

1.1 "<u>CCN</u>" shall mean a Certificate of Convenience and Necessity issued by the PUCT.

1.2 "<u>Commercial Operation</u>" shall mean the date on which Generator declares that the construction of the Plant has been substantially completed, Trial Operation of the Plant has been completed, and the Plant is ready for dispatch.

1.3 "<u>Control Area</u>" shall have the meaning ascribed thereto in PUCT Rule 25.5(8) or its successor.

1.4 "<u>ERCOT</u>" shall mean the Electric Reliability Council of Texas, Inc.

1.5 "<u>ERCOT Requirements</u>" means the ERCOT Operating Guides, ISO Generation Interconnection Procedures as well as any other documents adopted by the ISO or ERCOT relating to the interconnection and operation of generators and transmission systems in ERCOT as amended from time to time, and any successors thereto. Any requirement in the foregoing documents imposed upon generation entities or generation facilities shall become the responsibility of the Generator, and any requirements imposed on transmission providers or transmission facilities shall become the responsibility of the TSP.

1.6 "<u>Facilities Study</u>" shall have the meaning as described in PUCT Rule 25.198(g) or its successor.

1.7 "Facilities Study Agreement" shall mean an agreement executed by the Parties relating to the performance of the Facilities Study.

1.8 "GIF" shall mean Generator's interconnection facilities as described in Exhibit "C."

1.9 "Good Utility Practice" shall have the meaning described in PUCT Rule 25.5(23) or its successor.

1.10 "Governmental Authority(ies)" shall mean any federal, state, local or municipal body having jurisdiction over a Party.

1.11 "In-Service Date" shall be the date, as reflected in Exhibit "B," that the TIF will be ready to connect to the GIF.

1.12 "ISO" shall mean the ERCOT Independent System Operator.

1.13 "Plant" shall mean the electric generation facility owned and operated by the Generator, as specified in Exhibit "C."

1.14 "Point of Interconnection" shall mean the location(s) where the GIF connects to the TIF as negotiated and defined by the Parties and as shown on Exhibit "C" of this Agreement.

1.15 "PUCT" shall mean the Public Utility Commission of Texas.

1.16 "PUCT Rules" shall mean the Substantive Rules of the PUCT.

1.17 "Reasonable Efforts" shall mean the use of Good Utility Practice and the exercise of due diligence (pursuant to PUCT Rule 25.196(e)).

1.18 "System Protection Equipment" shall mean those facilities located within the TIF and the GIF as described in Section 5.6 and Exhibit "C."

1.19 "System Security Study" shall have the meaning as described in PUCT Rule 25.198(f) or its successor.

1.20 "TCOS" shall mean the TSP's transmission cost of service as allowed by the applicable Governmental Authority.

1.21 "TIF" shall mean the TSP's interconnection facilities as described in Exhibit "C" to this Agreement.

1.22 "Trial Operation" shall mean the process by which the Generator is engaged in on-site test operations and commissioning of the Plant prior to Commercial Operation.

1.23 "TSP" shall mean the Transmission Service Provider.

1.24 "TSP System" shall mean the electric transmission facilities, including the TIF, and all associated equipment and facilities owned and/or operated by the TSP.

ARTICLE 2. TERMINATION

2.1 Termination Procedures. This Agreement may be terminated as follows:

A. the Generator may terminate this Agreement after giving the TSP thirty (30) days advance written notice; or

B. the TSP may terminate this Agreement (subject to Governmental Authority approval, if required) on written notice to the Generator if the Generator's Plant has not achieved Commercial Operation within one year after the scheduled Commercial Operation date reflected in Exhibit "B"; or

C. either Party may terminate this Agreement in accordance with Section 10.6.

2.2 Termination Costs. If a Party elects to terminate the Agreement pursuant to Section 2.1 above, the Generator shall pay all costs incurred (or committed to be incurred) by TSP, as of the date of the other Party's receipt of such notice of termination, that are the responsibility of the Generator under this Agreement. In the event of termination by either Party, both Parties shall use commercially reasonable efforts to mitigate the damages and charges that they may incur as

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a consequence of termination. The provisions of the Sections 2.2 and 2.3 shall survive termination of the Agreement.

2.3 Disconnection. Upon termination of this Agreement, the Parties will disconnect the GIF from the TIF.

ARTICLE 3. REGULATORY FILINGS

3.1 Filing. The TSP shall file this executed Agreement with the appropriate Governmental Authority, if required. Any portions of this Agreement asserted by Generator to contain competitively sensitive commercial or financial information shall be filed by the TSP identified as "confidential" under seal stating, for the TSP's showing of good cause, that Generator asserts such information is confidential information and has requested such filing under seal. If requested by the TSP, Generator shall provide the TSP, in writing, with the Generator's basis for asserting that the information referred to in this Section 3.1 is competitively sensitive information, and the TSP may disclose such writing to the appropriate Governmental Authority.

3.2 Regulatory Approvals. Unless exempt, the TSP shall timely request ISO and all regulatory approvals necessary for it to carry out its responsibilities under this Agreement. Such approvals shall include any CCN required for the construction of the TIF.

ARTICLE 4. INTERCONNECTION FACILITIES ENGINEERING, PROCUREMENT, AND CONSTRUCTION

4.1 Options. The Generator shall select one of the following options (subsection A or subsection B) and include the selected option in Exhibit "B" for completion of the TIF:

A. The TSP shall design, procure, and construct the TIF, using Reasonable Efforts to complete the TIF by the In-Service Date reflected in Exhibit "B." The TSP will utilize its own resources and will contract for additional resources, as reasonably necessary, to meet the In-Service Date. Such resources shall include, as the TSP believes is reasonable, use of other contractors, other equipment suppliers, other material suppliers, additional contract personnel, additional payments to contractors for expedited work, and premiums paid to equipment and material suppliers for expedited delivery. The TSP shall not be required to undertake any initiative which is inconsistent with its standard safety practices, its material and equipment specifications, its design criteria and construction procedures, its labor agreements, applicable laws and regulations, and ERCOT Requirements. In the event the TSP reasonably expects that it will not be able to complete the TIF by the In-Service Date, the TSP will promptly provide written notice to the Generator and will undertake Reasonable Efforts to meet the earliest date thereafter.

B. (i) The TSP shall design, procure, and construct the TIF by the In-Service Date reflected in Exhibit "B." The Parties acknowledge that the In-Service Date was either agreed upon through good faith negotiations or designated by the Generator upon failure of the Parties to agree. In the process of negotiating the In-Service Date, Generator will request a date upon which it reasonably expects it will be ready to begin use of the TIF and upon which it reasonably expects to begin doing so. Any date designated by the Generator shall in no event be less than fifteen months from the date that all conditions of Sections 4.2 and 4.3 have been satisfied. The designated In-Service Date will be extended day for day for each day that the ISO refuses to grant clearances to install equipment. If the TSP fails to complete the TIF by the In-Service Date reflected in Exhibit "B," the TSP shall pay the Generator liquidated damages in accordance with this Section 4.1.B.

(ii) The Parties agree that actual damages to the Generator, in the event the TIF are not completed by the In-Service Date, may include Generator's fixed operation and maintenance costs and lost opportunity costs. Such actual damages are uncertain and impossible to determine at this time. The Parties agree that, because of such uncertainty, any liquidated damages paid by the TSP to the Generator shall be an amount equal to ½ of 1% of the actual cost of the TIF, per day. However, in no event shall the total liquidated damages exceed 20% of the actual cost of the TIF. The Parties agree that such liquidated damages are less than the Generator's actual damages. The Parties agree that the foregoing payments will be made by the TSP to the Generator as just compensation for the damages caused to the Generator, which actual damages are uncertain and impossible to determine at this time, and as reasonable liquidated damages, but not as a penalty or a method to secure performance of this Agreement.

(iii) The TSP shall apply to have the full costs of the TIF included in TCOS. If the PUCT issues a final, appealable order excluding from TCOS any portion of the TIF costs, including higher contractor and vendor costs due to liquidated damage provisions in those contracts and insurance costs to cover liquidated damages, which costs may have been reasonably incurred but which the PUCT finds should not be recovered through TCOS, the Generator shall reimburse the TSP for such costs in an amount not to exceed the difference between the TSP's estimate of the cost of the TIF under section 4.1.A and the TSP's estimate of the cost of the TIF under Section 4.1.B as reflected in Exhibit "C." Such costs shall be estimated using Good Utility Practice.

(iv) No liquidated damages shall be paid to Generator if the Generator is not ready to commence use of the TIF for the delivery of power to the Plant for Trial Operation or export of power from the Plant on the In-Service Date, unless the Generator would have been able to commence use of the TIF for the delivery of power to the Plant for Trial Operation or export of power from the Plant but for TSP's delay.

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(v) If the In-Service Date has been designated by the Generator upon a failure of the Parties to agree on the In-Service Date, the TSP may, at its option, require the Generator to subcontract with the TSP for all or part of the design, procurement and construction of the TIF in accordance with the TSP's standard subcontractor agreements. In such event, the TSP shall be subject to the payment of liquidated damages to the Generator only if the In-Service Date is not met solely due to the TSP's failure to complete the portion of the TIF for which the TSP has retained responsibility. It is the intent of this subsection to give the TSP full control of the contents and quality of the TIF. To the extent the Generator acts as a subcontractor to the TSP, the following will apply: 1) The Generator shall engineer, procure equipment, and construct the TIF (or portions thereof) using Good Utility Practice and using standards and specifications provided in advance by the TSP; 2) In its engineering, procurement and construction of the TIF, the Generator shall comply with all requirements of law to which the TSP would be subject in the engineering, procurement or construction of the TIF; 3) The TSP shall review and approve the engineering design, acceptance tests of equipment, and the construction of the TIF; 4) The TSP shall have the right to approve and accept for operation the TIF in accordance with the standards and specifications provided in advance by the TSP, such approval and acceptance shall not be unreasonably withheld, conditioned, or delayed; 5) Should any phase of the engineering, equipment procurement, or construction of the TIF, including selection of subcontractors, not meet the standards and specifications provided by the TSP, and therefore be deemed unacceptable, then the Generator shall be obligated to remedy that portion of the TIF or selection of subcontractors that is deemed unacceptable, the TSP's approval of the Generator's selection of subcontractors will not be unreasonably withheld, conditioned or delayed; and 6) Once the TIF is accepted for operation by the TSP, then the TSP shall reimburse the Generator for the reasonable and necessary costs incurred by the Generator to complete the TIF, not to exceed the amount specified in the subcontract. Such reimbursement shall be made within thirty days after receipt of the invoice, unless otherwise agreed to by the Parties.

4.2 Equipment Procurement. If responsibility for construction of the TIF is borne by the TSP, then the TSP shall commence design of the TIF and procure necessary equipment within a reasonable time after all of the following conditions are satisfied:

A. The TSP has completed the Facilities Study pursuant to the Facilities Study Agreement;

B. The TSP has received written authorization to proceed with design and procurement from the Generator by the date specified in Exhibit "B"; and

C. The Generator has provided security to the TSP in accordance with Section 8.3 by the dates specified in Exhibit "B."

4.3 Construction Commencement. The TSP shall commence construction of the TIF as soon as practicable after the following additional conditions are satisfied:

A. Approval of the appropriate Governmental Authority has been obtained for any facilities requiring regulatory approval;

B. Necessary real property rights, if any, have been obtained;

C. The TSP has received written authorization to proceed with construction from the Generator by the date specified in Exhibit "B"; and

D. The Generator has provided security to the TSP in accordance with Section 8.3 by the dates specified in Exhibit "B."

4.4 Work Progress. The Parties will keep each other advised periodically as to the progress of their respective design, procurement and construction efforts. If, at any time, the Generator

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becomes aware that the completion of the TIF will not be required until after the specified In-Service Date, the Generator will promptly provide written notice to the TSP of a new, later In-Service Date.

4.5 Conditions Precedent Delay. To the extent this Agreement incorporates a specified In-Service Date and the Generator fails to satisfy conditions precedent under Sections 4.2 and 4.3 so that the TSP may meet the In-Service Date, the Parties will negotiate in good faith to establish a new schedule for completion of the TIF.

ARTICLE 5. FACILITIES AND EQUIPMENT

5.1 Information Exchange. The Parties shall exchange information and mutually agree upon the design and compatibility of the Parties' interconnection facilities. The Parties shall work diligently and in good faith to make any necessary design changes to ensure compatibility of the GIF to the TSP System.

5.2 GIF Construction. Generator agrees to cause the GIF to be designed and constructed in accordance with Good Utility Practice, ERCOT Requirements and the National Electrical Safety Code in effect at the time of construction. Within one-hundred and twenty (120) days after Commercial Operation, unless the Parties agree on another mutually acceptable deadline, the Generator shall deliver to the TSP the following "as-built" drawings, information and documents for the GIF: a one-line diagram, a site plan showing the Plant and the GIF, plan and elevation drawings showing the layout of the GIF, a relay functional diagram, relaying AC and DC schematic wiring diagrams and relay settings for all facilities associated with the Generator's main-power transformers, the facilities connecting the Generator to the main power transformers and the GIF, and the impedances (determined by factory tests) for the associated main power transformers and the generators.

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5.3 TIF Construction. The TSP agrees to cause the TIF to be designed and constructed in accordance with Good Utility Practice, ERCOT Requirements and the National Electrical Safety Code in effect at the time of construction.

5.4 Equipment Changes. For facilities not described in Exhibit "C," if either Party makes equipment changes to the Plant, the GIF, the TIF or the TSP System which it knows will affect the operation or performance of the other Party's interconnection facilities, the Parties agree to notify the other Party, in writing, of such changes. Such changes shall be made in accordance with ERCOT Requirements and coordinated between the Parties.

5.5 Metering, Telemetry and Communications Requirements.

A. Metering and telemetry of data will be accomplished in accordance with ERCOT Requirements. The specific metering, telemetry and communications equipment to be installed and data to be telemetered are described in Exhibit "C."

B. At the Point of Interconnection, the metering and telemetry equipment shall be owned by the TSP. However, the TSP shall provide the Generator with metering and telemetry values in accordance with ERCOT Requirements.

C. A minimum set of inputs to the telemetry equipment are specified in Exhibit "C." Additional sets of inputs may be subsequently mutually agreed upon.

D. The TSP will notify the Generator at least five (5) working days in advance of any planned maintenance, inspection, testing, or calibration of the metering equipment, unless otherwise agreed to in writing. The Generator, or its designated representative, shall have the right to be present for these activities and to receive copies of any documents related to the procedures and results.

E. Prior to the connection of the GIF to the TIF, acceptance tests will be performed by the owning Party to ensure the proper functioning of all metering, telemetry and communications equipment associated with the Point of Interconnection and both Parties' interconnection facilities, and to verify the accuracy of data being received by the TSP, the Control Area(s) in which the Plant and the TSP are located and the Generator. All acceptance tests will be performed consistent with ERCOT Requirements.

F. The TSP shall, in accordance with Good Utility Practice and ERCOT Requirements, specify communications facilities, including those necessary to transmit data from the metering equipment to the TSP, that are necessary for the effective operation of the Plant and the GIF with the TSP System. Such communication facilities shall be included in Exhibit "C." The Generator shall make arrangements to procure and bear the cost of such facilities.

G. Any changes to the meters, telemetry equipment, voltage transformers, current transformers, and associated panels, hardware, conduit and cable, which will affect the data being received by the other Party must be mutually agreed to by the Parties.

H. Each Party will promptly advise the other Party if it detects or otherwise learns of any metering, telemetry or communications equipment errors or malfunctions that require the attention and/or correction by the other Party. The Party owning such equipment shall correct such error or malfunction as soon as reasonably feasible in accordance with ERCOT Requirements.

5.6 System Protection and Other Controls Requirements.

A. Each Party's facilities shall be designed to isolate any fault, or to correct or isolate any abnormality, that would negatively affect the other Party's system or other entities connected to the TSP System.

B. The Generator shall be responsible for protection of its facilities consistent with ERCOT Requirements.

C. Each Party's protective relay design shall incorporate the necessary test switches to perform the tests required in Section 5.6.F. The required test switches will be placed such that they allow operation of lockout relays while preventing breaker failure schemes from operating and causing unnecessary breaker operations and tripping the Generator's units.

D. Recording equipment shall be installed to analyze all system disturbances in accordance with ERCOT Requirements.

E. Each Party will test, operate and maintain System Protection Equipment in accordance with ERCOT Requirements. Each Party will provide reasonable notice to the other Party of any testing of its System Protection Equipment allowing such other Party the opportunity to have representatives present during testing of its System Protection Equipment.

F. Prior to the In-Service Date, and again prior to Commercial Operation, each Party or its agent shall perform a complete calibration test and functional trip test of the System Protection Equipment. At intervals suggested by Good Utility Practice or at intervals described in the ERCOT Requirements if so defined therein, and following any apparent malfunction of the System Protection Equipment, each Party shall perform both calibration and functional trip tests of its System Protection Equipment. These tests do not require the tripping of any in-service generation unit. These tests do, however, require that all protective relays and lockout contacts be activated.

5.7 No Annexation. Any and all equipment placed on the premises of a Party shall be and remain the property of the Party providing such equipment regardless of the mode and manner of annexation or attachment to real property, unless otherwise mutually agreed by the Parties.

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ARTICLE 6. OPERATION AND MAINTENANCE

6.1 Operation and Maintenance of Interconnection Facilities. The Parties agree to operate and maintain their systems in accordance with Good Utility Practice, National Electrical Safety Code, the ERCOT Requirements, PUCT Rules and all applicable laws and regulations. Subject to any necessary ISO approval, each Party shall provide necessary equipment outages to allow the other Party to perform periodic maintenance, repair or replacement of its facilities. Such outages shall be scheduled at mutually agreeable times, unless conditions exist which a Party believes, in accordance with Good Utility Practice, may endanger persons or property. No changes will be made in the normal operation of the Point of Interconnection without the mutual agreement of the Parties except as otherwise provided herein. All testing of the Plant that affects the operation of the Point of Interconnection shall be coordinated between the TSP, the Control Area(s) in which the Plant and the TSP are located, and the Generator and will be conducted in accordance with ERCOT Requirements.

6.2 Control Area Notification. At least six months before Trial Operation, the Generator shall notify the TSP in writing of the Control Area in which it will be located. If the Generator elects to be located in a Control Area other than the Control Area in which the TSP is located, all necessary agreements, including but not limited to remote control area generator interchange agreements, if applicable, and appropriate measures under such agreements, shall be executed and implemented prior to the placement of the Plant in the other Control Area. The Parties will diligently cooperate with one another to enable such agreements to be executed and implemented on a schedule necessary to meet the Trial Operation date specified in Exhibit "B."

6.3 Land Rights and Easements. Terms and conditions addressing the rights of the TSP and the Generator regarding any facilities located on the other Party's property shall be addressed in

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a separate, duly executed and recorded easement agreement between the Parties. Prior to Commercial Operation, the Parties will mutually agree upon procedures to govern access to each other's property as necessary for the Parties to fulfill their obligations hereunder.

6.4 Service Interruption. The Parties recognize that the interruption of service provisions of the PUCT Rules give TSP the right to disconnect the TSP System from the Plant under the conditions specified therein. The Generator will promptly disconnect the Plant from the TSP System when required by and in accordance with the PUCT Rules and ERCOT Requirements.

6.5 Switching and Clearance.

A. Any switching or clearances needed on the TIF or the GIF will be done in accordance with ERCOT Requirements.

B. Any switching and clearance procedure necessary to comply with Good Utility Practice or ERCOT Requirements that may have specific application to the Plant shall be addressed in Exhibit "C."

6.6 Start-Up and Synchronization. Consistent with ERCOT Requirements and the Parties' mutually acceptable procedure, the Generator is responsible for the proper synchronization of the Plant to the TSP System.

6.7 Routine Operational Communications. On a timely basis, the Parties shall exchange all information necessary to comply with ERCOT Requirements.

6.8 Blackstart Operations. If the Plant is capable of blackstart operations, Generator will coordinate individual Plant start-up procedures consistent with ERCOT Requirements. Any blackstart operations shall be conducted in accordance with the blackstart criteria included in the ERCOT Requirements and the TSP Blackstart Plan on file with the ISO. Notwithstanding this section, the Generator is not required to have blackstart capability by virtue of this Agreement.

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If the Generator will have blackstart capability, then Generator shall provide and maintain an emergency communication system that will interface with the TSP during a blackstart condition.

6.9 Power System Stabilizers. The Generator shall procure, install, maintain and operate power system stabilizers if required to meet ERCOT Requirements and as described in Exhibit "C."

ARTICLE 7. DATA REQUIREMENTS

7.1 Data Acquisition. 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. Therefore, the TSP and the Generator shall be required to submit specific information regarding the electrical characteristics of their respective facilities to each other as described below in accordance with ERCOT Requirements.

7.2 Initial Data Submission by TSP. The initial data submission by the TSP shall occur no later than 120 days prior to Trial Operation and shall include transmission system data necessary to allow the Generator to select equipment and meet any system protection and stability requirements.

7.3 Initial Data Submission by Generator. The initial data submission by the Generator, including manufacturer data, shall occur no later than 90 days prior to the Trial Operation and shall include a completed copy of the following forms contained in the ISO's Generation Interconnection Procedure: (1) Plant Description/Data and (2) Generation Stability Data. It shall also include any additional data provided to the ISO for the System Security Study. Data in the initial submissions shall be the most current Plant design or expected performance data. Data submitted for stability models shall be compatible with the ISO standard models. If there is no

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compatible model, the Generator will work with an ISO designated consultant to develop and supply a standard model and associated data.

7.4 Data Supplementation. Prior to Commercial Operation, the Parties shall supplement their initial data submissions with any and all "as-built" Plant 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, the Generator shall provide the TSP any data changes due to equipment replacement, repair, or adjustment. The TSP shall provide the Generator any data changes due to equipment replacement, repair, or adjustment in the directly connected substation or any adjacent TSP-owned substation that may affect the GIF equipment ratings, protection or operating requirements. The Parties shall provide such data no later than 30 days after the date of the actual change in equipment characteristics. Also, the Parties shall provide to each other a copy of any additional data later required by the ISO concerning these facilities.

7.5 Data Exchange. Each Party shall furnish to the other Party real-time and forecasted data as required by ERCOT Requirements. The Parties will cooperate with one another in the analysis of disturbances to either the Plant or the TSP's System by gathering and providing access to any information relating to any disturbance, including information from oscillography, protective relay targets, breaker operations and sequence of events records.

ARTICLE 8. PERFORMANCE OBLIGATION

8.1 Generator's Cost Responsibility. The Generator will acquire, construct, operate, test, maintain and own the Plant and the GIF at its sole expense. In addition, the Generator may be required to make a contribution in aid of construction in the amount set out in and for the facilities described in Exhibit "C," if any, in accordance with PUCT Rules.

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8.2 TSP's Cost Responsibility. The TSP will acquire, own, operate, test, and maintain the TIF at its sole expense, subject to the provisions of Section 4.1.B and the contribution in aid of construction provisions of Section 8.1 of this Agreement.

8.3 Financial Security Arrangements. The TSP may require the Generator to pay a reasonable deposit or provide another means of security, to cover the costs of planning, licensing, procuring equipment and materials, and constructing the TIF. The required security arrangements shall be specified in Exhibit "E." Within five business days after the Plant achieves Commercial Operation, the TSP shall return the deposit or security to the Generator. However, the TSP may retain an amount to cover the incremental difference between the TSP's actual out of pocket costs associated with the choice of Section 4.1.B over Section 4.1.A, pending a final PUCT Order as contemplated in Section 4.1.B(iii). If the Plant has not achieved Commercial Operation within one year after the scheduled Commercial Operation date identified in Exhibit "B" or if the Generator terminates this Agreement in accordance with Section 2.1 and the TIF are not required, the TSP may, subject to the provisions of Section 2.2, retain as much of the deposit or security as is required to cover the costs it incurred in planning, licensing, procuring equipment and materials, and constructing the TIF. If a cash deposit is made pursuant to Exhibit "E," any repayment of such cash deposit shall include interest at a rate applicable to customer deposits as established from time to time by the PUCT or other Governmental Authority.

ARTICLE 9. INSURANCE

9.1 Each Party shall, at its own expense, maintain in force throughout the period of this Agreement, and until released by the other Party, the following minimum insurance coverages, with insurers authorized to do business in Texas:

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A. Employers Liability and Worker's Compensation Insurance providing statutory benefits in accordance with the laws and regulations of the State of Texas. The minimum limits for the Employer's Liability insurance shall be One Million Dollars ($1,000,000) each accident bodily injury by accident, One Million Dollars ($1,000,000) each employee bodily injury by disease, and One Million Dollars ($1,000,000) policy limit bodily injury by disease.

B. Commercial General Liability Insurance including premises and operations, personal injury, broad form property damage, broad form blanket contractual liability coverage (including coverage for the contractual indemnification) products and completed operations coverage, coverage for explosion, collapse and underground hazards, independent contractors coverage, coverage for pollution to the extent normally available and punitive damages to the extent normally available and a cross liability endorsement, with minimum limits of One Million Dollars ($1,000,000) per occurrence/One Million Dollars ($1,000,000) aggregate combined single limit for personal injury, bodily injury, including death and property damage.

C. Comprehensive Automobile Liability Insurance for coverage of owned, non-owned and hired vehicles, trailers or semi-trailers designed for travel on public roads, with a minimum combined single limit of One Million Dollars ($1,000,000) per occurrence for bodily injury, including death, and property damage.

D. Excess Public Liability Insurance over and above the Employer's Liability, Commercial General Liability and Comprehensive Automobile Liability Insurance coverage, with a minimum combined single limit of Twenty Million Dollars ($20,000,000) per occurrence/Twenty Million Dollars ($20,000,000) aggregate.

E. The Commercial General Liability Insurance, Comprehensive Automobile Liability Insurance, and Excess Public Liability Insurance polices shall name the other Party, its

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parent, associated and affiliated companies and their respective directors, officers, agents, servants and employees ("Other Party Group") as additional insured. All policies shall contain provisions whereby the insurers waive all rights of subrogation in accordance with the provisions of this Agreement against the Other Party Group and provide thirty (30) days advance written notice to Other Party Group prior to anniversary date of cancellation or any material change in coverage or condition.

F. The Commercial General Liability Insurance, Comprehensive Automobile Liability Insurance and Excess Public Liability Insurance policies shall contain provisions that specify that the policies are primary and shall apply to such extent without consideration for other policies separately carried and shall state that each insured is provided coverage as though a separate policy had been issued to each, except the insurer's liability shall not be increased beyond the amount for which the insurer would have been liable had only one insured been covered. Each Party shall be responsible for its respective deductibles or retentions.

G. The Commercial General Liability Insurance, Comprehensive Automobile Liability Insurance and Excess Public Liability Insurance policies, if written on a Claims First Made basis, shall be maintained in full force and effect for two (2) years after termination of this Agreement, which coverage may be in the form of tail coverage or extended reporting period coverage if agreed by the Parties.

H. The requirements contained herein as to the types and limits of all insurance to be maintained by the Parties are not intended to and shall not in any manner, limit or qualify the liabilities and obligations assumed by the Parties under this Agreement.

I. Within ten (10) days following execution of this Agreement, and as soon as practicable after the end of each fiscal year or at the renewal of the insurance policy and in any

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event within ninety (90) days thereafter, each Party shall provide certification of all insurance required in this Agreement, executed by each insurer or by an authorized representative of each insurer.

J. Notwithstanding the foregoing, each Party may self-insure to the extent it maintains a self-insurance program; provided that, such Party's senior secured debt is rated at investment grade, or better, by Standard & Poor's. For any period of time that a Party's senior secured debt is unrated by Standard & Poor's or is rated at less than investment grade by Standard & Poor's, such Party shall comply with the insurance requirements applicable to it under Sections 9.1.A through 9.1.I. In the event that a Party is permitted to self-insure pursuant to this Section 9.1.J, it shall not be required to comply with the insurance requirements applicable to it under Sections 9.1.A through 9.1.I.

K. The Parties agree to report to each other in writing as soon as practical all accidents or occurrences resulting in injuries to any person, including death, and any property damage arising out of this Agreement.

ARTICLE 10. MISCELLANEOUS

10.1 Governing Law and Applicable Tariffs.

A. This Agreement for all purposes shall be construed in accordance with and governed by the laws of the State of Texas, excluding conflicts of law principles that would refer to the laws of another jurisdiction. The Parties submit to the jurisdiction of the federal and state courts in the State of Texas.

B. This Agreement is subject to all valid, applicable rules, regulations and orders of, and tariffs approved by, duly constituted Governmental Authorities.

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C. Each Party expressly reserves the right to seek changes in, appeal, or otherwise contest any laws, orders, rules, or regulations of a Governmental Authority.

10.2 No Other Services. This Agreement is applicable only to the interconnection of the Plant to the TSP System at the Point of Interconnection and does not obligate either Party to provide, or entitle either Party to receive, any service not expressly provided for herein. Each Party is responsible for making the arrangements necessary for it to receive any other service that it may desire from the other Party or any third party. This Agreement does not address the sale or purchase of any electric energy, transmission service or ancillary services by either Party, either before or after Commercial Operation.

10.3 Entire Agreement. This Agreement, including all Exhibits, Attachments and Schedules attached hereto, constitutes the entire agreement between the Parties with reference to the subject matter hereof, and supersedes all prior and contemporaneous understandings or agreements, oral or written, between the Parties with respect to the subject matter of this Agreement. There are no other agreements, representations, warranties, or covenants which constitute any part of the consideration for, or any condition to, either Party's compliance with its obligations under this Agreement. Notwithstanding the other provisions of this Section, the Facilities Study Agreement, if any, is unaffected by this Agreement.

10.4 Notices. Except as otherwise provided in Exhibit "D," any formal notice, demand or request provided for in this Agreement shall be in writing and shall be deemed properly served, given or made if delivered in person, or sent by either registered or certified mail, postage prepaid, overnight mail or fax to the address or number identified on Exhibit "D" attached to this Agreement. Either Party may change the notice information on Exhibit "D" by giving five business days written notice prior to the effective date of the change.

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10.5 Force Majeure.

A. The term "Force Majeure" as used herein shall mean any cause beyond the reasonable control of the Party claiming Force Majeure, and without the fault or negligence of such Party, which materially prevents or impairs the performance of such Party's obligations hereunder, including but not limited to, storm, flood, lightning, earthquake, fire, explosion, failure or imminent threat of failure of facilities, civil disturbance, strike or other labor disturbance, sabotage, war, national emergency, or restraint by any Governmental Authority.

B. Neither Party shall be considered to be in Default (as hereinafter defined) with respect to any obligation hereunder (including obligations under Article 4), other than the obligation to pay money when due, if prevented from fulfilling such obligation by Force Majeure. A Party unable to fulfill any obligation hereunder (other than an obligation to pay money when due) by reason of Force Majeure shall give notice and the full particulars of such Force Majeure to the other Party in writing or by telephone as soon as reasonably possible after the occurrence of the cause relied upon. Telephone notices given pursuant to this Section shall be confirmed in writing as soon as reasonably possible and shall specifically state full particulars of the Force Majeure, the time and date when the Force Majeure occurred and when the Force Majeure is reasonably expected to cease. The Party affected shall exercise due diligence to remove such disability with reasonable dispatch, but shall not be required to accede or agree to any provision not satisfactory to it in order to settle and terminate a strike or other labor disturbance.

10.6 Default A. The term "Default" shall mean the failure of either Party to perform any obligation in the time or manner provided in this Agreement. No Default shall exist where such failure to discharge an obligation (other than the payment of money) is the result of

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Force Majeure as defined in this Agreement or the result of an act or omission of the other Party. Upon a Default, the non-defaulting Party shall give written notice of such Default to the defaulting Party. Except as provided in Section 10.6.B, the defaulting Party shall have thirty (30) days from receipt of the Default notice within which to cure such Default; provided however, if such Default is not capable of cure within 30 days, the defaulting Party shall commence such cure within 30 days after notice and continuously and diligently complete such cure within 90 days from receipt of the Default notice; and, if cured within such time, the Default specified in such notice shall cease to exist.

B. If a Default is not cured as provided in this Section, or if a Default is not capable of being cured within the period provided for herein, the non-defaulting Party shall have the right to terminate this Agreement by written notice at any time until cure occurs, and be relieved of any further obligation hereunder and, whether or not that Party terminates this Agreement, to recover from the defaulting Party all amounts due hereunder, plus all other damages and remedies to which it is entitled at law or in equity. The provisions of this Section will survive termination of this Agreement.

10.7 <u>Intrastate Operation.</u> The operation of the Plant by Generator shall not cause there to be a synchronous or an asynchronous interconnection between ERCOT and any other transmission facilities operated outside of ERCOT unless ordered by the Federal Energy Regulatory Commission under Section 210 of the Federal Power Act. The Parties recognize and agree that any such interconnection will constitute an adverse condition giving the TSP the right to immediately disconnect the TIF from the GIF, until such interconnection has been disconnected. The Generator will not be prohibited by this Section from interconnecting the Plant with facilities operated by the Comision Federal de Electricidad of Mexico, unless such

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interconnection would cause ERCOT utilities that are not "public utilities" under the Federal Power Act to become subject to the plenary jurisdiction of the Federal Energy Regulatory Commission.

10.8 No Third Party Beneficiaries. This Agreement is not intended to and does not create rights, remedies, or benefits of any character whatsoever in favor of any persons, corporations, associations, or entities other than the Parties, and the obligations herein assumed are solely for the use and benefit of the Parties, their successors in interest and, where permitted, their assigns.

10.9 No Waiver.. The failure of a Party to this Agreement to insist, on any occasion, upon strict performance of any provision of this Agreement will not be considered a waiver of obligations, rights, or duties imposed upon the Parties. Termination or Default of this Agreement for any reason by the Generator shall not constitute a waiver of the Generator's legal rights to obtain an interconnection from the TSP under a new interconnection agreement.

10.10 Headings. . The descriptive headings of the various articles and sections of this Agreement have been inserted for convenience of reference only and are of no significance in the interpretation or construction of this Agreement.

10.11 Multiple Counterparts. This Agreement may be executed in two or more counterparts, each of which is deemed an original but all constitute one and the same instrument.

10.12 Amendment. This Agreement may be amended only upon mutual agreement of the Parties, which amendment will not be effective until reduced to writing and executed by the Parties.

10.13 No Partnership.. This Agreement shall not be interpreted or construed to create an association, joint venture, agency relationship, or partnership between the Parties or to impose any partnership obligation or liability upon either Party. Neither Party shall have any right,

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power or authority to enter into any agreement or undertaking for, or act on behalf of, or to act as or be an agent or representative of, or to otherwise bind, the other Party.

10.14 Further Assurances. The Parties agree to (i) furnish upon request to each other such further information, (ii) execute and deliver to each other such other documents, and (iii) do such other acts and things, all as the other Party may reasonably request for the purpose of carrying out the intent of this Agreement and the documents referred to in this Agreement. Without limiting the generality of the foregoing, the TSP shall, at the Generator's expense, when reasonably requested to do so by the Generator at any time after the execution of this Agreement, prepare and provide such information in connection with this Agreement (including, if available, resolutions, certificates, opinions of counsel or other documents relating to the TSP's corporate authorization to enter into this Agreement and to undertake the obligations set out herein) as may be reasonably required by any potential lender to the Generator under a proposed loan agreement. The TSP will use commercially reasonable efforts to obtain any opinion of counsel reasonably requested by Generator, but the TSP shall not be in Default of any obligation under this Agreement if the TSP is unable to provide an opinion of counsel that will satisfy any potential lender to the Generator. Specifically, upon the written request of one Party, the other Party shall provide the requesting Party with a letter stating whether or not, up to the date of the letter, that Party is satisfied with the performance of the requesting Party under this Agreement.

10.15 Indemnification and Liability. The indemnification and liability provisions of the PUCT Rule 25.202(b)(2) or its successor shall govern this Agreement.

10.16 Consequential Damages. OTHER THAN THE LIQUIDATED DAMAGES HERETOFORE DESCRIBED, IN NO EVENT SHALL EITHER PARTY BE LIABLE UNDER ANY PROVISION OF THIS AGREEMENT FOR ANY LOSSES, DAMAGES, COSTS OR

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EXPENSES FOR ANY SPECIAL, INDIRECT, INCIDENTAL, CONSEQUENTIAL, OR PUNITIVE DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFIT OR REVENUE, LOSS OF THE USE OF EQUIPMENT, COST OF CAPITAL, COST OF TEMPORARY EQUIPMENT OR SERVICES, WHETHER BASED IN WHOLE OR IN PART IN CONTRACT, IN TORT, INCLUDING NEGLIGENCE, STRICT LIABILITY, OR ANY OTHER THEORY OF LIABILITY; PROVIDED, HOWEVER, THAT DAMAGES FOR WHICH A PARTY MAY BE LIABLE TO THE OTHER PARTY UNDER ANOTHER AGREEMENT WILL NOT BE CONSIDERED TO BE SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES HEREUNDER.

10.17 Assignment.. This Agreement may be assigned by either Party only with the written consent of the other; provided that either Party may assign this Agreement without the consent of the other Party to any affiliate of the assigning Party with an equal or greater credit rating and with the legal authority and operational ability to satisfy the obligations of the assigning Party under this Agreement; and provided further that the Generator shall have the right to assign this Agreement, without the consent of the TSP, for collateral security purposes to aid in providing financing for the Plant, provided that the Generator will require any secured party, trustee or mortgagee to notify the TSP of any such assignment. Any financing arrangement entered into by the Generator pursuant to this Section will provide that prior to or upon the exercise of the secured party's, trustee's or mortgagee's assignment rights pursuant to said arrangement, the secured creditor, the trustee or mortgagee will notify the TSP of the date and particulars of any such exercise of assignment right(s). Any attempted assignment that violates this Section is void and ineffective. Any assignment under this Agreement shall not relieve a Party of its obligations, nor shall a Party's obligations be enlarged, in whole or in part, by reason thereof.

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Where required, consent to assignment will not be unreasonably withheld, conditioned or delayed.

10.18 Severability. If any provision in this Agreement is finally determined to be invalid, void or unenforceable by any court having jurisdiction, such determination shall not invalidate, void or make unenforceable any other provision, agreement or covenant of this Agreement; provided that if the Generator (or any third-party, but only if such third-party is not acting at the direction of the TSP) seeks and obtains such a final determination with respect to any provision of Section 4.1.B, then none of the provisions of Section 4.1.B. shall thereafter have any force or effect and the Parties' rights and obligations shall be governed solely by Section 4.1.A.

10.19 Comparability. The Parties will comply with all applicable comparability and code of conduct laws, rules and regulations, as amended from time to time.

10.20 Invoicing and Payment. Unless the Parties otherwise agree (in a manner permitted by applicable PUCT Rules and as specified in writing in an Exhibit "E" attached hereto), invoicing and payment rights and obligations under this Agreement shall be governed by PUCT Rules or applicable Governmental Authority. Invoices shall be rendered to the paying Party at the address specified on, and payments shall be made in accordance with the requirements of, Exhibit "D."

10.21 Confidentiality.

A. Subject to the exception in Section 10.21.B, any information that a Party claims is competitively sensitive, commercial or financial information under this Agreement ("Confidential Information") shall not be disclosed by the other Party to any person not employed or retained by the other Party, except to the extent disclosure is (i) required by law; (ii) reasonably deemed by the disclosing Party to be required to be disclosed in connection with a

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dispute between or among the Parties, or the defense of litigation or dispute; (iii) otherwise permitted by consent of the other Party, such consent not to be unreasonably withheld; or (iv) necessary to fulfill its obligations under this Agreement or as a transmission service provider or a Control Area operator including disclosing the Confidential Information to the ISO. The Party asserting confidentiality shall notify the other Party in writing of the information it claims is confidential. Prior to any disclosures of the other Party's Confidential Information under this subsection, or if any third party or Governmental Authority makes any request or demand for any of the information described in this subsection, the disclosing Party agrees to promptly notify the other Party in writing and agrees to assert confidentiality and cooperate with the other Party in seeking to protect the Confidential Information from public disclosure by confidentiality agreement, protective order or other reasonable measures.

B. This provision shall not apply to any information that was or is hereafter in the public domain (except as a result of a breach of this provision).

Exhibit "B"
Time Schedule

Interconnection Option chosen by Generator (check one): ____ Section 4.1.A. or ____ Section 4.1.B

If Section 4.1.B is chosen by Generator, the In-Service Date(s) was determined by (check one): (1)________good faith negotiations, or (2)__________Designated by Generator upon failure to agree.

Date by which Generator must provide notice to proceed with design and procurement and provide security, as specified in Section 4.2, so that TSP may maintain schedule to meet the In-Service Date:

Date by which Generator must provide notice to commence construction and provide security, as specified in Section 4.3, so that TSP may maintain schedule to meet the In-Service Date:

In - Service Date(s):

> (Notes: (1) In the event that it is not necessary for all facilities associated with the TIF to be completed on the same date, this entry may consist of multiple dates to reflect the staged completion of the TIF to meet those needs. (2) In-Service Date(s) can be expressed as either a specific date or expressed as a defined number of months after all conditions under Sections 4.2 and 4.3 have been satisfied.)

Scheduled Trial Operation Date:

Scheduled Commercial Operation Date:

Due to the nature of the subject of this Agreement, the Parties may mutually agree to change the dates and times of this Exhibit B.

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______ ________

Exhibit "C"
Interconnection Details

1. Name:
2. Point of Interconnection location:
3. Delivery Voltage:
4. Number and size of Generating Units:
5. Type of Generating Unit:

   Unit 1:
   Unit 2:
6. Metering and Telemetry Equipment:
7. Generator Interconnection Facilities:
8. Transmission Service Provider Interconnection Facilities:
9. Communications Facilities:
10. System Protection Equipment:
11. Inputs to Telemetry Equipment:
12. Supplemental Terms and Conditions, if any, attached:
13. Special Operating Conditions, if any, attached:
14. The difference between the estimated cost of the TIF under 4.1.A ($) and the estimated cost of the TIF under 4.1.B ($) is: ______________, if applicable.

DATE:______________

Exhibit "D"
Notice and EFT Information of the ERCOT Standard Generation Interconnection Agreement

(a) All notices of an operational nature shall be in writing and/or may be sent between the Parties via electronic means including facsimile as follows:

If to ______________________	If to ______________________
Company Name	Company Name
Attn:	Attn:
Address	Address
City, State, Zip	City, State, Zip
Operational/Confirmation Fax (__) ___-____	Operational/Confirmation Fax (__) ______
24 Hour Telephone (__) ___-____	24 Hour Telephone (__) ___-____
E-mail ______________________	E-mail ______________________

(b) Notices of an administrative nature:

If to ______________________	If to ______________________
Company Name	Company Name
Attn:	Attn:
Address	Address
City, State, Zip	City, State, Zip
Fax (__) ___-____	Fax (__) ___-____
Phone: ______________________	Phone: ______________________
E-mail ______________________	E-mail ______________________

(c) Notice for statement and billing purposes:

If to ______________________	If to ______________________
Company Name	Company Name
Attn:	Attn:
Address	Address
City, State, Zip	City, State, Zip
Phone: ______________________	Phone: ______________________
E-mail ______________________	E-mail ______________________

(d) Information concerning Electronic Funds Transfers:

If to ______________________	If to ______________________
Bank Name	Bank Name
City, State	City, State
ABA No. ______________	ABA No. ______________
for credit to	for credit to
______________________	______________________
Account No. ______________	Account No. ______________

Exhibit "E"
Security Arrangement Details

New Generation Interconnection Checklist

ERCOT
THE TEXAS CONNECTION

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

ERCOT has been notified by the QSE of the planned unit start-up testing for the Operating Day.

- Maximum capability and MVAR testing for the new unit will be planned in accordance with ERCOT procedures.

Attachment 1: Request to Commission Station Checklist

[RESOURCE ENTITY submits checklist to commission station]

RE Name:

Agent (optional):

Date form completed:

Proposed Station Energize Date:

* Actual date contingent on completion of requirements and approval from ERCOT.

Primary contact for Station Commissioning (Contacts may be RE's Agent):

Primary Contact Name:

Primary Contact Telephone Number:

Primary Contact E-mail Address:

Gen Site Name:	TDSP:	ESI ID:

Congestion Zone: Transmission Voltage:

Special Protection Scheme (SPS) Yes ☐ No ☐

Can unit synchronously connect to another grid? Yes ☐ No ☐

Identify the QSE/TDSP responsible for sending ERCOT station telemetry:

QSE primary contact (may be QSE's Agent):	TDSP primary telemetry contact:
Name:	Name:
Telephone Number:	Telephone Number:
E-mail Address:	E-mail Address:

By signing below I attest that information provided on this form (Attachment 1) is true, correct and complete, and that any substantial changes in such information will be provided to the Electric Reliability Council of Texas (ERCOT) in a timely manner.

Signature:

(RE Authorized Representative)

Printed Name:

(RE Authorized Representative)

Date Signed:

The QSE and Resource Entity are required to remain in compliance with ERCOT Protocol and Operating Guide upon initial day the interconnect becomes operational. The QSE will comply with telemetry requirements and procedures for operation of station to new Resource.

☐ Generation facility is in an ERCOT Control Area and is being reported by that RE's QSE to the ERCOT ISO in the manner as specified in Section 3 of the ERCOT Operating Guides, or any applicable ERCOT agreement requiring information on generation.

☐ Unit is greater than 10MW per ERCOT Operating Guide No. 3.1.4.

☐ Station telemetry from the facility's interconnecting station is in place and operational as of _____ (date) to QSE and TDSP (Optional) required under ERCOT Operating Guide No. 3.1.3.1 and ERCOT Operating Guide Attachment 8a. Enter specific comments about status of station telemetry in comment box on telemetry checklist below.

☐ RE's QSE has reliable voice communications for station operations to new Generating Facility, ERCOT Control Area, and TDSP (Optional) ERCOT Operating Guide No. 3.1.3.1.

☐ Resource Entity has provided ERCOT the technical equipment data to be used in modeling studies per ERCOT Operating Guide No. 3.1.4. **Comments:** _____

Station Telemetry

	Data	**Frequency**	**Mode**	**Reference/Comments**
☐	Station Switching Device status	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. (High side Typical TSP telemetry point; Low side typical QSE telemetry point) **RE Comment:**
☐	Station Breaker status	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision.(Typical QSE telemetry point) **RE Comment:**
☐	Generating Unit High Side bus voltage	10 sec	RTU/ICCP	Protocol Section 6.5.7, Voltage Support Service, May be supplied by the TDSP. (Typical TDSP telemetry point) or Low Side voltage with appropriate transformer model may be substituted.(Typical QSE telemetry point) **RE Comment:**
☐	Station Static Reactive Device(s) status	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision.(Typical QSE telemetry point) **RE Comment:**

	Data	Frequency	Mode	Reference/Comments
☐	Transmission Line Flow	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. (RE has confirmed that TSP is providing required points). **RE Comment:**

Attachment 2: Request for Initial Synchronization Checklist

[QSE submits checklist to request initial start-up]

QSE Name:

Agent (optional):

Date form completed:

* Proposed Initial Synchronization Date :

* Actual date contingent on completion of requirements and approval from ERCOT.

Primary and back-up contact personnel for Initial Synchronization (may be QSE's Agent):

Primary for Initial Synchronization Contact Name:

Primary Contact Telephone Number:

Primary Contact E-mail Address:

Back-Up Contact Name:

Back-Up Contact Telephone Number:

Back-Up Contact E-mail Address:

*If the unit is Split Metered:

Identify the QSE responsible for coordinating the start-up testing:

Identify all of the QSE's that are sharing this unit:

Identify all of the ESI ID's that are related to this unit:

Projected Commercial Date (unit available for market and/or reliability commitment):

By signing below I attest that information provided on this form (Attachment 2) is true, correct and complete, and that any substantial changes in such information will be provided to the Electric Reliability Council of Texas (ERCOT) in a timely manner.

Signature:
(QSE Authorized Representative)

Printed Name:
(QSE Authorized Representative)

Date Signed:

The QSE and Resource Entity are required to remain in compliance with ERCOT Protocol and Operating Guide upon initial day the interconnect becomes operational. The QSE will comply with procedures for new unit start-up testing, with initial synchronization schedule communicated to ERCOT Shift Supervisor.

If the new unit does not successfully synchronize to the ERCOT Transmission System within 30 days, as per **Procedure Step 2** above, the QSE will notify its ERCOT Client Representative of corrective measures and expected timelines for successful unit synchronization and unit testing.

☐ Generation facility is in an ERCOT Control Area and is being reported by that QSE to the ERCOT ISO in the manner as specified in Section 3 of the ERCOT Operating Guides, or any applicable ERCOT agreement requiring information on generation.

☐ Telemetry from the facility (station and generation) is in place and operational as of _____ (date) to QSE and TDSP (Optional). Enter specific comments about status of telemetry in QSE comment box on telemetry checklist on next page.

☐ QSE telemetry is being provided to ERCOT ISO (This information is summarized in Attachment 2 QSE New Generator Telemetry Checklist and is provided to assist Market Participants in identifying the telemetry required under ERCOT Operating Guide No. 3.1.3.1 and ERCOT Operating Guide Attachment 8a).

☐ QSE has reliable voice communications with the Generating Facility, ERCOT Control Area, and TDSP (Optional) ERCOT Operating Guide No. 3.1.3.1.

☐ Generation facility has automatic voltage regulators (in Voltage Control Mode) (AVR) and power system stabilizers (PSS) in service as of _____ (date) per ERCOT Operating Guide No. 3.1.4.5. AVR and PSS performance tests will be reported ERCOT within 30-days after start of commercial operations. **Comments:** _____

☐ The QSE is able to dispatch the reactive output (VARS) of this generation facility to maintain adequate transmission voltage at the point of Interconnection. (ERCOT Operating Guide 2.10.4.1 and 2.10.4.2). **Describe process for VAR dispatch**: _____

☐ QSE has submitted generation facility machine characteristics and plant design to incorporate the under frequency load shedding philosophy and criteria of ERCOT Operating Guide No. 3.1.4.6.

☐ Generation facility protective relaying is in place and operational, necessary to protect equipment from abnormal conditions consistent with the Control Area protective relaying criteria as described in ERCOT Operating Guide No. 3.1.4.6. **Comments:** _____

New Generator Telemetry Checklist

	Data	Frequency	Mode	Reference/Comments
☐	Real Time data accuracy			Real Time data for reliability purposes must be accurate to within three percent (3%). This telemetry may be provided from relaying accuracy instrumentation transformers. **QSE Comment:**
☐	Generating Unit gross and net MW output	2 sec	RTU	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. Net Generation is preferred. Otherwise, aux load should also be provided. **QSE Comment:**
☐	Generating Unit gross and net MVar output	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. Net Generation is preferred. Otherwise, aux load should also be provided. **QSE Comment:**
☐	Switching Device status other than reported in Attachment 1	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. **QSE Comment:**
☐	Breaker status other than reported in Attachment 1	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. **QSE Comment:**
☐	Generating Unit High Operating Limit	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. **QSE Comment:**
☐	Generating Unit Low Operating Limit	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. **QSE Comment:**
☐	Generating Unit Automatic Voltage Regulator status	10 sec	RTU/ICCP	Protocol Section 6.5.7.2 QSE Responsibilities. Applies to units required to provide VSS. **QSE Comment:**
☐	Generating Unit Power System Stabilizer status			Protocol Section 6.5.7.2 QSE Responsibilities. Applies to units required to provide VSS. **QSE Comment:**

Wind-Generation Resource Only

	Additional Wind Resource Data	Frequency (sec)	Protocol Reference
☐	Wind Speed (Miles per Hour)	10	6.5.11 (7)
☐	Wind Direction (Degrees)	10	6.5.11 (7)
☐	Temperature (Celsius)	10	6.5.11 (7)
☐	Barometric Pressure (Millibars)	10	6.5.11 (7)

QSE Comment: _____

Protocol Compliance provisions

ERCOT Protocols
Section 5: Dispatch

May 22, 2009

5 DISPATCH

5.1 ERCOT Control Area Authority

5.1.1 Single Control Area

ERCOT will assume authority as Control Area Operator for the revised regional control area encompassing the boundaries of the previous control areas within the ERCOT interconnection.

5.1.2 Operating Guides and North American Electric Reliability Corporation Guidelines

ERCOT will perform all control area functions as defined in the Operating Guides and the North American Electric Reliability Corporation (NERC) guidelines.

5.2 North American Electric Reliability Corporation/ERCOT Tagging Procedures

The QSE will follow all NERC guidelines for tagging of Control Area interchange transactions. ERCOT will be operated as a single Control Area. Therefore, no internal ERCOT transactions require tagging. Only transactions across ERCOT interconnections to SPP, WSCC, or Mexico, will be tagged by the QSE as prescribed in the NERC tagging guidelines.

5.2.1 Standards and Practices

Each TSP, DSP, and Private Use Network must meet the requirements specified in Section 5.2.1, Standards and Practices, or at their option, meet alternative requirements specifically approved by ERCOT. Such alternative requirements may include requirements for aggregated groups of Facilities.

(1) Sufficient static Reactive Power capability shall be installed by a DSP or a Private Use Network not subject to a TDSP tariff in substations and on the distribution voltage system to maintain at least a ninety-seven hundredths (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. In those cases where a Private Use Network's power factor is established and governed by a TDSP tariff, the TDSP and Private Use Network owner shall ensure that the Private Use Network meets the requirements as defined and measured in the applicable tariff. 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.

(2) Annually, ERCOT will review DSP power factors using the actual summer Load and power factor information included in the annual load data request to assess whether DSPs comply with the requirements of Section 5.2.1, Standards and Practices. All DSP substations whose annual peak Load has exceeded ten (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 (4) times per calendar year for each DSP substation or point of interconnection where power factor measurements are not available.

(3) All DSPs shall report any changes in their estimated net impact on ERCOT as part of the annual Load data assessment.

(4) As part of the annual Load-data-assessment, all Resource Entities owning Generation Resources shall provide an annual estimate of the highest potential affiliated MW and MVAR load (including any load netted with the generation output) and the highest potential MW and MVAR generation that could be experienced at the point of interconnection to the ERCOT Transmission Grid, based on the then current configuration (and the projected configuration if the configuration is going to change during the year) of the Generation Resource and any affiliated loads.

(5) 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.

(6) 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.

(7) 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. Except under Force Majeure conditions, if a TSP fails to maintain transmission system voltage within two percent (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.

(8) 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 Protocols
Section 6: Ancillary Services

November 1, 2009

Resources. Requests arising within the context of this subsection may not result in the operation of a Generation Resource outside of the specified reactive operating range. Accordingly, Generation Resources are expected to voluntarily comply with these requests. Nothing in this subsection is meant to supersede ERCOT's Dispatch authority in the event of emergency operations.

6.5.7.3 ERCOT Responsibilities

(1) ERCOT, in coordination with the TDSPs, shall establish, and update as necessary, Voltage Profiles at points of interconnection of Generation Resources required to provide VSS to maintain system voltages within established limits.

(2) ERCOT shall communicate to the QSE and the TDSPs the desired voltage at the point of generation interconnection by providing Voltage Profiles.

(3) ERCOT, in coordination with the TDSPs, shall deploy static Reactive Power Resources as required to continuously maintain dynamic Reactive Reserves from QSEs, both leading and lagging, adequate to meet ERCOT System requirements.

(4) For any Market Participant's failure to meet the Reactive Power voltage control requirements of these Protocols, ERCOT shall notify the Market Participant in writing of such failure and, upon a request from the Market Participant, explain whether and why the failure must be corrected.

(5) ERCOT shall notify all affected TDSPs of any alternative requirements it approves pursuant to Section 5.2.1, Standards and Practices.

6.5.8 Black Start Service

(1) Providers of Black Start Service shall meet the requirements specified in NERC policy and Operating Guides.

(2) Each Resource providing Black Start Service must meet technical requirements specified in Section 6.10, Ancillary Service Qualification, Testing and Performance Standards.

(3) Beginning in 2009, ERCOT will request bids from Generation Resource Entities for the provision of Black Start Service. Such bids shall be due on or before June 1 of each two (2) year period. Bids will be evaluated based on evaluation criteria attached as an appendix to the request for bids and contracted by December 31 for the following two (2) year period. ERCOT shall ensure Black Start Services are arranged, provided, and deployed as necessary to reenergize the ERCOT System following a total or partial system blackout.

(4) ERCOT shall schedule random testing or simulation, or both, to verify Black Start Service is operable according to the ERCOT System restoration plan. Testing and verification will be in accordance with established qualification criteria.

monitor the Real Time telemetry of the subject Resource breakers and megawatt output to determine if it is available as purchased. Performance shall be satisfactory if the Resource is brought On-line or made available and the QSE makes available required Balancing Energy bids, which, for a LaaR, is at least in the amount of the capacity of the awarded Resource, and, for an awarded Generation Resource, is the High Sustainable Limit minus the Low Sustainable Limit throughout the period requested. During periods when the Load level of a LaaR has been affected by a Dispatch Instruction from ERCOT, the performance of a LaaR in response to a Dispatch Instruction will be determined by subtracting the LaaR's actual Load response from its baseline. The actual Load response is the average of the real power consumption data being telemetered to ERCOT during the Settlement Interval indicated in the Dispatch Instruction. The baseline capacity is calculated by measuring the average of the real power consumption for the four (4) Settlement Intervals prior to the Dispatch Instruction. During hours when the Load level of a LaaR has not been affected by a Dispatch Instruction from ERCOT, the Resource quantity provided by a LaaR scheduled or selected by ERCOT to provide Replacement Reserves shall be measured as the LaaR's average Load level during the hour. QSEs failing to bring the Generation Resource On-line or make the LaaR active shall not be entitled to compensation for the intervals that the capacity was not available. QSEs failing to provide the required levels of Balancing Energy bids in response to the awards shall not be entitled to compensation for that amount of capacity not made available.

6.10.9 Reactive Power Supply from Generation Resources Required to Provide VSS Performance Criteria

(1) ERCOT will maintain a performance log of QSEs acknowledgements of Dispatch Instructions concerning scheduled voltage or scheduled Reactive output requests. QSEs responding in less than two (2) minutes from the time of issuance of such requests shall be deemed satisfactory.

(2) ERCOT shall monitor the Automatic Voltage Regulator, as required in Section 6.5.7, Voltage Support Service, to assure that it is on and operating automatically at least ninety-eight percent (98%) of the time in which the QSE is providing the Reactive Power Supply from Generation Resources required to provide VSS. The percentage is calculated as: Time (Automatic Voltage Regulator is on while providing Service) / (Total Time Providing Services) × 100%.

(3) Except under Force Majeure conditions or ERCOT-permitted operation of the generating unit, failure of a Generation Resource required to provide VSS to provide either leading or lagging reactive up to the required capability of the unit upon request from a TSP or ERCOT may, at the discretion of ERCOT, be reported to the ERCOT Compliance Office.

(4) Except under Force Majeure conditions or ERCOT-permitted operation of the generating unit, if a Generation Resource required to provide VSS fails to maintain transmission system voltage at the point of interconnection with the TSP within two percent (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.

(5) The ERCOT Compliance Office will investigate claims of alleged non-compliance and Force Majeure conditions, and 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.

6.10.10 System Black Start Capability Performance Criteria

The Black Start Unit shall maintain qualified System Black Start Capability, with the declared capacity and capabilities of the Resources continuously; except during those periods allowed for routine maintenance. During a system restoration emergency, the provider shall respond to the instructions of ERCOT, subject to the declared capacity and capabilities of the system Black Start Capability Generation Resources.

The Black Start Resource shall complete all initial and ongoing qualification requirements.

6.10.11 ERCOT Operations Performance

(1) ERCOT shall continuously self-assess its operations and report to all Market Participants its performance in controlling the ERCOT Control Area according to requirements and criteria established by the Operating Guides and NERC Policy and Standards for operation of Control Areas. ERCOT shall report all substandard operations to the ERCOT Technical Advisory Committee and to the NERC Compliance and Enforcement Committees.

(2) ERCOT shall publish for all Market Participants the total amount of Regulation Up energy deployed and the total amount of Regulation Down energy deployed in each Settlement Interval.

(3) ERCOT shall provide monthly a report analyzing the accuracy of each Operating Day's Load forecast that was issued at 0600 the Day Ahead of the Operating Day. ERCOT shall make similar comparisons for the 1100 forecast and the forecast in effect at midnight of the start of the Operating Day. In its reports, ERCOT shall statistically analyze the expected error in energy and peak forecasting.

(4) ERCOT shall publish for all Market Participants the percentage of the Bid Stack awarded for Balancing Energy Service for each Settlement Interval that ERCOT deploys any Non-Spinning Reserve Service.

(5) ERCOT shall provide a monthly report showing the average percentage of the Bid Stack award for Balancing Energy Service for the Settlement Intervals that ERCOT deploys Non-Spinning Reserve Service for the month.

Minutes of October 22, 2009 PRS meeting

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

Attendance

Members:

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

Guests:

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

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

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

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

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

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

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

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

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

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

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

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

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

Review of Recommendation Report, Impact Analysis and Cost/Benefit Analysis (see Key Documents)
PRR821, Update of Section 21, Process for Protocol Revision
Ann Boren reviewed ERCOT comments to PRR821, noting clarifications to what actions might be taken before a PRR is deemed rejected.

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

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

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

PRR827, Find Transaction and Find ESI ID Functions on the MIS
NPRR196, Synchronization of Nodal Protocols with PRR827, Find Transaction and Find ESI ID Functions on the MIS
Regarding PRR827, Ms. Hobbs recommended deleting "Public Area" from the language referencing "MIS Public Area" as the term "Public Area" applies to the Nodal Protocols. Ms. Hobbs also informed PRS that the black line language in the 09/17/09 PRS Recommendation Report was incorrectly updated

and would be corrected with the 10/22/09 PRS Recommendation Report to properly reference the grey-boxed language for PRR805, Adding POLR Customer Class and AMS Meter Flag to the Database Query Function on the MIS.

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

Review of PRR Language (see Key Documents)

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

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

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

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

PRR830, Reactive Power Capability Requirement – URGENT

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

PRR832, Deletion of Schedule Control Error (SCR) Posting Requirement

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Notice of Withdrawal
There were no notices of withdrawal.

Other Business

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

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

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

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

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

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

PRR837, Load Used in RMR Studies

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

2010 ERCOT Membership/Market Segment Elections

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

Adjournment

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

Revised RARF Guide and New Procedures

ERCOT

Resource Asset Registration Guide
v4.11

Revision History

Date	Version	Description	Author
10/10/2007	0.03	Draft for Internal Review	D. Showalter
10/10/2007	0.04	Second draft for Internal Review	D. Showalter
10/10/2007	0.05	Draft for Posting	D. Showalter
10/11/2007	0.06	Revised Draft for Posting	D. Showalter
10/16/2007	0.07	Revised with Market Comments	D. Showalter
12/13/2007	0.08	Revised for Planning Submittal	D. Showalter
4/01/2008	3.99	Draft –Reorganized and reformatted for RARF Ver 4	D. Showalter
4/08/2008	4.00	Released with RARF Ver 4 (Official RARF)	D. Showalter
12/16/08	4.01	Updated RARF Guide V4.01	A. Moy
2/4/2009	4.02	Updated and re-wrote transmission and load data tabs	S. Middleton
3/10/2009	4.03	Corrected / Modified business rules for transformer tab	S. Middleton
6/5/2009	4.04	Added Business Rules for Planning / Protection	S. Middleton
6/10/2009	4.05	Added Business Rules for Planning / Protection	P. Nellutla
6/23/2009	4.06	Added Business Rules for Planning / Protection	P. Nellutla
07/06/09	4.07	Updated Business Rules for Planning, Line Data, Transformer tab and updated the definition of unit commercial date in section 4, Date effective field is included in section 12-18	P. Nellutla
07/24/09	4.08	Updated Business Rules for Line Data, Transformer, Breaker/Switch, Series Device, Load Data, Capacitor Reactor, Static Var Compensator, Planning, Protection. Updated Section 7.4	P. Nellutla
09/01/09	4.09	Updated Section 7.3 and updated Business Rules for Transformer/Line/Breaker-Switch/Series Device Data/Capacitor or Reactor/Load Data.	P. Nellutla
11/2/2009	4.10	Updated Business Rules for Capacitor/Reactor and Transformer tabs.	P. Nellutla
11/18/2009	4.11	Updated section 6.5 with Business Rules for Operational Parameters-GEN,CC,Wind. Updated Business Rules for Capacitor- Reactor Tab	P. Nellutla

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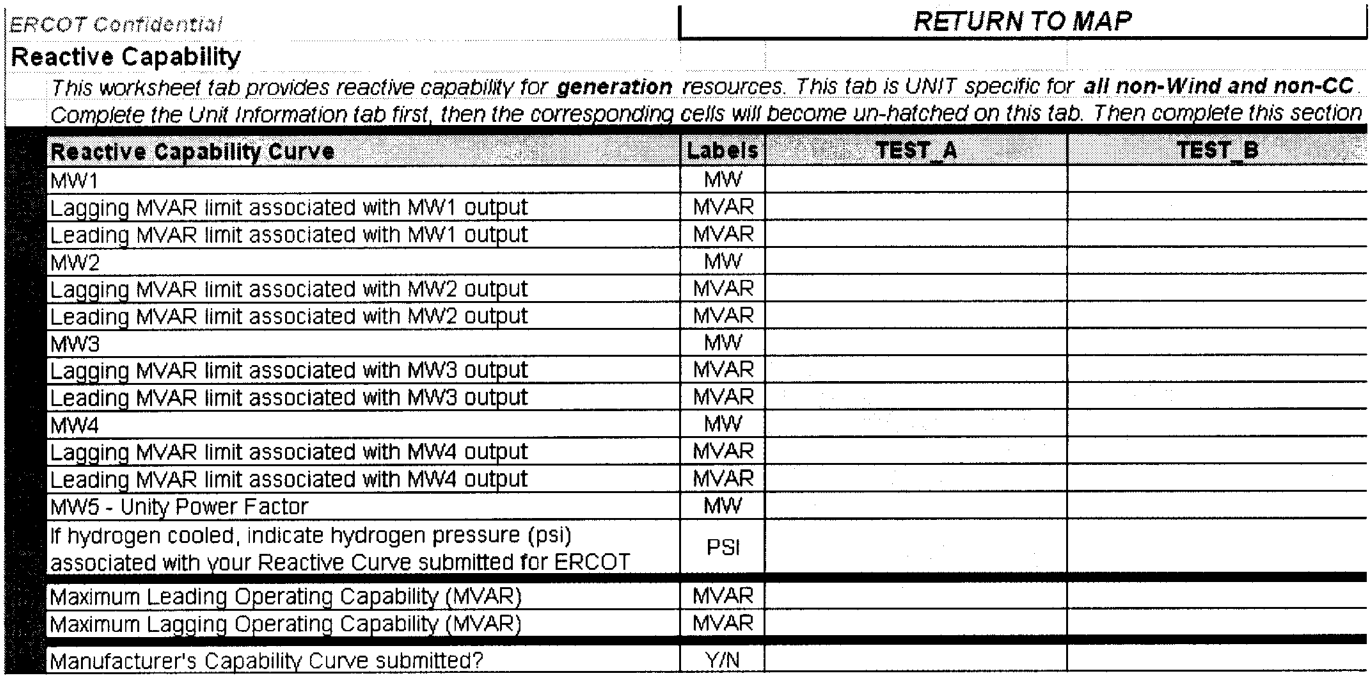
7.0 Reactive Capability

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.

7.1 Reactive Capability – non-Wind, non-CC Generation Units



ERCOT Confidential *RETURN TO MAP*

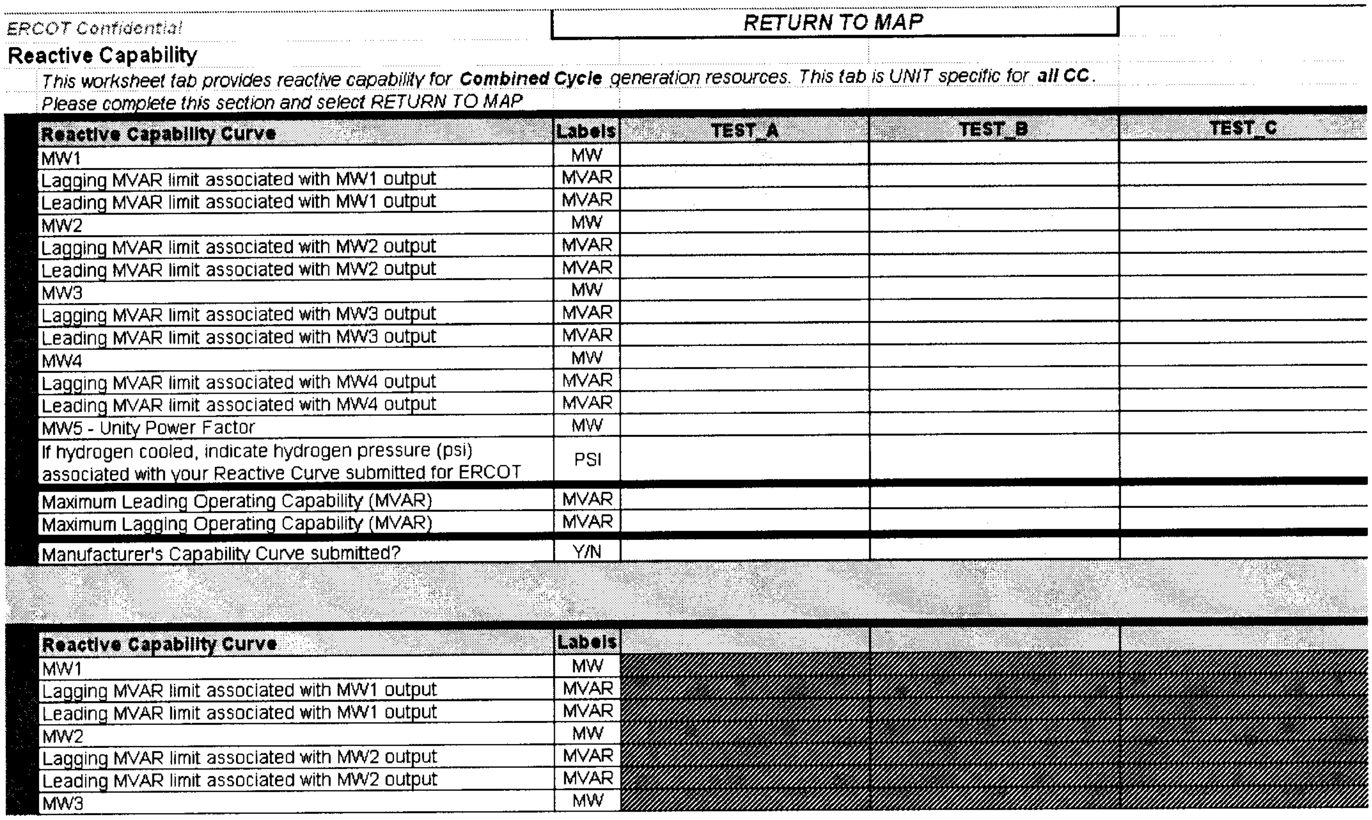
Reactive Capability

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

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 Confidential

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**
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			

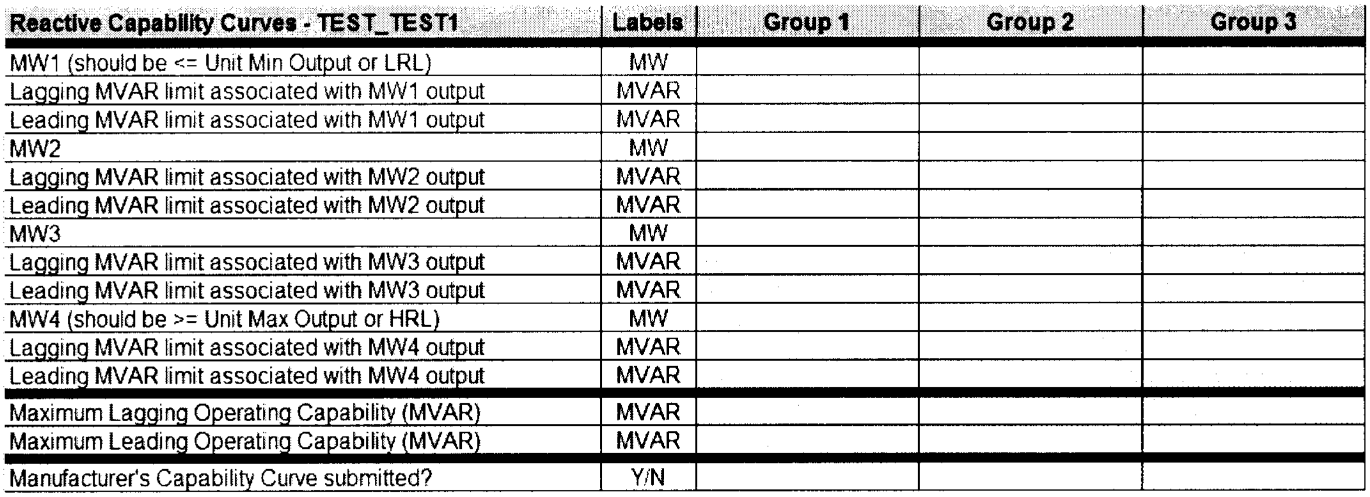
Reactive Capability Curve	**Labels**			
MW1	MW			
Lagging MVAR limit associated with MW1 output	MVAR			
Leading MVAR limit associated with MW1 output	MVAR			
MW2	MW			
Lagging MVAR limit associated with MW2 output	MVAR			
Leading MVAR limit associated with MW2 output	MVAR			
MW3	MW			

7.3 Reactive Capability – Wind Units

Reactive capability must be completed 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.

Wind Resources that have multiple groupings of turbines need to provide one consolidated reactive curve for the Unit. The reactive curve is representative at the location of the modeled equivalent generator (low side of the GSU touching the transmission grid), it does not include the additional equipment installed (Capacitors or reactors). Capacitors or reactors are to be specified on the 'Capacitor or Reactor Tab' of the RARF. WGRs that have multiple groups of turbines need to submit an addendum to register combined reactive curve data for each unit.

The Authorized Representative (AR), Back up AR or officers of the RE must submit this addendum accompanied by the RARF submittal through Texas Market Link (TML) Service Request. As an alternative to ERCOT TML, the addendum may be sent by email to ercotregistration@ercot.com and mpaapl@ercot.com.



Reactive Capability Curves - TEST_TEST1	Labels	Group 1	Group 2	Group 3
MW1 (should be <= Unit Min Output or LRL)	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 (should be >= Unit Max Output or HRL)	MW			
Lagging MVAR limit associated with MW4 output	MVAR			
Leading MVAR limit associated with MW4 output	MVAR			
Maximum Lagging Operating Capability (MVAR)	MVAR			
Maximum Leading Operating Capability (MVAR)	MVAR			
Manufacturer's Capability Curve submitted?	Y/N			

RARF DATA FIELD	Business Rules	Data type
MW1	1. This is a required field. 2. MW1 >0 3.MW1<MW2. 4. MW1 <= Unit Minimal output or LRL. Warning when this rule fails.	Numeric
Lagging MVAR limit associated with MW1 output	1. This is a Required field. 2. Lagging MVAR limit associated with MW1 output >=0. 3..The square root of (X(i)^2 + Ym(i)^2) <= S(unit MVA Rating), 1<=m<=2, 1<=i<=n. where X ->MW and Y1-> Lagging MVAR, Y2-> Leading MVAR	Numeric

Leading MVAR limit associated with MW1 output	1. This is a Required field. 2.Leading MVAR limit associated with MW1 output <=0 3.The square root of (X(i)^2 + Ym(i)^2) <= S(unit MVA Rating), 1<=m<=2, 1<=i<=n. where X ->MW and Y1-> Lagging MVAR, Y2-> Leading MVAR	Numeric
MW2	1. This is a Required field. 2. MW2 >0 3. MW2<MW3	Numeric
Lagging MVAR limit associated with MW2 output	1. This is a Required field. 2. Lagging MVAR limit associated with MW2 output >=0 3. The square root of (X(i)^2 + Ym(i)^2) <= S(unit MVA Rating), 1<=m<=2, 1<=i<=n. where X ->MW and Y1-> Lagging MVAR, Y2-> Leading MVAR	Numeric
Leading MVAR limit associated with MW2 output	1. This is a Required field. 2.Leading MVAR limit associated with MW2 output <=0 3.The square root of (X(i)^2 + Ym(i)^2) <= S(unit MVA Rating), 1<=m<=2, 1<=i<=n. where X ->MW and Y1-> Lagging MVAR, Y2-> Leading MVAR	Numeric
MW3	1. This is a Required field. 2. MW3 >0 3. MW3<MW4	Numeric
Lagging MVAR limit associated with MW3 output	1 This is a Required field. 2. Lagging MVAR limit associated with MW3 output >=0 3.The square root of (X(i)^2 + Ym(i)^2) <= S(unit MVA Rating), 1<=m<=2, 1<=i<=n. where X ->MW and Y1-> Lagging MVAR, Y2-> Leading MVAR	Numeric
Leading MVAR limit associated with MW3 output	1. This is a Required field. 2.Leading MVAR limit associated with MW3 output <=0 3.The square root of (X(i)^2 + Ym(i)^2) <= S(unit MVA Rating), 1<=m<=2, 1<=i<=n. where X ->MW and Y1->	Numeric

	Lagging MVAR, Y2-> Leading MVAR	
MW4	1. This is a Required field. 2. MW4<MW5 3. X (n) > = WMX (Unit Max output or HRL), where n is the last MW value in the curve. If the curve has 4 points, X (n) is X (4) [Generate an Error When this rule fails.	Numeric
Lagging MVAR limit associated with MW4 output	1. This is a Required field. 2.Lagging MVAR limit associated with MW4 output >=0	Numeric
Leading MVAR limit associated with MW4 output	1. This is a Required field. 2.Leading MVAR limit associated with MW3 output <=0	Numeric
Maximum Leading Operating Capability	1. This is a Required field. 2.Maximum Leading Operating Capability <=0	Numeric
Maximum Lagging Operating Capability	1This is a Required field. 2.Maximum Lagging Operating Capability >=0	Numeric
Manufacturer's Capability Curve submitted?	1. This is a Required field. 2.Select from Y or N	Numeric

7.4 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 represents the operating limits of the generator. The Reactive Capability Curve of a generator unit shows the X-axis as MW and the Y-axis as MVAR. Values above the x-axis (positive VARs) are "LAGGING" MVARs and values below the x-axis (negative VARs) are "LEADING" MVARs.

GENERATION INTERCONNECTION OR CHANGE REQUEST PROCEDURE~~:~~

Date Implemented

Version 4.10.~~2~~3

Document Revisions

Date	Version	Description	Author(s)
	4.0	First draft based on Ken Donohoo's changes before he left ERCOT plus subsequent revisions proposed at 8/1/2008 RPG.	ERCOT
10/10/08	4.1	Changes made using RPG comments prior to 10/17/08 RPG Meeting.	ERCOT
10/19/08	4.2	Comments annotated from 10/17/08 RPG meeting	ERCOT/RPG
10/20/08	4.3	Changes made to document incorporating RPG comments from 10/17/08 meeting Need to check: 1. What modeling fee is used for. 2. Validate and verify generator capability reference.	ERCOT/RPG
10/28/08	4.4	Changes to 2.1.1 and moved 2.1.4 to 2.1.2 and added section 2.1.3 on where to submit via standard mail or email and contact ERCOT for FAX number.	ERCOT
10/28/08	4.5	Chad Seely comments and additions to sections 2.1.1 through 2.1.4.	ERCOT
11/01/08	4.6	Cleanup and additions/modifications	ERCOT
11/20/08	4.7	Changes to reflect 11/14/08 RPG Meeting	ERCOT/RPG
11/26/08	4.8	Changes to reflect comments on draft 4.7	ERCOT/RPG
12/12/08	4.91	Added Oncor comments	ERCOT/Oncor
12/15/08		Added changes at RPG meeting	RPG
12/22/08	4.10	Added changes to reflect 12/15/08 meeting and accept changes discussed at same meeting. Version sent to RPG on 1/13/09	ERCOT/TOs
1/21/09	4.10.1	Version sent to RPG on 1/13/09 with Jeff Herring comments, Jose Conto link updates, and changes due to ERCOT Board approval of PRR 779 on 1/20/09.	ERCOT/Oncor
1/30/09	4.10.2	Version 4.10.1 with all edits and comments accepted and comments by PSEG and FPL added.	RPG
11/6/09	4.10.3	Comments in 4.10.2 accepted or rejected, links to RARF updated, added charter language regarding econ analysis of >$25M direct connection projects added, section organization changes to clarify distinctions between screening and FIS; add storage.	ERCOT
11/18/2009	4/11	Accepted changes in 4.10.3 and added changes as a result of 11/13 RPG; general changes to fix type of days and references to application	ERCOT/RPG

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1 INTRODUCTION

1.1 Purpose

The primary purpose of the *ERCOT Generation Interconnection or Change Request Procedure* (Procedure) is to define the requirements and processes used to facilitate new or modified generation interconnections with the transmission system of the Electric Reliability Council of Texas (ERCOT). The activities outlined in this Procedure are expected to:

- Determine the facilities required to directly interconnect new or modified generation to the ERCOT System;[1]
- Ensure that the interconnection of the new or modified generation is accomplished in a manner that maintains the reliability of the ERCOT System and its compliance with the North American Electric Reliability Corporation (NERC) Reliability Standards, ERCOT Protocols and Operating Guides;
- Increase the quality of communications between the generating entity (GE), transmission service provider (TSP), and ERCOT;
- Provide for the best available information on future capacity additions for use in identifying, forecasting, and analyzing both short- and long-range ERCOT capabilities, demands, and reserves; and,
- Provide for accurate and appropriate data to aid ERCOT Staff and stakeholders in identifying and developing potential transmission improvement projects to alleviate expected transmission constraints in order to maintain the reliability of the ERCOT System.

The requirements and procedures in this Procedure conform to all applicable rules, standards, protocols, and guides of the Public Utility Commission of Texas (PUCT), NERC, and ERCOT. In the event of a conflict between this Procedure and those applicable rules, standards, protocols, and guides of the PUCT, NERC and ERCOT, then such rules, standards, protocols and guides will take precedence over the Procedure.

1.2 Applicability

The requirements in this Procedure are applicable, in general, to the following:

- New generating Resources~~units, plants,~~ or storage devices, with an aggregate power output (gross generating unit output minus auxiliary Load directly related to the generating unit) of 10 MW or greater, planning to interconnect to transmission in the ERCOT System.
- Existing generating ~~units~~ Resources interconnected in the ERCOT System that are seeking to:
    - upgrade the rated capacity of the ~~unit~~Resource by 10 MW or greater within a single year,

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[1] Unless noted otherwise, capitalized terms contained herein shall have the meaning ascribed to them in the ERCOT Protocols.

  - re-power the ~~unit~~Resource, or
  - change the physical or electrical interconnection of the ~~unit~~Resource.

Interconnection requirements for on-site distributed generation[2] -are not subject to this~~ese~~ P~~p~~rocedure~~s~~ but are addressed in PUCT Substantive Rules §25.211 (Interconnection of On-Site Distributed Generation) and §25.212 (Technical Requirements for Interconnection and Parallel Operation of On-Site Distributed Generation).

1.3 Effective Date

This Procedure and modifications thereto will become effective upon approval and will apply to all future and current interconnection requests that have not yet signed an Interconnection Agreement (IA) by the date of this approval.

1.4 Modification and Approval Process

Modifications to this Procedure will be proposed by ERCOT, presented to the Regional Planning Group (RPG) and Technical Advisory Committee (TAC) for comment prior to approval, and approved by the ERCOT CEO.

2 INTERCONNECTION PROCESS AND PROCEDURES

The ERCOT interconnection process is designed in accordance with PUCT Substantive Rule §25.198 (Initiating Transmission Service) which delegates to ERCOT the responsibility for implementing the transmission interconnection process.

2.1 Generation Interconnection or Change Request (GINR) Application

Any generating entity (GE) seeking an interconnection to the ERCOT System, as applicable in Section 1, Applicability, must submit the following to ERCOT:

- a generation entity information sheet (Appendix A),
- a generation interconnection request screening study data form (Appendix B), and
- the appropriate fee (as detailed in Section 4.2.1).

2.1.1 Submitting Generation Interconnection or Change Request to ERCOT

All ~~generation interconnection request~~GINR A~~a~~pplications and supporting data submittals shall be delivered to ERCOT by standard mail, facsimile (fax), or Internet email. Applications and supporting data shall be sent as discrete file attachments. The application with signature may be in PDF form if desired but the supporting data shall be sent as a Microsoft Excel file attachment so that data may be easily extracted to reduce transcription errors.

In order to clearly identify GINR~~the~~ ~~application~~Applications, it is important that GENERATION INTERCONNECTION REQUEST is the first line of the address field or is in the subject field of an email request.

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[2] As defined in PUCT Substantive Rule §25.211(c)(10)

The GE shall include in the ~~generation interconnection request a~~GINR Application all information necessary to allow for timely development, design, and implementation of any electric system improvements or enhancements required by ERCOT and the TSP to reliably meet the interconnection requirements of the proposed generation. This information shall be of sufficient detail for use in establishing transfer capabilities, operating limits (including stability), and planning margins to provide both reliability and operating efficiency as well as facilitating coordinated planning for future transmission system additions.

ERCOT Staff will notify the GE within 7 business days through telephone call or email if the generation interconnection request application fails to include the applicable fees or the information that is necessary to perform the initial screening interconnection studies. If the applicant fails to respond to ERCOT's inquiries within 10 business days, the ~~application~~ GINR will be deemed incomplete and rejected. ERCOT shall notify the applicant if such condition occurs.

Once the application has been deemed materially complete, ERCOT Staff will date-stamp the application, add the interconnection request to the ERCOT interconnection list, and notify the GE of receipt of the completed application within 10 business days. The GE should note that the date stamp is not a reservation of transmission capacity, either planned or unplanned.

An ERCOT Staff engineer will be assigned to oversee the interconnection study process and answer questions concerning the interconnection screening study and process. Once assigned, this engineer will contact the GE and will be the primary ERCOT contact for interconnection studies. If during the course of the studies, additional information is needed by ERCOT from the GE, ERCOT will immediately notify the GE and the GE will have 10 business days to answer the request for additional information without impacting the study timeline.

Prior to the initial contact from this engineer, GEs should direct questions concerning this ~~generation interconnection p~~Procedure to GINR@ercot.com. The GE should contact their ERCOT Wholesale Services client representative for all queries that are not related to the interconnection studies.

If a generation facility that uses the same physical transmission interconnection is to be built in stages with in-service dates more than one year apart, the stages should be treated as ~~two~~ separate interconnection requests but may be included in the same study[A1].

2.1.2 Interconnection Request Screening Study Fees

In order to consider the ~~interconnection or change application~~GINR, a security screening study fee must be remitted to ERCOT along with the generation interconnection request application as explained in detail in Section 4.2.1. The security screening study fee is non-refundable. The GE may choose to wire money to ERCOT to comply with the fee requirements.

For instructions on how to wire the funds to ERCOT, send an email to GINR@ercot.com requesting the account and wiring information. For security purposes, this information has not been included in this Procedure nor is it posted on an ERCOT website.

If submitting the payment via standard mail, please make the check payable to Electric Reliability Council of Texas, Inc. Please contact GINR@ercot.com to alert ERCOT to this method of submission for the application.

2.1.3 Where to Submit Data and Fees

All standard mail submissions for the application, data, or fees shall be sent to the following address:

GENERATION INTERCONNECTION REQUEST
ATTN: Manager, Regional Planning
ERCOT, INC.
2705 WEST LAKE DRIVE
TAYLOR, TEXAS 76574-2136

Submission of the application and data via email shall be addressed to GINR@ercot.com. All data for studies shall be submitted electronically.

2.1.4 Unique Project Identification

ERCOT Staff will assign a unique name to all ~~generation interconnection request applications~~GINRs according to the following convention:

yrINRxxxxp

where:

yr is the calendar year the generation is anticipated to be online (08, 09, 10)

INR indicates interconnection request

xxxx is a sequence number beginning with 0001 (reset for each year)

p is an optional, sequential alphabetical identifier beginning with 'a' to be used for phased projects

It is vital that all correspondence relating to a specific ~~generation interconnection request application~~GINR, security screening or full interconnection study reference this unique project identification number once it has been assigned by ERCOT.

2.2 Full Interconnection Study Request

Any GE seeking a Full Interconnection Study (FIS) for interconnection to the ERCOT System, as applicable in Section 1, Applicability, must submit the following to ERCOT:

- a notice to proceed with the FIS,
- ~~Information in the yellow-highlighted cells of all tabs applicable to the resource type within~~ the Resource Asset Registration Form (RARF) excel spreadsheet with applicable information ~~completed~~required for interconnection studies as described in the RARF instructions (the RARF is located in the Resource Asset Registration Forms zip file located at http://www.ercot.com/gridinfo/generation/index).
- ~~a Resource Asset Registration Form (RARF) with the associated project INR number and facility design data (Appendix C),~~
- a stability modeling fee (as detailed in Section 4.2.2), and
- proof of site control (see Section 3.2.6)

In addition, there will be a FIS fee/cost paid directly to the TSP(s) (see Section 4.2.3).

2.2.1 Submitting FIS Request to ERCOT

All FIS requests and supporting data submittals shall be delivered to ERCOT by Internet email. The supporting data shall be sent as discrete file attachments.

In order to clearly identify the ~~application~~GINR, it is important that the associated project INR number is referenced in the subject field of all communications.

The GE shall include in the FIS request all information necessary to allow for timely development, design, and implementation of any electric system improvements or enhancements required by ERCOT and the TSP to reliably meet the interconnection requirements of the proposed generation. This information shall be of sufficient detail for use in establishing transfer capabilities, operating limits (including stability), and planning margins to provide both reliability and operating efficiency as well as facilitating coordinated planning for future transmission system additions.

Upon receipt of the FIS request, the assigned ERCOT Staff engineer will continue to be the primary ERCOT contact for the GE, ensuring RARF data is communicated to the TSP. The engineer will initiate a meeting between the TSP(s) and the GE. If during the course of the studies, additional information is needed from the GE, ERCOT will immediately notify the GE and the GE will have 10 business days to answer the request for additional information without impacting the study timeline.

~~If a generation resourcefacility that uses the same physical transmission interconnection is to be built in stages with in-service dates more than one year apart, the stages should be treated as two separate interconnection requests but may be included in the same study.~~

2.2.2 FIS Request Application Fees

When a FIS is requested, a stability modeling fee must be remitted to ERCOT as explained in detail in Section 4.2.2. The stability modeling fee is non-refundable. The GE may choose to wire money to ERCOT to comply with the fee requirements.

For instructions on how to wire the funds to ERCOT, send an email to GINR@ercot.com requesting the account and wiring information. For security purposes, this information has not been included in this document nor is it posted on an ERCOT website.

If submitting the payment via standard mail, please make the check payable to Electric Reliability Council of Texas, Inc. Please contact GINR@ercot.com to alert ERCOT to this method of submission for the application.

2.2.3 Where to Submit Data

Submission of the ~~application~~ data via email shall be addressed to GINR@ercot.com. All design data shall be submitted electronically.

2.2.4 Use of the Resource Asset Registration Form

The GE shall use the RARF in order to facilitate data submittal for the planning studies and to reduce duplication/redundancy of forms. Key portions of the workbook include, but are not limited to, the following tabs:

unless stated elsewhere in this document. If the number of days shown is less than 30, these are business days; if 30 days and over, these are calendar days.

TASK	Responsible Entity	Time Required to Complete (Days)
Acknowledgement of Generation Interconnection Request Application	**ERCOT**	**1 to 10**
Notification of Additional Information Needed to Complete Application	**ERCOT**	**1 to 15**
Perform Security Screening Study *(after application deemed complete)*	**ERCOT**	**10 to 90**
Decision to Pursue Full Interconnection Study *(following issuance of Screening Study by ERCOT)*	**GE**	**up to 180**
Develop Scope Agreement for Full Interconnection Study *(following GE's notification to ERCOT of desire for Full Interconnection Study and remittance of appropriate fees)*	**ERCOT, TSP(s), GE**	**up to 60**
Perform Full Interconnection Study *(following agreement on scope)*		**40 to 300**
Steady State and Transfer Analysis		*10 to 90*
System Protection Analysis *(following Steady State Analysis)*		*10 to 30*
Dynamic and Transient Stability Analysis *(following System Protection Study)*		*10 to 90*
Facility Study	**TSP(s)**	*10 to 90*
Study Report Review and Acceptance *(following issuance of Full Interconnection Study)*	**ERCOT, TSP(s), GE**	**10 to 15**
Negotiate and Execute Interconnection Agreement *(following acceptance of Full Interconnection Study)*	**TSP and GE**	**180**

4.4 GENERAL AND TECHNICAL STANDARDS

~~The~~ In addition to requirements under the NERC Reliability Standards, ERCOT Protocols and Operating Guides contain provisions that apply to generation interconnections. As of the effective date of this P~~p~~rocedure, such provisions include, but are not necessarily limited to:

- Protocol 1.3.1
- Protocol 12.2 and 12.3
- Protocol 6.5.7
- Protocol 6.7.6
- Protocol 6.10.3
- Operations Guide 2.2.4
- Operations Guide 3.1.4
- Operations Guide 7.2.2
- Operations Procedure Steady State Voltage Control Procedures

ERCOT Board Packet for November 17, 2009 meeting

ERCOT Board of Directors Meeting

November 17, 2009
10:00 AM - 6:00 PM
ERCOT Austin Room 206
7620 Metro Center Dr.
Austin, TX 78744

Agenda

Item	Topic	Presenter	Time
1.	Call Open Session to Order and Announce Proxies	J. Newton	10:00 a.m.
2.	Consent Agenda Items: 3a; 3b; 12a □ Protocol Revision Request (PRR) 836* (Vote)	J. Newton	10:05 a.m.
3.	Approval of Minutes	J. Newton	10:10 a.m.
	a. Minutes of October 19, 2009 Joint Nominating Committee and Board of Directors Meeting* (Vote)	--	--
	b. Minutes of October 20, 2009 Board of Directors Meeting* (Vote)	--	--
4.	Chief Executive Officer (CEO) Update*	T. Doggett	10:15 a.m.
5.	Financial Summary Report*	R. Bowman	10:30 a.m.
6.	Market Operations Report*	B. Day	--
7.	IT Service Availability Metrics Report*	R. Morgan	--
8.	Grid Operations and Planning Report*	K. Saathoff	--
	a. Voltage Ride-Through (VRT) Study Update*	D. Woodfin	--
	b. Resource Adequacy and Market Signals: ERCOT Activities*	D. Woodfin	--
	c. 2010 Ancillary Services Methodology Recommendation* (Vote)	J. Dumas	--
	d. Corpus Christi Area Improvements Project Recommendation* (Vote)	D. Woodfin	--
9.	Special Nodal Program Committee Report	B. Helton	11:30 a.m.
10.	Nodal Program Update*	M. Cleary	11:45 a.m.
11.	Lunch	--	12:30 p.m.
12.	Technical Advisory Committee (TAC) Report	M. Bruce	1:30 p.m.
	a. PRR830; *see also* Consent Agenda* (Vote)	J. Houston	--
	b. Appeal of PRR830* (Vote)	M. Bruce	--
	c. Load Profiling Guide Revision Request (LPGRR) 035* (Vote)	M. Bruce	--
	d. Review of Quarterly Renewables Report to Public Utility Commission of Texas (PUCT)*	M. Bruce	--
13.	Finance & Audit (F&A) Committee Report	C. Karnei	3:00 p.m.
	a. Approval of F&A Committee Charter & Structure* (Vote)	--	--
	b. Approval of Financial and Investment Corporate Standards* (Vote)	--	--
	c. Semiannual Enterprise Risk Management (ERM), Compliance and Internal Control Update*	C. Yager	--
	d. Potential Future Exposure (PFE) Q2 2010 Presentation*	R. Baker	--
14.	Human Resources (H.R.) and Governance Committee Report	M. Armentrout	3:35 p.m.
	a. Membership Affiliates Update	--	--
	b. Approval of Recommendation of Proposed Amendments to Bylaws to Corporate Members* (Vote)	--	--
	c. Ratification of CEO Search Subcommittee (Vote)	--	--
15.	Nominating Committee Report	J. Newton	4:35 p.m.
16.	Other Business	J. Newton	4:50 p.m.
17.	Future Agenda Items*	J. Newton	4:55 p.m.
	Convene to Executive Session	--	--
18.	Approval of Executive Session Minutes	J. Newton	5:10 p.m.
	a. Executive Session Minutes of October 19, 2009 Joint Nominating Committee and Board of Directors Meeting* (Vote)	--	--
	b. Executive Session Minutes of October 20, 2009 Board of Directors Meeting* (Vote)	--	--
19.	Personnel	N. Capezzuti	--
20.	Litigation*	Staff	--
21.	Contracts*	Staff	--
22.	Security and Compliance*	--	--
	Reconvene to Open Session	--	--
23.	Vote on Matters from Executive Session (Vote)	J. Newton	5:50 p.m.
24.	Adjourn	J. Newton	6:00 p.m.

Future Meetings

- December 14, 2009

- December 14, 2009

Additional Information

*Background material enclosed or will be distributed prior to meeting.
http://www.texasadmin.com/cgi-bin/ercot.cgi

Key Documents

November 17, 2009 Board Agenda
Agenda
(11/10/09, .doc, 81.5 KB)

Item 03a - 10-19-2009 Drft Nom. Comm. and Board Meeting Mins.
Board Meeting Material
(11/09/09, .pdf, 17 KB)

Item 03b - October 20, 2009 Draft Board Meeting Minutes
Board Meeting Material
(11/10/09, .pdf, 59.6 KB)

Item 04 - CEO Update
Board Meeting Material
(11/10/09, .pdf, 32.1 KB)

Item 05 - Financial Summary Report
Board Meeting Material
(11/10/09, .pdf, 27.2 KB)

Item 06 - Market Operations Report
Board Meeting Material
(11/10/09, .pdf, 219.2 KB)

Item 07 - IT Service Availability Metrics Report
Board Meeting Material
(11/09/09, .pdf, 506.6 KB)

Item 08 - Grid Operations and Planning Report
Board Meeting Material
(11/09/09, .pdf, 246.7 KB)

Item 08a - Voltage Ride-Through (VRT) Study Update
Board Meeting Material
(11/09/09, .pdf, 34.9 KB)

Item 08b - Resource Adequacy and Market Signals - ERCOT Activiti
Board Meeting Material
(11/09/09, .pdf, 36.3 KB)

Item 08c - 2010 Ancillary Services Methodology Recommendation
Board Meeting Material
(11/10/09, .zip, 148.9 KB)

Item 08c - 2010 Method for Determining AS Requirements - Revised
Board Meeting Material
(11/12/09, .pdf, 59.8 KB)

Item 08d - AEPSC Corpus Christi Area Improvements Project
Board Meeting Material
(11/10/09, .zip, 1.5 MB)

Item 10 - Nodal Program Update
Board Meeting Material
(11/09/09, .pdf, 350.5 KB)

Item 12 - TAC Report
Board Meeting Material
(12/03/09, .pdf, 144.4 KB)

Item 12a - Protocol Revision Requests (PRRs)
Board Meeting Material
(11/10/09, .zip, 167.2 KB)

Item 12b - Appeal of PRR830
Board Meeting Material
(11/10/09, .zip, 2.2 MB)

Item 12b - Appeal of PRR830 - TAC Advocate
Board Meeting Material
(11/11/09, .pdf, 71.9 KB)

Item 12c - Load Profiling Guide Revision Request (LPGRR)
Board Meeting Material
(11/10/09, .zip, 333.1 KB)

Item 12d - Review of Quarterly Renewables Report to PUCT
Board Meeting Material
(11/10/09, .zip, 295.4 KB)

Item 13a - F&A Committee Charter Revisions
Board Meeting Material
(11/10/09, .zip, 47.7 KB)

Item 13b - Approval of Financial & Investment Corporate Standard
Board Meeting Material
(11/10/09, .zip, 1 MB)

Item 13c - Semi-Annual Audit, Compliance and Enterprise Risk Man
Board Meeting Material
(11/10/09, .pdf, 86.2 KB)

Item 13d - Potential Future Exposure (PFE) Q2 2010 Presentation
Board Meeting Material
(11/09/09, .pdf, 122.5 KB)

Item 14b - Approval of Recommendation of Proposed Amendments to
Board Meeting Material
(11/10/09, .zip, 172.4 KB)

Item 17 - Future Agenda Items
Board Meeting Material
(11/10/09, .pdf, 7.6 KB)

Proxy and Alternate Rep Form - May 2009
Board Meeting Material
(05/21/09, .doc, 40 KB)

All information is posted as Public in accordance with the ERCOT Websites Content Management Corporate Standard.

Agenda Item	Title
12	TAC Report
12a	Protocol Revision Requests (PRRs)
12a(1)	Item 12a – Protocol Revision Requests (PRRs)
12a(2)	PRR830 CEO Revision Request Review
12a(3)	PRR830 Impact Analysis
12a(4)	PRR830 TAC Recommendation Report
12a(5)	PRR830 TAC Roll Call Vote
12b	Appeal of PRR830
12b(1)	AEP Service Corp. – Comments
12b(2)	AES Corporation – Comments
12b(3)	CenterPoint Energy Houston Electric – Comments
12b(4)	ERCOT – Comments
12b(5)	Horizon Wind Energy LLC – Comments
12b(6)	NextEra Energy – Comments
12b(7)	Oncor EDC LLC – ERCOT Gen. Int. Change Request Procedure 09/12/2007
12b(8)	Oncor EDC LLC – Presentation
12b(9)	Oncor EDC LLC – Reference Page
12b(10)	Oncor EDC LLC – TAC Approved Voltage and Reactive Requirements 08/06/2003
12b(11)	Oncor EDC LLC – Comments
12b(12)	Wind Coalition – Comments
12b(13)	Memorandum to Board re: Appeal of PRR 830
12b(14)	Appeal of PRR 830 – TAC Advocate

Technical Advisory Committee

Presentation to the
ERCOT Board of Directors
November 17, 2009

TAC Report Summary

- 2 PRRs for Board approval
- 1 LPGRR for Board approval
- Report on Approved Guide Revision Request
- Notice of PRR Rejection
- Notice of 2010 CRE Additions
- Quarterly Renewables Report to PUCT
- Preview: Future Board meetings

Protocol Revision Requests

PRR 830 Reactive Power Capability Requirement – URGENT

PRR 836 Revised Minimum Ramp Rate for Balancing Energy Service Down to Comport with PRR 803 – URGENT

PRR830, Reactive Power Capability Requirement

\- [illegible]

Purpose (ERCOT)	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).	
Benefit	Provides additional clarity to the reactive requirements for wind generation.	
Market Impact	N/A	
System Change	Minor	Minor changes to ERCOT databases to incorporate additional SCADA points, which will be managed under the O&M budgets of affected departments
Assumptions	N/A	
TAC Vote	TAC voted to recommend approval of PRR830 as recommended by PRS via roll call vote. There was one opposing vote (Independent Generator) and six abstentions (Investor Owned Utility, Independent Generator, Residential Consumer, Industrial Consumer, and 2 Independent Power Marketer). All Market Segments were present.	
CEO Determination	No opinion	
Effective Date	December 1, 2009	

PRR830, Reactive Power Capability Requirement - [illegible]

Item Reviewed	No Impact	Impact	Description
Budget	★		
Staffing	★		
Computer Systems		★	Minor changes to ERCOT databases to incorporate additional SCADA points; will be managed through O&M budget.
Business Functions	★		
Grid Operations	★		
Credit Monitoring/ Liability	★		

PRR836, Revised Minimum Ramp Rate for Balancing Energy Service Down to Comport with PRR803 - [illegible]

<table>
<tr><td>Purpose
(Luminant)</td><td colspan="2">Changes the divisor for the minimum ramp rate required for a Balancing Energy Service (BES) Down bid from 40 to 56 to reflect the change resulting from the implementation of PRR803, Revised Implementation Approach for PRR 601, as it relates to the number of minutes of BES ramping over a one-hour time period.</td></tr>
<tr><td>Benefit</td><td colspan="2">Correctly aligns the minimum ramp rate requirement for mandatory BES Down bids submitted by QSEs to the 14-minute ramp rate period incorporated with the implementation of PRR803.</td></tr>
<tr><td>Market Impact</td><td colspan="2">N/A</td></tr>
<tr><td>System Change</td><td>No</td><td>N/A</td></tr>
<tr><td>Assumptions</td><td colspan="2">N/A</td></tr>
<tr><td>TAC Vote</td><td colspan="2">TAC unanimously recommended approval as recommended by PRS; all Market Segments were present.</td></tr>
<tr><td>CEO Determination</td><td colspan="2">No opinion</td></tr>
<tr><td>Effective Date</td><td colspan="2">December 1, 2009</td></tr>
</table>

PRR836, Revised Minimum Ramp Rate for Balancing Energy Service Down to Comport with PRR803 - [illegible]

Item Reviewed	*No Impact*	*Impact*	*Description*
Budget	★		
Staffing	★		
Computer Systems	★		
Business Functions	★		
Grid Operations	★		
Credit Monitoring/ Liability	★		

Load Profile Guide Revision Request

LPGRR 035 Addition of Time of Use Schedules (TOUS) to Profiles with Interval Data Recorder Meter Data Type Codes for Advanced Meters

- TAC recommended approval with one abstention (Independent Generator)
- REPs still need the TOU data on the 867_03s for their TOUS Customers, even after ERCOT begins settling on the 15-minute interval data for AMS meters. PUCT Final Order requires REPs to continue to support their existing TOUS functionality.
- Impact Analysis
  - Minor cost impact to be managed under the operations and management (O&M) budgets of the affected departments
  - System impact due to update to Lodestar table to include Profile IDs that allow TOUS for AMS meters. No code changes are necessary.
- Effective Date:
  - BOD Approval 11/17/2009
  - Required 150 day notice will end around 4/17/2010

Guide Revision Requests approved by TAC

NOGRR 026 Change the Name of Emergency Electric Curtailment Plan (EECP) to Energy Emergency Alert (EEA) and Synchronization of EEA Steps with Protocols

Notice of PRR Rejection

PRR 754 Resource Settlement Due to Forced Transmission Outage

PRR 835 Reactive Power Requirement

Notice of CRE Approval

- In accordance with Protocols Section 7.2.3, TAC approved the following additions to the list of Closely Related Elements for calendar year 2010:
  - Singleton - Roans Prairie
  - Temple Switch - Sandow
  - Temple Switch - Sandow

- These CREs were approved in time for inclusion by ERCOT in the 2010 annual TCR Auction.

Quarterly Renewables Report to PUCT

- This report covers 4 months (not 3) in order to align the report with normal quarterly reporting periods; future reports will cover 3 month periods.
- Total new wind generating capacity in ERCOT as of September 30, 2009 = 8,515 MW, an increase of 380 MW from the last report.
  - Panther Creek III (200 MW in Sterling County)
  - Papalote Creek 1 Wind (180 MW in San Patricio County)
- Total new renewable capacity in ERCOT increased from 8,278 MW to 8,660 MW, an increase of 382 MW from the last report.
- Two wind farms signed Generation Interconnect Agreements since the last report:
  - Rattlesnake Wind Farm (200 MW in McCulloch County)
  - Cedro Hill Wind (150 MW in Webb County)

Preview: next Board meeting

- Confirmation of 2010 TAC Representatives
- PRR 821 Update of Section 21, Process for Protocol Revision
- PRR 824 Primary Frequency Response from WGRs
- PRR 827 Find Transaction and Find ESI ID Functions on the MIS
- NPRR 196 Synchronization of Nodal Protocols with PRR 827 Find Transaction and Find ESI ID Functions on the MIS

Date: November 10, 2009
To: ERCOT Board of Directors
From: Mark Bruce, Technical Advisory Committee (TAC) Chair
Subject: Protocol Revision Requests (PRRs)

Issue for the ERCOT Board of Directors

ERCOT Board of Directors (ERCOT Board) Meeting Date: November 17, 2009
Agenda Item No.: 12a

Issue:
Consideration of the following PRRs:

- PRR830 – Reactive Power Capability Requirement – URGENT
- PRR836 – Revised Minimum Ramp Rate for Balancing Energy Service Down to Comport with PRR803 – URGENT

Background/History:
Unless otherwise noted: (i) all Market Segments were present for each vote and (ii) ERCOT Credit Staff and the Credit Work Group (CWG) have reviewed the revision requests and do not believe it requires changes to credit monitoring activity or the calculation of liability.

- **PRR830 – Reactive Power Capability Requirement [ERCOT] – URGENT.**
  Proposed Effective Date: December 1, 2009.
  Chief Executive Officer (CEO) Determination: No opinion on whether or not PRR830 is necessary prior to the Texas Nodal Market Implementation Date.
  ERCOT Impact Analysis: No budgetary impact; no additional full-time equivalents needed; minor changes to ERCOT databases to incorporate additional Substation Control and Data Acquisition (SCADA) points, which will be managed under the operational and management (O&M) budgets of affected departments; existing business processes can accommodate this PRR; no impact to grid operations or practices.
  Revision Description: This 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).
  Procedural History: PRR830 was posted on September 8, 2009. On September 10, 2009 the Protocol Revision Subcommittee (PRS) voted to grant Urgent status to PRR830 via a PRS email vote. On September 17, 2009 PRS unanimously voted to table PRR830 for one (1) month. On October 22, 2009 PRS voted to recommend approval of PRR830 as endorsed in the October 19, 2009 Reliability and Operations Subcommittee (ROS) comments via roll call vote. On November 5, 2009 TAC voted to recommend approval of PRR830 as recommended by PRS in the October 22, 2009 PRS Recommendation Report and as revised by the October 29, 2009 ERCOT comments via roll call vote.

- **PRR836 – Revised Minimum Ramp Rate for Balancing Energy Service Down to Comport with PRR803 [Luminant] – URGENT.**
  Proposed Effective Date: December 1, 2009.
  CEO Determination: No opinion on whether or not PRR836 is necessary prior to the Texas Nodal Market Implementation Date.
  ERCOT Impact Analysis: No budgetary impact; no additional full-time equivalents needed; no system changes; no impact to business processes or functionality; no impact to grid operations or practices.
  Revision Description: This PRR changes the divisor for the minimum ramp rate required for a Balancing Energy Service Down bid from forty (40) to fifty six (56) to reflect the change resulting from the implementation of PRR803, Revised Implementation Approach for PRR601, as it relates to the number of minutes of Balancing Energy Service ramping over a one-hour time period.
  Procedural History: PRR836 was posted on October 14, 2009. On October 16, 2009 PRS voted to grant Urgent status to PRR836 via a PRS email vote. On October 22, 2009 PRS unanimously voted to recommend approval of PRR836 as submitted. On November 05, 2009 TAC unanimously voted to recommend approval of PRR836 as recommended by PRS in the October 22, 2009 PRS Recommendation Report.

The TAC Recommendation Reports, Impact Analyses, and CEO Determinations, if applicable, for these PRRs are included in the ERCOT Board meeting materials. In addition, these PRRs and supporting materials are posted on the ERCOT website at the following link: http://www.ercot.com/mktrules/protocols/prr.html.

Key Factors Influencing Issue:
PRS met, discussed the issues and submitted recommendation reports to TAC regarding the PRRs described herein. TAC considered the issues and voted to take action on the PRRs as described above.

Alternatives:
1. Approve the TAC recommendation on PRRs 830 and/or 836 as described above or as modified by the ERCOT Board;
2. Reject the TAC recommendation on PRRs 830 and/or 836;
3. Defer decision on the merits of the TAC recommendation on PRRs 830 and/or 836; or
4. Remand PRRs 830 and/or 836 to TAC with instructions.

Conclusion/Recommendation:
As more specifically described above, TAC recommends that the ERCOT Board approve PRRs 830 and/or 836.

ERCOT

ELECTRIC RELIABILITY COUNCIL OF TEXAS, INC.
BOARD OF DIRECTORS RESOLUTION

WHEREAS, after due consideration of the alternatives, the Board of Directors (Board) of Electric Reliability Council of Texas, Inc. (ERCOT) deems it desirable and in the best interest of ERCOT to approve the following PRRs:

- PRR830 – Reactive Power Capability Requirement; and,
- PRR836 – Revised Minimum Ramp Rate for Balancing Energy Service Down to Comport with PRR803.

THEREFORE BE IT RESOLVED, that ERCOT is hereby authorized to approve PRRs 830 and 836.

CORPORATE SECRETARY'S CERTIFICATE

I, Michael G. Grable, Corporate Secretary of EROCT, do hereby certify that, at its November 17, 2009 meeting, the ERCOT Board of Directors passed a motion approving the above Resolution by ____________________.

IN WITNESS WHEREOF, I have hereunto set my hand this ___ day of _____________, 2009.

____

Michael G. Grable
Corporate Secretary

CEO Revision Request Review

I. REVISION REQUEST DETAILS	
Date	9/8/09
Revision Request Number	PRR830
Revision Request Name	Reactive Power Capability Requirement

ERCOT Position – PROVIDED BY CEO

☐ Needed for Go-Live ☐ Not Needed for Go-Live ☒ No opinion on the need for Go-Live

Protocol Revision Request (PRR) 830, Reactive Power Capability Requirement, provides clarification on the Reactive Power capability requirement at the Point of Interconnection and specifically addresses existing Wind-powered Generation Resources (WGRs) by allowing WGRs to meet the Reactive Power capability requirement through a combination of the WGR's Unit Reactive Limit (URL) and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices.

After initial review, PRR830 does not impact Nodal systems, budget or schedule; therefore, the ERCOT CEO believes this PRR should proceed through the stakeholder review process.

Because there are no Nodal impacts, the ERCOT CEO has no opinion on whether or not PRR830 is necessary prior to the Texas Nodal Market Implementation Date. The ERCOT CEO has the right to reevaluate the PRR if there are any changes during the stakeholder process.

II. SUGGESTED ERCOT POSITION – PROVIDED BY AREA OWNERS

DECISION CRITERIA - NEEDED FOR GO-LIVE FOR:

- Nodal system to work properly
  - Functionality
  - Quality (system performance, security, usability, efficiency, data accuracy, etc.)
- Reliability (grid performance, system stability, etc.)
- Compliance (Protocols, PUCT rules, NERC, etc.)
- Fair Market Practices
- Synchronization
  - Zonal to Nodal
    - Updating Nodal protocols to reflect changes to Zonal protocols so we aren't reverting back to prior rules when Nodal goes live (Example: NPRR149)
    - Updating Nodal protocols to account for essential Zonal functionality that is missing from Nodal (Example: NPRR156)
  - Nodal to Nodal
    - Updating Nodal protocols to reflect logic that exists in the Nodal systems as currently planned or developed
- Cost-Benefit indicates beneficial to implement prior to Go-Live

Business Perspective

Grid Operations

☐ Does not apply to my area

☒ No opinion on the need for Go-Live

☐ Perform complete impact analysis prior to recommending ERCOT position

☐ High level (1-4)
☐ Full Impact Analysis

☐ "Needed for Go-Live"

Indicate criteria not met unless this revision request is implemented
☐ Nodal system to work properly
☐ Reliability
☐ Compliance
☐ Fair Market Practices
☐ Synchronization
☐ Cost-Benefit

Explain: ______________________________

☐ "Not Needed for Go-Live"

Explain: ______________________________

Indicate potential impact
☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other)
☐ No impact to ERCOT

Explain: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.

Wholesale Markets

☐ Does not apply to my area

☒ No opinion on the need for Go-Live

☐ Perform complete impact analysis prior to recommending ERCOT position

☐ High level (1-4)
☐ Full Impact Analysis

☐ "Needed for Go-Live"

Indicate criteria not met unless this revision request is implemented
- ☐ Nodal system to work properly
- ☐ Reliability
- ☐ Compliance
- ☐ Fair Market Practices
- ☐ Synchronization
- ☐ Cost-Benefit

Explain: ____________________

☐ "Not Needed for Go-Live"

Explain: ____________________

Indicate potential impact
- ☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other)
- ☐ No impact to ERCOT

Explain: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.

System Planning

☐ Does not apply to my area

☒ No opinion on the need for Go-Live

☐ Perform complete impact analysis prior to recommending ERCOT position

☐ High level (1-4)
☐ Full Impact Analysis

☐ "Needed for Go-Live"

Indicate criteria not met unless this revision request is implemented
- ☐ Nodal system to work properly
- ☐ Reliability
- ☐ Compliance
- ☐ Fair Market Practices
- ☐ Synchronization
- ☐ Cost-Benefit

Explain: ____________________

☐ "Not Needed for Go-Live"

Explain: ____________________

Indicate potential impact
- ☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other)
- ☐ No impact to ERCOT

Explain: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.

Compliance

☐ Does not apply to my area ☒ No opinion on the need for Go-Live	☐ Perform complete impact analysis prior to recommending ERCOT position ☐ High level (1-4) ☐ Full Impact Analysis
☐ "Needed for Go-Live" Indicate criteria not met unless this revision request is implemented ☐ Nodal system to work properly ☐ Reliability ☐ Compliance ☐ Fair Market Practices ☐ Synchronization ☐ Cost-Benefit Explain: ______________________	☐ "Not Needed for Go-Live" Explain: ______________________

Indicate potential impact
- ☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other)
- ☐ No impact to ERCOT

Explain: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.

Nodal Perspective

☐ Does not apply to my area ☒ No opinion on the need for Go-Live	☐ Perform complete impact analysis prior to recommending ERCOT position ☐ High level (1-4) ☐ Full Impact Analysis
☐ "Needed for Go-Live" Indicate criteria not met unless this revision request is implemented ☐ Nodal system to work properly ☐ Reliability ☐ Compliance ☐ Fair Market Practices ☐ Synchronization ☐ Cost-Benefit	☐ "Not Needed for Go-Live"

Explain: ________________	Explain: ________________

Indicate potential impact
☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other)
☐ No impact to ERCOT

Explain: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.

IT Perspective

☐ Does not apply to my area ☒ No opinion on the need for Go-Live	☐ Perform complete impact analysis prior to recommending ERCOT position ☐ High level (1-4) ☐ Full Impact Analysis
☐ "Needed for Go-Live" Indicate criteria not met unless this revision request is implemented ☐ Nodal system to work properly ☐ Reliability ☐ Compliance ☐ Fair Market Practices ☐ Synchronization ☐ Cost-Benefit Explain: ________________	☐ "Not Needed for Go-Live" Explain: ________________

Indicate potential impact
☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other)
☐ No impact to ERCOT

Explain: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.

III. OTHER VIEWS – PROVIDED BY AREA OWNERS

Alternate View / Rationale	Person holding alternate view	Alternate view provided by

IV. SUGGESTED ERCOT POSITION – PROVIDED BY COO/CTO/CIO

COO

Suggested ERCOT Position: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.

☐ Perform complete impact analysis prior to recommending ERCOT position

☐ High level (1-4)
☐ Full Impact Analysis

☐ "Needed for Go-Live"

Indicate criteria not met unless this revision request is implemented

- ☐ Nodal system to work properly
- ☐ Reliability
- ☐ Compliance
- ☐ Fair Market Practices
- ☐ Synchronization
- ☐ Cost-Benefit

Explain: ______________________________

☐ "Not Needed for Go-Live"

Explain: ______________________________

Indicate potential impact

- ☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other)
- ☐ No impact to ERCOT

Explain: ______________________________

CTO

Suggested ERCOT Position: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.

☐ Perform complete impact analysis prior to recommending ERCOT position

☐ High level (1-4)
☐ Full Impact Analysis

☐ "Needed for Go-Live"

Indicate criteria not met unless this revision request is implemented

- ☐ Nodal system to work properly
- ☐ Reliability
- ☐ Compliance
- ☐ Fair Market Practices
- ☐ Synchronization
- ☐ Cost-Benefit

Explain: ______________________________

☐ "Not Needed for Go-Live"

Explain: ______________________________

Indicate potential impact

- ☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other)
- ☐ No impact to ERCOT

Explain: ______________________________

CIO

Suggested ERCOT Position: Concurred with ERCOT position agreed to during 08/26/09 CEO Review discussion.

☐ Perform complete impact analysis prior to recommending ERCOT position

- ☐ High level (1-4)
- ☐ Full Impact Analysis

☐ "Needed for Go-Live"

Indicate criteria not met unless this revision request is implemented

- ☐ Nodal system to work properly
- ☐ Reliability
- ☐ Compliance
- ☐ Fair Market Practices
- ☐ Synchronization
- ☐ Cost-Benefit

Explain: ______________________________

☐ "Not Needed for Go-Live"

Explain: ______________________________

Indicate potential impact

- ☐ Impact (System, Business process/procedure, Schedule, Budget, Project Resources, Staffing, Other)
- ☐ No impact to ERCOT

Explain: ______________________________

ERCOT Impact Analysis Report

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

Alternatives for a More Efficient Implementation *(include explanation of impacts)*
None.

Evaluation of Interim Solutions *(e.g., manual workarounds)*
None.

Feasibility of Implementation
Impact on Resource Availability: None **Impact on Other Projects:** None

Comments
None.

TAC Recommendation Report

<table>
<tr><td>PRR Number</td><td>830</td><td>PRR Title</td><td colspan="2">Reactive Power Capability Requirement</td></tr>
<tr><td>Timeline</td><td>Urgent</td><td colspan="2">Recommended Action</td><td>Approval</td></tr>
<tr><td colspan="2">Date of Decision</td><td colspan="3">November 5, 2009</td></tr>
<tr><td colspan="2">Proposed Effective Date</td><td colspan="3">December 1, 2009</td></tr>
<tr><td colspan="2">Priority and Rank Assigned</td><td colspan="3">Not applicable.</td></tr>
<tr><td colspan="2">Protocol Section(s) Requiring Revision</td><td colspan="3">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</td></tr>
<tr><td colspan="2">Revision Description</td><td colspan="3">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.</td></tr>
<tr><td colspan="2">Reason for Revision</td><td colspan="3">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.</td></tr>
<tr><td colspan="2">Overall Market Benefit</td><td colspan="3">Provides additional clarity to the reactive requirements for wind generation.</td></tr>
<tr><td colspan="2">Overall Market Impact</td><td colspan="3">Unknown.</td></tr>
<tr><td colspan="2">Consumer Impact</td><td colspan="3">None.</td></tr>
<tr><td colspan="2">Credit Impacts</td><td colspan="3">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.</td></tr>
<tr><td colspan="2">Relevance to Nodal Market</td><td colspan="3">Yes. The Reactive Power capability requirements exist in Nodal as well.</td></tr>
</table>

TAC Recommendation Report

Nodal Protocol Sections Requiring Revision	2.1, Definitions 2.2, Acronyms and Abbreviations 3.15, Voltage Support 6.5.7.7, Voltage Support Service
Procedural History	➢ On 9/08/09, PRR830, a preliminary Impact Analysis, and CEO Revision Request Review were posted. ➢ On 9/10/09, PRR830 was granted Urgent status via a PRS e-mail vote. ➢ On 9/15/09, Horizon Wind Energy LLC comments were posted. ➢ On 9/17/09, PRS considered PRR830. ➢ On 9/28/09, Calpine comments were posted. ➢ On 10/7/09, Iberdrola Renewables comments were posted. ➢ On 10/8/09, a second set of Horizon Wind Energy LLC comments were posted. ➢ On 10/8/09, LCRA comments were posted. ➢ On 10/19/09, ROS comments were posted. ➢ On 10/21/09, Wind Coalition comments were posted. ➢ On 10/22/09, Vestas comments were posted. ➢ On 10/22/09, PRS again considered PRR830. ➢ On 10/22/09, NextEra Energy Resources comments were posted. ➢ On 10/26/09, the Impact Analysis was posted. ➢ On 10/28/09, a second set of Calpine comments were posted. ➢ On 10/29/09, Oncor comments were posted. ➢ On 10/29/09, ERCOT comments were posted. ➢ On 10/30/09, AEP comments were posted. ➢ On 11/2/09, Invenergy comments were posted. ➢ On 11/3/09, a second set NextEra Energy Resources comments were posted. ➢ On 11/3/09, a third set of Horizon Wind Energy LLC comments were posted. ➢ On 11/4/09, a second set of Vestas comments were posted. ➢ On 11/5/09, TAC considered PRR830.
PRS Decision	On 9/17/09, PRS unanimously voted to table PRR830 for one month and to encourage ROS to provide comments on PRR830. All Market Segments were present for the vote. On 10/22/09, PRS voted to recommend approval of PRR830 as endorsed by ROS. The motion passed via roll call vote. All Market Segments were present for the vote.
Summary of PRS Discussion	On 9/17/09, there was discussion regarding the appeal currently at the Public Utility Commission of Texas (PUCT) which stemmed from an ERCOT interpretation of the current Protocols regarding Reactive Power. It was debated whether or not the proposed content of PRR830 was being addressed in the contested case.

	On 10/22/09, ERCOT Staff explained that PRR830 is not intended to change the philosophy of the Protocols. ERCOT Staff also provided clarification of the proposed change to the WGR definition, and noted that dynamic devices will be required going forward, but that existing WGRs can meet the requirement with static devices. There was also discussion regarding the use of the "cone" versus the "rectangle" for Reactive Power capability and that having differing requirements makes planning difficult and may pose fairness and grid stability issues. Some Market Participants expressed concerns that requirements of PRR830 would impose costs to retrofit existing units and that studies should be performed to demonstrate need.
TAC Decision	On 11/5/09, TAC voted to recommend approval of PRR830 as recommended by PRS in the 10/22/09 PRS Recommendation Report and as amended by the 10/29/09 ERCOT comments. All Market Segments were present for the vote.
Summary of TAC Discussion	On 11/5/09, TAC reviewed PRR830 comments. A Market Participant proposed including language that allowed a hybrid solution to meet Reactive Power capability requirements. ERCOT Staff explained that paragraph (6) of Section 6.5.7.1 allows Market Participants to submit alternative proposals to ERCOT for meeting the requirement, which could include a hybrid solution. Some Market Participants opined that changing the definition of WGR would have repercussions not only where "WGR" is used in the Protocols or market guides, but could also create complications in instances where the terms "generator," "Resource," or "unit" are used. ERCOT Staff contended that the definition change is needed in order to ensure that ERCOT has an accurate representation of each WGR's Reactive Power capability. Questions were raised regarding ERCOT's acceptance of the "triangle" that was provided in the Resource Asset Registration Forms (RARFs). ERCOT Staff explained that the RARFs should provide an accurate representation of what a unit is physically capable of doing and should not be taken as a substitute for the requirements in the Protocols, which require the "rectangle". Some Market Participants expressed concern regarding retrofits to existing units. It was stated that in the past, most rules that would impose cost on existing units were implemented on a prospective basis unless there was a demonstrated need, and it was argued that at this point, there has been no evidence provided indicating that there is a need to retrofit. Others countered that if generators are not operating in the "rectangle" as the current system was designed that it is a reliability issue versus a cost issue since the risk of a voltage

	collapse increases as you increase capacity not operating within the "rectangle."

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

Sponsor	
Name	John Dumas
E-mail Address	jdumas@ercot.com
Company	ERCOT
Phone Number	(512) 248-3195
Cell Number	
Market Segment	N/A

Market Rules Staff Contact	
Name	Sandra Tindall
E-Mail Address	stindall@ercot.com
Phone Number	512-248-3867

Comments Received	
Comment Author	**Comment Summary**
Horizon Wind Energy LLC 091509	Recommended that PRR830 be rejected as submitted.
Calpine 092809	Supported approval of PRR830.
Iberdrola Renewables 100709	Suggested existing Protocol language is clear. Proposed additional revisions only as an alternative to the ERCOT proposed changes.
Horizon Wind Energy LLC 100809	Opined that PRR830 is contrary to existing Protocols, and is proposed without demonstration of need. Commented that PRR830 re-defines Reactive Power capability requirements for Generation Resources interconnected with the ERCOT Transmission Grid, imposing new requirements on WGRs and requiring retrofits to the majority of operating WGRs.
LCRA 100809	Proposed clarifying language which would allow Resources to start at lower voltage levels. Also proposed changes related to establishing Reactive Power requirements.
ROS 101909	Endorsed PRR830 as submitted.
Wind Coalition 102109	Provided alternative language to the definition of a WGR and the subsequent changes that are intended to improve the modeling of wind-powered generation reactive capabilities.
Vestas 102209	Stated that if PRR830 is adopted as proposed, it may unnecessarily increase the costs of WGRs in Texas with no improvements in reliability. Suggested that hybrid systems that have the effective performance of a fully dynamic system should be allowed.
NextEra Energy Resources102209	Recommended that PRS reject PRR830 and instead recommended that PRR835 be approved.
Calpine 102809	Responded to NextEra's 10/22/09 comments and supported ERCOT's efforts to maintain system reliability and the fairness found in PRR830.
Oncor 102909	Supported ERCOT's efforts to maintain system reliability with PRR830.
ERCOT 102909	Provided comments to support the need for the WGR definition change. Also proposed additional language changes which revised the effective date in both the Revision Description and in paragraph (2) of Section 6.5.7.1 to December 1, 2009 and provided administrative edits and clarification to proposed language revisions.
AEP 103009	Supported the passage of PRR830.
Invenergy 110209	Proposed the addition of paragraph (12) to Section 6.5.7.1 to clarify the requirements and approximated the treatment afforded to other types of Generation Resources that have multiple turbines behind the same POI such as combined cycle units
NextEra Energy Resources 110309	Incorporated concepts and specific amendments proposed in comments submitted by LCRA (10/08/09), The Wind Coalition (10/21/09), ERCOT (10/29/09), and Invenergy (11/02/09). Also

	proposed additional language changes that utilized the "rectangle" requirement for all technologies as proposed by ERCOT.
Horizon Wind Energy 110309	Recommended that PRR830 be rejected.
Vestas 110409	Provided additional language changes so that dynamic VAR capable devices would include hybrid devices and would be considered as an acceptable alternative to meet ERCOT's Reactive Power interconnection requirement.

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~~Generator Step Up (GSU) ~~T~~transformer~~ (GSU)~~.

2.2 Acronyms

POI	Point of Interconnection
GSU	~~Generation~~Generator 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 ~~to~~ at the same ~~transmission bus~~Point of Interconnection (POI) that have gross generating unit ratings aggregating to greater than twenty (20) MVA, that supply power to the ERCOT Transmission Grid, shall provide Voltage Support Service (VSS).

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

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

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

~~(2)~~ Generation Resources ~~required to provide VSS except as noted below in items (3) or (4),~~ shall ~~have and maintain a URL which~~ comply with the following Reactive Power requirements: ~~has~~ an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ERCOT ~~t~~Transmission ~~g~~Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the ~~point of interconnection~~POI ~~to the TDSP~~. The Reactive Power requirements shall be available at all MW output levels and may be met through a combination of the Generation Resource's Unit Reactive Limit (URL), which is the generating unit's dynamic leading and lagging operating capability, and/or dynamic VAR capable devices. For Wind-powered Generation Resources (WGRs), the Reactive Power requirements shall be available at all MW output levels at or above 10 percent (10%) of the WGR's nameplate capacity. When a WGR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT may require a WGR to 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~~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 ~~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, 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~~Reactive Power requirements established in paragraph (1) above, will be required to maintain a ~~URL~~ Reactive Power requirement as defined by the Generation Resource's URL that was submitted to ERCOT and established per the ~~is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and~~ criteria ~~described~~ in the Operating Guides.

(5) ~~Upon request to, and with the approval of ERCOT, multiple generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these URL requirements only.~~For purposes of meeting the Reactive Power requirements in paragraphs (1) and (2) above, multiple generation units including wind turbines shall, at a Generation Entity's option, be treated as a single Generation Resource or WGR if the units are connected to the same transmission bus.

(6) ~~Upon submission by a~~ Generation ~~Resource~~ Entities ~~required to provide VSS~~may submit to ERCOT ~~of a~~ specific proposals ~~for requirements~~ to ~~substitute for these URL~~meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices.~~,~~ ERCOT ~~shall~~ may, at its sole discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall ~~such alternative requirements or~~ provide the submitter an explanation of its ~~objections to the proposal~~decision. ~~Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements.~~

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

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(b) The number of wind turbines out of service and not available for operation.

WGRs must comply with ~~these~~ requirements of paragraph (10) by no later than ~~six (6) months after the effective date of this paragraph~~June 1, 2010.

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(11) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by automatically switchable static VAR capable devices.

6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or Transmission and/or Distribution Service Providers (TDSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional M~~m~~egavolt-A~~a~~mperes R~~r~~eactive (MVAR), nor will they be requested to operate on a voltage schedule outside the ~~Unit Reactive Limits (~~URL~~)~~ specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

(2) ERCOT and ~~Transmission and/or Distribution Service Providers (~~TDSPs~~)~~ shall develop operating procedures specifying Voltage Profiles of transmission controlled reactive Resources to minimize the dependence on generation-supplied reactive Resources. For Generation Resources required to provide VSS, ~~step-up~~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 ~~r~~Reactive Power capability requirements.

(4) All Generation Resources required to provide VSS shall ~~maintain~~support the transmission voltage at the ~~point of interconnection~~POI to the ERCOT ~~t~~Transmission ~~g~~Grid, or at the transmission bus in accordance with paragraph (5) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

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

(~~6~~5) The QSEs providing V~~oltage Support Servic~~SSe shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

Version 2.0

2009 TAC MOTION: H

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

Tally Votes

Date: November 5, 2009

Clear

Prepared by: B. Albracht

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

Sector / Entity		Representative	Present	Yes	No	Abstain
Cooperatives						
Lower Colorado River Authority		Brad Belk (Sandy Morris)	y	1		
Brazos Electric Power Cooperative, Inc.		Hugh Lenox	y	1		
Nueces Electric Cooperative		John L. Sims (Clif Lange)	y	1		
South Texas Electric Cooperative, Inc.		Henry Wood (Clif Lange)	y	1		
		Segment Vote:	4	4	0	0
Municipals						
CPS Energy		Les Barrow	y	1		
Austin Energy		Mark Dreyfus	y	1		
Brownsville Public Utilities Board		Fernando Saenz (James McCann)	y	1		
GEUS		David McCalla (Gary Singleton)	y	1		
		Segment Vote:	4	4	0	0
Investor Owned Utilities						
Luminant Energy		Brad Jones	y			a
CenterPoint Energy		John Houston	y	1		
First Choice Power, Inc.		Steven Moss	y	1		
AEP Corporation		Richard Ross (Kip Fox)	y	1		
		Segment Vote:	4	3	0	1
Indepent Generators						
FPL Energy		Mark Bruce	y		1	
Calpine Corporation		Randy Jones	y	1		
NRG Texas		Adrian Pieniazek	y			a
PSEG TX		Marguerite Wagner	y	1		
		Segment Vote:	4	2	1	1
Consumers **Divide Subsegments?**	n	Consumer Vote Total	1			
Residential Consumer	Resi	Shannon McClendon	y			a
Office of Public Utility Counsel	Resi	Danny Bivens	y	1		
City of Lewisville	Comm	Phillip Boyd	y	1		
City of Eastland	Comm	Chris Brewster	y	1		
Austin White Lime Company	Indu	Oscar Robinson (Mark Smith)	y			a
Air Liquide	Indu	Bill Smith	y	1		
		Segment Vote:	6	4	0	2
Independent Retail Electric Providers						
Strategic Energy, LLC		Read Comstock	y	1		
TriEagle Energy		Martin Downey	y	1		
Cirro Group		William Lewis (Marcie Zlotnic)	y	1		
Star Electricity dba StarTex Power		Marcie Zlotnik	y	1		
		Segment Vote:	4	4	0	0
Independent Power Marketers						
Exelon Generation Company, LLC		Kristy Ashley	y	1		
Sempra Energy Trading		Seth Cochran	y	1		
BP Energy		Eric Schubert (Judy Briscoe)	y			a
DB Energy Trading		Brandon Whittle	y			a
		Segment Vote:	4	2	0	2
All Sectors Voting Totals						**Total**
		Segment Vote:	30	23	1	6

PRR Appeal of Decision

PRR Number	830	**PRR Title**	**Reactive Power Capability Requirement**

Date	November 6, 2009

Decision Being Appealed	Technical Advisory Committee Recommendation Report
Date of Decision	November 5, 2009

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

Comments

NextEra Energy Resources ("NextEra") respectfully appeals the November 5, 2009 decision of the Technical Advisory Committee ("TAC") to recommend approval of PRR 830 Reactive Power Capability Requirement to the ERCOT Board of Directors ("Board").

NextEra believes the TAC erred in its decision with respect to a number of technical concerns which were raised during deliberations on the PRR but which are not resolved in the TAC-recommended language. NextEra also believes the TAC-recommended language of PRR 830 contradicts previously adopted Board policy regarding the imposition of new technical capabilities on existing Resources in ERCOT.

PRR 830 has been granted Urgent Status and is, therefore, scheduled for decision by the Board at its November 17, 2009 regular meeting. In accordance with Section 8.4 of the Board Policies and Procedures, NextEra's appeal is timely filed and NextEra requests the Board hear this appeal on November 17, 2009. NextEra commits to filing documentation in support of this appeal sufficiently in advance of the November Board meeting to allow timely review of the material by Directors prior to hearing the appeal at the meeting.

PRR Comments

PRR Number	830	**PRR Title**	**Reactive Power Capability Requirement**

Date	11/10/2009

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

AEP supports the TAC Approved language of PRR830, Reactive Power Capability Requirement and requests the Board deny the appeal. Similar to MW (real power) concerns created with large wind generation shifts, large wind generation shifts within a short period of time can create significant MVAR (Reactive Power) concerns. While the Transmission Owners have installed a large amount of dynamic reactive devices in recent years, the large swings on the system can quickly exhaust dynamic reactive capability. The proper amount of reactive capability, including capability from Generation Resources, is necessary to maintain the reliability of the grid. Unlike thermal limits that can be exceeded for short periods of time, violating the reactive needs of the system can have immediate and severe consequences.

While AEP is supportive of the development of the vast wind Resources in the region, those Resources must provide the reactive capabilities necessary to support their power injections on the grid. There is clear evidence that the ERCOT System has significant Reactive Power deficiency that is directly correlated to wind generation including:

1. AEP can get large voltage swings because of significant changes in wind in a short period of time and we do not have time to adjust. We are also taking a large number of circuits out because of overloads to maximize wind output. We believe lack of dynamic Reactive Power support from wind

farms is a primary root cause for large voltage swings for large wind changes. This problem will be exacerbated with events such as a "carbon tax" where base load coal plants are likely to reduce their output during these high wind periods. There is a growing, significant possibility of voltage collapse that AEP believes is beyond the risk tolerance for ERCOT's reliable operations.

2. The primary purpose of the Transmission System is to reliably deliver power and energy to Load. Historically, transmission maintenance is scheduled in spring and fall to prepare for the summer Load. Maintenance in these periods coincides with periods of high wind production. Transmission Service Providers (TSPs) continue to see ERCOT move planned Maintenance Outages and lines taken out of service for upgrades which over time will have significant reliability impact on the transmission system and the ability of the transmission system to meet its primary purpose. AEP believes that PRR 830 as written will improve this condition by having a better dispersion of Reactive Power in the network around wind.
3. Operating Guides and local controls are being used more frequently and to less effect than in years past during high wind conditions. AEP operates transmission in Southwest Power Pool (SPP), PJM and ERCOT. Operating issues during high wind events take place significantly more in ERCOT than the rest of the AEP system nationwide. AEP believes that PRR 830 as written will improve this condition.
4. Just as MW reserves are made available to protect for more than just an N-1 event, reactive reserves are needed for such large generation swings across multiple wind units and farms. The dynamic language is specifically important since numerous events over the last few years can show large voltage swings when dynamic reserves were exhausted with the larger wind generation swings, which happen frequently.

The ROS subcommittee, tasked with reliability matters, took a significant amount of time to address the dynamic VAR requirement issues and endorsed PRR 830. These issues have been debated and reviewed among the stakeholders since February 2004. In 2004, a compromise was reached among the stakeholders that "grandfathered" wind generators installed before February 2004. It was understood that future wind farms would meet the reactive and static requirements of all generators in compliance with ERCOT requirements as we moved forward. AEP does commend those wind farms that are meeting their obligation under this compromise and request the ERCOT Board approve the TAC recommendation in order to continue to honor this compromise. Even prior to this proposed change, the requirements are clear. Providing any further exemption to wind farms outside the current grandfathered language would amount to a retroactive relaxation/change in the protocol requirements. While a waiver of such provisions of the Protocols might be considered reasonable in a situation where the reactive needs of the system are stable, it should not be considered in this case given the reactive needs in the area.

The consequences if the Board grants the language proposed by Nextera would be for TSP's to submit reactive element upgrades for the transmission system such as Static VAR Compensators (SVCs), static compensators (STATCOMs), other Flexible AC Transmission Systems (FACTS) and synchronous condensers which provide dynamic Reactive Power with various time responses to quickly changing system conditions. The costs of these upgrades should be borne by those that are charged with meeting the requirements outlined in the Protocols and their choice is clear. Install the equipment to meet the standards outlined in the Protocols or make contributions in aide of construction in lieu of meeting the standard as outlined in paragraph (7) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability.

Revised Proposed Protocol Language

None proposed.

PRR Comments

PRR Number	830	**PRR Title**	**Reactive Power Capability Requirement**

Date	11/10/2009

Submitter's Information	
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E-mail Address	robert.sims@aes.com
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Market Segment	Independent Generator

Comments

PRR 830 should not be implemented in the present form for a number of reasons. The following are 3 issues important to the AES Corporation.

1) PRR 830 requires voltage and power factor capabilities higher than the requirements of FERC 661A "Interconnection Requirements for Wind Energy implemented in December of 2005. ERCOT has not demonstrated the need for voltage and power factor support capabilities higher than the accepted National standard.

Many existing wind projects, and particularly those that use type 3 and 4 turbines from General Electric and Siemens can provide substantial voltage support now without retrofits. The systems in these turbines have been designed to conform to the voltage and power factor requirements mandated by FERC in order 661A and by many other regulatory bodies around the world. These regulatory requirements and turbine capabilities are based on numerous system studies performed specific to wind turbine interaction and integration with utility power systems.

ERCOT has arbitrarily required a higher level of voltage and power factor support than what is required under FERC 661A. No studies have been conducted and no justification has been provided by ERCOT as to why this higher level of voltage support is needed, or if it can even be utilized by the ERCOT System.

Technical studies conducted by AES indicate that wind projects will hit their over and under voltage limits and trigger protective relaying at the levels of voltage support required under PRR 830. AES suggests that existing and future wind generators will be required to spend millions of dollars to enhance the voltage and power factor capabilities and these systems will never be utilized.

ERCOT should be required to demonstrate the *need* and *ability* of the ERCOT transmission system to utilize voltage and power factor support at levels above those required under the accepted national standard of FERC 661A.

2) PRR 830 is incomplete and a piecemeal approach to providing the ERCOT System with additional reliability and support from wind turbines. ERCOT should take a comprehensive approach to studying and specifying the need for voltage and power factor support along with Low Voltage Ride Through (LVRT) for wind turbines.

ERCOT is presently studying the need for LVRT capability for wind turbines as directed by the ERCOT Board under OGRR 208, Voltage Ride-Through (VRT) Requirement. Should this study result in additional requirements for wind turbines it would involve the same voltage and power factor systems within the turbines and wind projects that may require modification under PRR 830. This very well may result in a situation where existing projects spend substantial capital to retrofit existing turbines to conform to PRR 830 only to find that additional or different retrofits may be required to conform to new LVRT requirements. A comprehensive analysis of what is ***needed*** and can be ***utilized*** by the ERCOT system from the installed fleet of wind turbines is recommended.

3) PRR 830 retroactively changes the interconnection requirements for thousands of megawatts of operating wind projects with no technical basis, no system studies, and no documented need.

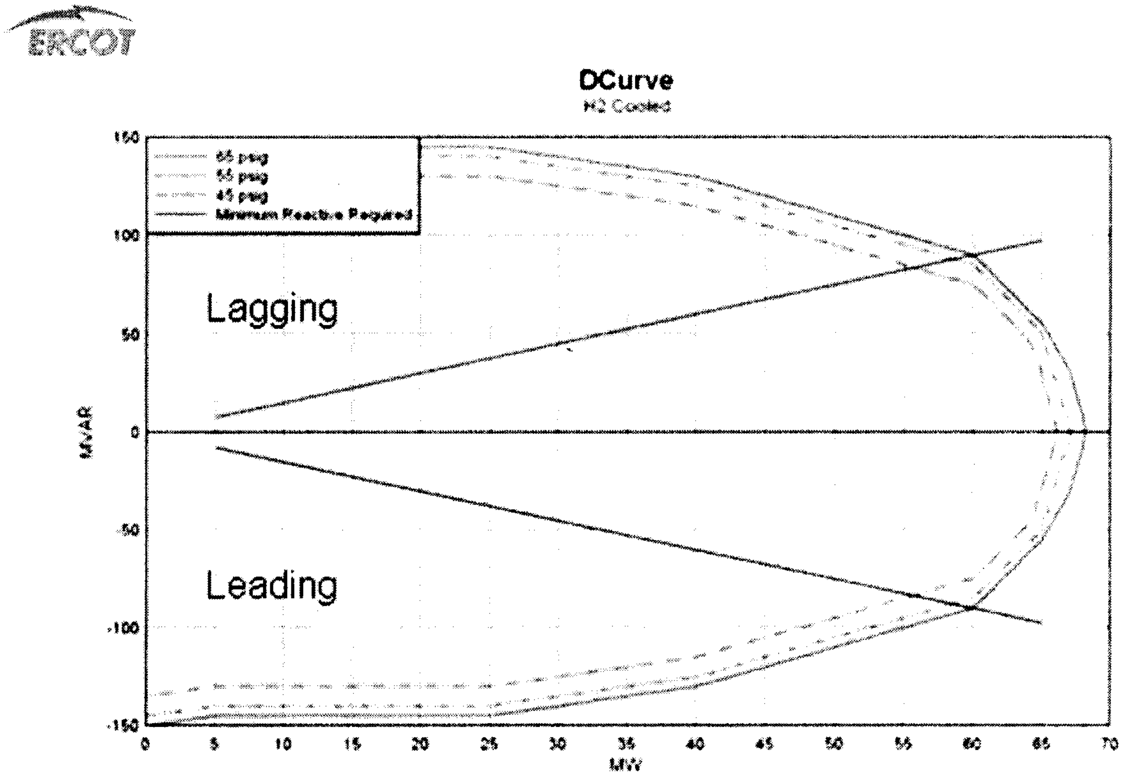
Prior to PRR 830, the "cone" reactive requirement was clearly defined in the Protocols and related ERCOT documents and has been accepted by ERCOT as detailed in the individual generator registrations (RARF).

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

> *(5) At all times a Generation Resource unit required to provide VSS is On-line, the URL must be available for utilization at the generating unit's continuous rated active power output, and Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the Reactive Power available be less than the required installed <u>reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output</u>, and any Reactive Power*

available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP

b) The ERCOT Resource Registration Guide as recently as June 2009 illustrated the "cone" requirement in section 7.4. As noted in the diagram from page # 30 below the purple line illustrates the "Minimum Reactive Required" as the "cone"



c) Virtually all wind projects installed in ERCOT prepared and submitted Resource Asset Registration Forms (RARFs) that clearly stated their reactive capability as the "cone". These detailed official registration documents convey the operating parameters and capabilities of the generation projects to ERCOT. The RARF forms were reviewed and accepted by ERCOT with the "cone" parameters as each generator connected to the ERCOT system.

As stated above, ERCOT should be required to demonstrate the <u>*need*</u> and <u>*ability*</u> 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 Position Statement

PRR Number	830	**PRR Title**	**Reactive Power Capability Requirement**

Date	November 10, 2009

Submitter's Information	
Name	John Houston, TAC Advocate
E-mail Address	
Company	CenterPoint Energy Houston Electric
Phone Number	
Cell Number	
Market Segment	

Comments

John Houston, Vice President of Transmission and Substation Operations for CenterPoint Energy Houston Electric, has agreed to serve as the Technical Advisory Committee ("TAC") Advocate for the appeal of PRR 830. Due to business meetings in Washington D.C., Mr. Houston was not contacted until late in the day on Monday, November 9, 2009; therefore, Mr. Houston has not had adequate time to prepare documents to submit to the Board of the Electric Reliability Council of Texas ("ERCOT Board") by the deadline of Tuesday, November 10, 2009. Mr. Houston will submit more complete documents prior to the ERCOT Board's consideration. The following information is submitted in support of the TAC approval of PRR 830.

The issues raised in PRR 830 have been adequately vetted through the stakeholder process and it passed each vote with overwhelming approval rates. At the October 12, 2009, Reliability and Operations Subcommittee ("ROS") meeting, at least two hours were spent on presentations and consideration of comments. The vote passed with 5.5 in favor, 2.0 opposed, and two abstentions. As the ERCOT Board is aware, ROS "is responsible to review operations of ERCOT in relation to system security, operating guides application, and emergency operations." At the October 19, 2009, Protocol Revision Subcommittee meeting, several hours were also spent in consideration of the issues raised by various interested persons. The vote passed with 5.889 in favor, 1.111 opposed, and five abstentions. Another thorough vetting occurred at the November 5, 2009, TAC meeting. The PRR was approved with a vote of 23 in favor, one opposed, and six abstentions.

PRR 830 was proposed by ERCOT Staff. PRR 830 clarifies the reactive power capability requirement applicable to generators. Reactive power requirements are fundamentally a reliability concern to ensure voltage stability is maintained on the ERCOT network. ERCOT requirements relating to reactive power capability were originally developed by ROS and approved by TAC. The requirements are based upon an equitable and workable approach that recognizes ensuring voltage stability requires reactive power performance from three entities: generators, loads, and transmission owners. Generators and loads have a fixed reactive power requirement and transmission owners supply whatever additional reactive power is needed based upon engineering analyses. For generators, the fixed performance requirement is to provide and maintain reactive power (MVAR) capability based on 0.95 power factor or less calculated at the unit's maximum real power (MW) capability throughout the range of the unit's real power output. The generator reactive power requirement does not vary based on need determined by engineering analysis. For example, engineering analysis performed at various times have determined the Dallas-Fort Worth metroplex and the greater Houston area required significant reactive resources, both static and dynamic, to ensure voltage stability is maintained. The identified need is not met by requiring additional reactive capability from generators located in such areas because, as previously noted, the philosophy behind the ERCOT requirements is that generators have a fixed requirement. Instead, the additional reactive resources are provided by the transmission owners that have the variable requirement based on need identified through engineering analysis.

The overwhelming majority of the members of ROS, PRS, and TAC support PRR 830 due to reliability concerns for the electric transmission grid within ERCOT as well as concerns that all generators within ERCOT are treated equitably. The ERCOT transmission system was designed and built upon the criteria that all generators would provide the specified requirement for reactive power. PRR 830 clarifies the reactive requirement for generators to ensure that the system is operated in the manner in which it was planned and built. The majority of the ROS, PRS, and TAC members agree that PRR 830, as proposed by ERCOT, is a well-reasoned, flexible, and fair approach consistent with the reliability requirements understood and implemented by the majority of industry participants.

Lastly, the issues raised in PRR 830 do not need further study. As previously noted, generators have a fixed reactive capability requirement. The requirements for generators are not determined based on study and do not increase or decrease based on need identified by a different studies performed at different times over the life of the generating units. Instead, studies are performed to identify the variable transmission owner requirements.

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 12b – ERCOT ISO's Position Statement regarding TAC Approval of PRR830 and NextEra Energy Resource's Appeal

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Greetings:

Protocol Revision Request (PRR) 830, *Reactive Power Capability Requirement*, has been approved overwhelmingly at the Reliability Operations Subcommittee (ROS), the Protocol Revision Subcommittee (PRS), and the Technical Advisory Committee (TAC) and should now be approved by the ERCOT Board of Directors (ERCOT Board). This PRR will preserve important reliability requirements, maintain parity among Generation Resources, reduce uplift of costs to Load, and at the same time it will grant major concessions to Wind-powered Generation Resources (WGRs), both in the form of increased flexibility regarding alternative means of compliance to the existing Protocols and in the form of an entire year to bring substandard equipment into compliance. Pursuant to Section 8.3.3 of the ERCOT Board Policies and Procedures, Electric Reliability Council of Texas, Inc. (ERCOT ISO) submits this Position Statement encouraging the ERCOT Board to approve PRR830 as recommended by TAC and to reject NextEra Energy Resource's appeal as without merit.

ERCOT ISO proposed PRR830 after providing an interpretation of the existing Protocols (which was subsequently withdrawn) and determining that a majority of the WGRs were unable to meet the Reactive Power requirements under Section 6.5.7.1(2) of the ERCOT Protocols. Wind-powered Generation Entities have questioned the interpretation and responded that they were in compliance with the existing Protocols when ERCOT ISO requested a mitigation plan from them that would enable them to meet the Protocol requirement. ERCOT ISO drafted and proposed PRR830 to provide a framework and a pathway to compliance for existing WGRs. PRR830 is consistent with Section 6.5.7.1(6) of the Protocols which allows participants to propose alternative designs for meeting the 0.95 lead/lag rectangle requirement. These alternative designs can include static and/or dynamic reactive devices. The PRR also allows the stakeholder groups which drafted the existing Protocol requirements to consider the issue and decide whether ERCOT ISO's view is consistent with the understanding of the majority of stakeholders. As previously noted, the overwhelming majority of all three stakeholder groups that reviewed ERCOT ISO's proposal (ROS, PRS, and TAC) agree with the language proposed by ERCOT.

Wind-powered Generation Entities have argued that because PRR830 clarifies the existing Protocol requirements, the existing requirements were ambiguous and therefore should not be applied to certain WGRs who did not understand the requirements. The stakeholder groups that reviewed PRR830 heard and rejected such arguments. The existing Protocol requirements were developed through the stakeholder process, with multiple opportunities for parties to propose clarifications, and have been in place for several years without allegations being made that the requirements were ambiguous. Generation Entities have understood and complied with the requirements. For those WGRs that do not currently comply, there are workable and equitable ways to comply without a complete retrofit of the WGRs. Specifically, WGRs can install reactive resources at the Point of Interconnection to meet the requirement or pay a contribution-in-aid-of construction to Transmission Service Providers (TSPs) to offset the incremental cost paid by TSPs (who have the variable Reactive Power requirement) attributable to the generator's non-compliance, so that Consumers paying transmission rates are held harmless. The ERCOT Protocols also has a provision for generators that cannot meet the exact requirements to propose alternatives for ERCOT ISO to review and consider. In short, the majority of the ROS, PRS, and TAC agree that PRR830, as proposed by ERCOT ISO, is a well-reasoned, flexible, and fair approach consistent with the reliability requirements understood and implemented by the majority of industry participants.

ERCOT ISO believes that PRR830 addresses several key reliability and policy issues that the ERCOT Board should take into consideration.

Reliability of the ERCOT Transmission Grid. First and foremost, PRR830 emphasizes the importance of Reactive Power support in maintaining the reliability of the ERCOT Transmission Grid. ERCOT ISO believes that without the required Reactive Power support with the appropriate characteristics, the ERCOT Transmission Grid could face difficulties in maintaining required voltage levels and potentially voltage collapse. PRR830 ensures the reliability of the ERCOT Transmission Grid by allowing existing WGRs to meet the 0.95 lead/lag rectangle requirement through a combination of the WGR's Unit Reactive Limit (URL) and/or automatically switchable static and/or dynamic VAR capable devices. These existing WGRs have until December 31, 2010 to add necessary equipment in order to meet the Reactive Power capability requirement that was established in 2004. Thus, PRR830 offers a path to compliance for existing WGRs that are presently not meeting the longstanding 0.95 lead/lag rectangle requirement at the Point of Interconnection based solely on their URL.

Second, PRR830 emphasizes the importance of dynamic Reactive Power support going forward. Any new WGRs (with signed SGIAs after December 1, 2009) and all other Generation Resources must meet the 0.95 lead/lag rectangle requirement through a combination of the Generation Resource's URL (which is dynamic capability) and/or dynamic VAR capable devices. The ERCOT Transmission Grid operates in a dynamic environment, meaning that it is constantly changing to meet the demands and changing topology of the system. Requiring dynamic devices for voltage support ensures that the stability of the ERCOT Transmission Grid is maintained during Real Time events. PRR830 accomplishes this objective by requiring full dynamic capability for all Generation Resources in the ERCOT Region, whether conventional or renewable.

Parity Among Generation Resources. NextEra's appeal of PRR830 requires that the ERCOT Board consider whether existing WGRs should be given special treatment by exempting them from the Reactive Power rectangle requirement. With the exception of certain older generators, all Generation Resources have been required to provide equal Reactive Power support through either the inherent characteristics of their generation or through supplemental equipment. This requirement has existed in the ERCOT Protocols since 2004 and in other key documents, such as the Generation Interconnection Procedures, since 1999. The current language of the Protocols requires that all Generation Resources are required ***to have and maintain*** a URL with a power factor capability of 0.95 lead/lag ***both determined at the generating unit's maximum net power***. This capability must be dynamic and is determined at the Generation Resource's max output to the transmission system, and it must be maintained at all output levels.

From an ERCOT Planning perspective, ERCOT ISO assumes that all Generation Resources comply with this rectangle requirement when conducting long-term system planning studies. This assumption was used in the initial Competitive Renewable Energy Zones (CREZ) studies and is being used for the full CREZ Reactive Power studies (that are currently underway) which includes the integration of 18,000 MWs of wind onto the ERCOT Transmission Grid. Should the WGRs succeed in avoiding their Reactive Power requirements, the reliability assumptions underlying ERCOT ISO's planning studies will not be valid. Furthermore, ERCOT ISO believes that having a common, minimum set of standards for all Generation Resources levels the playing field and enables all Generation Resources to compete on an equal basis. PRR830 accomplishes this objective by keeping in place the same standard for all Generation Resources in the ERCOT Region.

Cost Responsibility. NextEra's appeal of PRR830 requires that the ERCOT Board consider the cost responsibility of who ultimately pays for Reactive Power support in the ERCOT Region. Again, ERCOT ISO believes that the current Protocol language requires all Generation Resources to provide Reactive Power support based upon the rectangle requirement. There are no exceptions to this requirement except for the exemptions noted in other paragraphs of Section 6.5.7.1 (pre September 1, 1999 Generation Resources and renewable Generation Resources in operation before February 17, 2004). Thus, Generation Resources pay for this required level of Reactive Power support in the ERCOT Region.

On the other hand, acceptance of NextEra's appeal of PRR830 would place the cost of full Reactive Power support on conventional Generation Resources and Consumers. From an ERCOT Operations perspective, it is suboptimal not to have the same Reactive Power support from all units, and ERCOT has experienced events that may not have occurred had all WGRs been capable of providing full Reactive Power support. Nevertheless, ERCOT ISO can maintain reliability with operational tools despite the additional complexity. However, a reduction in reactive reserves may make it more difficult to allow needed maintenance outages or take optimal operational actions when ERCOT's options are limited by voltage issues that could have been avoided with full Reactive Power capability. Moreover, there are cost issues. ERCOT ISO may have to bring on conventional Generation Resources who are able to provide full Reactive Power support, deny Resource or transmission outages, or open lines in order to maintain overall reliability of the ERCOT Transmission Grid. These actions will have cost impacts on other Market Participants and will be a direct result of not holding existing WGRs to the same Reactive Power requirements as conventional Generation Resources. Furthermore, if this requirement is not met, it will require ERCOT ISO to change its assumptions in the full CREZ Reactive Power studies to compensate for existing WGRs not providing full Reactive Power (the rectangle requirement). As such, the CREZ Reactive Power study results may show voltage issues which would require that TSPs provide that Reactive Power support with additional equipment on their systems. These types of upgrades will be included in the Transmission Cost of Service (TCOS), which is paid by Consumers. The needs of the system are constantly changing and a decision to allow the existing WGRs an exemption of the requirement may affect who pays in the future for Reactive Support.

For these reasons stated above, ERCOT ISO respectfully requests that the ERCOT Board reject NextEra's appeal and approve PRR830 as recommended by TAC.

I look forward to discussing this issue with you. Please let me know if you have any questions in the meantime.

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

PRR Number	830	**PRR Title**	**Reactive Power Capability Requirement**

Date	November 10, 2009

Decision Being Appealed	Technical Advisory Committee Recommendation Report
Date of Decision	November 5, 2009

Submitter's Information	
Name	Brian Hayes
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Company	Horizon Wind Energy LLC
Phone Number	(713) 265-0245
Cell Number	
Market Segment	Independent Generator

Comments

Horizon submits this, its *Brief in Support of the NextEra Appeal of the Technical Advisory Committee Recommendation Report Relating to PRR 830,* styled as comments, and incorporates by reference the earlier Horizon comments made throughout the committee process including to the Technical Advisory Committee ("TAC")[1] in opposition to PRR 830 and in support of the NextEra Energy Resources Appeal of the TAC Recommendation Report with regard to PRR 830.

Horizon incorporates NextEra's briefing in support of its appeal by reference herein and focuses its brief on demonstrating that PRR 830 is neither "clarification" of existing Protocols, nor in anyway consistent with the current Protocols and will create hardships on a single segment of the generation market that answered the call to make Texas the wind capital of the United States.

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[1] Each set of comments is attached at the end of this, Horizon's Brief in Support of the NextEra Appeal of the TAC Recommendation Report relating to PRR 830, as Exhibits F, G, and H.

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

PRR 830 submitted by the Electric Reliability Council of Texas ("ERCOT") purports to clarify what ERCOT has previously stated is already the clear standard set forth in the ERCOT Protocols relating to reactive power. This position has been the ERCOT position since it submitted its November 13, 2008 Interpretation of Reactive Power Protocols §§6.5.7.1(2) and 6.7.6(5), which was later withdrawn for procedural defects following an appeal to the Public Utility Commission of Texas ("PUCT" or "Commission"), and that ERCOT has stated it will still enforce. ERCOT is now attempting to modify the ERCOT Protocols to retroactively require retrofits to wind generation resources that have been operating in the ERCOT market for years, and at great expense—tens of millions of dollars for Horizon alone.

This is a sea change in the way the market has operated and is in direct conflict with the plain language of the ERCOT Protocols—it is not a clarification or consistent with the market rules that have been in place since 2004. The best way to explain the intent of the Protocols is to use ERCOT's own presentation to the market—conventional generators and wind generation resources alike, noting which generation is exempt from these requirements, and what the requirement is for generation that is not exempt. That presentation is dated August of 2008 and is the first attachment hereto (Exhibit A). The second slide of ERCOT's PowerPoint discusses the lead and lag requirement in the Protocols. Anyone listening to the discussions in the earlier ERCOT Committees would notice that this standard is referred to by ERCOT or Calpine as the "rectangle". However, as clearly discussed on slide 2, and demonstrated pictorially on slide 3, the .95 lead and lag requirement means that the MVAR or reactive power requirement starts at 0 and increases gradually under a .95 lead and lag standard as generation increases. Note also that the minimum requirement is clearly triangle or cone-shaped and noted plainly in ERCOT's presentation—intended to demonstrate what ERCOT's interpretation of these requirements was until just before the ERCOT Official Interpretation was issued in November of 2008 (see Exhibit B).

Wind-powered generation resources ("WGRs") have entered the Texas market and invested billions of dollars in this market under the existing rules. It is those WGRs that have made the investment under the rules in effect at the time, and today, that will be penalized by PRR 830. The reason is that PRR 830 is meant to require massive retrofits for WGRs that have long since financed their generation and for generation that has been operating in accordance with the Protocols for years.

WGRs have made their capabilities clear to ERCOT and ERCOT has allowed them to interconnect, sent them notices that they meet the ERCOT checklist, and ERCOT has had before it each time a Generation Asset Registration Form ("GARF") (now termed a Resource Asset Registration Form ("RARF")) that depicts the reactive power capability of WGRs—and that reflects the triangle. ERCOT has consistently accepted these GARFs and RARFs. For years and until very recently in the Resource Asset Registration Guide (Exhibit C), the minimum requirement for reactive power for WGRs has been depicted, clearly, as the triangle—increasing with the output of the wind project. It is unclear how changes were made to the Resource Asset Registration Guide to remove the pictorial, but it was apparently removed in a July 2009 revision.

In addition to all of the above, ERCOT has permitted WGRs clearly providing the "cone" or "triangle" to interconnect using the Public Utility Commission of Texas ("PUCT" or "Commission") Standard Generation Interconnection Agreement ("SGIA") with the relevant transmission service provider ("TSP"). The SGIA requires that the TSP request ISO approval necessary to carry out its responsibilities. Further, ERCOT has the obligation not to interconnect generation in violation of the ERCOT Protocols or the Commission's Rules. In practice, ERCOT gets on the phone with the WGR and the TSP to discuss the project before allowing it to interconnect—including in its checklist the RARF or GARF demonstrating that it meets the ERCOT cone/triangle requirement and then sends a notice to the WGR that it complies with all of the requirements—which include reactive power requirements. WGRs go farther than the standards in the Protocols require though and implement any additional reactive equipment the TSP deems necessary at the time after the TSP has run its studies. All of this is the expectation of cost, value, market expectation and a clear sense of what the rules are—prior to interconnection and has resulted in all GARF and RARF forms striving to meet the cone/triangle in accordance with the Resource Asset Registration Guide. In addition, ERCOT required all WGRs to meet the New Generator Interconnection 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 multiples the retrofit investment by a factor of four. ERCOT is incorrect in stating that PRR 830 is not a change from the current Protocols. ERCOT's 2008 survey of WGR equipment confirmed that many have installed static reactive equipment. The "dynamic requirement" is not in the Protocols today. Only two manufacturers arguably can meet that requirement with their turbines, but those manufacturers are not comfortable warranting that their turbines have that capability. Similarly, there were no turbines on the market that could meet a rectangle standard at the time the Protocol language at issue was instituted.

Despite arguments largely from Calpine and PSEG in ERCOT committee meetings that WGRs are not "providing their fair share", it is important to note that PRR 830 only requires retrofits of WGRs, leaving all of the other conventional generation in service before 1999 exempt. To the extent retrofits are being required, which is what PRR 830 does only to WGRs, Calpine argues that generators in the market need to "step up" and "pay their fair share" for reliability. Horizon suggests that if the language requires retrofits to existing generation to meet a new standard, that same standard should be applied across the board such that WGRs that complied with the Protocols as drafted and now are being asked to retrofit should be joined by conventional generators such as Calpine that should be treated in the same manner.

The singling out of one category of generation for retrofits is inappropriate, particularly when, as here, ERCOT has done no study or analysis to determine what is actually needed for reliability. As was stated by Mr. Dumas in the TAC meeting, ERCOT has modeled the transmission system as if WGRs met its "interpretation" (and the PRR 830 requirements) even though ERCOT knew from its own presentations, the language of the Protocols and the RARFs and GARFs submitted by WGRs, exactly what was on the system—WGRs providing the cone/triangle. ERCOT modeled a system different from what currently exists, and now seeks to force WGRs to make retrofits to make the system look like the model, rather than changing ERCOT's modeling and determining if the expense would provide any value or just be gold-plating that will not support reliability, as the only study done on the subject by NextEra demonstrates.

Looking at the language of the current Protocols, it can be easily demonstrated that PRR 830 is a shift intended to require retrofits from WGRs alone.

> § 6.5.7.1 Generation Resources Required to Provide VSS Installed Reactive Capability
>
> (2) Generation Resources required to provide VSS except as noted below in items (3) or (4), shall have and maintain a URL which has an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the transmission grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the point of interconnection to the TDSP.
>
> § 6.7.6 Deployment of Voltage Support Service
>
> (5) At all times a Generation Resource unit required to provide VSS is On-line, the URL must be available for utilization at the generating unit's continuous rated active power output, and Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any Reactive Power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP.

The operating capability is the level at which a WGR is running. The Protocols require that reactive power **up to the operating capability** and at lower levels must be available. Reactive power is not to be less that the installed reactive capability (which is the total possible reactive capability) **multiplied by the ratio of lower active power output to the continuous rated output** (the ratio of the amount the WGR is providing in output compared to the total it could provide). Thus, the reactive power will always be a percentage based on the output—increasing when output increases and decreasing when output decreases—as demonstrated in Exhibit A, ERCOT's presentation on reactive power.

Paragraphs (3) and (4) of Protocol Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability explicitly state which Generation Resources are exempt from meeting the Reactive Power capability requirement and which Resources are not required to retrofit in PRR 830 as would WGRs. Since the end date of that exemption, over 40 WGRs with approximately 7,000 MW of capacity have interconnected with the ERCOT Transmission Grid. Horizon is not aware of a single WGR that meets ERCOT's interpretation of the required Reactive Power capability. This can be verified by reviewing the asset registration forms that ERCOT accepted from these WGRs, and from the results of an informal survey ERCOT undertook in the last half of 2008 of WGR capabilities and procedures. It is hard to comprehend how so many projects could be interconnected in a manner contrary to ERCOT's interpretation of the Reactive Power requirements, particularly if such interconnections would create reliability problems.

More than 40 wind resources that have interconnected with ERCOT since the Reactive Power capability requirement in the Protocols were instituted. At the time of such interconnections, WGRs interpreted the minimum Reactive Power requirement as the "triangle". This is borne out by ERCOT's survey of wind resources conducted in the summer and fall of 2008. The survey shows that WGRs have Reactive Power capability in the triangle, unless they have installed additional equipment. Thirty of the 49 WGRs surveyed have installed additional equipment. In every case where that additional equipment was specified, WGRs had installed capacitors. Horizon's projects are included in this number. Based on the studies conducted as part of the interconnection process, those projects installed sufficient capacitance to provide Reactive Power as described in the top half of the rectangle (lagging). The projects' leading Reactive Power capability as described by the triangle. While the minimum Reactive Power capability was agreed by all parties involved in the interconnection of these projects to be the triangle, Horizon, among others, installed additional equipment determined by the TSP to be necessary for system reliability. This equipment has been reported to ERCOT in several rounds of asset registration forms, which were accepted and approved by ERCOT prior to the issuance of its "compliance letters" in June of 2009 shortly after it withdrew its Official Protocol Interpretation and sought to remove the issue from Commission review in seeking dismissal of PUCT Docket 36482. The letter states that, based on the Reactive Power curves in the asset registration forms Horizon had submitted, Horizon's projects appear unable to comply with ERCOT's interpretation of the protocol requirements.

ERCOT has never discussed or mentioned how WGRs supplying a good deal of energy to the ERCOT market will operate if this PRR passes. If WGRs do not comply with the Protocols, will they be allowed to continue to provide service and how would retrofits be accomplished with virtually all existing WGRs requiring retrofits and units having to be shut down? What would such a result do to increase market prices as conventional units are dispatched in place of WGRs that are down for retrofits? How will this benefit reliability if at all?

Horizon can answer some of the above questions—some WGRs may not be able to afford the retrofits and those that can will have to recover those investments from the market, raising the price for power in the ERCOT market, and benefiting conventional generation that would otherwise not be dispatched, such as Calpine's units. ERCOT states that the current system can be run reliably and has no studies or analyses of any kind to demonstrate that retrofits are needed. If this is true, then there is no reason not to implement this new standard on a forward-looking basis as NextEra's PRR compromise amendments to PRR 830 at the TAC would have done, and which Horizon supports.

Horizon believes that ERCOT got it right the first time, from 2004 through at least August of 2008, when it explained that the ERCOT requirement meant the cone/triangle as demonstrated on Exhibit A, rather than three months later when ERCOT changed its interpretation following its discovery that it had modeled the transmission system incorrectly. Market certainty in the requirements applicable to WGRs is extremely important. Investors depend upon stable rules to invest in the ERCOT market. In the case of PRR 830 where there is no demonstrated reliability need for retrofits and the only study that has been done shows that such changes do not provide reliability benefits, there is no reason to require a single WGR to spend tens of millions of dollars or the collective WGR market to spend what may well be hundreds of millions of dollars, without basis. PRR 830 should not be implemented such that one segment of the generation market is burdened with retrofits (WGRs), while other generation resources (exempt conventional generation) with which WGRs compete are benefited as market prices rise and are passed on to consumers. Horizon agrees with the NextEra comments provided at TAC to implement these new standards only on a forward-looking basis and not to penalize existing generation that has invested in the Texas market, resulting in overall lower market costs to consumers and cleaner power. Horizon incorporates the comments of NextEra in support of its appeal.

EXHIBIT A

Voltage Control Requirement

ERCOT Operations Planning

August 22, 2008

Voltage Control Protocols that apply to WGRs

- **Protocol 6.5.7.1-**

  Generation Resources Required to Provide VSS Installed Reactive Capability

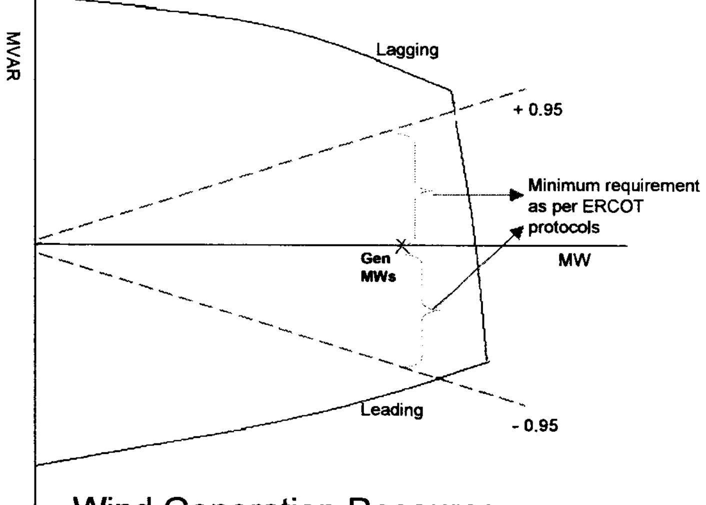
  - (2) Generation Resources required to provide VSS except as noted below in items (3) or (4), shall have and maintain a Unit Reactive Limit (URL) which has an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability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

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

0.95 PF requirement for generators

- Shown to the right are the reactive capability curves for a conventional generator and a WGR
- As seen from the figures, each generator is required to provide a + 0.95 to -0.95 pf voltage support
- Example:
  - **Wind generation output equals 100 MW; MVAR requirement = +/- 33 MVAR at Point of Interconnect**
  - **Wind generation output equals 0 MW; MVAR requirement = 0 MVAR at Point of Interconnect**

Conventional Generator



Wind Generation Resource

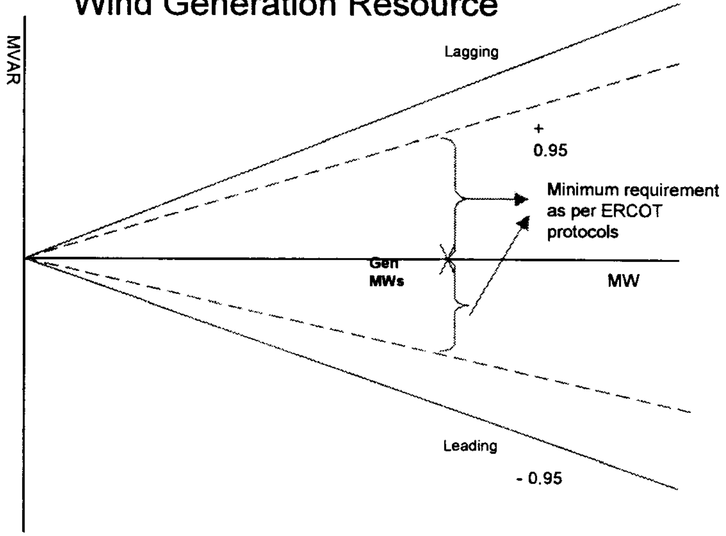


EXHIBIT B

NOTICE DATE: November 13, 2008

NOTICE TYPE: M-D111308-01 Legal

SHORT DESCRIPTION: Protocol Interpretation Request on Reactive Power Capability Requirements

INTENDED AUDIENCE: All ERCOT Market Participants

LONG DESCRIPTION: An Entity has submitted to ERCOT a Protocol Clarification/Interpretation Request (PIR) regarding subsection (2) in Protocol Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, and subsection (5) in Protocol Section 6.7.6, Deployment of Voltage Support Service. Specifically, the PIR seeks clarification on issues surrounding Reactive Power capability requirements.

ERCOT provides the following guidance to the questions submitted by the Entity.

1. **Clarify if the power factor capability of +/- 0.95 is required at all levels of generation.**

Yes. Protocol Section 6.5.7.1(2) sets the Reactive Power capability requirement for all Generation Resources that provide Voltage Support Service (VSS). The section states that a Generation Resource is required to have and maintain an Unit Reactive Limit (URL) with a power factor capability of +/- 0.95, determined at its net max output to the transmission system, and that this capability must be maintained – no exceptions are provided.

2. **Clarify the minimum reactive capability requirements at lower levels of generation and exactly how this is calculated.**

There is no minimum Reactive Power capability requirement. The Reactive Power requirement is set forth in Protocol Section 6.5.7.1, *Generation Resources Required to Provide VSS Installed Reactive Capability*. Specifically, subsection (2) states:

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

As described in the response to Question 1, Protocol Section 6.5.7.1(2) states that a Generation Resource must provide the MVAR requirement (+/- 0.95 power factor) calculated at the maximum net output to the ERCOT Transmission Grid, and that level must be available at all MW output levels.

ERCOT, or TSPs designated by ERCOT, have the right to instruct Generation Resources to make adjustments for voltage support within the URL capacity limits. However, dispatching a Generation Resource within a URL range is the right of the system operator, and is unrelated to, and does not affect a Generation Resource's obligation to maintain a power factor capability of +/- 0.95 when dispatched by ERCOT or TSPs.

Protocol Section 6.7.6(5) confirms the power factor capability requirement in Protocol Section 6.5.7.1(2). Specifically, the first sentence reads:

> At all times a Generation Resource unit required to provide VSS is On-Line, the URL must be available for utilization at the generating unit's continuous rated active power output, and **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.

sg

EXHIBIT C

ERCOT

Resource Asset Registration Guide
v4.03

Revision History

Date	Version	Description	Author
10/10/2007	0.03	Draft for Internal Review	D. Showalter
10/10/2007	0.04	Second draft for Internal Review	D. Showalter
10/10/2007	0.05	Draft for Posting	D. Showalter
10/11/2007	0.06	Revised Draft for Posting	D. Showalter
10/16/2007	0.07	Revised with Market Comments	D. Showalter
12/13/2007	0.08	Revised for Planning Submittal	D. Showalter
4/01/2008	3.99	Draft -Reorganized and reformatted for RARF Ver 4	D. Showalter
4/08/2008	4.00	Released with RARF Ver 4 (Official RARF)	D. Showalter
12/16/08	4.01	Updated RARF Guide V4.01	A. Moy
2/4/2009	4.02	Updated and re-wrote transmission and load data tabs	S. Middleton
3/10/2009	4.03	Corrected / Modified business rules for transformer tab	S. Middleton

Table of Contents

1.0 Summary of Resource Registration Guide

This document is a guide to completing Resource Asset Registration with ERCOT in accordance with Section 16 of the ERCOT Nodal Protocols. Historically, the GARF, along with other documents, has been used for Resource Entities (RE) to provide information necessary to setup a Resource within ERCOT's systems, including registration, market operations, power operations, and commercial operations.

Upon obtaining the forms from Resource Entities, ERCOT will keep the RARFs in a central repository hub so the files can be tracked and easily accessed by all ERCOT systems, as well as communicated back to the Resource Entity through audits (Figure 1 below illustrates the process flow of receiving and loading RARF data).

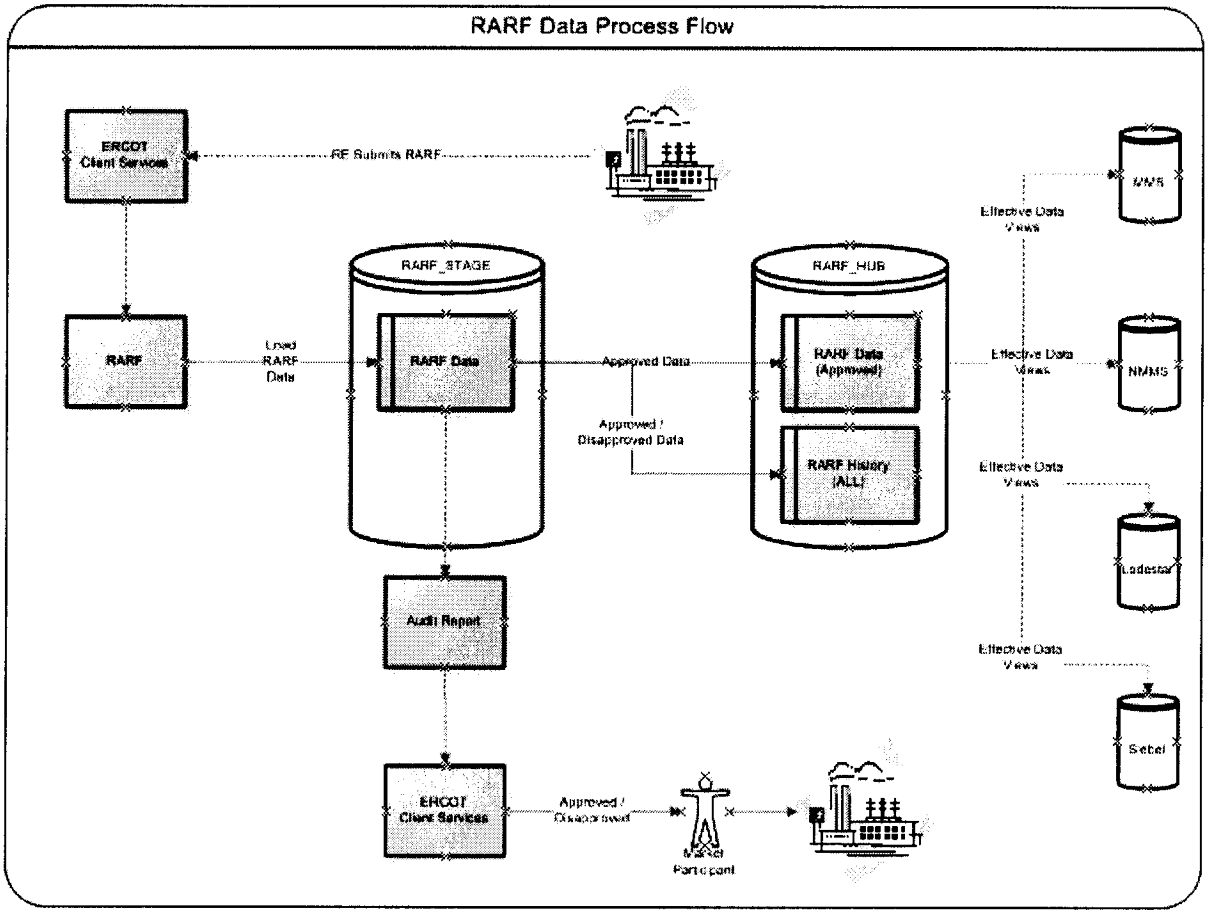


Figure 1

1.1 Tabs

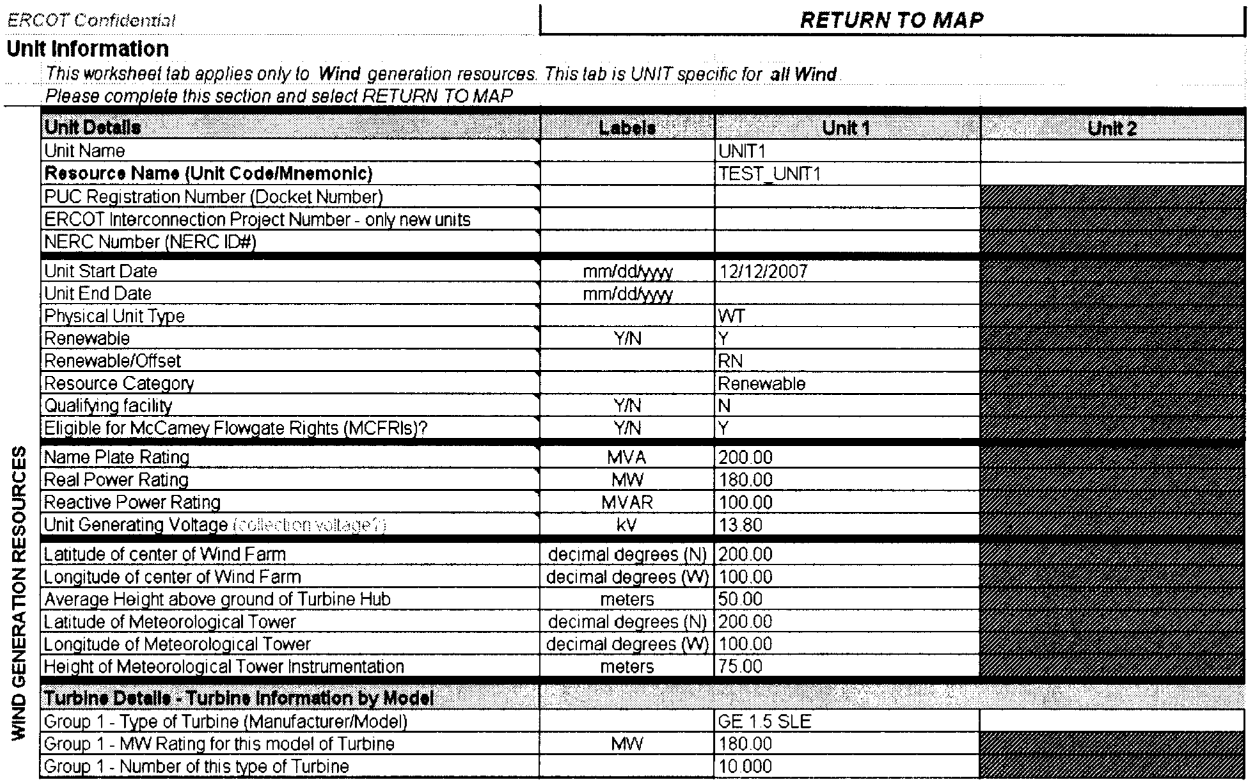
The RARF uses the worksheet tabs to focus on areas. The goal is to get this as close to web-interface entry as possible. The list of tabs is as follows:

- Instructions
- Spreadsheet Map
- General Information - ALL
- Site Information - All GEN RES
- Unit Info - GEN
- Unit Info - CC
- Unit Info - WIND
- Resource Parameters - GEN
- Resource Parameters - CC
- Resource Parameters - CC CFG
- Resource Parameters - WIND
- Operational Resource Parameters - GEN
- Operational Resource Parameters - CC CFG
- Operational Resource Parameters - WIND
- Reactive Capability - GEN
- Reactive Capability - CC
- Reactive Capability - WIND
- Ownership - GEN
- Ownership - CC
- Ownership - WIND
- Configurations - CC1
- Transitions - CC1
- Configurations - CC2
- Transitions - CC2
- Configurations - CC3
- Transitions - CC3
- Planning - GEN
- Planning - CC
- Planning - WIND
- Protection - GEN
- Protection - CC
- Protection - WIND
- SubSync Resonance - GEN
- SubSync Resonance - CC
- Private Network
- GEN Owned Transmission Assets
- Line Data
- Breaker Switch Data
- Capacitor and Reactor Data

- Transformer Data

1.2 Colors

The new form for the official RARFs will primarily use colors to identify sections of the workbook. However, a pale yellow cell indicates any cell that is blank or set to zero.



ERCOT Confidential **RETURN TO MAP**

Unit Information

This worksheet tab applies only to ***Wind*** *generation resources. This tab is UNIT specific for* ***all Wind***

Please complete this section and select RETURN TO MAP

WIND GENERATION RESOURCES

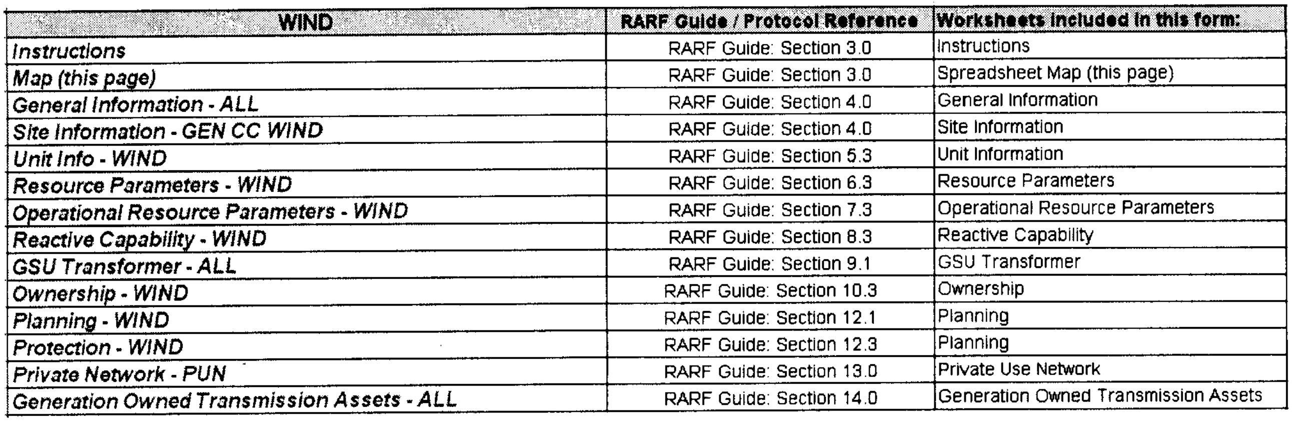
Unit Details	Labels	Unit 1	Unit 2
Unit Name		UNIT1	
Resource Name (Unit Code/Mnemonic)		TEST_UNIT1	
PUC Registration Number (Docket Number)			▨
ERCOT Interconnection Project Number - only new units			▨
NERC Number (NERC ID#)			▨
Unit Start Date	mm/dd/yyyy	12/12/2007	▨
Unit End Date	mm/dd/yyyy		▨
Physical Unit Type		WT	▨
Renewable	Y/N	Y	▨
Renewable/Offset		RN	▨
Resource Category		Renewable	▨
Qualifying facility	Y/N	N	▨
Eligible for McCamey Flowgate Rights (MCFRIs)?	Y/N	Y	▨
Name Plate Rating	MVA	200.00	▨
Real Power Rating	MW	180.00	▨
Reactive Power Rating	MVAR	100.00	▨
Unit Generating Voltage (collection voltage?)	kV	13.80	▨
Latitude of center of Wind Farm	decimal degrees (N)	200.00	▨
Longitude of center of Wind Farm	decimal degrees (W)	100.00	▨
Average Height above ground of Turbine Hub	meters	50.00	▨
Latitude of Meteorological Tower	decimal degrees (N)	200.00	▨
Longitude of Meteorological Tower	decimal degrees (W)	100.00	▨
Height of Meteorological Tower Instrumentation	meters	75.00	▨
Turbine Details - Turbine Information by Model			
Group 1 - Type of Turbine (Manufacturer/Model)		GE 1.5 SLE	
Group 1 - MW Rating for this model of Turbine	MW	180.00	▨
Group 1 - Number of this type of Turbine		10.000	▨

- If a cell is hatched, the cell is not ready to be filled out, and should be left blank. Upon completing the Resource Names and defining all basic site and unit information, all cells that need to be completed should be hatch-free. Do not enter data behind hatched cells.
- If a field has a Label, the data for the corresponding cell must show only the applicable data value, not the label itself,.
- N/A values or other descriptive information is not allowed in cells unless otherwise provided in the pull-down menu selection.

1.3 RARF - Hyperlinks and Mapping

In an attempt to ease accessibility to this document, hyperlinks and a mapping page have been used. Each worksheet has a "RETURN TO MAP" link at the top, in or near cell C1.

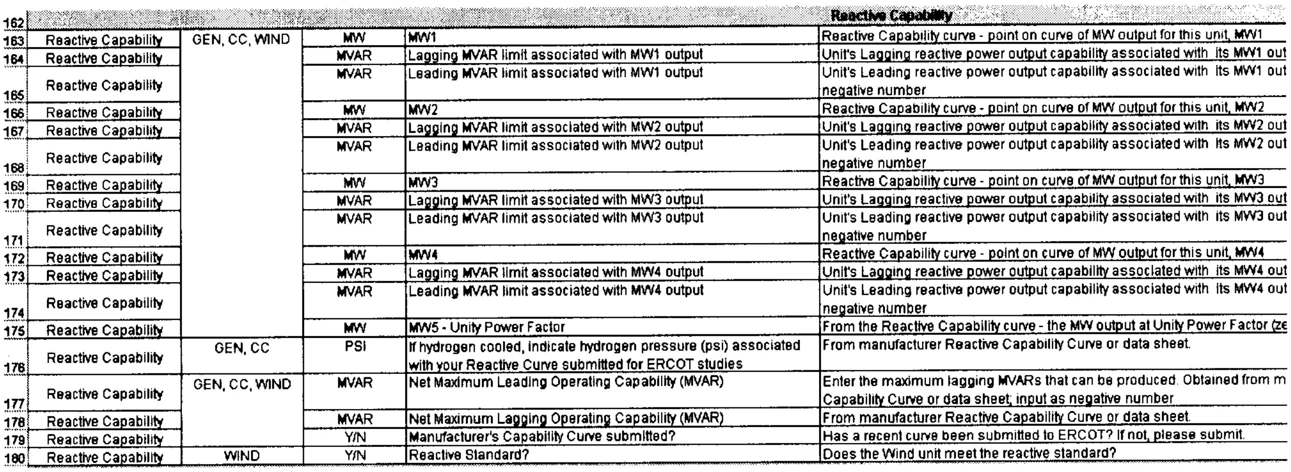
The Map page is categorized by generation type – CC, WIND and GEN where GEN is all non-wind, non-CC Generation Resources. The example below is for wind. In addition, the map shows a reference to this guide.



WIND	RARF Guide / Protocol Reference	Worksheets included in this form:
Instructions	RARF Guide: Section 3.0	Instructions
Map (this page)	RARF Guide: Section 3.0	Spreadsheet Map (this page)
General Information - ALL	RARF Guide: Section 4.0	General Information
Site Information - GEN CC WIND	RARF Guide: Section 4.0	Site Information
Unit Info - WIND	RARF Guide: Section 5.3	Unit Information
Resource Parameters - WIND	RARF Guide: Section 6.3	Resource Parameters
Operational Resource Parameters - WIND	RARF Guide: Section 7.3	Operational Resource Parameters
Reactive Capability - WIND	RARF Guide: Section 8.3	Reactive Capability
GSU Transformer - ALL	RARF Guide: Section 9.1	GSU Transformer
Ownership - WIND	RARF Guide: Section 10.3	Ownership
Planning - WIND	RARF Guide: Section 12.1	Planning
Protection - WIND	RARF Guide: Section 12.3	Planning
Private Network - PUN	RARF Guide: Section 13.0	Private Use Network
Generation Owned Transmission Assets - ALL	RARF Guide: Section 14.0	Generation Owned Transmission Assets

1.4 Glossary

A glossary has been created and is being provided as a separate document to this form. The glossary is the source for the definition of each field requested in the RARF.



162					**Reactive Capability**
163	Reactive Capability	GEN, CC, WIND	MW	MW1	Reactive Capability curve - point on curve of MW output for this unit, MW1
164	Reactive Capability		MVAR	Lagging MVAR limit associated with MW1 output	Unit's Lagging reactive power output capability associated with its MW1 out
165	Reactive Capability		MVAR	Leading MVAR limit associated with MW1 output	Unit's Leading reactive power output capability associated with its MW1 out negative number
166	Reactive Capability		MW	MW2	Reactive Capability curve - point on curve of MW output for this unit, MW2
167	Reactive Capability		MVAR	Lagging MVAR limit associated with MW2 output	Unit's Lagging reactive power output capability associated with its MW2 out
168	Reactive Capability		MVAR	Leading MVAR limit associated with MW2 output	Unit's Leading reactive power output capability associated with its MW2 out negative number
169	Reactive Capability		MW	MW3	Reactive Capability curve - point on curve of MW output for this unit, MW3
170	Reactive Capability		MVAR	Lagging MVAR limit associated with MW3 output	Unit's Lagging reactive power output capability associated with its MW3 out
171	Reactive Capability		MVAR	Leading MVAR limit associated with MW3 output	Unit's Leading reactive power output capability associated with its MW3 out negative number
172	Reactive Capability		MW	MW4	Reactive Capability curve - point on curve of MW output for this unit, MW4
173	Reactive Capability		MVAR	Lagging MVAR limit associated with MW4 output	Unit's Lagging reactive power output capability associated with its MW4 out
174	Reactive Capability		MVAR	Leading MVAR limit associated with MW4 output	Unit's Leading reactive power output capability associated with its MW4 out negative number
175	Reactive Capability		MW	MW5 - Unity Power Factor	From the Reactive Capability curve - the MW output at Unity Power Factor (ze
176	Reactive Capability	GEN, CC	PSI	If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT studies	From manufacturer Reactive Capability Curve or data sheet.
177	Reactive Capability	GEN, CC, WIND	MVAR	Net Maximum Leading Operating Capability (MVAR)	Enter the maximum lagging MVARs that can be produced. Obtained from m Capability Curve or data sheet; input as negative number
178	Reactive Capability		MVAR	Net Maximum Lagging Operating Capability (MVAR)	From manufacturer Reactive Capability Curve or data sheet.
179	Reactive Capability		Y/N	Manufacturer's Capability Curve submitted?	Has a recent curve been submitted to ERCOT? If not, please submit.
180	Reactive Capability	WIND	Y/N	Reactive Standard?	Does the Wind unit meet the reactive standard?

2.0 Instructions and Map

A RARF should be submitted for each generation resource site that contains data for all generation at the site. A separate RARF should also be submitted for each Resource Entity covering all load resources represented by that entity. A RARF is to be completed for all active and mothballed generation resources inside ERCOT. Organizations must submit a market participant application as a Resource Entity prior to submission of this form, if not eligible for Federal Hydro waiver (Section 16.5). If questions arise related to the completion of this form, please contact your designated ERCOT Account Manager or email Wholesale Client Services at NodalMarketTransition@ercot.com with the subject "Resource/Asset Registration Form".

Please bear in mind the following for the completion of this form:

- A single RARF must be submitted for each generation resource site. This form will accommodate generation Resources located at a common site as well as generation load splitting.
- A single RARF must be submitted for load resources represented by a common Resource Entity.

2.1 Process for Official Submittal

There are two methods of submitting the RARF, as follows:

PRIMARY: RARFs are to be submitted through the Texas Market Link (TML) located at https://tml.ercot.com. Submission through the TML link requires a valid Authorized Representative's digital certificate.

ALTERNATIVE: An alternate email signature document is available upon request from your ERCOT Account Manager for those who have technical problems submitting via the TML portal. The RARF must be emailed in both portable document format (pdf) and Microsoft Excel spreadsheet (xls) format, along with the signature document to: MPAPPL@ERCOT.COM and NodalMarketTransition@ercot.com.

The following are instructions for submitting the RARF through TML:

- Access to ERCOT TML requires a user digital certificate with a minimal role that allows access to "Create Service Request" on the "Market Activities" page. The "user digital certificate" is authorized by the Market Participant's User Security Administrator.
- Upon accessing TML, go to the "*Market Activities*" page and select "*Create Service Request*". Be advised that the Service Request will display in a new window as a pop-up, which may be restricted by browser settings.
- Complete the required fields on the "*Service Request*" screen annotated by red asterisks.

- The following Request Type and Sub-Type are essential to a proper submittal:
    - *Request Type:* Select "**MP Registration**" from the drop-down list
    - *Request Sub-Type:* Select "**Resource/Asset Registration**" from the drop-down list

Please note that if the Type and Sub-Type values above are not used, the RARF will not be received or processed by ERCOT Client Services.

- Click "*Submit*" (you will add the RARF file on the next screen)

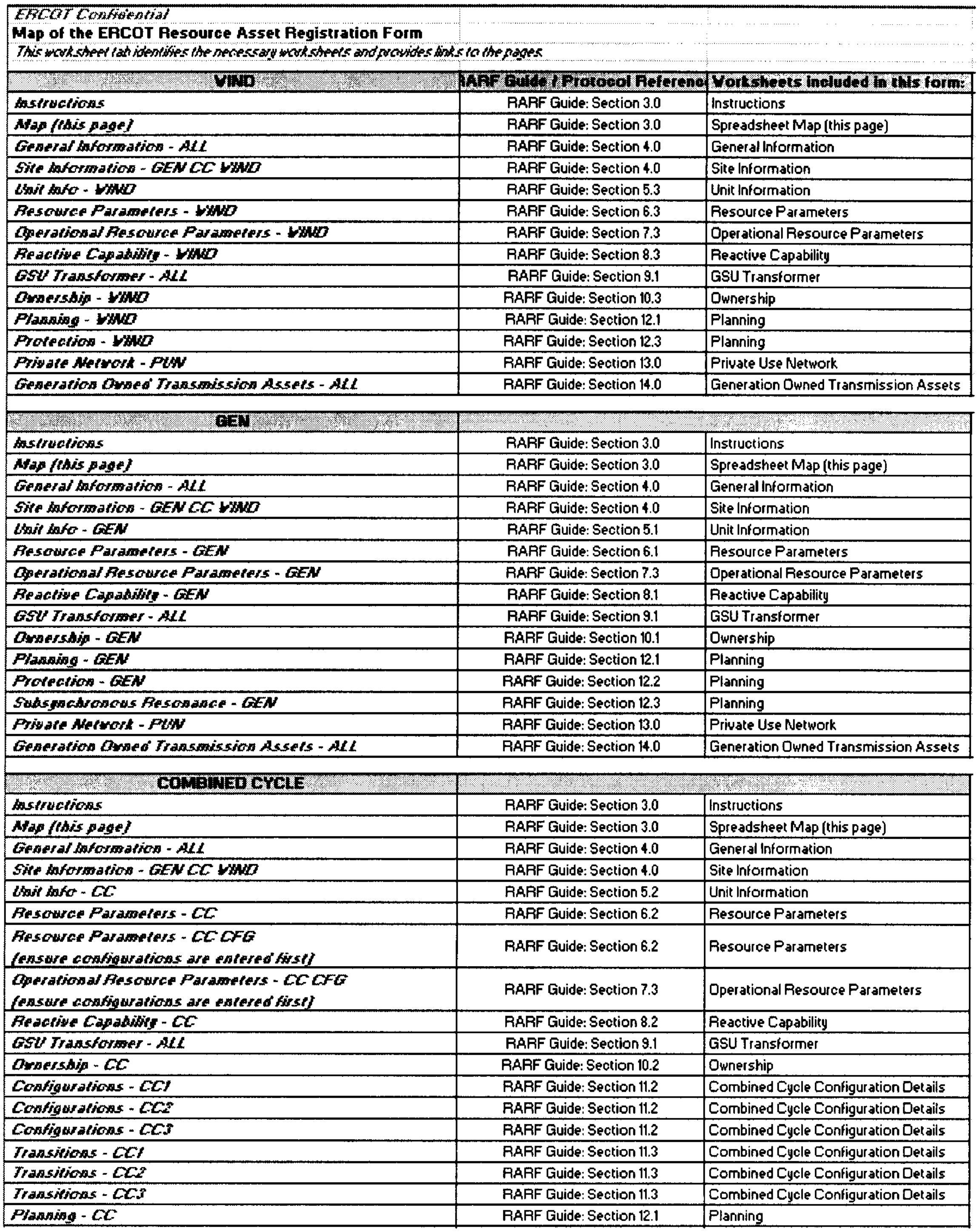
- From the "*Activities and Attachments*" screen, under the Attachments heading of the Service Request click the 'Add' button.

- Select "*Browse*" icon and find the completed RARF file on your computer

- Click "*Submit*" (comments are optional)

ERCOT will verify the RARF is sent from the Authorized Representative of the registered Resource Entity via digital certificate. ERCOT may request additional authentication as deemed necessary.

2.2 Map



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Map of the ERCOT Resource Asset Registration Form

This worksheet tab identifies the necessary worksheets and provides links to the pages.

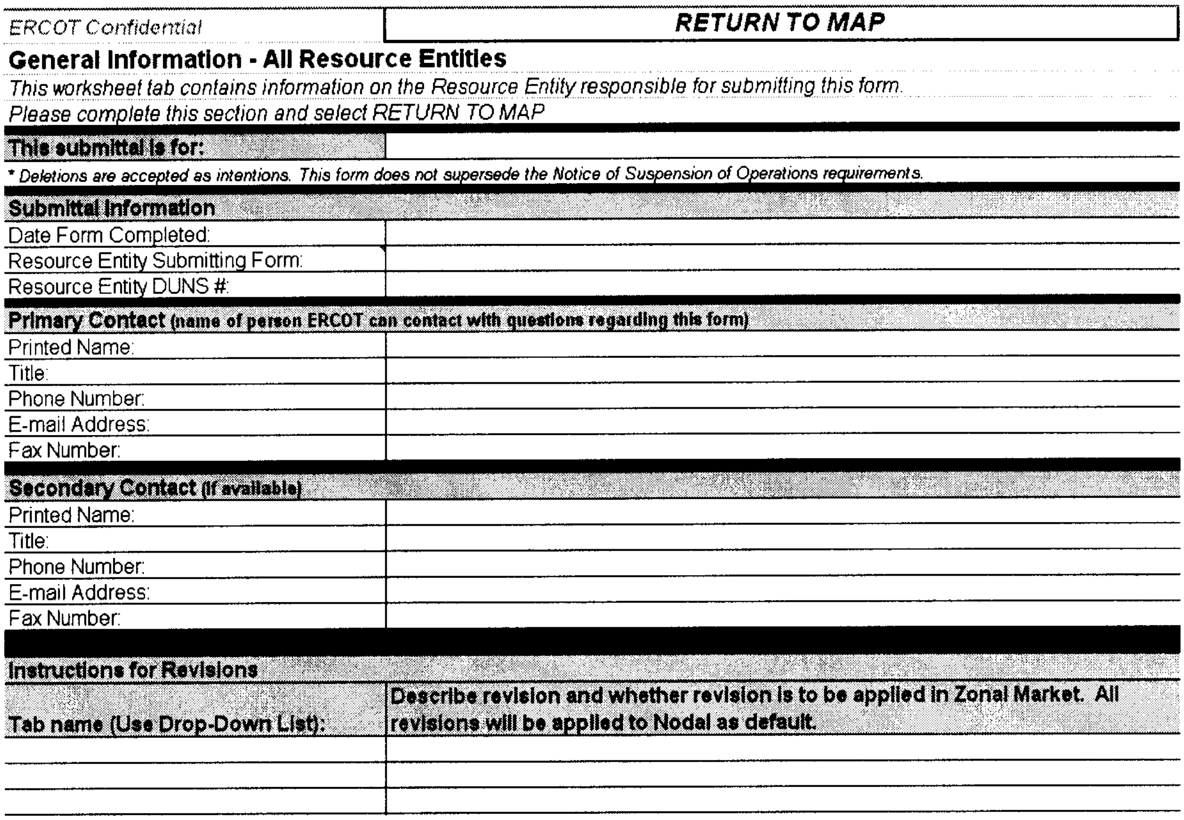
VIND	**ARF Guide / Protocol Referenc**	**Worksheets included in this form:**
Instructions	RARF Guide: Section 3.0	Instructions
Map (this page)	RARF Guide: Section 3.0	Spreadsheet Map (this page)
General Information - ALL	RARF Guide: Section 4.0	General Information
Site Information - GEN CC VIND	RARF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

3.0 General Information and Site Information

These sections contain information that applies to the RARF submittal and/or the site.

3.1 General Information

The General Information tab should be updated with every submittal for load and generation resources. The submittal information, such as date completed, should be updated with every submission, while the remainder of the fields should be verified. Primary contact information is essential, as it provides ERCOT with an additional contact in case of questions regarding the RARF.



ERCOT Confidential	***RETURN TO MAP***

General Information - All Resource Entities

This worksheet tab contains information on the Resource Entity responsible for submitting this form.

Please complete this section and select RETURN TO MAP

This submittal is for:	

** Deletions are accepted as intentions. This form does not supersede the Notice of Suspension of Operations requirements.*

Submittal Information	
Date Form Completed:	
Resource Entity Submitting Form:	
Resource Entity DUNS #:	
Primary Contact **(name of person ERCOT can contact with questions regarding this form)**	
Printed Name:	
Title:	
Phone Number:	
E-mail Address:	
Fax Number:	
Secondary Contact **(If available)**	
Printed Name:	
Title:	
Phone Number:	
E-mail Address:	
Fax Number:	

Instructions for Revisions

Tab name (Use Drop-Down List):	**Describe revision and whether revision is to be applied in Zonal Market. All revisions will be applied to Nodal as default.**

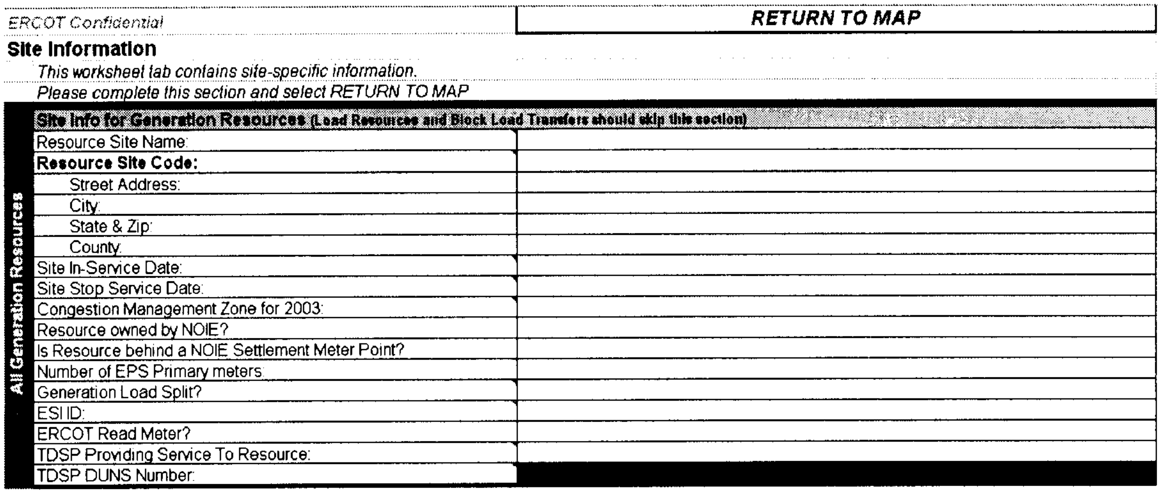
3.2 Site Information

The Site Information tab identifies information for the generation resource site, such as address and ERCOT Polled Settlement metering information. The Resource Site Code is determined jointly with ERCOT, and typically aligns with the substation name at the point of interconnection.

All fields in this section must be completed with the exception of Site Stop Service Date. For assistance in identifying the 2003 Congestion Management Zone or the Resource ID (RID), please contact NodalMarketTransition@ercot.com.

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

This section does not apply to load resources.



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RETURN TO MAP

Site Information

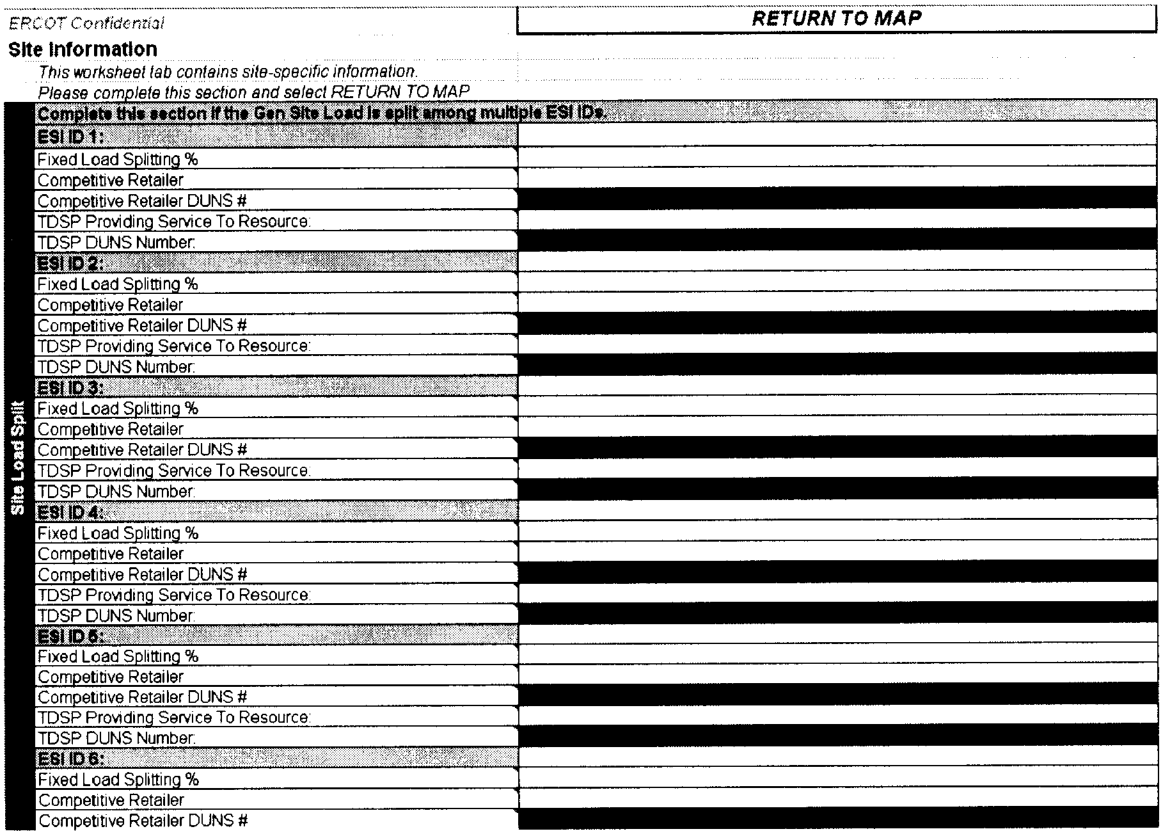
This worksheet tab contains site-specific information.

Please complete this section and select RETURN TO MAP

All Generation Resources

Site Info for Generation Resources (Load Resources and Block Load Transfers should skip this section)	
Resource Site Name:	
Resource Site Code:	
Street Address:	
City:	
State & Zip:	
County:	
Site In-Service Date:	
Site Stop Service Date:	
Congestion Management Zone for 2003:	
Resource owned by NOIE?	
Is Resource behind a NOIE Settlement Meter Point?	
Number of EPS Primary meters:	
Generation Load Split?	
ESI ID:	
ERCOT Read Meter?	
TDSP Providing Service To Resource:	
TDSP DUNS Number:	

If the facility has the Gen Site Load split among multiple competitive retailers or among multiple TDSPs, the second part of the Site Information tab should be filled out as applicable (not the top ESI ID & TDSP fields). Otherwise this section should be left blank.



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RETURN TO MAP

Site Information

This worksheet tab contains site-specific information.

Please complete this section and select RETURN TO MAP

Site Load Split

Complete this section if the Gen Site Load is split among multiple ESI IDs.	
ESI ID 1:	
Fixed Load Splitting %	
Competitive Retailer	
Competitive Retailer DUNS #	
TDSP Providing Service To Resource:	
TDSP DUNS Number:	
ESI ID 2:	
Fixed Load Splitting %	
Competitive Retailer	
Competitive Retailer DUNS #	
TDSP Providing Service To Resource:	
TDSP DUNS Number:	
ESI ID 3:	
Fixed Load Splitting %	
Competitive Retailer	
Competitive Retailer DUNS #	
TDSP Providing Service To Resource:	
TDSP DUNS Number:	
ESI ID 4:	
Fixed Load Splitting %	
Competitive Retailer	
Competitive Retailer DUNS #	
TDSP Providing Service To Resource:	
TDSP DUNS Number:	
ESI ID 5:	
Fixed Load Splitting %	
Competitive Retailer	
Competitive Retailer DUNS #	
TDSP Providing Service To Resource:	
TDSP DUNS Number:	
ESI ID 6:	
Fixed Load Splitting %	
Competitive Retailer	
Competitive Retailer DUNS #	

4.0 Unit Information

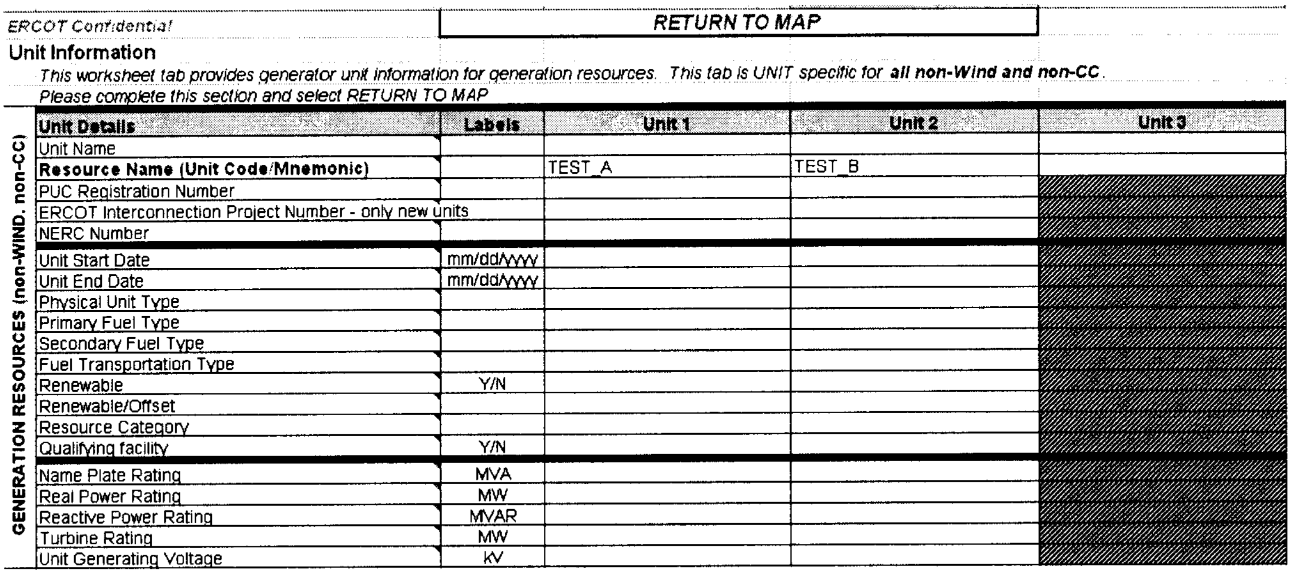
The Unit Information section is required for all generation resources. This tab is split into the different sections based on generation resource type: Wind, CC, or other non-Wind, non-CC Generation.

Please enter the PUC Registration number and the NERC Registration number for tracking purposes. The ERCOT Interconnection Project number is only needed for NEW units to aid with tying the interconnection process and the commercial operation process together.

All fields in this section should be completed. Also, the ERCOT Interconnection Project Number is not needed for units already in commercial operation.

4.1 Unit Info – non-Wind, non-CC Generation Units

The Resource Name (also known as the Unit Code/Mnemonic) is the unique identifier that propagates through ERCOT systems. This is determined jointly between ERCOT and the resource, but is already established for existing units. The Resource Name consists of "SITECODE_UNITNAME". This field will populate the remainder of the spreadsheet, identifying additional fields that must be completed.



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RETURN TO MAP

Unit Information

*This worksheet tab provides generator unit information for generation resources. This tab is UNIT specific for **all non-Wind and non-CC**.*

Please complete this section and select RETURN TO MAP

GENERATION RESOURCES (non-WIND. non-CC)

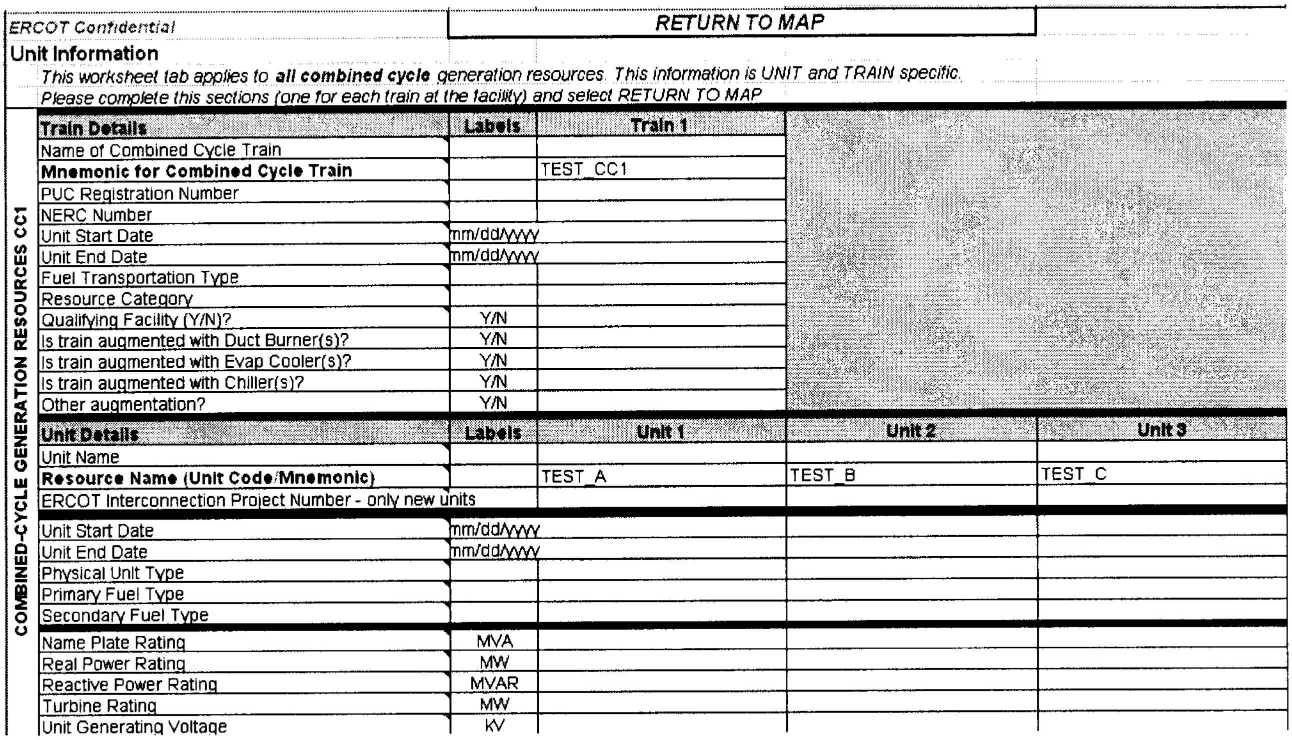
Unit Details	**Labels**	**Unit 1**	**Unit 2**	**Unit 3**
Unit Name				
Resource Name (Unit Code/Mnemonic)		TEST_A	TEST_B	
PUC Registration Number				▨
ERCOT Interconnection Project Number - only new units				▨
NERC Number				▨
Unit Start Date	mm/dd/yyyy			▨
Unit End Date	mm/dd/yyyy			▨
Physical Unit Type				▨
Primary Fuel Type				▨
Secondary Fuel Type				▨
Fuel Transportation Type				▨
Renewable	Y/N			▨
Renewable/Offset				▨
Resource Category				▨
Qualifying facility	Y/N			▨
Name Plate Rating	MVA			▨
Real Power Rating	MW			▨
Reactive Power Rating	MVAR			▨
Turbine Rating	MW			▨
Unit Generating Voltage	kV			▨

4.2 Unit Info – Combined-Cycle Units

This tab contains three parts – for registering up to three trains at one site.

The Mnemonic of Combined Cycle Train is the unique identifier that will propagate through ERCOT systems to identify the Train. This is determined by ERCOT by simply using "SITECODE_CCx" where x is 1, 2, or 3.

The Resource Name (also known as the Unit Code/Mnemonic) is the unique identifier that propagates through ERCOT systems. This is determined jointly between ERCOT and the resource, but is already established for existing units. The Resource Name consists of "SITECODE_UNITNAME". This field will populate the remainder of the spreadsheet, identifying additional fields that must be completed.



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Unit Information

This worksheet tab applies to ***all combined cycle*** *generation resources. This information is UNIT and TRAIN specific.*

Please complete this sections (one for each train at the facility) and select RETURN TO MAP

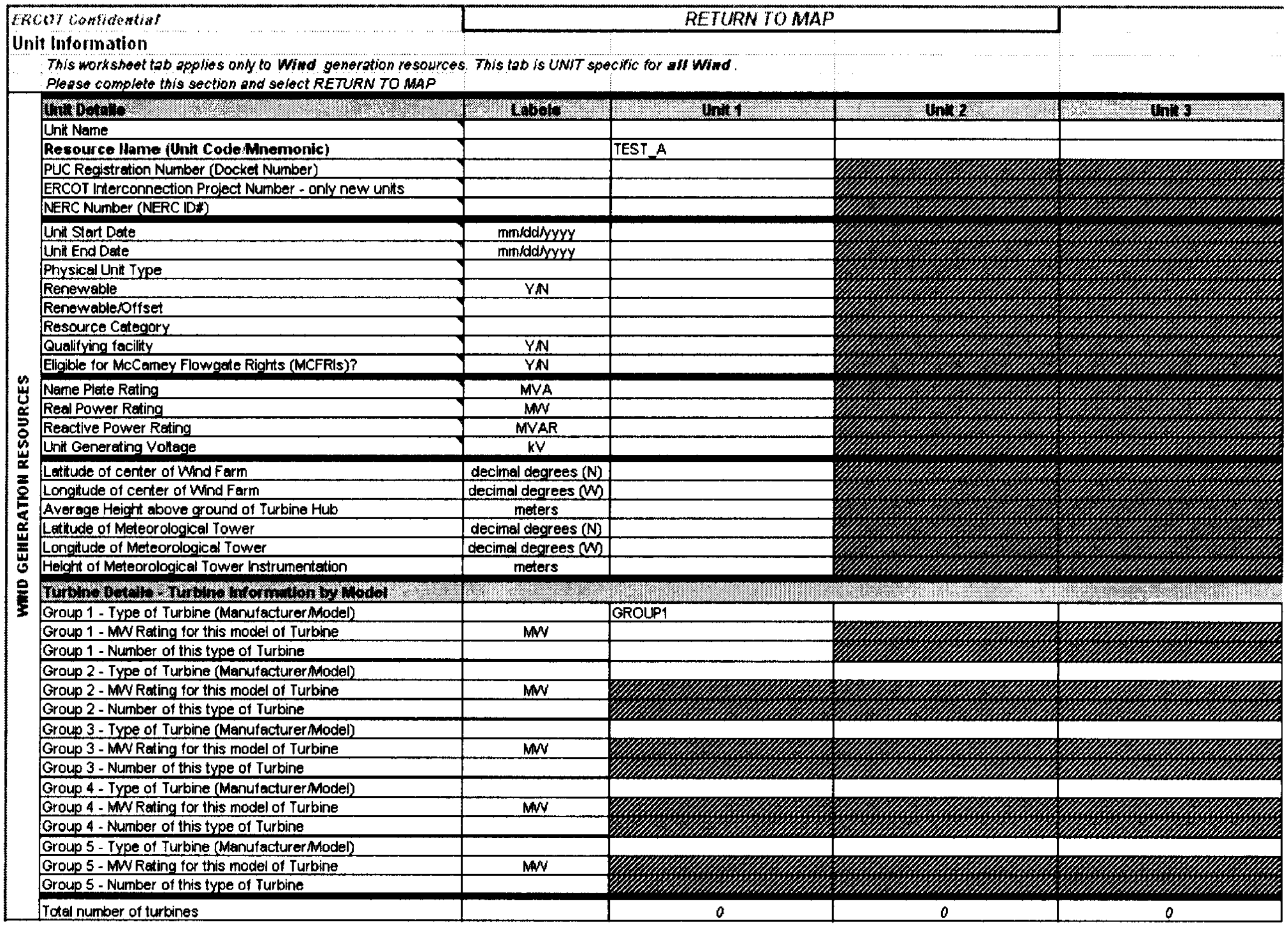
COMBINED-CYCLE GENERATION RESOURCES CC1

Train Details	**Labels**	**Train 1**		
Name of Combined Cycle Train				
Mnemonic for Combined Cycle Train		TEST_CC1		
PUC Registration Number				
NERC Number				
Unit Start Date	mm/dd/yyyy			
Unit End Date	mm/dd/yyyy			
Fuel Transportation Type				
Resource Category				
Qualifying Facility (Y/N)?	Y/N			
Is train augmented with Duct Burner(s)?	Y/N			
Is train augmented with Evap Cooler(s)?	Y/N			
Is train augmented with Chiller(s)?	Y/N			
Other augmentation?	Y/N			
Unit Details	**Labels**	**Unit 1**	**Unit 2**	**Unit 3**
Unit Name				
Resource Name (Unit Code/Mnemonic)		TEST_A	TEST_B	TEST_C
ERCOT Interconnection Project Number - only new units				
Unit Start Date	mm/dd/yyyy			
Unit End Date	mm/dd/yyyy			
Physical Unit Type				
Primary Fuel Type				
Secondary Fuel Type				
Name Plate Rating	MVA			
Real Power Rating	MW			
Reactive Power Rating	MVAR			
Turbine Rating	MW			
Unit Generating Voltage	KV			

4.3 Unit Info – Wind Units

The Resource Name (also known as the Unit Code/Mnemonic) is the unique identifier that propagates through ERCOT systems. This is determined jointly between ERCOT and the resource, but is already established for existing units. The Resource Name consists of "SITECODE_UNITNAME". This field will populate the remainder of the spreadsheet, identifying additional fields that must be completed.

The Wind Unit Information tab contains information on the turbine groups. Each Wind Unit may identify up to 5 groups of turbine types, or 5 different models, within a particular unit. This section asks for the model, quantity, and rating of each.



ERCOT Confidential — *RETURN TO MAP*

Unit Information

*This worksheet tab applies only to **Wind** generation resources. This tab is UNIT specific for **all Wind**.*
Please complete this section and select RETURN TO MAP

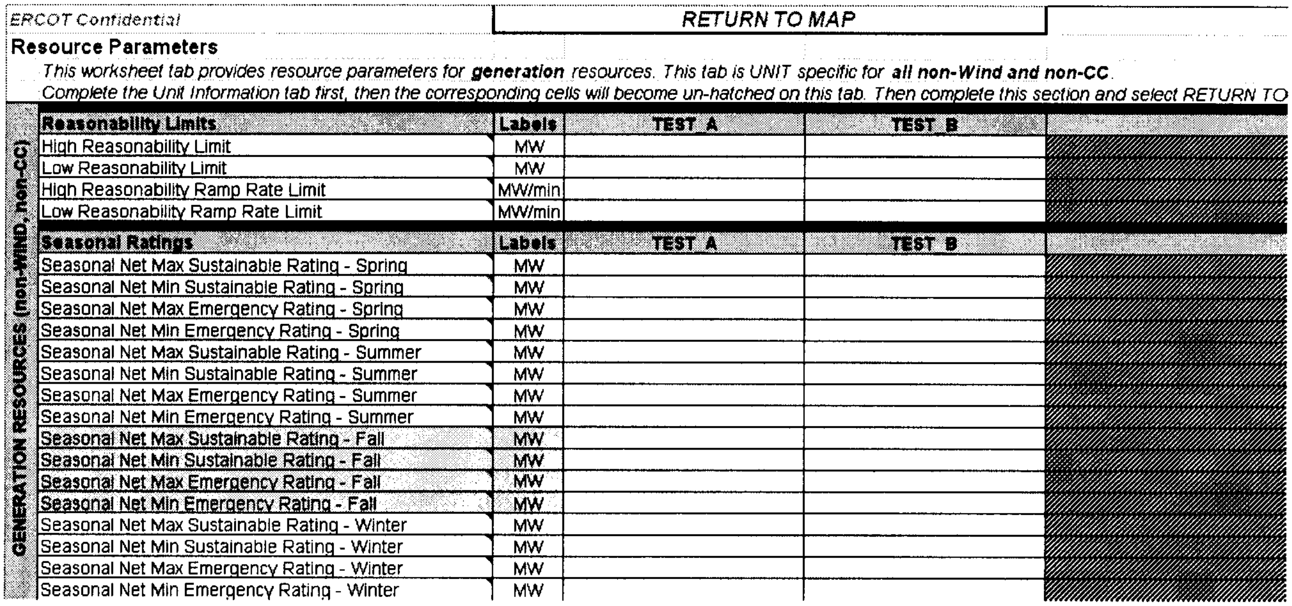
Unit Details	**Labels**	**Unit 1**	**Unit 2**	**Unit 3**
Unit Name				
Resource Name (Unit Code/Mnemonic)		TEST_A		
PUC Registration Number (Docket Number)			▨	▨
ERCOT Interconnection Project Number - only new units			▨	▨
NERC Number (NERC ID#)			▨	▨
Unit Start Date	mm/dd/yyyy		▨	▨
Unit End Date	mm/dd/yyyy		▨	▨
Physical Unit Type			▨	▨
Renewable	Y/N		▨	▨
Renewable/Offset			▨	▨
Resource Category			▨	▨
Qualifying facility	Y/N		▨	▨
Eligible for McCamey Flowgate Rights (MCFRIs)?	Y/N		▨	▨
Name Plate Rating	MVA		▨	▨
Real Power Rating	MW		▨	▨
Reactive Power Rating	MVAR		▨	▨
Unit Generating Voltage	kV		▨	▨
Latitude of center of Wind Farm	decimal degrees (N)		▨	▨
Longitude of center of Wind Farm	decimal degrees (W)		▨	▨
Average Height above ground of Turbine Hub	meters		▨	▨
Latitude of Meteorological Tower	decimal degrees (N)		▨	▨
Longitude of Meteorological Tower	decimal degrees (W)		▨	▨
Height of Meteorological Tower Instrumentation	meters		▨	▨
Turbine Details - Turbine Information by Model				
Group 1 - Type of Turbine (Manufacturer/Model)		GROUP1		
Group 1 - MW Rating for this model of Turbine	MW		▨	▨
Group 1 - Number of this type of Turbine			▨	▨
Group 2 - Type of Turbine (Manufacturer/Model)				
Group 2 - MW Rating for this model of Turbine	MW	▨	▨	▨
Group 2 - Number of this type of Turbine		▨	▨	▨
Group 3 - Type of Turbine (Manufacturer/Model)				
Group 3 - MW Rating for this model of Turbine	MW	▨	▨	▨
Group 3 - Number of this type of Turbine		▨	▨	▨
Group 4 - Type of Turbine (Manufacturer/Model)				
Group 4 - MW Rating for this model of Turbine	MW	▨	▨	▨
Group 4 - Number of this type of Turbine		▨	▨	▨
Group 5 - Type of Turbine (Manufacturer/Model)				
Group 5 - MW Rating for this model of Turbine	MW	▨	▨	▨
Group 5 - Number of this type of Turbine		▨	▨	▨
Total number of turbines		*0*	*0*	*0*

5.0 Resource Parameters

The Resource Parameters tab allows generation resources to establish operational limits and long term planning information. The Seasonal Net Max Sustainable ratings for each season will also be used for the Mitigated Offer Cap.

All fields on this tab should be completed.

5.1 Generation Resources – non-Wind, non-CC Generation Units



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RETURN TO MAP

Resource Parameters

This worksheet tab provides resource parameters for ***generation*** *resources. This tab is UNIT specific for* ***all non-Wind and non-CC****.*

Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section and select RETURN TO

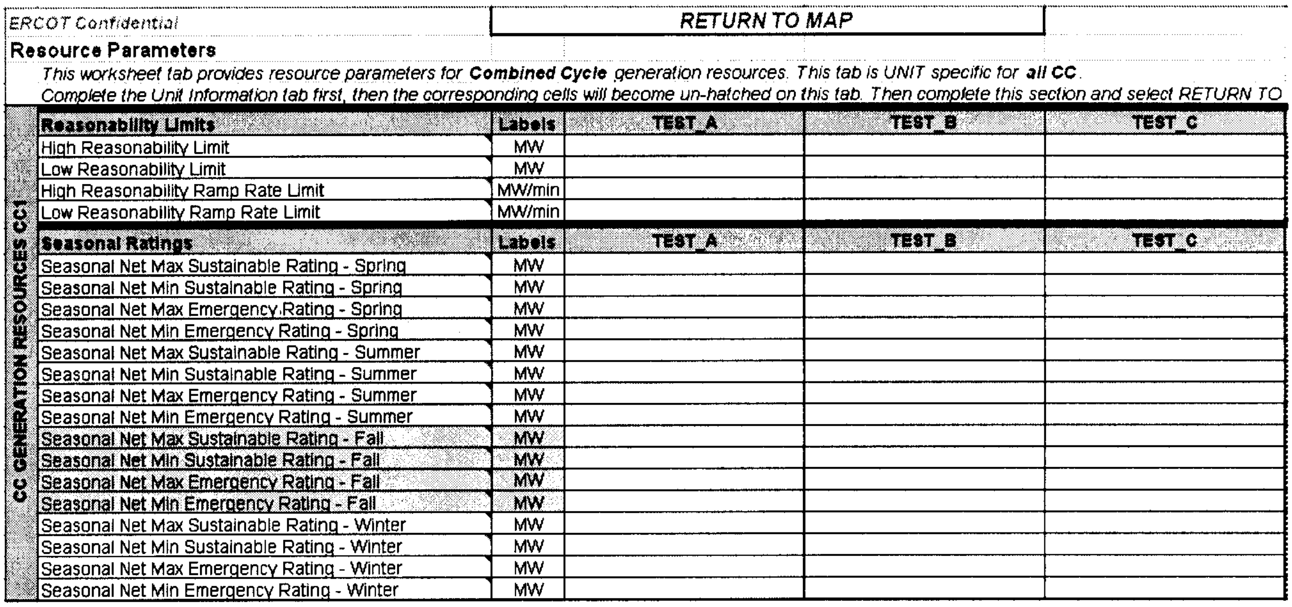
GENERATION RESOURCES (non-WIND, non-CC)

Reasonability Limits	**Labels**	**TEST A**	**TEST B**	
High Reasonability Limit	MW			
Low Reasonability Limit	MW			
High Reasonability Ramp Rate Limit	MW/min			
Low Reasonability Ramp Rate Limit	MW/min			
Seasonal Ratings	**Labels**	**TEST A**	**TEST B**	
Seasonal Net Max Sustainable Rating - Spring	MW			
Seasonal Net Min Sustainable Rating - Spring	MW			
Seasonal Net Max Emergency Rating - Spring	MW			
Seasonal Net Min Emergency Rating - Spring	MW			
Seasonal Net Max Sustainable Rating - Summer	MW			
Seasonal Net Min Sustainable Rating - Summer	MW			
Seasonal Net Max Emergency Rating - Summer	MW			
Seasonal Net Min Emergency Rating - Summer	MW			
Seasonal Net Max Sustainable Rating - Fall	MW			
Seasonal Net Min Sustainable Rating - Fall	MW			
Seasonal Net Max Emergency Rating - Fall	MW			
Seasonal Net Min Emergency Rating - Fall	MW			
Seasonal Net Max Sustainable Rating - Winter	MW			
Seasonal Net Min Sustainable Rating - Winter	MW			
Seasonal Net Max Emergency Rating - Winter	MW			
Seasonal Net Min Emergency Rating - Winter	MW			

5.2 Generation Resources – Combined-Cycle Units and Configurations

This tab contains three parts – for registering up to three trains at one site. This information is required for Units and Configurations.

Units:



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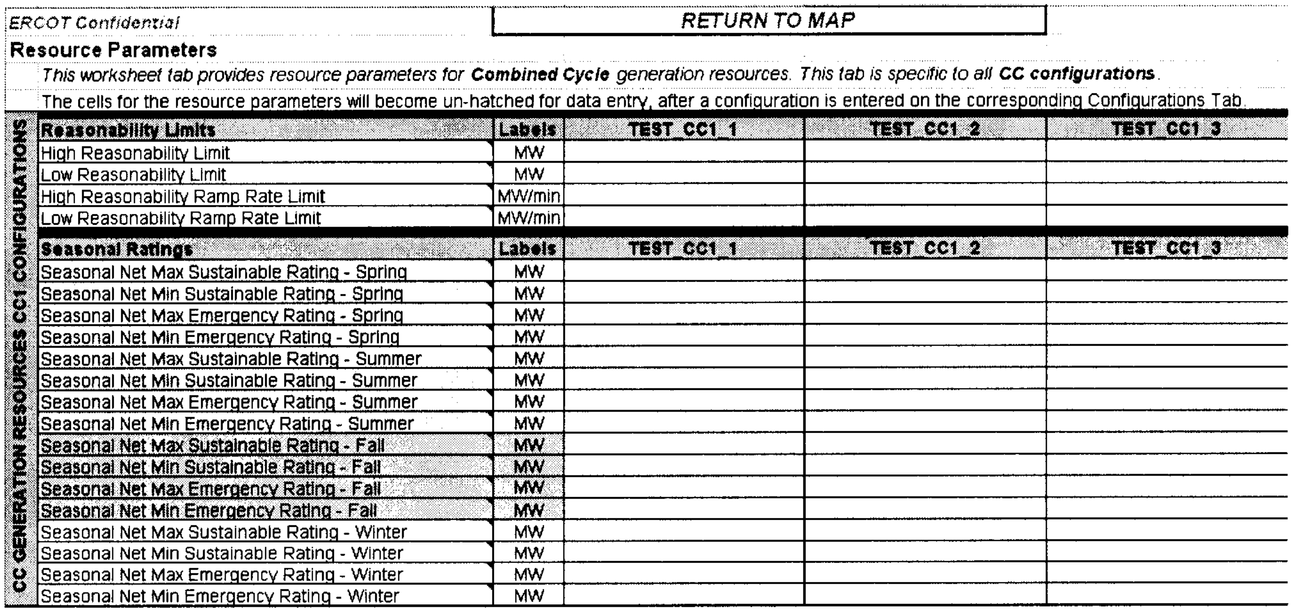
Resource Parameters

This worksheet tab provides resource parameters for ***Combined Cycle*** *generation resources. This tab is UNIT specific for* ***all CC****.*

Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section and select RETURN TO

Reasonability Limits	**Labels**	**TEST_A**	**TEST_B**	**TEST_C**
High Reasonability Limit	MW			
Low Reasonability Limit	MW			
High Reasonability Ramp Rate Limit	MW/min			
Low Reasonability Ramp Rate Limit	MW/min			
Seasonal Ratings	**Labels**	**TEST_A**	**TEST_B**	**TEST_C**
Seasonal Net Max Sustainable Rating - Spring	MW			
Seasonal Net Min Sustainable Rating - Spring	MW			
Seasonal Net Max Emergency Rating - Spring	MW			
Seasonal Net Min Emergency Rating - Spring	MW			
Seasonal Net Max Sustainable Rating - Summer	MW			
Seasonal Net Min Sustainable Rating - Summer	MW			
Seasonal Net Max Emergency Rating - Summer	MW			
Seasonal Net Min Emergency Rating - Summer	MW			
Seasonal Net Max Sustainable Rating - Fall	MW			
Seasonal Net Min Sustainable Rating - Fall	MW			
Seasonal Net Max Emergency Rating - Fall	MW			
Seasonal Net Min Emergency Rating - Fall	MW			
Seasonal Net Max Sustainable Rating - Winter	MW			
Seasonal Net Min Sustainable Rating - Winter	MW			
Seasonal Net Max Emergency Rating - Winter	MW			
Seasonal Net Min Emergency Rating - Winter	MW			

Configurations:



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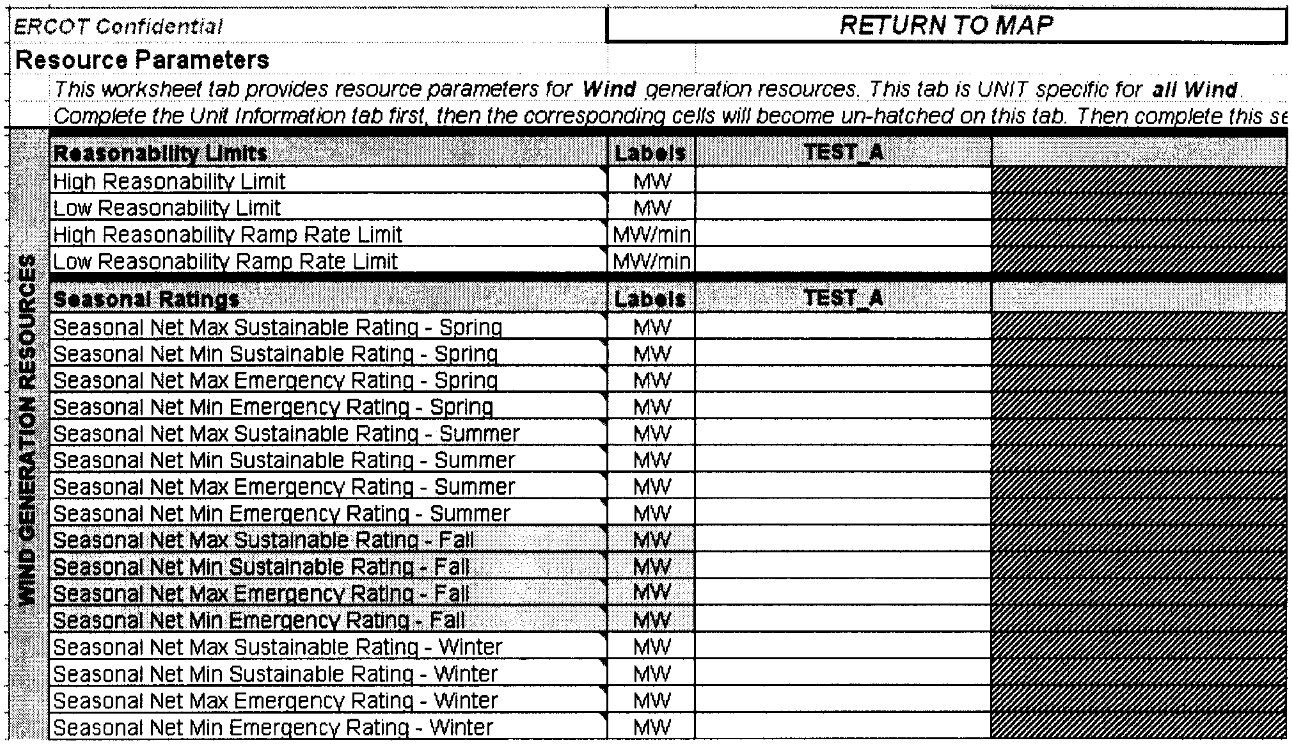
Resource Parameters

This worksheet tab provides resource parameters for ***Combined Cycle*** *generation resources. This tab is specific to all* ***CC configurations****.*

The cells for the resource parameters will become un-hatched for data entry, after a configuration is entered on the corresponding Configurations Tab.

Reasonability Limits	**Labels**	**TEST_CC1_1**	**TEST_CC1_2**	**TEST_CC1_3**
High Reasonability Limit	MW			
Low Reasonability Limit	MW			
High Reasonability Ramp Rate Limit	MW/min			
Low Reasonability Ramp Rate Limit	MW/min			
Seasonal Ratings	**Labels**	**TEST_CC1_1**	**TEST_CC1_2**	**TEST_CC1_3**
Seasonal Net Max Sustainable Rating - Spring	MW			
Seasonal Net Min Sustainable Rating - Spring	MW			
Seasonal Net Max Emergency Rating - Spring	MW			
Seasonal Net Min Emergency Rating - Spring	MW			
Seasonal Net Max Sustainable Rating - Summer	MW			
Seasonal Net Min Sustainable Rating - Summer	MW			
Seasonal Net Max Emergency Rating - Summer	MW			
Seasonal Net Min Emergency Rating - Summer	MW			
Seasonal Net Max Sustainable Rating - Fall	MW			
Seasonal Net Min Sustainable Rating - Fall	MW			
Seasonal Net Max Emergency Rating - Fall	MW			
Seasonal Net Min Emergency Rating - Fall	MW			
Seasonal Net Max Sustainable Rating - Winter	MW			
Seasonal Net Min Sustainable Rating - Winter	MW			
Seasonal Net Max Emergency Rating - Winter	MW			
Seasonal Net Min Emergency Rating - Winter	MW			

5.3 Generation Resource – Wind Units



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RETURN TO MAP

Resource Parameters

*This worksheet tab provides resource parameters for **Wind** generation resources. This tab is UNIT specific for **all Wind**.*

Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete this se

WIND GENERATION RESOURCES

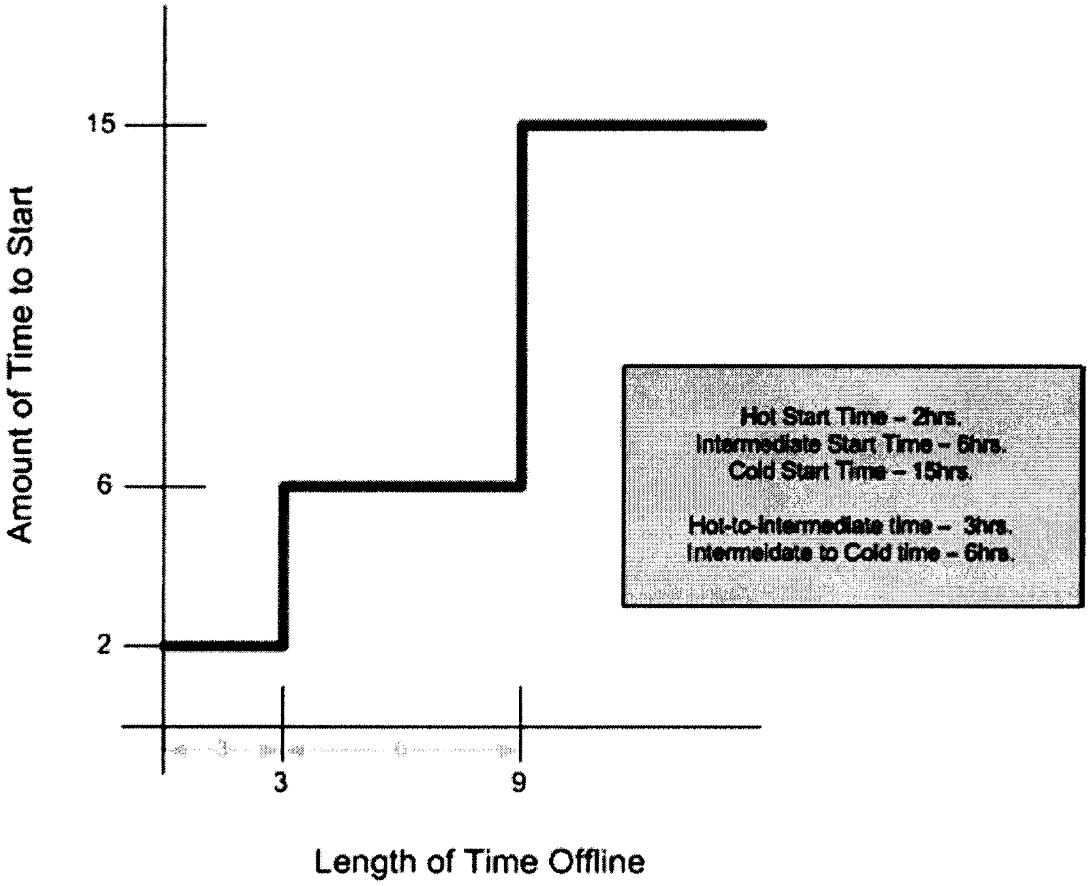
Reasonability Limits	**Labels**	**TEST_A**	
High Reasonability Limit	MW		▨
Low Reasonability Limit	MW		▨
High Reasonability Ramp Rate Limit	MW/min		▨
Low Reasonability Ramp Rate Limit	MW/min		▨
Seasonal Ratings	**Labels**	**TEST_A**	
Seasonal Net Max Sustainable Rating - Spring	MW		▨
Seasonal Net Min Sustainable Rating - Spring	MW		▨
Seasonal Net Max Emergency Rating - Spring	MW		▨
Seasonal Net Min Emergency Rating - Spring	MW		▨
Seasonal Net Max Sustainable Rating - Summer	MW		▨
Seasonal Net Min Sustainable Rating - Summer	MW		▨
Seasonal Net Max Emergency Rating - Summer	MW		▨
Seasonal Net Min Emergency Rating - Summer	MW		▨
Seasonal Net Max Sustainable Rating - Fall	MW		▨
Seasonal Net Min Sustainable Rating - Fall	MW		▨
Seasonal Net Max Emergency Rating - Fall	MW		▨
Seasonal Net Min Emergency Rating - Fall	MW		▨
Seasonal Net Max Sustainable Rating - Winter	MW		▨
Seasonal Net Min Sustainable Rating - Winter	MW		▨
Seasonal Net Max Emergency Rating - Winter	MW		▨
Seasonal Net Min Emergency Rating - Winter	MW		▨

6.0 Operational Resource Parameters

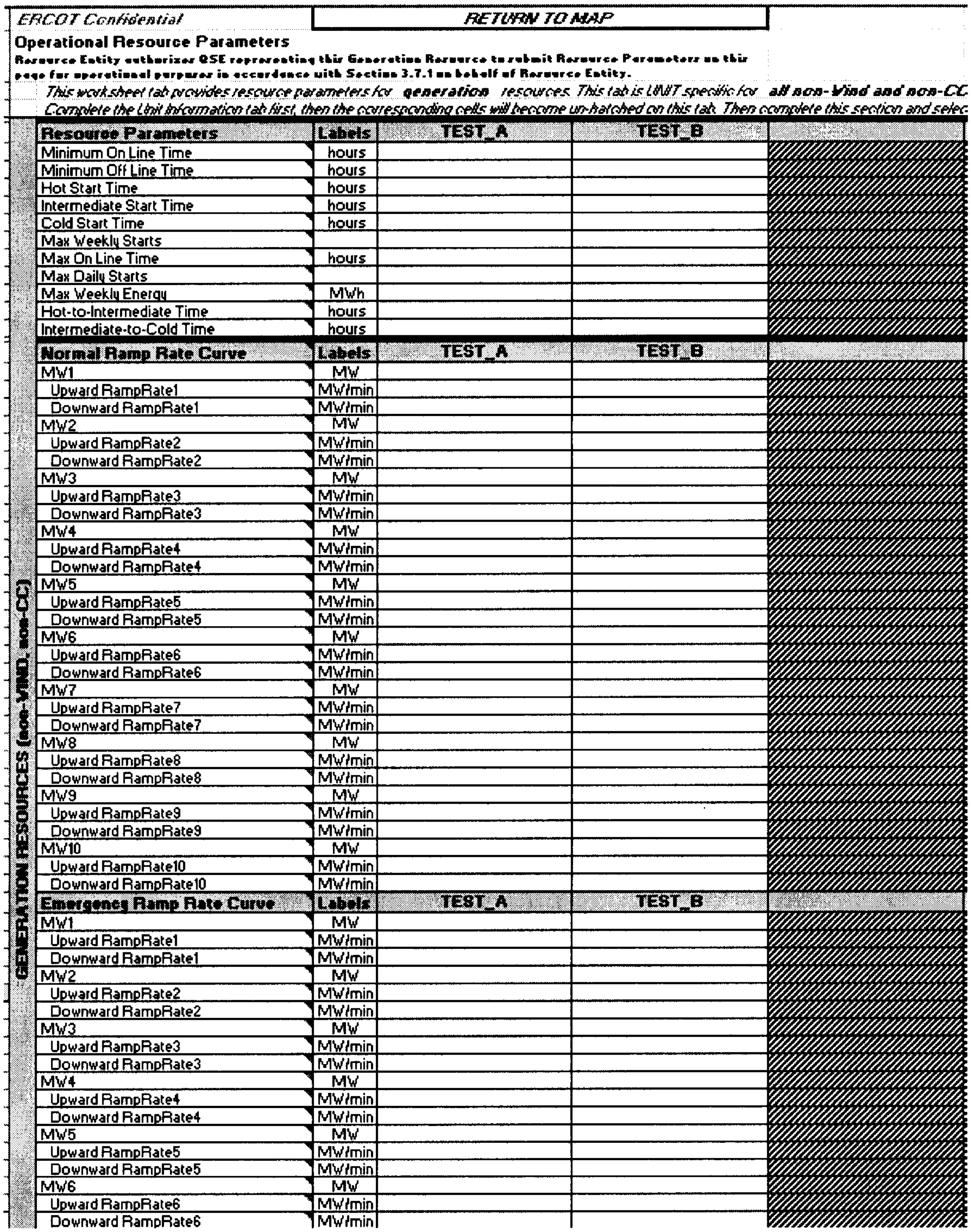
The Operational Resource Parameters section of the RARF provides base values for start-up. The QSE will be able to update these values through the MMS.

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



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RETURN TO MAP

Operational Resource Parameters

Resource Entity authorizes QSE representing this Generation Resource to submit Resource Parameters on this page for operational purposes in accordance with Section 3.7.1 on behalf of Resource Entity.

This worksheet tab provides resource parameters for ***generation*** *resources. This tab is UNIT specific for* ***all non-Wind and non-CC***

Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section and selec

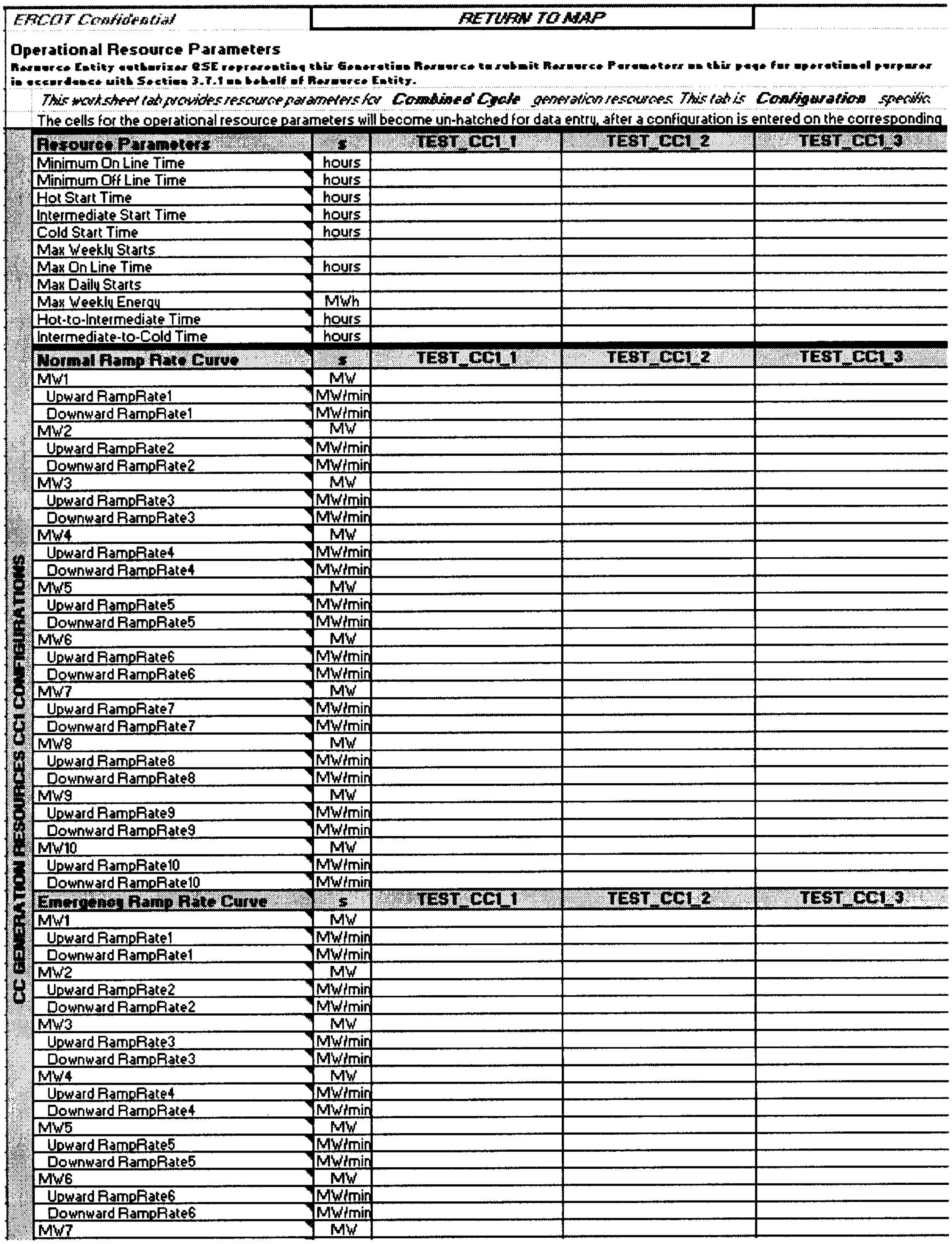
Resource Parameters	**Labels**	**TEST_A**	**TEST_B**	
Minimum On Line Time	hours			▨
Minimum Off Line Time	hours			▨
Hot Start Time	hours			▨
Intermediate Start Time	hours			▨
Cold Start Time	hours			▨
Max Weekly Starts				▨
Max On Line Time	hours			▨
Max Daily Starts				▨
Max Weekly Energy	MWh			▨
Hot-to-Intermediate 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			▨

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.



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RETURN TO MAP

Operational Resource Parameters

Resource Entity authorizes QSE representing this Generation Resource to submit Resource Parameters on this page for operational purposes in accordance with Section 3.7.1 on behalf of Resource Entity.

*This worksheet tab provides resource parameters for **Combined Cycle** generation resources. This tab is **Configuration** specific.*

The cells for the operational resource parameters will become un-hatched for data entry, after a configuration is entered on the corresponding

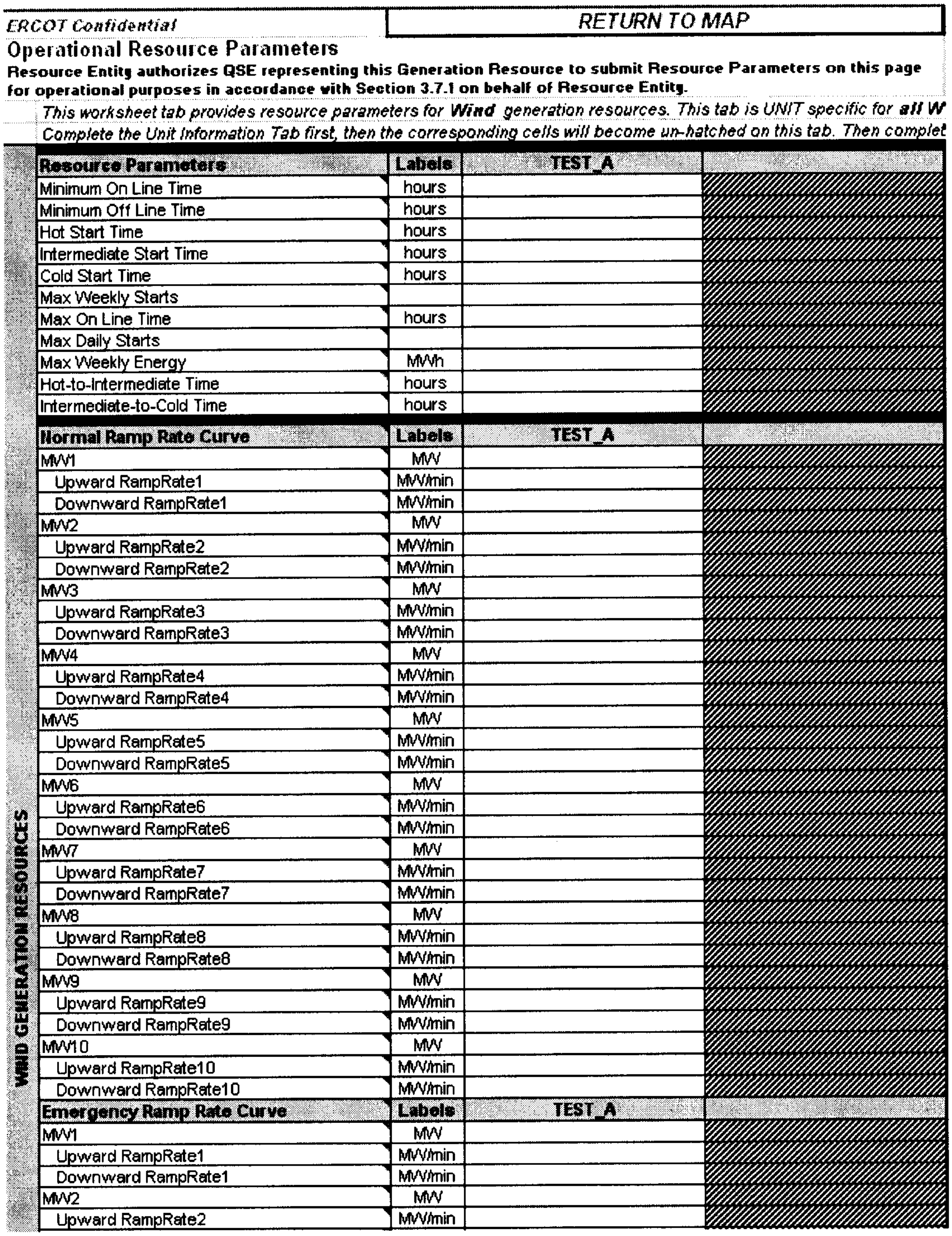
CC GENERATION RESOURCES CC1 CONFIGURATIONS

Resource Parameters	s	TEST_CC1_1	TEST_CC1_2	TEST_CC1_3
Minimum On Line Time	hours			
Minimum Off Line Time	hours			
Hot Start Time	hours			
Intermediate Start Time	hours			
Cold Start Time	hours			
Max Weekly Starts				
Max On Line Time	hours			
Max Daily Starts				
Max Weekly Energy	MWh			
Hot-to-Intermediate Time	hours			
Intermediate-to-Cold Time	hours			

Normal Ramp Rate Curve	s	TEST_CC1_1	TEST_CC1_2	TEST_CC1_3
MW1	MW			
Upward RampRate1	MW/min			
Downward RampRate1	MW/min			
MW2	MW			
Upward RampRate2	MW/min			
Downward RampRate2	MW/min			
MW3	MW			
Upward RampRate3	MW/min			
Downward RampRate3	MW/min			
MW4	MW			
Upward RampRate4	MW/min			
Downward RampRate4	MW/min			
MW5	MW			
Upward RampRate5	MW/min			
Downward RampRate5	MW/min			
MW6	MW			
Upward RampRate6	MW/min			
Downward RampRate6	MW/min			
MW7	MW			
Upward RampRate7	MW/min			
Downward RampRate7	MW/min			
MW8	MW			
Upward RampRate8	MW/min			
Downward RampRate8	MW/min			
MW9	MW			
Upward RampRate9	MW/min			
Downward RampRate9	MW/min			
MW10	MW			
Upward RampRate10	MW/min			
Downward RampRate10	MW/min			

Emergency Ramp Rate Curve	s	TEST_CC1_1	TEST_CC1_2	TEST_CC1_3
MW1	MW			
Upward RampRate1	MW/min			
Downward RampRate1	MW/min			
MW2	MW			
Upward RampRate2	MW/min			
Downward RampRate2	MW/min			
MW3	MW			
Upward RampRate3	MW/min			
Downward RampRate3	MW/min			
MW4	MW			
Upward RampRate4	MW/min			
Downward RampRate4	MW/min			
MW5	MW			
Upward RampRate5	MW/min			
Downward RampRate5	MW/min			
MW6	MW			
Upward RampRate6	MW/min			
Downward RampRate6	MW/min			
MW7	MW			

6.3 Operational Resource Parameters – Wind Units



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RETURN TO MAP

Operational Resource Parameters

Resource Entity authorizes QSE representing this Generation Resource to submit Resource Parameters on this page for operational purposes in accordance with Section 3.7.1 on behalf of Resource Entity.

*This worksheet tab provides resource parameters for **Wind** generation resources. This tab is UNIT specific for **all W***

Complete the Unit Information Tab first, then the corresponding cells will become un-hatched on this tab. Then complet

WIND GENERATION RESOURCES

Resource Parameters	Labels	TEST_A	
Minimum On Line Time	hours		
Minimum Off Line Time	hours		
Hot Start Time	hours		
Intermediate Start Time	hours		
Cold Start Time	hours		
Max Weekly Starts			
Max On Line Time	hours		
Max Daily Starts			
Max Weekly Energy	MWh		
Hot-to-Intermediate Time	hours		
Intermediate-to-Cold Time	hours		
Normal Ramp Rate Curve	**Labels**	**TEST_A**	
MW1	MW		
Upward RampRate1	MW/min		
Downward RampRate1	MW/min		
MW2	MW		
Upward RampRate2	MW/min		
Downward RampRate2	MW/min		
MW3	MW		
Upward RampRate3	MW/min		
Downward RampRate3	MW/min		
MW4	MW		
Upward RampRate4	MW/min		
Downward RampRate4	MW/min		
MW5	MW		
Upward RampRate5	MW/min		
Downward RampRate5	MW/min		
MW6	MW		
Upward RampRate6	MW/min		
Downward RampRate6	MW/min		
MW7	MW		
Upward RampRate7	MW/min		
Downward RampRate7	MW/min		
MW8	MW		
Upward RampRate8	MW/min		
Downward RampRate8	MW/min		
MW9	MW		
Upward RampRate9	MW/min		
Downward RampRate9	MW/min		
MW10	MW		
Upward RampRate10	MW/min		
Downward RampRate10	MW/min		
Emergency Ramp Rate Curve	**Labels**	**TEST_A**	
MW1	MW		
Upward RampRate1	MW/min		
Downward RampRate1	MW/min		
MW2	MW		
Upward RampRate2	MW/min		

6.4 Ramp Rates

The Ramp Rate Curve data must be entered for both Normal and Emergency Operations. The ramp rates are initially submitted in the RARF, however the QSE will be able to update the ramp rates in Market Management System (MMS).

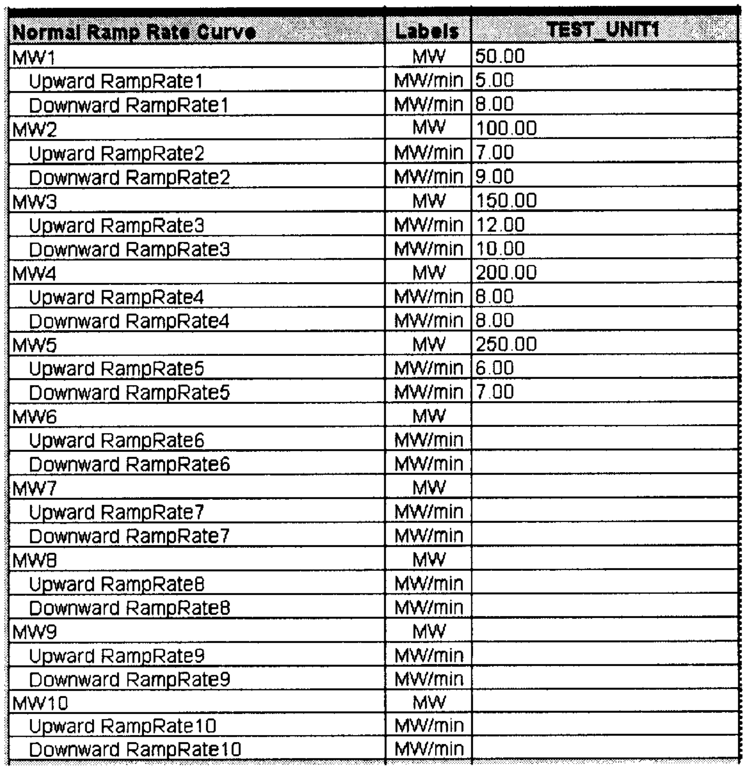
Ramp rate curves are step functions in the up and down directions at ten MW break points. All ramp rate values, including downward rates, should be entered in the RARF as non-zero positive values. The ramp rates and curves are critical and must be provided for every unit or, in the case of Combined Cycle facilities, ramp rates curves are needed for every configuration

The values submitted in the RARF are used to build the ramp rate step curves, and should not be used as tools to restrain the operating range of the unit or configuration. The curves are limited to LRL and HRL. Further operating restrictions exist as part of the COP and telemetry.

For ranges where the resource must be manually ramped, the up and down ramp rate should be a MW rate at which, if requested, the resource can be manually ramped to within a 5 minute period.

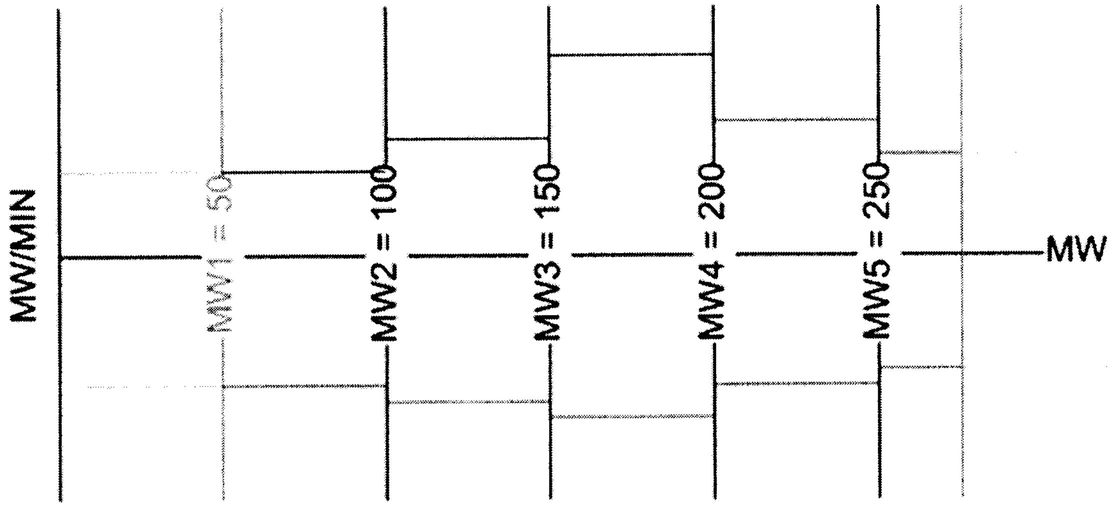
Only one ramp rate is required for the Normal curve and the Emergency curve.

The following picture is an example of a Ramp Rate curve using only five MW break points.



Normal Ramp Rate Curve	**Labels**	**TEST_UNIT1**
MW1	MW	50.00
Upward RampRate1	MW/min	5.00
Downward RampRate1	MW/min	8.00
MW2	MW	100.00
Upward RampRate2	MW/min	7.00
Downward RampRate2	MW/min	9.00
MW3	MW	150.00
Upward RampRate3	MW/min	12.00
Downward RampRate3	MW/min	10.00
MW4	MW	200.00
Upward RampRate4	MW/min	8.00
Downward RampRate4	MW/min	8.00
MW5	MW	250.00
Upward RampRate5	MW/min	6.00
Downward RampRate5	MW/min	7.00
MW6	MW	
Upward RampRate6	MW/min	
Downward RampRate6	MW/min	
MW7	MW	
Upward RampRate7	MW/min	
Downward RampRate7	MW/min	
MW8	MW	
Upward RampRate8	MW/min	
Downward RampRate8	MW/min	
MW9	MW	
Upward RampRate9	MW/min	
Downward RampRate9	MW/min	
MW10	MW	
Upward RampRate10	MW/min	
Downward RampRate10	MW/min	

The curve below is shown to help visualize how the reasonability and sustainable limits act as operational limiters as entered on the COP:



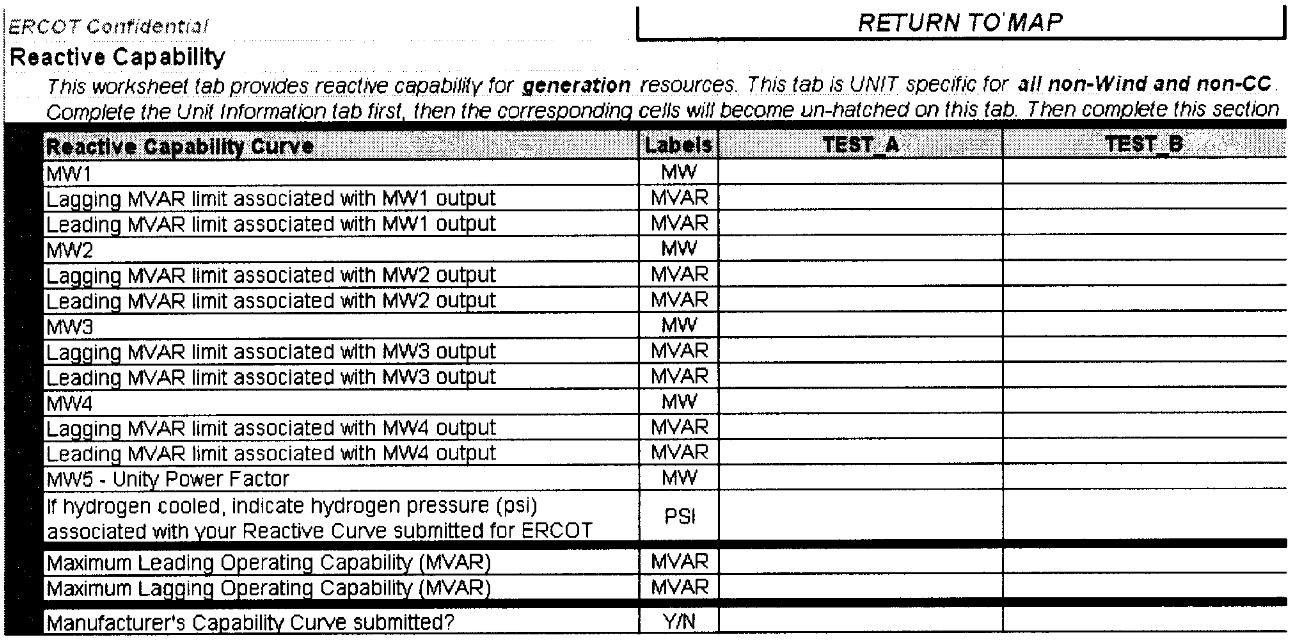
LRL = 50MW, HRL = 275MW

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



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RETURN TO MAP

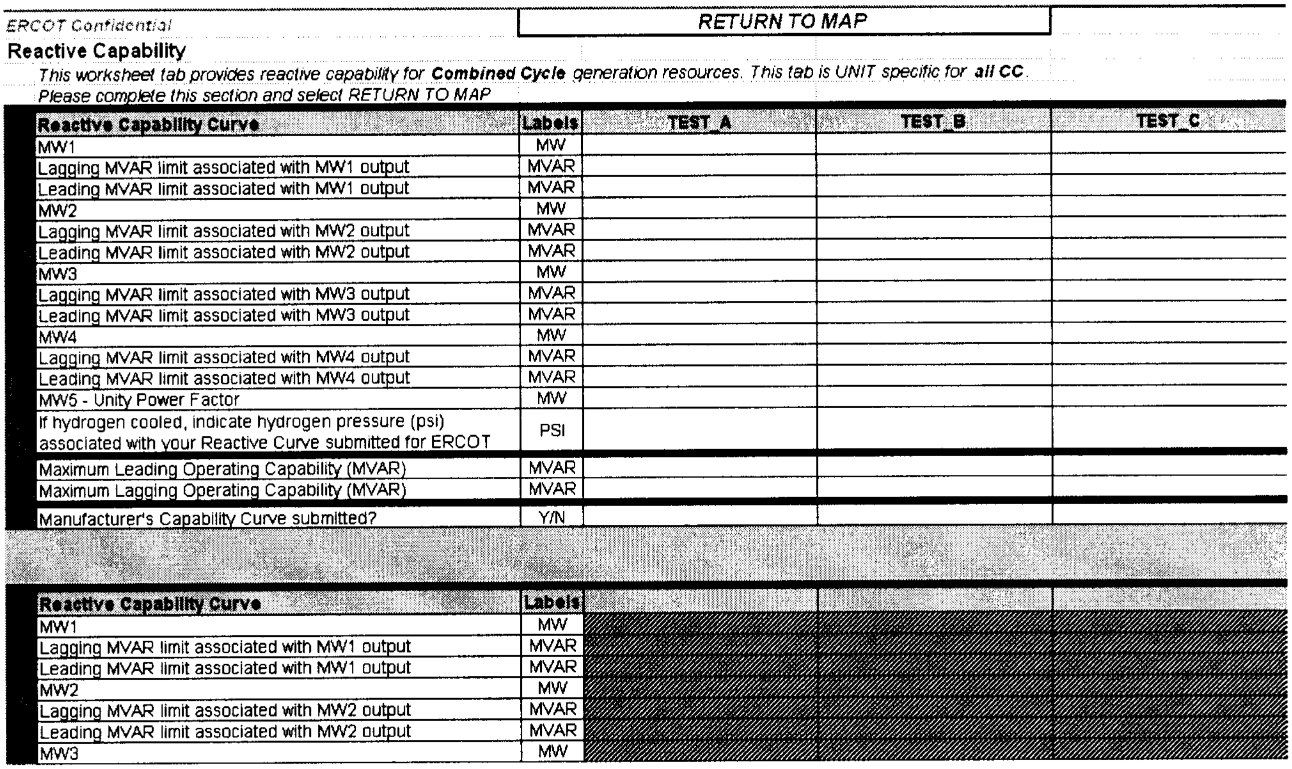
Reactive Capability

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

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.



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RETURN TO MAP

Reactive Capability

This worksheet tab provides reactive capability for ***Combined Cycle*** *generation resources. This tab is UNIT specific for* ***all CC**.*

Please complete this section and select RETURN TO MAP

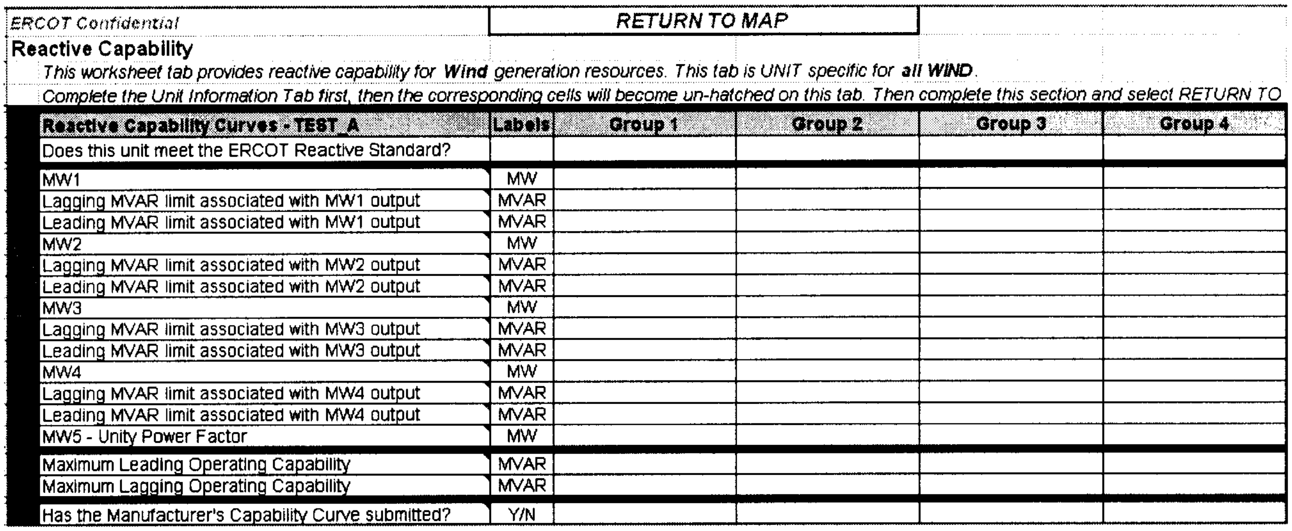
Reactive Capability Curve	**Labels**	**TEST_A**	**TEST_B**	**TEST_C**
MW1	MW			
Lagging MVAR limit associated with MW1 output	MVAR			
Leading MVAR limit associated with MW1 output	MVAR			
MW2	MW			
Lagging MVAR limit associated with MW2 output	MVAR			
Leading MVAR limit associated with MW2 output	MVAR			
MW3	MW			
Lagging MVAR limit associated with MW3 output	MVAR			
Leading MVAR limit associated with MW3 output	MVAR			
MW4	MW			
Lagging MVAR limit associated with MW4 output	MVAR			
Leading MVAR limit associated with MW4 output	MVAR			
MW5 - Unity Power Factor	MW			
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT	PSI			
Maximum Leading Operating Capability (MVAR)	MVAR			
Maximum Lagging Operating Capability (MVAR)	MVAR			
Manufacturer's Capability Curve submitted?	Y/N			

Reactive Capability Curve	**Labels**			
MW1	MW			
Lagging MVAR limit associated with MW1 output	MVAR			
Leading MVAR limit associated with MW1 output	MVAR			
MW2	MW			
Lagging MVAR limit associated with MW2 output	MVAR			
Leading MVAR limit associated with MW2 output	MVAR			
MW3	MW			

7.3 Reactive Capability – Wind Units

The 9 point reactive curve data points must be submitted for each unit, as well as the manufacturer's capability curve. The units are listed in the vertical columns – the RARF allows up to five. The groups are horizontal.

Reactive capability must be completed for each group of each unit.



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Reactive Capability

*This worksheet tab provides reactive capability for **Wind** generation resources. This tab is UNIT specific for **all WIND**.*

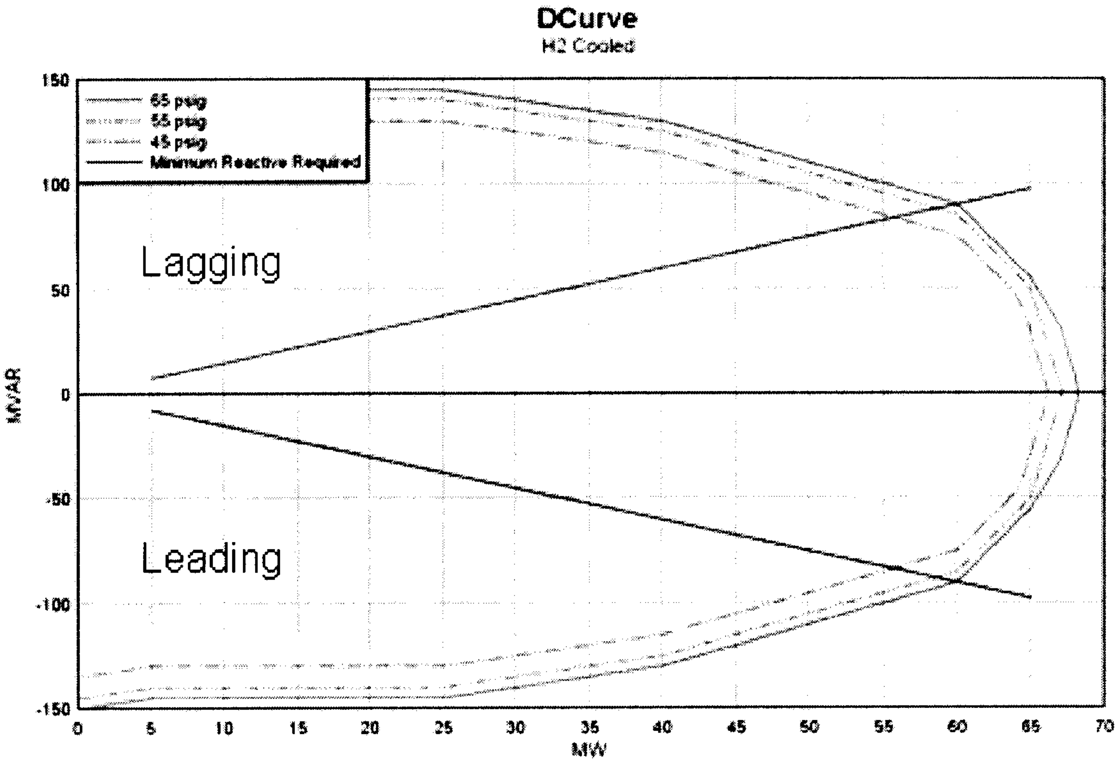
Complete the Unit Information Tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section and select RETURN TO

Reactive Capability Curves - TEST_A	Labels	Group 1	Group 2	Group 3	Group 4
Does this unit meet the ERCOT Reactive Standard?					
MW1	MW				
Lagging MVAR limit associated with MW1 output	MVAR				
Leading MVAR limit associated with MW1 output	MVAR				
MW2	MW				
Lagging MVAR limit associated with MW2 output	MVAR				
Leading MVAR limit associated with MW2 output	MVAR				
MW3	MW				
Lagging MVAR limit associated with MW3 output	MVAR				
Leading MVAR limit associated with MW3 output	MVAR				
MW4	MW				
Lagging MVAR limit associated with MW4 output	MVAR				
Leading MVAR limit associated with MW4 output	MVAR				
MW5 - Unity Power Factor	MW				
Maximum Leading Operating Capability	MVAR				
Maximum Lagging Operating Capability	MVAR				
Has the Manufacturer's Capability Curve submitted?	Y/N				

7.4 D-Curve / REACTIVE CAPABILITY CURVES

Reactive capability is the ability of a generator unit to supply/absorb reactive power (MVAR) to the grid continuously for a given MW operating value without damaging the unit. Reactive power is required to control voltage under normal and emergency situations in order to prevent voltage collapse of the grid. Reactive capability qualification testing is required by ERCOT for verification of maximum leading and lagging capability of all generation resources required to provide voltage support service.

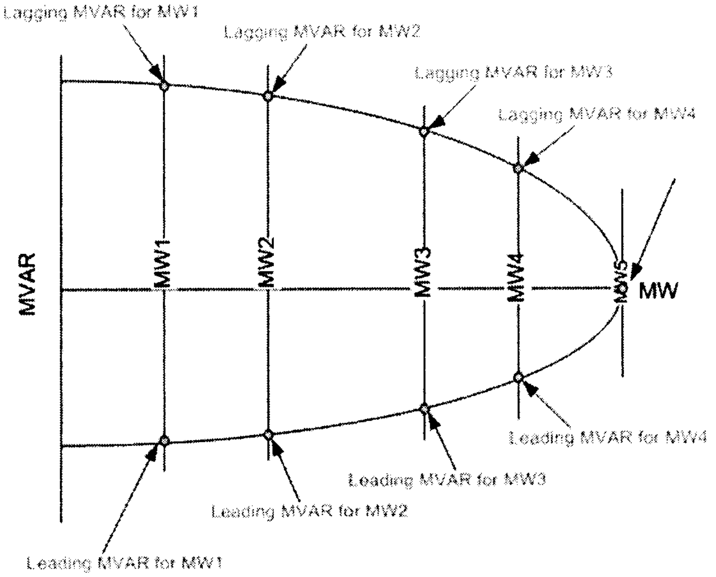
The Reactive Capability Curve, also known as the D-curve, represents the operating limits of the generator. The example Reactive Capability Curve pictured below shows the Reactive Capability Curve or D-Curve of a generator unit where the X-axis is MW and the Y-axis is MVAR, and is intended for illustrative purposes only. Values above the x-axis (positive VARs) are "LAGGING" MVARs and values below the x-axis (negative VARs) are "LEADING" MVARs.


DCurve
H2 Cooled
65 psig
55 psig
45 psig
Minimum Reactive Required
Lagging
Leading
MVAR
MW
150
100
50
0
-50
-100
-150
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70

To establish the curve in the RARF, ERCOT requests nine points of data. When entering data on the RARF, use POSITIVE values to represent the lagging MVARs and NEGATIVE values to represent leading MVARs. If the unit is hydrogen cooled, indicate pressure of hydrogen in psi; otherwise leave the cell blank. Supply 5 increasing MW values of operating real power - MW1 at the lowest operation MW through MW 5 at unity power factor. An example of this entry is shown below.

Reactive Capability Curve	Labels	TEST_UNIT1
MW1	MW	50.00
Lagging MVAR limit associated with MW1 output	MVAR	10.00
Leading MVAR limit associated with MW1 output	MVAR	-12.00
MW2	MW	100.00
Lagging MVAR limit associated with MW2 output	MVAR	15.00
Leading MVAR limit associated with MW2 output	MVAR	-25.00
MW3	MW	150.00
Lagging MVAR limit associated with MW3 output	MVAR	20.00
Leading MVAR limit associated with MW3 output	MVAR	-35.00
MW4	MW	200.00
Lagging MVAR limit associated with MW4 output	MVAR	30.00
Leading MVAR limit associated with MW4 output	MVAR	-50.00
MW5 - Unity Power Factor	MW	250.00
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT studies	PSI	65.0
Maximum Lagging Operating Capability (MVAR)	MVAR	40.00
Maximum Leading Operating Capability (MVAR)	MVAR	-55.00
Manufacturer's Capability Curve submitted?	Y/N	Y

The following is an example of a D-curve and the selection of points. The graph below shows five MW points and corresponding MVARs. After entering these values in the form, the end curve is shown. This implies that the MW selection points should move closer to the unity end to more accurately depict the curve and reactive capability of the resource.

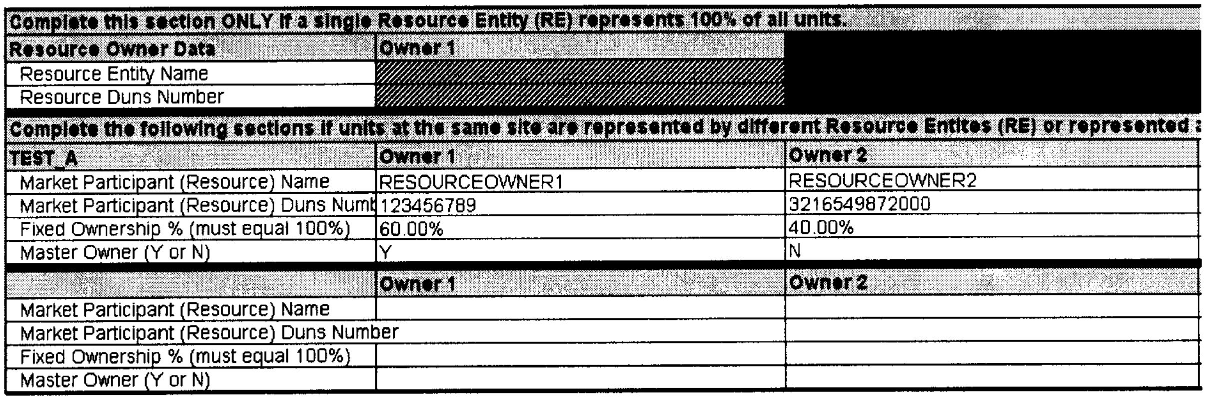


8.0 Split Generation Resources

The responsibility for ensuring proper resource registration belongs to the Resource Entity that represents or controls the output of the unit(s). Joint-ownership is not formally defined in ERCOT. These resources are referred to as Split Generation.

If the entire output of all units at a facility/site is controlled by one Resource Entity only, then the top section should be completed. However, if multiple Resource Entities share ownership, even if the split is by entire units, then the Split Generation Resource section must be completed. This will allow the unit to be properly aligned with the Resource Entity in the ERCOT registration system.

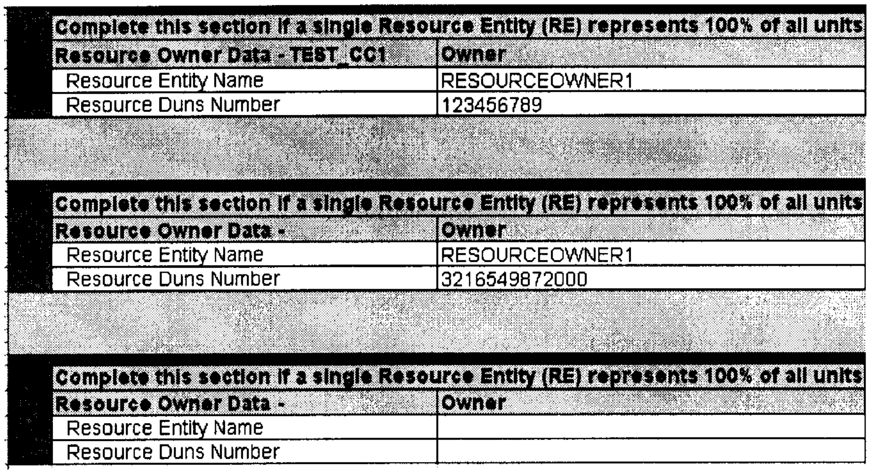
8.1 Ownership – non-Wind, non-CC Generation Units



Complete this section ONLY if a single Resource Entity (RE) represents 100% of all units.		
Resource Owner Data	**Owner 1**	
Resource Entity Name	▨	
Resource Duns Number	▨	
Complete the following sections if units at the same site are represented by different Resource Entites (RE) or represented		
TEST_A	**Owner 1**	**Owner 2**
Market Participant (Resource) Name	RESOURCEOWNER1	RESOURCEOWNER2
Market Participant (Resource) Duns Numb	123456789	3216549872000
Fixed Ownership % (must equal 100%)	60.00%	40.00%
Master Owner (Y or N)	Y	N
	Owner 1	**Owner 2**
Market Participant (Resource) Name		
Market Participant (Resource) Duns Number		
Fixed Ownership % (must equal 100%)		
Master Owner (Y or N)		

8.2 Split Resource Generation – Combined-Cycle Units

This tab contains three parts, for registering up to three trains at one site. The information is required for each train. ERCOT does not allow Combined-Cycle Resources to register as Split Generation.

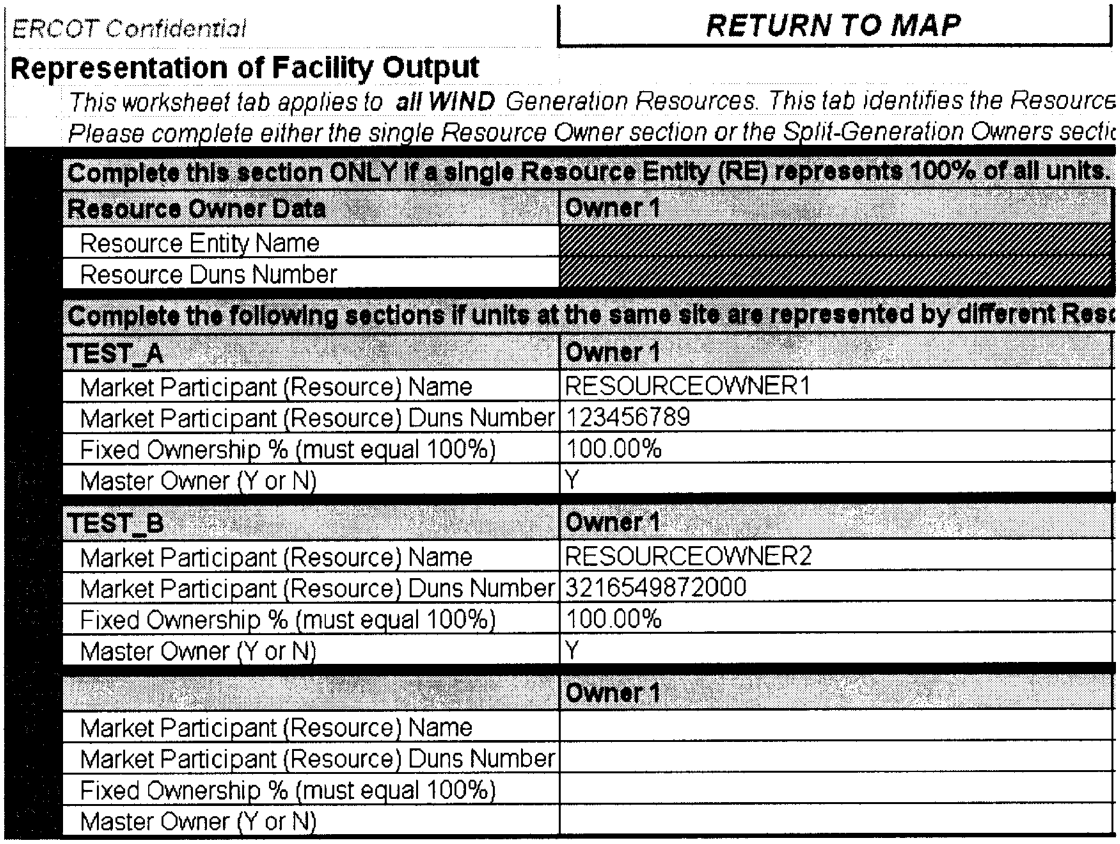


Complete this section if a single Resource Entity (RE) represents 100% of all units	
Resource Owner Data - TEST_CC1	**Owner**
Resource Entity Name	RESOURCEOWNER1
Resource Duns Number	123456789

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

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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Representation of Facility Output

This worksheet tab applies to ***all WIND*** *Generation Resources. This tab identifies the Resourc*

Please complete either the single Resource Owner section or the Split-Generation Owners sectio

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 Res	
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.

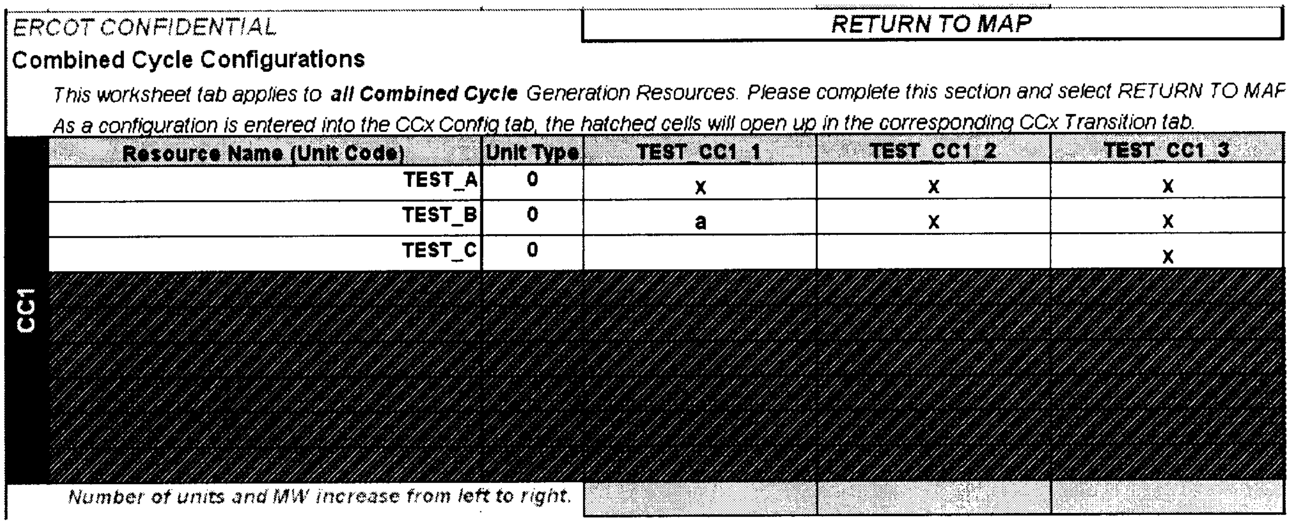
9.1 Configurations

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.



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RETURN TO MAP

Combined Cycle Configurations

This worksheet tab applies to ***all Combined Cycle*** *Generation Resources. Please complete this section and select RETURN TO MAF*

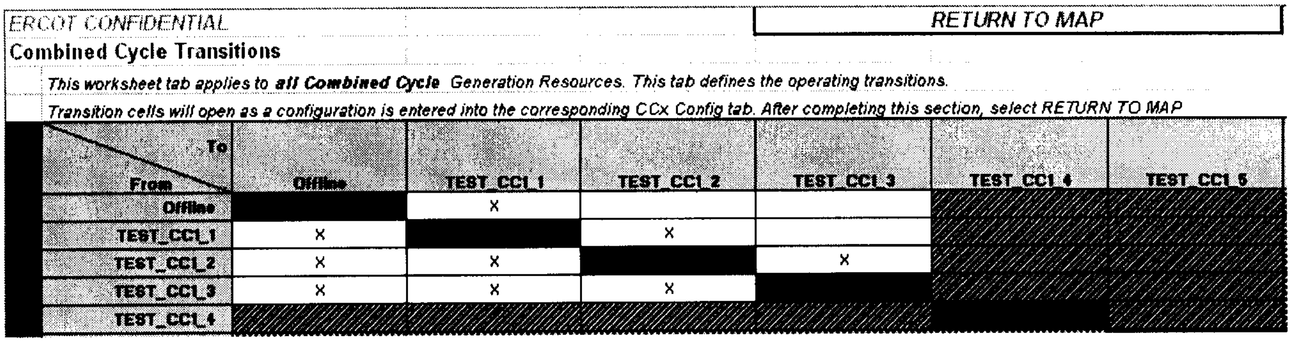
As a configuration is entered into the CCx Config tab, the hatched cells will open up in the corresponding CCx Transition tab.

	Resource Name (Unit Code)	Unit Type	TEST CC1 1	TEST CC1 2	TEST CC1 3
CC1	TEST_A	0	x	x	x
	TEST_B	0	a	x	x
	TEST_C	0			x

Number of units and MW increase from left to right.

9.2 Transitions

As a configuration is entered into the CCx Config tab, the hatched cells will open up in the corresponding CCx Transition tab. This table is a map that, for each operating state/configuration, identifies what states/configurations are next available – e.g. adding a unit or removing a unit. This map is critical to properly transition the ERCOT systems.



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Combined Cycle Transitions

*This worksheet tab applies to **all Combined Cycle** Generation Resources. This tab defines the operating transitions.*

Transition cells will open as a configuration is entered into the corresponding CCx Config tab. After completing this section, select RETURN TO MAP

To From	Offline	TEST_CC1_1	TEST_CC1_2	TEST_CC1_3	TEST_CC1_4	TEST_CC1_5
Offline	■	x			▨	▨
TEST_CC1_1	x	■	x		▨	▨
TEST_CC1_2	x	x	■	x	▨	▨
TEST_CC1_3	x	x	x	■	▨	▨
TEST_CC1_4	▨	▨	▨	▨	■	▨

9.3 Establishing Configurations and Transitions

The following are steps intended to aid in developing configurations and transitions. These steps are not required.

An example is included for illustrative purposes only. For the example, assume a three unit train named ABC_CC1, consisting of two 100MW combustion turbines (CT) and one 100MW steam turbine (CA). When one CT is on, assume the CA can operate at 50% output.

Step 1:

Establish and register all operationally unique configurations with ERCOT. When registering additional configurations, bear in mind the configurations represent logical configurations (1-0, 2-0, 1-1, etc), and should NOT represent uniqueness for individual units. In the example below, whether running Unit1&Steamer or Unit2&Steamer, the resource would only represent one unique configuration of 1-on-1. Additional background to assist with this step can be obtained from the combined cycle whitepaper found at http://www.ercot.com/calendar/2008/01/20080121-TPTF.html, item 31.

This step should also establish a configuration order, 1 through xx (where xx represents, at a maximum, the number of unique configurations for the train). The sort order for the configurations should be from lowest to highest MW. A secondary sort order, if needed, would be to assign the lower configuration number to the configuration with fewer units operating.

Step 1 Example:

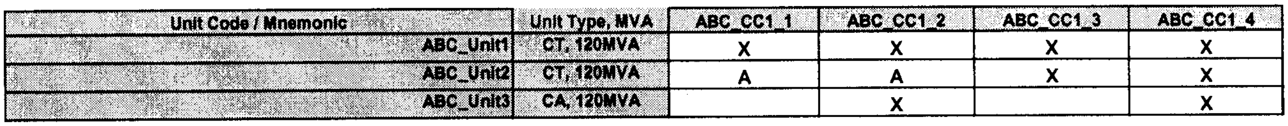
CC1 can operate in four unique configurations – 1x0, 2x0, 1x1, and 2x1. Each configuration has a different MW output. These configurations and the output have been identified in the table to the right. Applying the configuration order requirement, the yellow cells identify the order that they should be entered into the CCx Config table.

CC1		MW	1x0	2x0	1x1	2x1
Unit 1	CT	100	x	x	x	x
Unit 2	CT	100	a	x	a	x
Unit 3	CA	100			x	x
		300	100	200	150	300
			1	*3*	*2*	*4*

Step 2:

Enter the configurations into the CCx Config tab of Addendum 2.

Step 2 Example:



Unit Code / Mnemonic	Unit Type, MVA	ABC_CC1_1	ABC_CC1_2	ABC_CC1_3	ABC_CC1_4
ABC_Unit1	CT, 120MVA	X	X	X	X
ABC_Unit2	CT, 120MVA	A	A	X	X
ABC_Unit3	CA, 120MVA		X		X

Step 3:

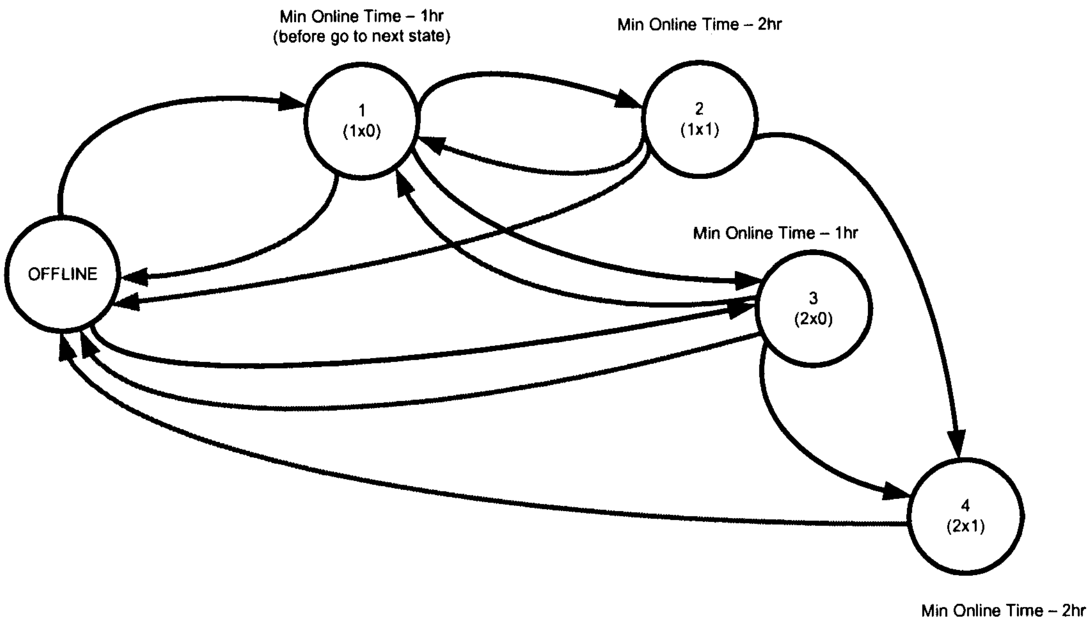
Enter resource parameter information for the configurations. Use the hyperlinks and the map to return to these sections.

Step 4:

Construct a state diagram, where each configuration is a "state" represented by a circle. Then arrows are drawn from each configuration to any other that can be reached **within the minimum online time.**

The state diagram should be laid out from left to right, where OFFLINE is furthest to the left, and the highest configuration number is furthest to the right. Draw arrows between states/configurations to indicate where the train could operate next. If the configurations were assigned correctly, arrows to the right should add a unit and increase MW. Arrows to the left should indicate decreasing MW and units. This diagram will help you build an accurate matrix for the Nodal systems.

Step 4 Example:



Step 5:

Go to the transition tab to complete the transition matrix.

Referring to the state diagram constructed in Step 4, each arrow should be an X in the matrix. With this layout, an arrow from left to right will be entered as an X in the transition matrix *above* the black diagonal, and any arrow from right to left will be entered as an X in the transition matrix *below* the black diagonal.

Please keep in mind that the unit will stay in any one state/configuration for the duration of the minimum online time.

Step 5 Example:

From Offline, this train can go to ABC_CC1_1 or ABC_CC1_2. This could be any state that could be reached in one hour from offline. The unit will stay in the initial state for the duration of the minimum online time.

To From	Offline	ABC_CC1_1	ABC_CC1_2	ABC_CC1_3	ABC_CC1_4
Offline	■	X		X	
ABC_CC1_1	X	■	X	X	
ABC_CC1_2	X	X	■		X
ABC_CC1_3	X	X		■	X
ABC_CC1_4	X				■

In this example, the train could reach Configuration 4 after 1 hour by going from Offline to Configuration 3 (ABC_CC1_3), wait the minimum online time of 1 hour, then transition to Configuration 4 (ABC_CC1_4). If the steamer cannot be ready in 1 hour, then the minimum online time should be increased for Configuration 3.

Alternatively, the train could reach Configuration 4 in 3 hours by going from ABC_CC1_1, wait 1 hour, go to ABC_CC1_2, wait 2 hours, then go to ABC_CC1_4. Again, if the steamer cannot be ready in 1 hour, then the minimum online time for Configuration 1 should be increased.

Complete these steps for each CC train.

10.0 Planning

The Planning Information section of the RARF, along with the PSSE Model datasheets, provides ERCOT with the information needed to properly complete studies. The planning section of the RARF has been separated into three sections.

10.1 Planning Information

This section provides details to ERCOT regarding generator details, auxiliary load information, acknowledgement of PSSE model submittals, as well as transient and subtransient reactances.

Machine Impedance is equivalent to Zeq, which consists of the armature, rotor, and mutual coupling impedances. In addition, the System Protection Working Group needs the Positive, Negative, and Zero sequence impedances.

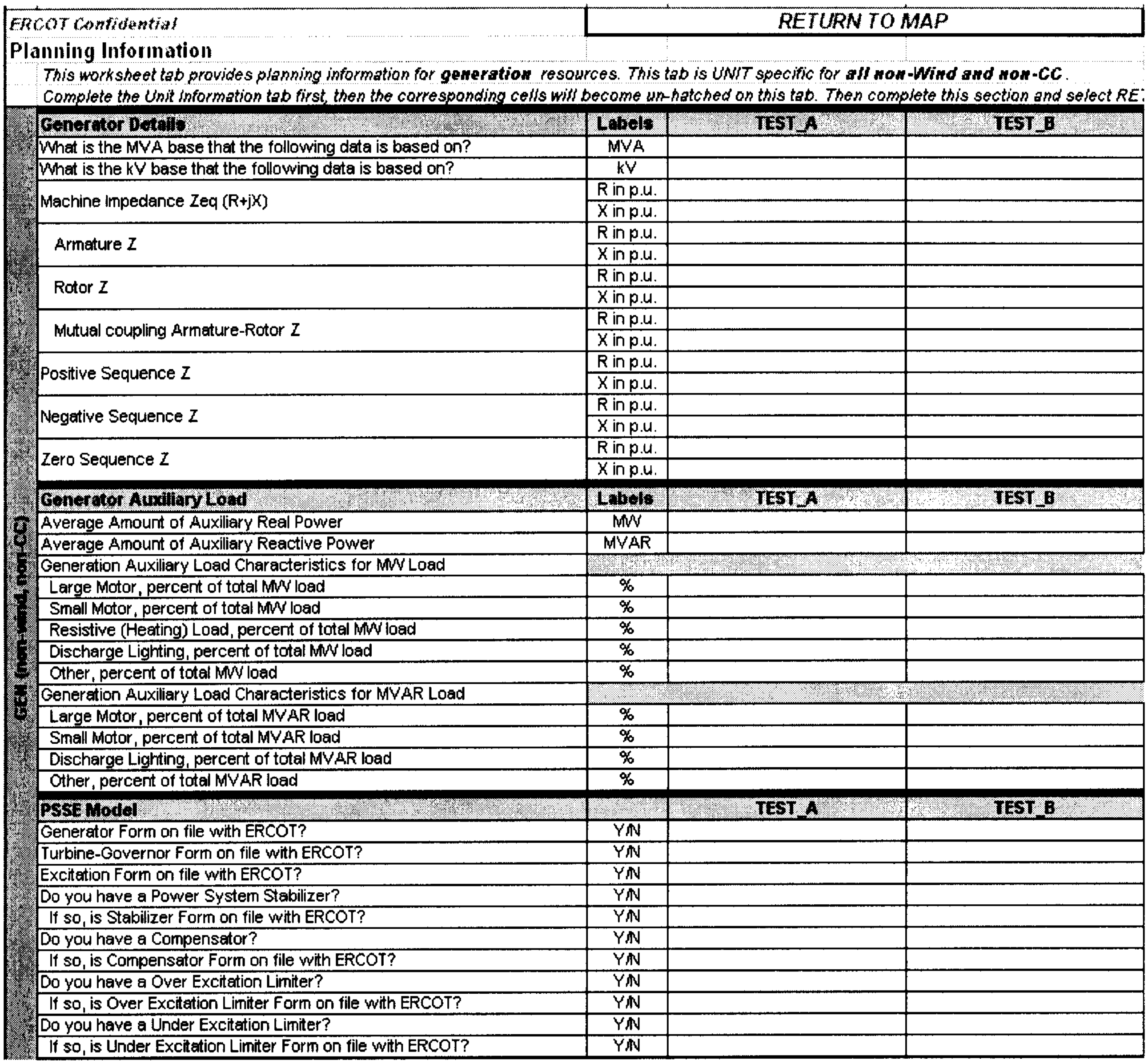
The Auxiliary Load should be defined by identifying the amount of load in MW and MVAR for each unit. The Load Characteristics should be completed to allocate 100% of the MW and MVAR (separately) across the types of load the facility may have. Please include any motor connected to 2400V/4160V and above with the large motor percentage and lower voltage motors as small.

New Resources should request the PSSE model direct from the manufacturer, especially if the standard models do not exist.

If there are questions related to the PSSE models, please contact your designated ERCOT Account Manager or email Wholesale Client Services at NodalMarketTransition@ercot.com.

All fields in this section should be completed.

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

GEN (non-wind, non-CC)

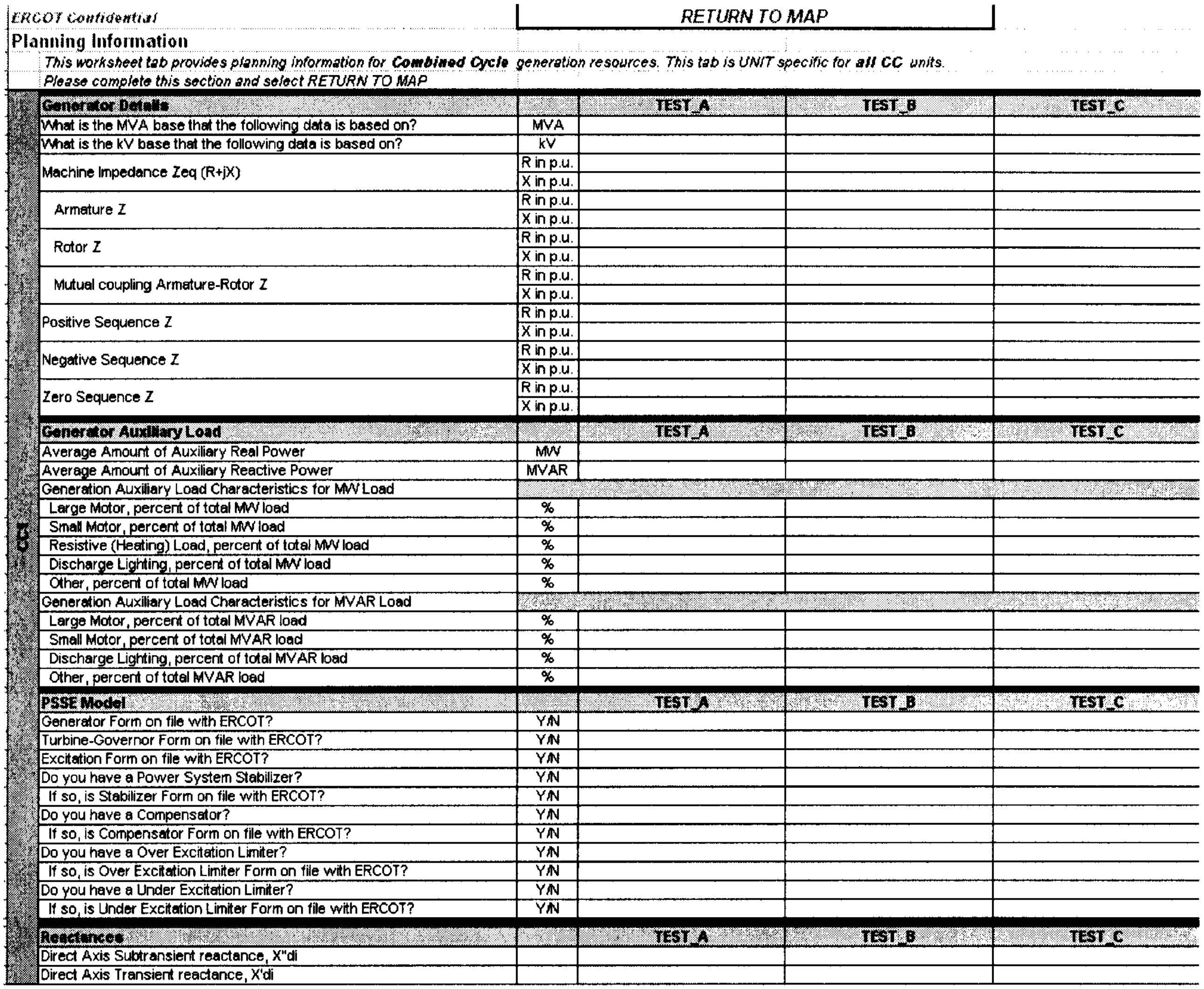
Generator Details	**Labels**	**TEST_A**	**TEST_B**
What is the MVA base that the following data is based on?	MVA		
What is the kV base that the following data is based on?	kV		
Machine Impedance Zeq (R+jX)	R in p.u.		
	X in p.u.		
Armature Z	R in p.u.		
	X in p.u.		
Rotor Z	R in p.u.		
	X in p.u.		
Mutual coupling Armature-Rotor Z	R in p.u.		
	X in p.u.		
Positive Sequence Z	R in p.u.		
	X in p.u.		
Negative Sequence Z	R in p.u.		
	X in p.u.		
Zero Sequence Z	R in p.u.		
	X in p.u.		

Generator Auxiliary Load	**Labels**	**TEST_A**	**TEST_B**
Average Amount of Auxiliary Real Power	MW		
Average Amount of Auxiliary Reactive Power	MVAR		
Generation Auxiliary Load Characteristics for MW Load			
Large Motor, percent of total MW load	%		
Small Motor, percent of total MW load	%		
Resistive (Heating) Load, percent of total MW load	%		
Discharge Lighting, percent of total MW load	%		
Other, percent of total MW load	%		
Generation Auxiliary Load Characteristics for MVAR Load			
Large Motor, percent of total MVAR load	%		
Small Motor, percent of total MVAR load	%		
Discharge Lighting, percent of total MVAR load	%		
Other, percent of total MVAR load	%		

PSSE Model		**TEST_A**	**TEST_B**
Generator Form on file with ERCOT?	Y/N		
Turbine-Governor Form on file with ERCOT?	Y/N		
Excitation Form on file with ERCOT?	Y/N		
Do you have a Power System Stabilizer?	Y/N		
If so, is Stabilizer Form on file with ERCOT?	Y/N		
Do you have a Compensator?	Y/N		
If so, is Compensator Form on file with ERCOT?	Y/N		
Do you have a Over Excitation Limiter?	Y/N		
If so, is Over Excitation Limiter Form on file with ERCOT?	Y/N		
Do you have a Under Excitation Limiter?	Y/N		
If so, is Under Excitation Limiter Form on file with ERCOT?	Y/N		

10.1.2 Planning – Combined Cycle

This tab contains three parts, for registering up to three trains at one site. This information should be completed for each unit of the trains.



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RETURN TO MAP

Planning Information

*This worksheet tab provides planning information for **Combined Cycle** generation resources. This tab is UNIT specific for **all CC** units.*

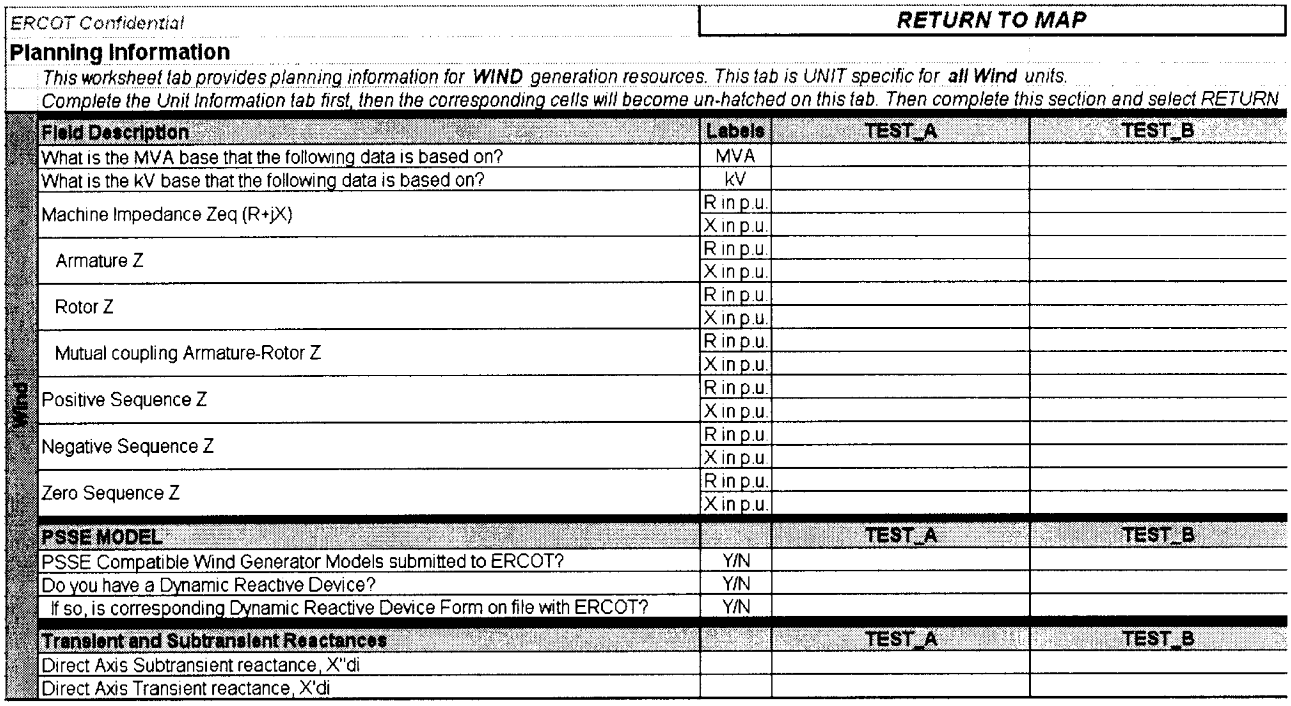
Please complete this section and select RETURN TO MAP

Generator Details		**TEST_A**	**TEST_B**	**TEST_C**
What is the MVA base that the following data is based on?	MVA			
What is the kV base that the following data is based on?	kV			
Machine Impedance Zeq (R+jX)	R in p.u.			
	X in p.u.			
Armature Z	R in p.u.			
	X in p.u.			
Rotor Z	R in p.u.			
	X in p.u.			
Mutual coupling Armature-Rotor Z	R in p.u.			
	X in p.u.			
Positive Sequence Z	R in p.u.			
	X in p.u.			
Negative Sequence Z	R in p.u.			
	X in p.u.			
Zero Sequence Z	R in p.u.			
	X in p.u.			
Generator Auxiliary Load		**TEST_A**	**TEST_B**	**TEST_C**
Average Amount of Auxiliary Real Power	MW			
Average Amount of Auxiliary Reactive Power	MVAR			
Generation Auxiliary Load Characteristics for MW Load				
Large Motor, percent of total MW load	%			
Small Motor, percent of total MW load	%			
Resistive (Heating) Load, percent of total MW load	%			
Discharge Lighting, percent of total MW load	%			
Other, percent of total MW load	%			
Generation Auxiliary Load Characteristics for MVAR Load				
Large Motor, percent of total MVAR load	%			
Small Motor, percent of total MVAR load	%			
Discharge Lighting, percent of total MVAR load	%			
Other, percent of total MVAR load	%			
PSSE Model		**TEST_A**	**TEST_B**	**TEST_C**
Generator Form on file with ERCOT?	Y/N			
Turbine-Governor Form on file with ERCOT?	Y/N			
Excitation Form on file with ERCOT?	Y/N			
Do you have a Power System Stabilizer?	Y/N			
If so, is Stabilizer Form on file with ERCOT?	Y/N			
Do you have a Compensator?	Y/N			
If so, is Compensator Form on file with ERCOT?	Y/N			
Do you have a Over Excitation Limiter?	Y/N			
If so, is Over Excitation Limiter Form on file with ERCOT?	Y/N			
Do you have a Under Excitation Limiter?	Y/N			
If so, is Under Excitation Limiter Form on file with ERCOT?	Y/N			
Reactances		**TEST_A**	**TEST_B**	**TEST_C**
Direct Axis Subtransient reactance, X"di				
Direct Axis Transient reactance, X'di				

10.1.3 Planning – Wind Units

For non-Wind Generation Resources, the Over/Under Excitation Limiter form is new and must be submitted to ERCOT as soon as possible.

All fields in this section should be completed.



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RETURN TO MAP

Planning Information

*This worksheet tab provides planning information for **WIND** generation resources. This tab is UNIT specific for **all Wind** units.*

Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete this section and select RETURN

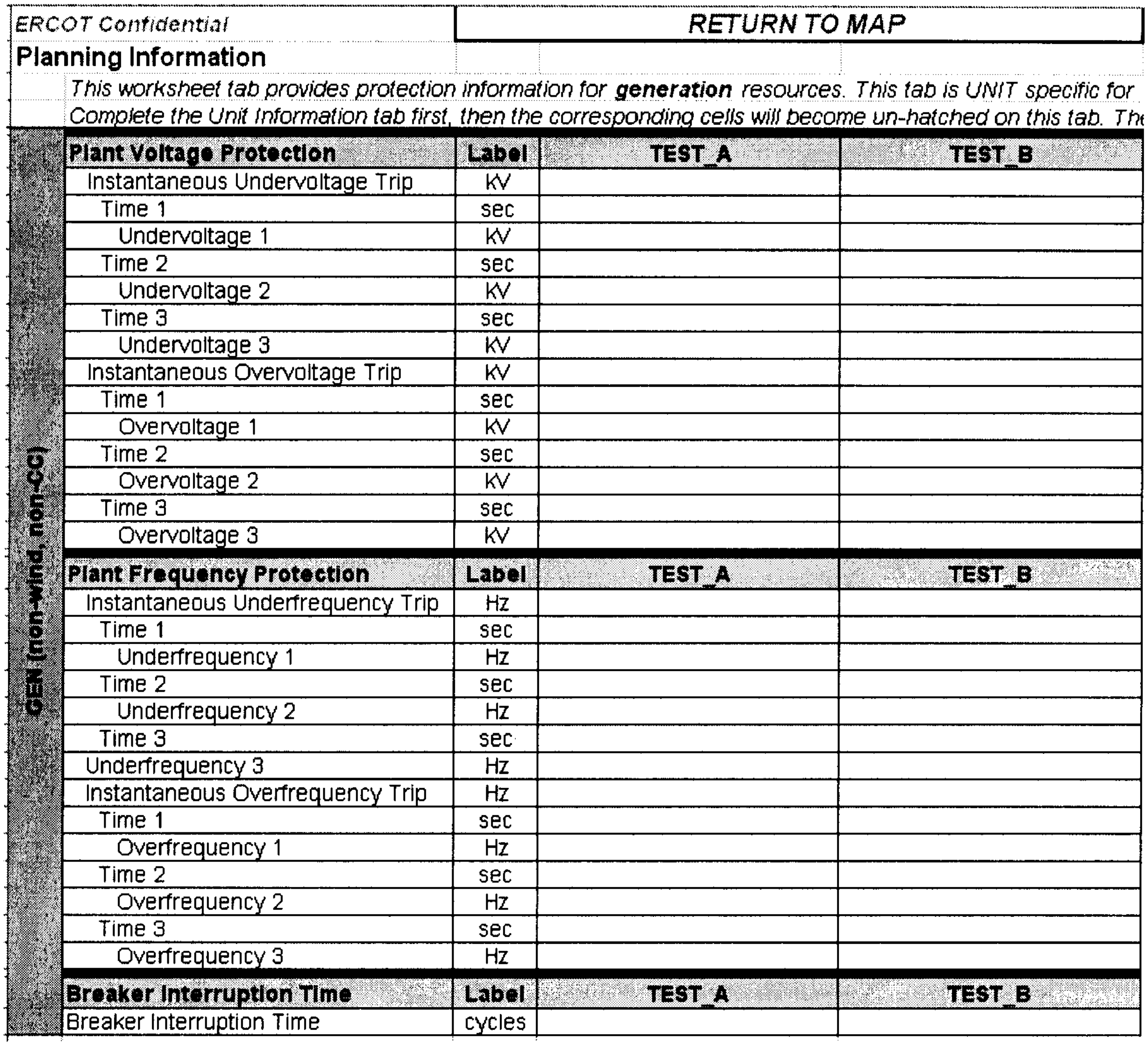
Field Description	**Labels**	**TEST_A**	**TEST_B**
What is the MVA base that the following data is based on?	MVA		
What is the kV base that the following data is based on?	kV		
Machine Impedance Zeq (R+jX)	R in p.u.		
	X in p.u.		
Armature Z	R in p.u.		
	X in p.u.		
Rotor Z	R in p.u.		
	X in p.u.		
Mutual coupling Armature-Rotor Z	R in p.u.		
	X in p.u.		
Positive Sequence Z	R in p.u.		
	X in p.u.		
Negative Sequence Z	R in p.u.		
	X in p.u.		
Zero Sequence Z	R in p.u.		
	X in p.u.		
PSSE MODEL		**TEST_A**	**TEST_B**
PSSE Compatible Wind Generator Models submitted to ERCOT?	Y/N		
Do you have a Dynamic Reactive Device?	Y/N		
If so, is corresponding Dynamic Reactive Device Form on file with ERCOT?	Y/N		
Transient and Subtransient Reactances		**TEST_A**	**TEST_B**
Direct Axis Subtransient reactance, X"di			
Direct Axis Transient reactance, X'di			

10.2 Protection

The protection section of the Planning tabs covers the breaker interruption time as well as the voltage and frequency protection of the unit.

Protection information must be provided as applicable. Please ensure that the generator protection is defined.

10.2.1 Protection – non-Wind, non-CC Generation Units



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Planning Information

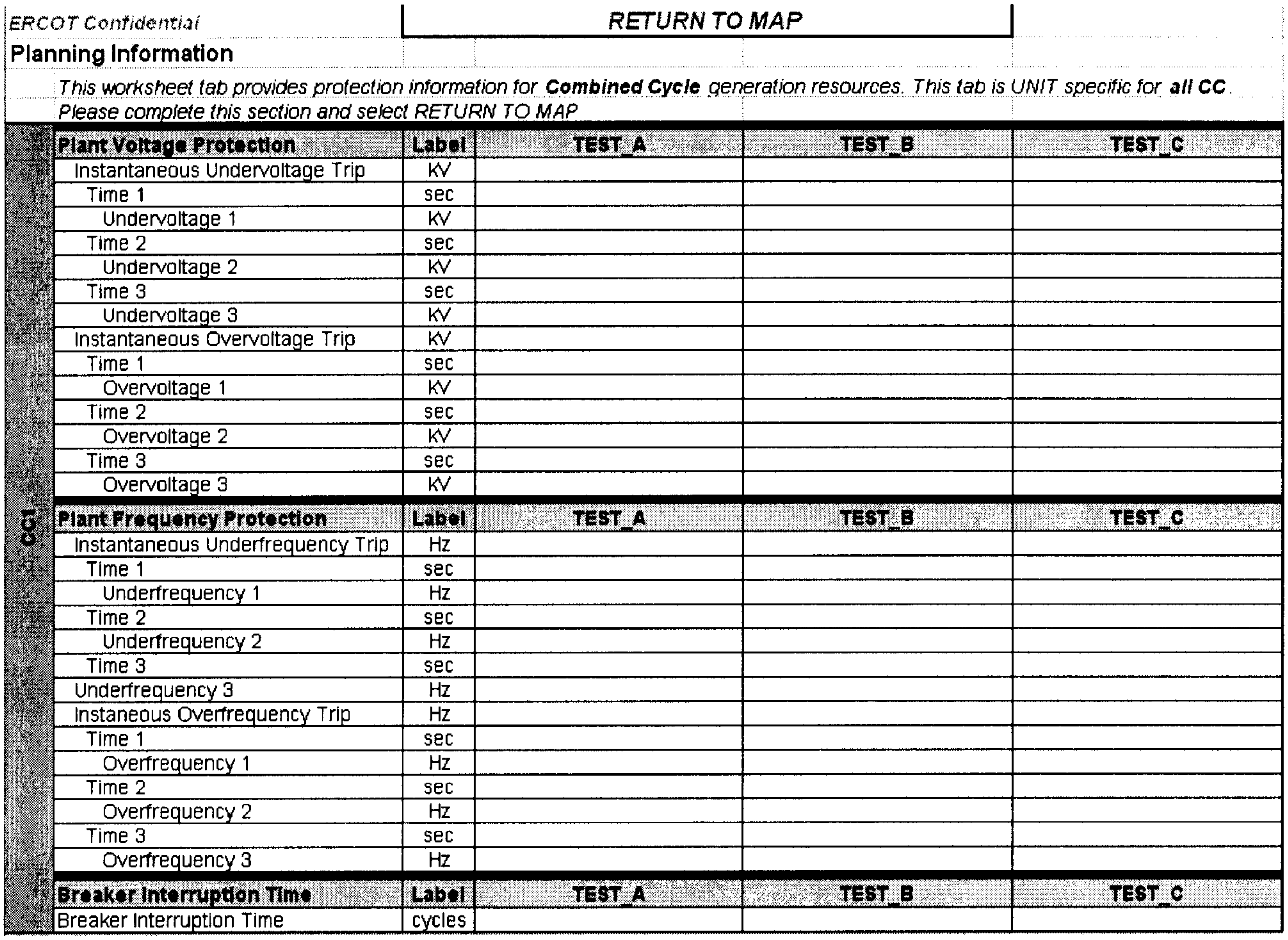
This worksheet tab provides protection information for ***generation*** *resources. This tab is UNIT specific for*
Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Th

GEN (non-wind, non-CC)

Plant Voltage Protection	**Label**	**TEST_A**	**TEST_B**
Instantaneous Undervoltage Trip	kV		
Time 1	sec		
Undervoltage 1	kV		
Time 2	sec		
Undervoltage 2	kV		
Time 3	sec		
Undervoltage 3	kV		
Instantaneous Overvoltage Trip	kV		
Time 1	sec		
Overvoltage 1	kV		
Time 2	sec		
Overvoltage 2	kV		
Time 3	sec		
Overvoltage 3	kV		
Plant Frequency Protection	**Label**	**TEST_A**	**TEST_B**
Instantaneous Underfrequency Trip	Hz		
Time 1	sec		
Underfrequency 1	Hz		
Time 2	sec		
Underfrequency 2	Hz		
Time 3	sec		
Underfrequency 3	Hz		
Instantaneous Overfrequency Trip	Hz		
Time 1	sec		
Overfrequency 1	Hz		
Time 2	sec		
Overfrequency 2	Hz		
Time 3	sec		
Overfrequency 3	Hz		
Breaker Interruption Time	**Label**	**TEST_A**	**TEST_B**
Breaker Interruption Time	cycles		

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

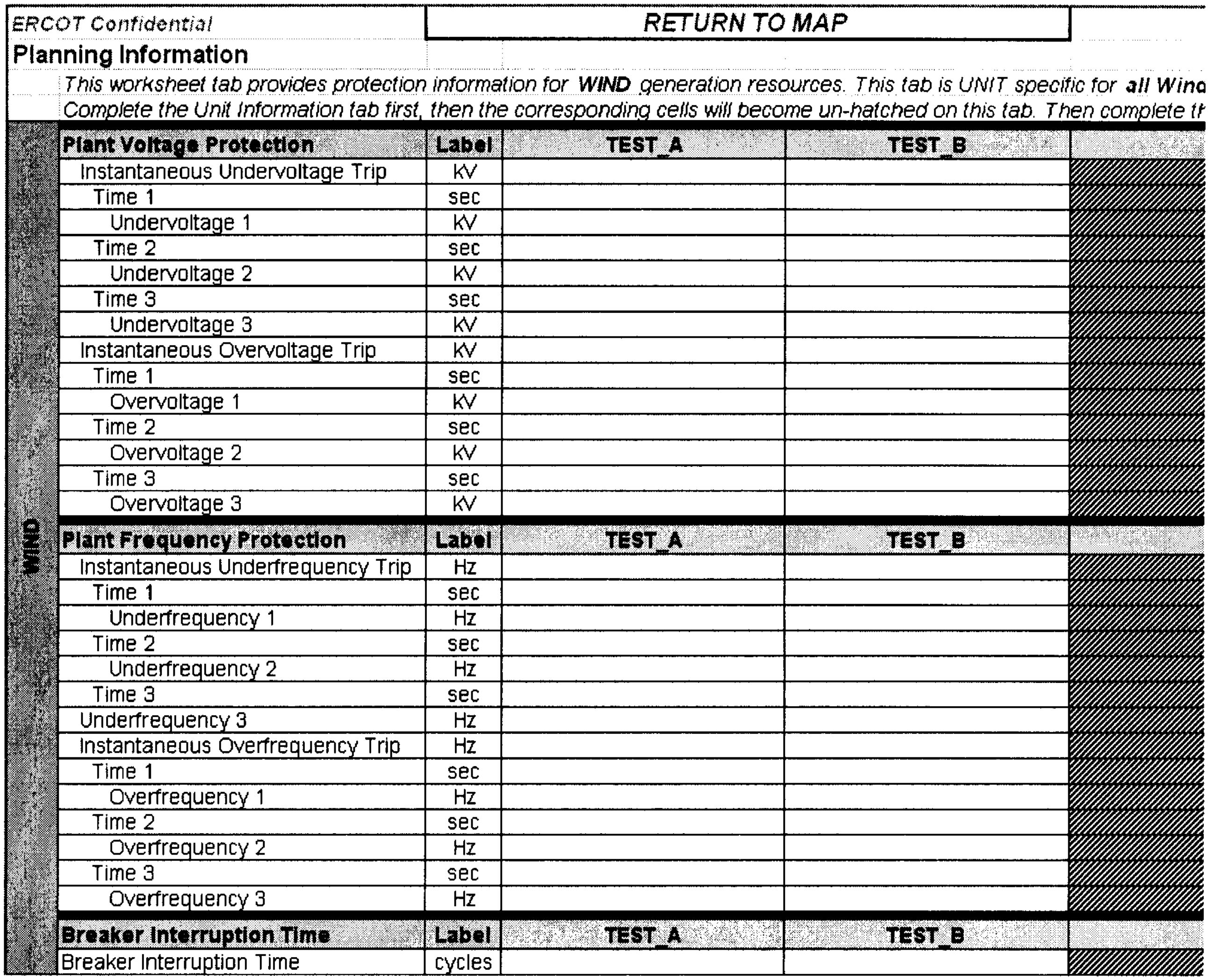
*This worksheet tab provides protection information for **Combined Cycle** generation resources. This tab is UNIT specific for **all CC**. Please complete this section and select RETURN TO MAP*

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			
Instaneous Overfrequency Trip	Hz			
Time 1	sec			
Overfrequency 1	Hz			
Time 2	sec			
Overfrequency 2	Hz			
Time 3	sec			
Overfrequency 3	Hz			

Breaker Interruption Time	Label	TEST_A	TEST_B	TEST_C
Breaker Interruption Time	cycles			

10.2.3 Protection – Wind Units



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Planning Information

This worksheet tab provides protection information for ***WIND*** *generation resources. This tab is UNIT specific for* ***all Win***

Complete the Unit Information tab first, then the corresponding cells will become un-hatched on this tab. Then complete t

WIND

Plant Voltage Protection	**Label**	**TEST_A**	**TEST_B**	
Instantaneous Undervoltage Trip	KV			▨
Time 1	sec			▨
Undervoltage 1	KV			▨
Time 2	sec			▨
Undervoltage 2	KV			▨
Time 3	sec			▨
Undervoltage 3	KV			▨
Instantaneous Overvoltage Trip	KV			▨
Time 1	sec			▨
Overvoltage 1	KV			▨
Time 2	sec			▨
Overvoltage 2	KV			▨
Time 3	sec			▨
Overvoltage 3	KV			▨
Plant Frequency Protection	**Label**	**TEST_A**	**TEST_B**	
Instantaneous Underfrequency Trip	Hz			▨
Time 1	sec			▨
Underfrequency 1	Hz			▨
Time 2	sec			▨
Underfrequency 2	Hz			▨
Time 3	sec			▨
Underfrequency 3	Hz			▨
Instantaneous Overfrequency Trip	Hz			▨
Time 1	sec			▨
Overfrequency 1	Hz			▨
Time 2	sec			▨
Overfrequency 2	Hz			▨
Time 3	sec			▨
Overfrequency 3	Hz			▨
Breaker Interruption Time	**Label**	**TEST_A**	**TEST_B**	
Breaker Interruption Time	cycles			▨

10.3 Sub-synchronous Resonance

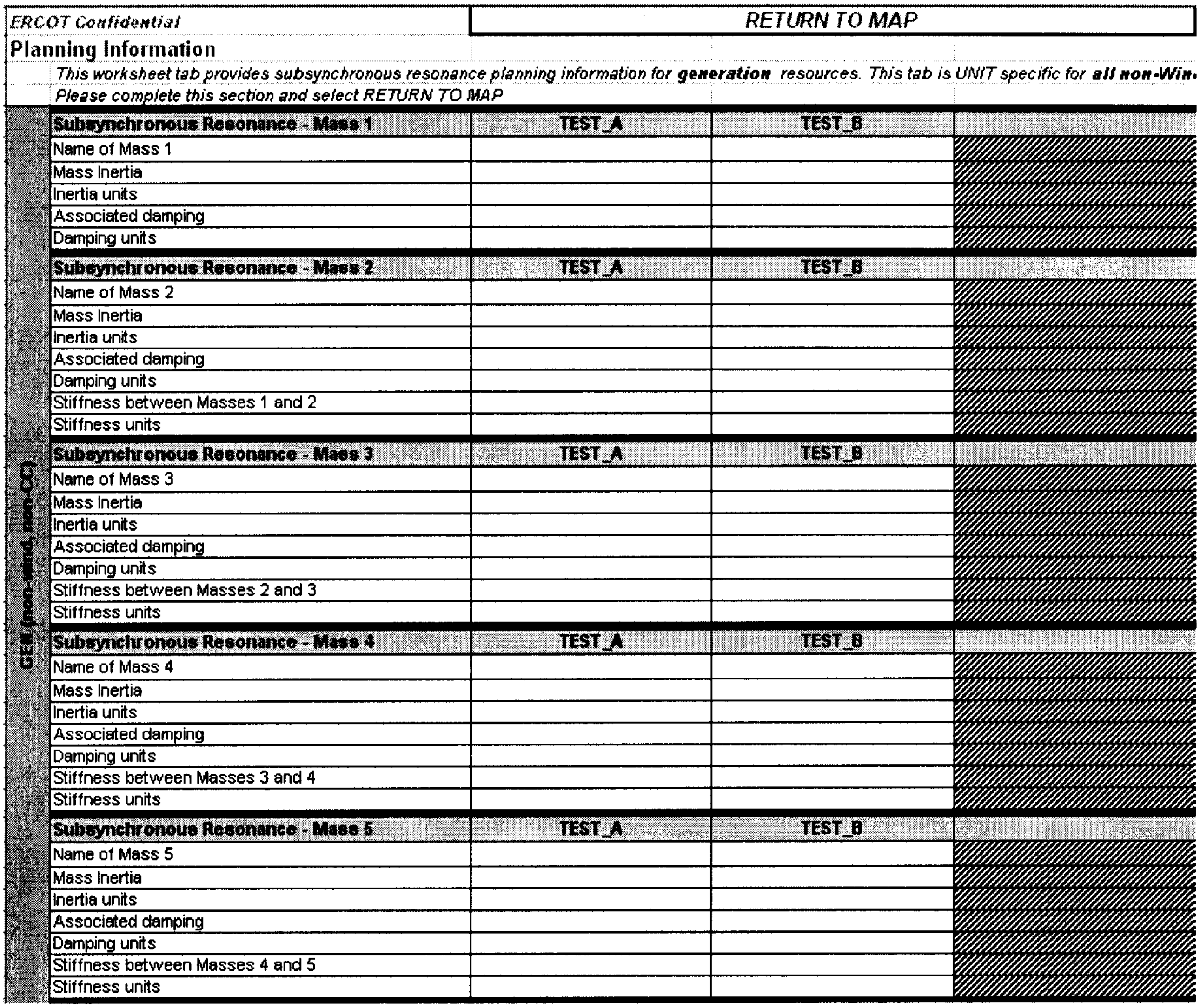
Sub-synchronous Resonance information has been difficult for many Resources to provide. At this time, the studies that need this information are not completed often, but will become more common as capacitor compensation is used in series on long transmission lines.

The studies focus on the units at either end of the lines compensated with the series capacitors to ensure the resonance from these lines will not excite critical frequencies in the machines in the areas at the ends of these lines.

In the future, these studies will be useful to Resource owners interested in equipment damage prevention.

Due to the infrequent nature of these studies, ERCOT accepts minimal information in these fields at this time. However, as series compensation is installed on our grid, this information will become necessary and critical to system performance

10.3.1 Sub-synchronous Resonance – non-Wind, non-CC Generation Units



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Planning Information

This worksheet tab provides subsynchronous resonance planning information for ***generation*** *resources. This tab is UNIT specific for* ***all non-Win***

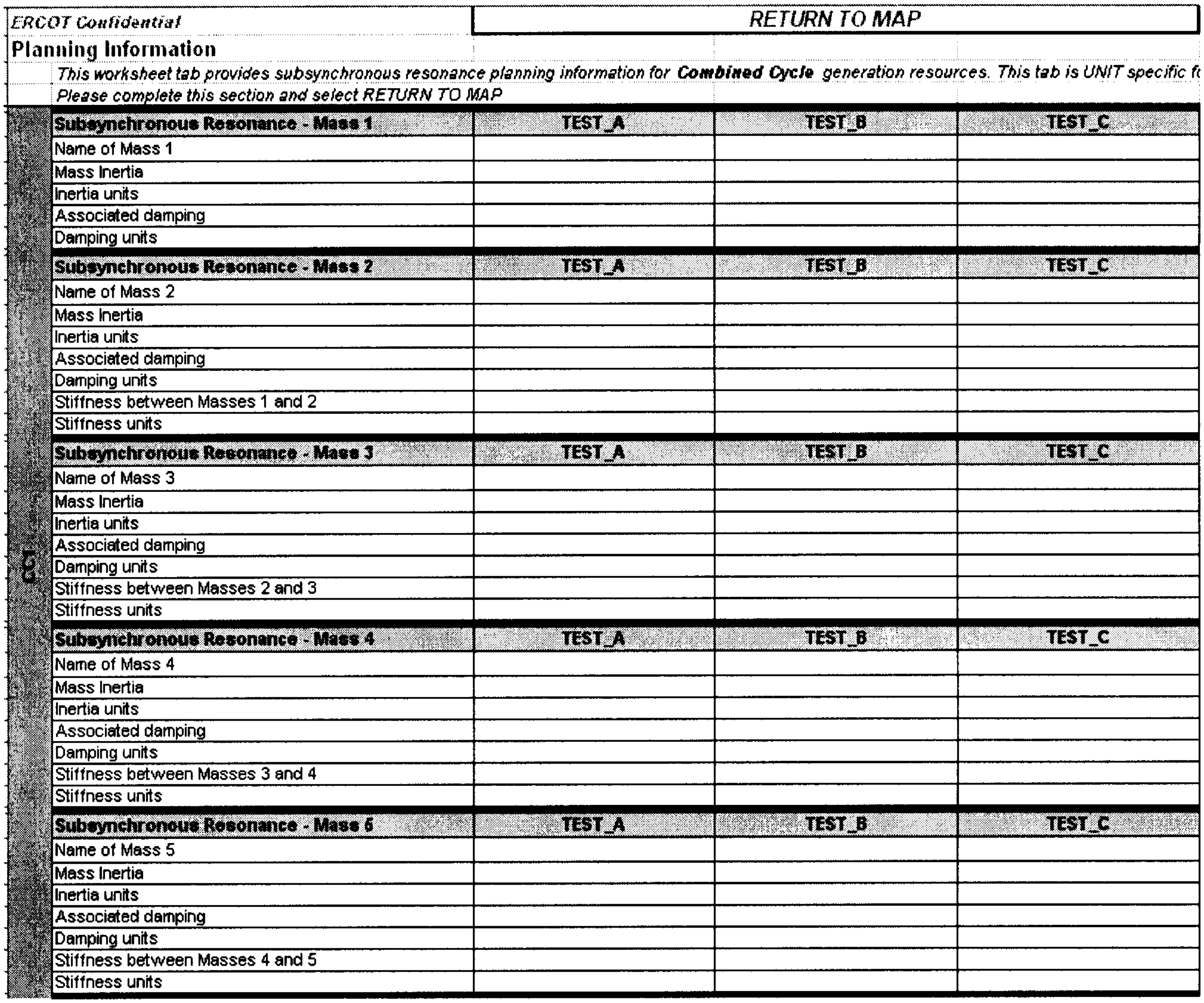
Please complete this section and select RETURN TO MAP

GEN (non-wind, non-CC)

Subsynchronous Resonance - Mass 1	**TEST_A**	**TEST_B**	
Name of Mass 1			▨
Mass Inertia			▨
Inertia units			▨
Associated damping			▨
Damping units			▨
Subsynchronous Resonance - Mass 2	**TEST_A**	**TEST_B**	
Name of Mass 2			▨
Mass Inertia			▨
Inertia units			▨
Associated damping			▨
Damping units			▨
Stiffness between Masses 1 and 2			▨
Stiffness units			▨
Subsynchronous Resonance - Mass 3	**TEST_A**	**TEST_B**	
Name of Mass 3			▨
Mass Inertia			▨
Inertia units			▨
Associated damping			▨
Damping units			▨
Stiffness between Masses 2 and 3			▨
Stiffness units			▨
Subsynchronous Resonance - Mass 4	**TEST_A**	**TEST_B**	
Name of Mass 4			▨
Mass Inertia			▨
Inertia units			▨
Associated damping			▨
Damping units			▨
Stiffness between Masses 3 and 4			▨
Stiffness units			▨
Subsynchronous Resonance - Mass 5	**TEST_A**	**TEST_B**	
Name of Mass 5			▨
Mass Inertia			▨
Inertia units			▨
Associated damping			▨
Damping units			▨
Stiffness between Masses 4 and 5			▨
Stiffness units			▨

10.3.2 Sub-synchronous Resonance – Combined Cycle

This tab contains three parts, for registering up to three trains at one site. This information is required for each unit of the train.



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RETURN TO MAP

Planning Information

*This worksheet tab provides subsynchronous resonance planning information for **Combined Cycle** generation resources. This tab is UNIT specific f*

Please complete this section and select RETURN TO MAP

Subsynchronous Resonance - Mass 1	**TEST_A**	**TEST_B**	**TEST_C**
Name of Mass 1			
Mass Inertia			
Inertia units			
Associated damping			
Damping units			
Subsynchronous Resonance - Mass 2	**TEST_A**	**TEST_B**	**TEST_C**
Name of Mass 2			
Mass Inertia			
Inertia units			
Associated damping			
Damping units			
Stiffness between Masses 1 and 2			
Stiffness units			
Subsynchronous Resonance - Mass 3	**TEST_A**	**TEST_B**	**TEST_C**
Name of Mass 3			
Mass Inertia			
Inertia units			
Associated damping			
Damping units			
Stiffness between Masses 2 and 3			
Stiffness units			
Subsynchronous Resonance - Mass 4	**TEST_A**	**TEST_B**	**TEST_C**
Name of Mass 4			
Mass Inertia			
Inertia units			
Associated damping			
Damping units			
Stiffness between Masses 3 and 4			
Stiffness units			
Subsynchronous Resonance - Mass 5	**TEST_A**	**TEST_B**	**TEST_C**
Name of Mass 5			
Mass Inertia			
Inertia units			
Associated damping			
Damping units			
Stiffness between Masses 4 and 5			
Stiffness units			

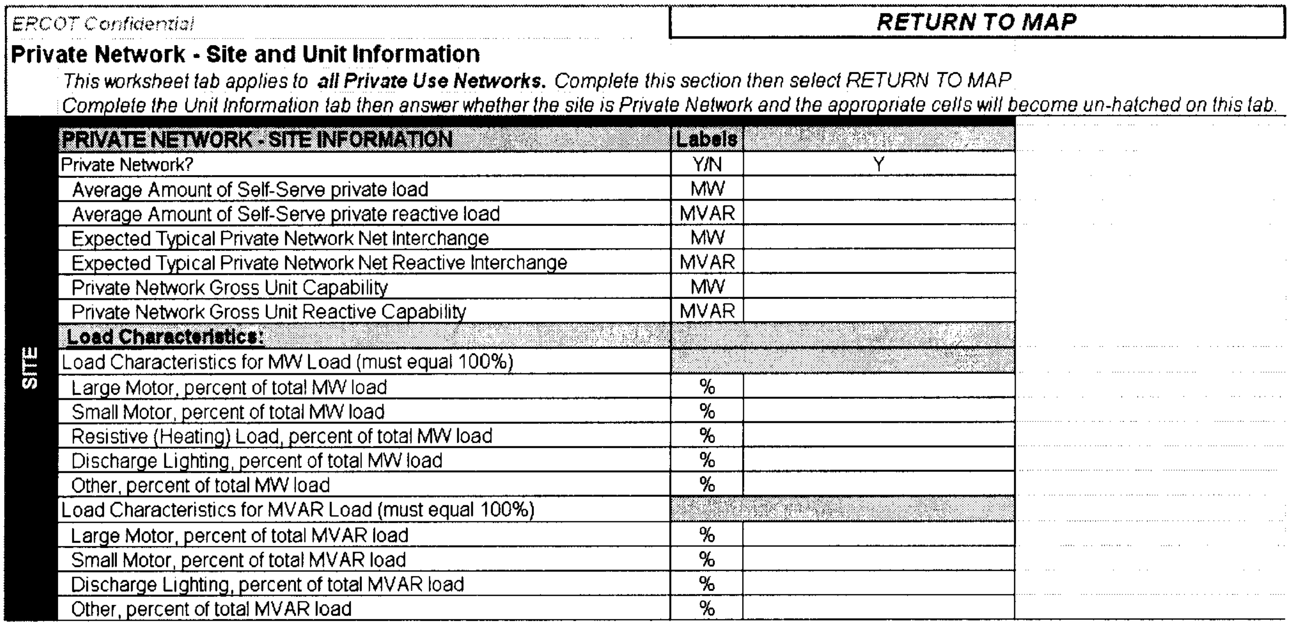
11.0 Private Use Networks

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 Confidential

RETURN TO MAP

Private Network - Site and Unit Information

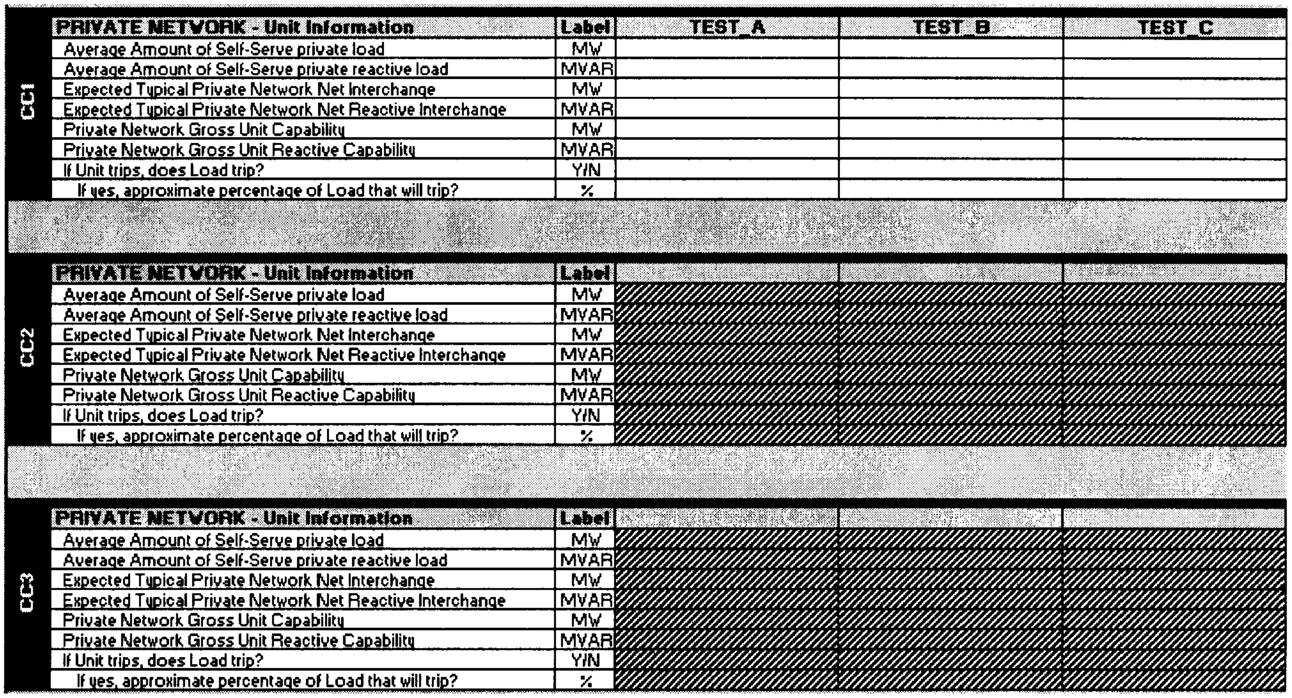
*This worksheet tab applies to **all Private Use Networks.** Complete this section then select RETURN TO MAP*

Complete the Unit Information tab then answer whether the site is Private Network and the appropriate cells will become un-hatched on this tab.

	PRIVATE NETWORK - SITE INFORMATION	**Labels**	
SITE	Private Network?	Y/N	Y
	Average Amount of Self-Serve private load	MW	
	Average Amount of Self-Serve private reactive load	MVAR	
	Expected Typical Private Network Net Interchange	MW	
	Expected Typical Private Network Net Reactive Interchange	MVAR	
	Private Network Gross Unit Capability	MW	
	Private Network Gross Unit Reactive Capability	MVAR	
	Load Characteristics:		
	Load Characteristics for MW Load (must equal 100%)		
	Large Motor, percent of total MW load	%	
	Small Motor, percent of total MW load	%	
	Resistive (Heating) Load, percent of total MW load	%	
	Discharge Lighting, percent of total MW load	%	
	Other, percent of total MW load	%	
	Load Characteristics for MVAR Load (must equal 100%)		
	Large Motor, percent of total MVAR load	%	
	Small Motor, percent of total MVAR load	%	
	Discharge Lighting, percent of total MVAR load	%	
	Other, percent of total MVAR load	%	

11.2 Unit Information

After completing the site details, the generation and load must be allocated across the units. Please identify the amount of load allocated to each unit, as well as the percentage of load that will trip if the unit trips. Some facilities become a large load to ERCOT if the generation trips, which can create issues with the reliability studies if the load cannot trip within a minute of the generation unit trip.



	PRIVATE NETWORK - Unit Information	Label	TEST_A	TEST_B	TEST_C
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?	%			

	PRIVATE NETWORK - Unit Information	Label			
CC2	Average Amount of Self-Serve private load	MW	▨	▨	▨
	Average Amount of Self-Serve private reactive load	MVAR	▨	▨	▨
	Expected Typical Private Network Net Interchange	MW	▨	▨	▨
	Expected Typical Private Network Net Reactive Interchange	MVAR	▨	▨	▨
	Private Network Gross Unit Capability	MW	▨	▨	▨
	Private Network Gross Unit Reactive Capability	MVAR	▨	▨	▨
	If Unit trips, does Load trip?	Y/N	▨	▨	▨
	If yes, approximate percentage of Load that will trip?	%	▨	▨	▨

	PRIVATE NETWORK - Unit Information	Label			
CC3	Average Amount of Self-Serve private load	MW	▨	▨	▨
	Average Amount of Self-Serve private reactive load	MVAR	▨	▨	▨
	Expected Typical Private Network Net Interchange	MW	▨	▨	▨
	Expected Typical Private Network Net Reactive Interchange	MVAR	▨	▨	▨
	Private Network Gross Unit Capability	MW	▨	▨	▨
	Private Network Gross Unit Reactive Capability	MVAR	▨	▨	▨
	If Unit trips, does Load trip?	Y/N	▨	▨	▨
	If yes, approximate percentage of Load that will trip?	%	▨	▨	▨

12.0 Line Data

The Line Data tab is used for registering both, internal lines and lines which go outside of the generation site, but are owned by the resource entity. All lines registered here are those owned by the Resource Entity.

Each line registered must use the Line names as they appear in the ERCOT model.

For connected devices, ERCOT requires at least 1 device, but no more than 10.

Line Data Business Rules / Basic Validations
Use this section to pre-validate the information entered in the RARF.

RARF DATA FIELD	Business Rules/Basic UI validations	Datatype
Description of Change	1) This field is conditionally Required - If there is a change to a tab, the change must be described.	Alpha
ERCOT Line Name	1) This field is required 2) Warn if > 14 characters 3) This field may not have any special characters, except an underscore "_" and a dash "-"	Alpha
Line Voltage Level	1) This field is required. 2) If the value >= 69kv it must be 69,138, or 345 3) The value must be < 345 4) The value must be > 1	Float
TO STATION - ERCOT Station Code Mnemonic	1) This field is Optional 2) Warn if left blank 3) This field must match ERCOT records (unless new)	Alpha
TO STATION - TSP Name	1) This field is conditionally required if TO STATION - Internal Line - 'N' 2) This field must match ERCOT records (drop down in RARF)	Alpha
TO STATION - Connected Device Name(s) (multiple)	1) This field is required 2) May not be >= than 17 characters 3) May not have duplicates within the TO or FROM Station 4) May not contain special characters except for an underscore "_" and a dash "-"	Alpha
TO STATION - Bus Number (PTI Bus Number)	1) This field is optional 2) This field must be between 1 - 99,999	Integer
TO STATION - Weather Zone / Weather Station (used for Dynamic Ratings)	1) This field is conditionally required if "Line Rating (Static or Dynamic)" = 'DYNAMIC' 2) Value must be from the following list: COAST, EAST, FAR_WEST, NORTH, NORTH_C, SOUTH_C, SOUTHERN, WEST, KABI, KAUS, KBRO, KCRP, KDFW, KGLS, KIAH, KJCT, KLRD, KLFK, KMAF, KMWL, KSJT, KSAT, KTYR, KVCT, KACT, KSPS, KINK, KPRX	Alpha
FROM STATION - ERCOT Station Code Mnemonic	1) This field is required 2) Must match ERCOT records (unless new) 3) Value must be <= 8 characters	Alpha
FROM STATION - Connected Device Name(s) (multiple)	1) This field is required 2) May not be > than 17 characters	Alpha

	3) May not have duplicates within the TO or FROM Station 4) May not contain special characters except for an underscore "_" and a dash "-"	
FROM STATION - Bus Number (PTI Bus Number)	1) This field is optional 2) This field must be between 1 - 99,999 3) Warn if left blank	Integer
FROM STATION - Weather Zone / Weather Station (used for Dynamic Ratings)	1) This field is conditionally required if "Line Rating (Static or Dynamic)" = 'DYNAMIC' 2) Value must be from the following list: COAST, EAST, FAR_WEST, NORTH, NORTH_C, SOUTH_C, SOUTHERN, WEST, KABI, KAUS, KBRO, KCRP, KDFW, KGLS, KIAH, KJCT, KLRD, KLFK, KMAF, KMWL, KSJT, KSAT, KTYR, KVCT, KACT, KSPS, KINK, KPRX	Alpha
Resistance in P.U. (100 MVA Base)	1) Field is required 2) Value must be >= 0.0001 3) If Line Data - Line Voltage Level = 69kV, value must be <= 1.5 If Line Data - Line Voltage Level = 138kV or 345kV, value must be <= 0.5 WARN if value is outside of these conditions	Float
Reactance in P.U. (100 MVA Base)	1) Field is required 2) Value must be >= 0.0001 If Line Data - Line Voltage Level = 69kV, value must be <=1.0 If Line Data - Line Voltage Level = 138kV, value must be <=0.1 If Line Data - Line Voltage Level = 345kV, value must be <=.05 WARN if value is outside of these conditions	Float
Charging Susceptance in PU (100 MVA Base)	1) Field is required 2) Value must be >= 0 If Line Data - Line Voltage Level = 69kV, value must be <=0.3 If Line Data - Line Voltage Level = 138kV, value must be <=0.5 If Line Data - Line Voltage Level = 345kV, value must be <=1.75	Float
Type (overhead / underground)	1) Field is required 2) Value must be at from the following list: OVERHEAD, UNDERGROUND, BOTH	Alpha
Segment Length	1) Field is required 2) Value must > 0 3) Formula on Line Data - Segment Length: The formula to determine the length of a line based on the Reactance (X) and the Charging Susceptance (Chg) is 486 * SQRT(X_pu * Chg_pu). 25% variation This is a warning	Float
Line Rating (Static or Dynamic)	1) Field is required 2) Field must be from the following list: STATIC, DYNAMIC	Alpha
Nominal (Static) - Continuous Rating	1) This field is required regardless of STATIC or DYNAMIC 2) Value must be <= Nominal (Static) - 2-hr Emergency Rating	Integer

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

	field must be blank 3) If required, these values must be >= the subsequent dynamic rating. For example: 20 °F - 2-hr 15-min Rating >= 25 °F - 15-min Rating 25 °F - 2-hr 15-min Rating >= 30 °F - 15-min Rating 4) If required, within each temp rating, the following must apply Continuous Rating <= 2-hr Emergency Rating <= 15-min rating	
General	This tab is conditionally required if Private Network - Private Network? = 'Y'	N/A

13.0 Breaker / Switch Data

The Breaker and Switch Data tab is used for registering all breakers and switches. All Breakers and Switches registered here are those owned by the Resource Entity.

Each Breakers and Switches registered must use the name as it appears in the ERCOT model.

For directly connected devices, ERCOT requires at least 1 device, but no more than 10.

Breaker and Switch Business Rules / Basic Validations
Use this section to pre-validate the information entered into the RARF.

RARF DATA FIELD	Business Rules/Basic UI validations	Datatype
Description of Change	1) This field is conditionally Required - If there is a change to a tab, the change must be described.	Alpha
ERCOT Station Code Mnemonic	1) This field is required 2) Must match ERCOT records (unless new) 3) Must be <= 8 characters	Alpha
Is this a Fault Isolating Device (e.g. Circuit Breaker)	1) This is a required field 2) Values must from the following list: 'Y', 'N'	Alpha
Switch Name	1) This field is required 2) Value may contain no special characters except an underscore "_" and a dash "-" 3) Must be <=14 characters	Alpha
Normal Operating Status (when in-service)	1) This field is required 2) Value must be from the following list: 'OPEN', 'CLOSED'	Alpha
Voltage Level	1) This field is required. 2) If the value >= 69kv it must be 69,138, or 345 3) The value may not exceed 345 4) The value must be > 0	Float
Side 1 / Side 2 - Directly connected device name(s)	1) This field is required 2) Value may contain no special characters except an underscore "_" and a dash "-" 3) Must be <=17 characters	Alpha

General	This tab is required	N/A

14.0 Capacitor Reactor Data

The Capacitors Reactor Data tab is used for registering all capacitors and reactors. All Capacitor and Reactors registered here are those owned by the Resource Entity.

Each Capacitors Reactor registered must use the name as it appears in the ERCOT model.

Capacitors and Reactors Business Rules / Basic Validations
Use this section to pre-validate the information entered in the RARF.

RARF DATA FIELD	**Business Rules/Basic UI validations**	**Datatype**
Description of Change	1) This field is conditionally Required - If there is a change to a tab, the change must be described.	Alpha
ERCOT Station Code Mnemonic	1) This field is required 2) Must match ERCOT records (unless new) 3) Value must be <= 8 characters	Alpha
Capacitor or Reactor	1) This field is required 2) Value must be from the following list: 'C', 'R'	Alpha
Device Name	1) This field is required 2) Value may contain no special characters except an underscore "_" and a dash "-" 3) Must be <=14 characters	Alpha
Nominal MVAR	1) This field is required 2) Value must be > 0	Float
Voltage Level kV	1) This field is required. 2) If the value >= 69kv it must be 69,138, or 345 3) The value may not exceed 345 4) The value must be > 0	Float

PTI Bus Number	1) This field is optional 2) This field must be between 1 - 99,999	Float
Device Name(s) - that this reactive device is directly connected to	1) This field is optional 2) May not be > than 17 characters 3) May not contain special characters except for an underscore "_" and a dash "-"	Alpha
Automatic Voltage Regulation	1) This field is required 2) Value must be from the following list: 'Y', 'N'	Alpha
Voltage Level of Busbar being regulated	1) This field is conditionally required if Automatic Voltage Regulation = 'Y' 2) If the value >= 69kv it must be 69,138, or 345 3) The value may not exceed 345 4) The value must be > 0	Float
Desired Regulating voltage	1) This field is conditionally required if Automatic Voltage Regulation = 'Y' 2) The value may not exceed 345 3) The value must be > 0 4) The value must >= Minimum Regulating Voltage 5) The value must <=Maximum Regulating Voltage	Float
Minimum Regulating Voltage	1) This field is conditionally required if Automatic Voltage Regulation = 'Y' 2) The value may not exceed 345 3) The value must be > 0 4) The value must be <= Maximum Regulating Voltage 5) Warning if value exceeds 50% from Maximum Regulating Voltage	Float
Maximum Regulating Voltage	1) This field is conditionally required if Automatic Voltage Regulation = 'Y' 2) The value may not exceed 345 3) The value must be > 0 4) The value must be >= Minimum Regulating Voltage 5) Warning if value exceeds 50% from Minimum Regulating Voltage	Float

15.0 Transformers

GSU Transformers

Note that for associated units, this field is only for the GSU (Generator Step-Up) Transformer.

Some resources use multiple transformers for one unit and some have one transformer for multiple units. In order to accommodate this, the GSU section has been developed independent of units.

Ensure the proper unit(s) is(are) assigned to the transformer. A dropdown list is provided to supply the previously supplied unit name as identified on the General Information tab.

All Transformers

The Transformer Data tab is used for registering all transformers. All Transformer registered here are those owned by the Resource Entity.

There is only one Transformer data tab for all resource types.

Each Transformer registered must use the name as it appears in the ERCOT model.

Transformer Business Rules / Basic Validations
Use this section to pre-validate the information entered in the RARF.

RARF DATA FIELD	Business Rules/Basic UI validations	Datatype
Description of Change	1) This field is conditionally Required - If there is a change to a tab, the change must be described.	Alpha
ERCOT Station Name (Station Code or Station Mnemonic)	1) This field is required 2) Must match ERCOT records 3) Must be <= 8 characters	Alpha
Transformer Name	1) This field is required 2) Warn if >= 14 characters. First 14 characters must be unique 3) May not contain special characters except for an underscore "_" and a dash "-"	Alpha
Is this transformer in Master / Follower of Current Balancing configuration?	1) This field is required 2) Value must be in the following list: 'Y', 'N'	Alpha
Master Name (can be same as this transformer)	1) This field is conditionally required if Transformer Data - Is this transformer in Master / Follower of Current Balancing configuration? = 'Y' 2) Warn if >= 14 characters. First 14 characters must be unique 3) May not contain special characters except for an underscore "_" and a dash "-" 4) Either the Master Name or the Follower Name MUST = Transformer Data - Transformer Name	Alpha
Follower Name (can be same as this transformer)	1) This field is conditionally required if Transformer Data - Is this transformer in Master / Follower of Current Balancing configuration? = 'Y' 2) Warn if >= 14 characters. First 14 characters must be unique 3) May not contain special characters except for an underscore "_" and a dash "-" 4) Either the Master Name or the Follower Name MUST = Transformer Data - Transformer Name	Alpha

Generation Step-Up Transformer?	1) This field is required 2) Value must be in the following list: 'Y', 'N'	Alpha
Unit(s) associated with this transformer	1) This field is conditionally required - if Generation Step-up = 'Y', this is required 2) Value(s) must be <=17 characters 3) Warn if the unit name is not in the Unit Info - GEN or Unit Info - CC or Unit Info - Wind	Alpha
High Side Voltage Level (no-load)	1) This field is required 2) If the value >= 69kv it must be 69,138, or 345 3) The value may not exceed 345 4) The value must be > 0 5) The value must be >= Low Voltage Level (no-load)	Float
High Side Voltage Level (PTI)	1) This field is optional 2) This field must be between 1 - 99,999	Integer
High Side Voltage Connection - Wye or Delta	1) This field is required 2) Value must be of the following: 'Wye', 'Delta'	Alpha
High Side Voltage Connected devices (list on separate lines)	1) This field is required a) Error: if High Side Voltage >= 60kV and Low Side Voltage >1kV b) Warn: if High Side Voltage < 60kV and Low Side Voltage = 1kV 2) Warn if >= 17 characters 3) No special characters except an underscore or a dash	Alpha
High Side Manufactured Nominal Voltage	1) This field is required 2) If value > 60kV **Accepted** if value (using 5%) Deviates < |3.45| kV from 69 Deviates < |6.9| kV from 138 Deviates < |17.25| kV from 345 **Warn** if value (using >= 5% and <10%) Deviates > = |3.45| but deviates < |6.9| from 69 Deviates >= |6.9| but deviates < 13.8 from 138 Deviates >= |17.25| but deviates < 34.5 from 345 **Error** if value (using > =10%) Deviates >= |6.9| kV from 69 Deviates >= |13.8|kV from 138 Deviates >= |34.5|kV from 345 3) Warn if value > 345 4) The value must be > 0 5) High Side Manufactured Nominal Voltage >= Low Side Manufactured Nominal Voltage	Float
Low Side Voltage Level (no-load)	1) This field is required 2) If the value >= 69kv it must be 69,138, or 345 3) The value may not exceed 345 4) The value must be > 0 5) The value must be <= High Voltage Level (no-load) 6) If Generator Step-up Transformer = 'Y' AND Low Side Voltage Level (no-load) > 1kV AND Then the Low Side Voltage Level (no-load) must be equal to Unit Info - GEN / CC / WIND - Unit Generating Voltage	Float

Low Side Voltage Level (PTI)	1) This field is optional 2) This field must be between 1 - 99,999	Integer
Low Side Voltage Connected device(s) (list on separate lines)	1) This field is required a) Error: if High Side Voltage >= 60kV and Low Side Voltage >1kV b) Warn: if High Side Voltage < 60kV and Low Side Voltage = 1kV 2) Warn if >= 17 characters. 3) No special characters except an underscore "_" or a dash "-"	Alpha
Low Side Manufactured Nominal Voltage	1) This field is required 2) If the value >= 69kv: **Accepted** if value (using 5%) Deviates < |3.45| kV from 69 Deviates < |6.9| kV from 138 Deviates < |17.25| kV from 345 **Warn** if value (using >= 5% and <10%) Deviates > = |3.45| but deviates < |6.9| from 69 Deviates >= |6.9| but deviates < 13.8 from 138 Deviates >= |17.25| but deviates < 34.5 from 345 **Error** if value (using > =10%) Deviates >= |6.9| kV from 69 Deviates >= |13.8|kV from 138 Deviates >= |34.5|kV from 345 3) Warn if value > 345 4) The value must be > 0 5) High Side Manufactured Nominal Voltage >= Low Side Manufactured Nominal Voltage	Float
Series Resistance (100 MVA Base)	1) This field is required 2) Value must be >=0	Float
Series Reactance (100 MVA Base)	1) This field is required 2) Warn if value > 1. Error! Reactance (value) > 1.0. Reactance should be expressed in terms of per unit (e.g. not percentage).	Float
Continuous Rating	1) This field is required 2) Value must be <= 2-hr Emergency Rating 3) Value must be <= 15-min Rating	Integer
2-hr Emergency Rating	1) This field is required 2) Value must be >= Continuous Rating 3) Value must be <= 15-min Rating	Integer
15-min Rating	1) This field is required 2) Value must be >= Continuous Rating 3) Value must be >= 2-hr Emergency Rating	Integer
Automatic Voltage Regulation	1) This field is required 2) Value must be from the following list: 'Y', 'N'	Alpha
Does Transformer have a Load Tap Changer?	1) This field is conditionally required if Automatic Voltage Regulation = 'Y' 2) Value must be from the following list: 'Y', 'N'	Alpha
Location of Tap Changer	1) This field is required 2) Value must be of the following: 'HIGH', 'LOW'	Alpha
Base kV of Regulated Side	1) This field is conditionally required if Automatic Voltage Regulation = 'Y' 2) If the value >= 69kv it must be 69,138, or 345	Float

	3) The value may not exceed 345 4) The value must be > 0 5) The value must be >= Low Voltage Level (no-load)	
Target kV of Regulated Side	1) This field is conditionally required if Automatic Voltage Regulation = 'Y' 2) Value must be > 0	Float
Acceptable Deviation of Target Voltage in Percent	1) This field is conditionally required if Automatic Voltage Regulation = 'Y' 2) Value must not exceed 50%	Percentage
Low Tap Settings - Tap position at Manufactured Nominal Voltage	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap Second Condition: This field must be left blank if Low Voltage Level = 1 2) Note: this value may be negative	Integer
Low Tap Settings - Total Number of Tap Positions	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap Second Condition: This field must be left blank if Low Voltage Level = 1 2) Value must be >= 2 3) Warn if value < 16 and "Automatic Voltage Regulation" = 'Y'	Integer
Low Tap Settings - Normal Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out. Note that it is valid for both, Low and High Tap settings to be filled out. Second Condition: This field must be left blank if Low Voltage Level = 1 2) Value must be >= Low Tap Settings - Lowest Tap Position 3) Value must be <= Low Tap Settings - Highest Tap Position 4) Note: this value may be negative	Integer
Low Tap Settings - Lowest Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both,	Integer

	Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap Second Condition: This field must be left blank if Low Voltage Level = 1 2) Value must be <= Low Tap Settings - Highest Tap Position 3) Note: this value may be negative	
Low Tap Settings - Voltage at Lowest Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap Second Condition: This field must be left blank if Low Voltage Level = 1 2) Value must be <= Low Tap Settings - Voltage at Highest Tap Position 3) Value must be < High Tap Settings - Voltage at Lowest Tap Position 4) Value must be >= 0	Float
Low Tap Settings - Highest Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out. Note that it is valid for both, Low and High Tap settings to be filled out. Second Condition: This field must be left blank if Low Voltage Level = 1 2) Value must be >= Low Tap Settings - Low Tap Position 3) Note: this value may be negative	Integer
Low Tap Settings - Voltage at Highest Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out. Note that it is valid for both, Low and High Tap settings to be filled out. Second Condition: This field may be left blank if Low Voltage Level = 1 2) Value must be >= Low Tap Settings - Voltage at Lowest Tap Position 3) Value must be <= High Tap Settings - Voltage at Highest Tap Position 4) Value must be >= 0	Float
Low Tap Settings – Size of each Voltage Step	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of	Float

	the Load Tap Second Condition: This field may be left blank if Low Voltage Level = 1 2) Value must > 0 3) Warn if < 0.002 * Low Side Voltage Level (no-load) 4) Warn if > 0.05 * Low Side Voltage Level (no-load)	
High Tap Settings - Tap position at Manufactured Nominal Voltage	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap 2) Note: this value may be negative	Integer
High Tap Settings - Total Number of Tap Positions	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap 2) Value must be >= 2 3) Warn if value < 16 and "Automatic Voltage Regulation" = 'Y'	Integer
High Tap Settings - Normal Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap 2) Value must be >= High Tap Settings - LowestTap Position 3) Value must be <= High Tap Settings - Highest Tap Position 4) Note: this value may be negative	Integer
High Tap Settings - Lowest Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap	Integer

	2) Value must be <= High Tap Settings - Highest Tap Position 3) Note: this value may be negative	
High Tap Settings – Voltage at Lowest Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap 2) Value must be <= High Tap Settings - Voltage at Highest Tap Position 3) Value must be > Low Tap Settings - Voltage at Lowest Tap Position 4) Value must be >= 0	Float
High Tap Settings - Highest Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap 2) Value must be >= Low Tap Position 3) Note: this value may be negative	Integer
High Tap Settings - Voltage at Highest Tap Position	1) This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap 2) Value must be >= High Tap Settings - Voltage at Lowest Tap Position 3) Value must be > Low Tap Settings - Voltage at Highest Tap Position 4) Value must be > 0	Float
High Tap Settings – Size of each Voltage Step	1)This field is conditionally required If "Does transformer have a loadtap changer?" = 'Y' then either Low Tap Settings or High Tap Settings must be filled out based on the Location of the Load Tap Changer (e.g. Load Tap is on the high side, high tap settings is now required). Note that it is valid for both, Low and High Tap settings to be filled out if there is a non-load tap on the opposite side of the Load Tap 2) Value must > 0 3) Warn if < 0.002 * High Side Voltage Level	Float

	(no-load) 4) Warn if > 0.05 * High Side Voltage Level (no-load)	
General	This tab is conditionally required if Private Network - Private Network? = 'Y'	N/A

16.0 Static Var Compensator

The Static Var Compensator Data tab is used for registering all Static Var Compensator. All Static Var Compensator registered here are those owned by the Resource Entity.

Each Static Var Compensator registered must use the name as it appears in the ERCOT model.

Static Var Compensator Business Rules / Basic Validations
Use this section to pre-validate the information entered in the RARF.

RARF DATA FIELD	**Business Rules/Basic UI validations**	**Datatype**
Description of Change	1) This field is conditionally Required - If there is a change to a tab, the change must be described.	Alpha
ERCOT Station Name (Station Code or Station Mnemonic)	1) This field is required 2) Must match ERCOT records (unless new) 3) Must be <= 8 characters	Alpha
SVC Name	1) This field is required 2) May not be > than 14 characters 3) May not contain special characters except for an underscore "_" and a dash "-"	Alpha
Device Name(s) - that this reactive device is directly connected to	1) This field is optional 2) May not be > than 17 characters 3) May not contain special characters except for an underscore "_" and a dash "-"	Alpha

SVC Base Voltage Level	1) This field is required 2) If the value >= 69kv it must be 69,138, or 345 3) The value may not exceed 345 4) The value must be > 0	Float
Fixed MVAR (VAR injection at nominal voltage)	1) This field is required 2) Value must be > 0	Float
Minimum Admittance Limits (100 MVA Base)	1) This field is required 2) Value must be <= Maximum Admittance	Float
Maximum Admittance Limits (100 MVA Base)	1) This field is required 2) Value must be >= Minimum Admittance	Float
Minimum Steady State Reactive Power Limits	1) This field is required 2) Value must be >= Maximum Steady State Reactive Power Limits	Float
Maximum Steady State Reactive Power Limits	1) This field is required 2) Value must be >= Minimum Steady State Reactive Power Limits	Float
Minimum Threshold (post contingency) Reactive Power Limits	1) This field is required 2) Value must be <= Maximum Threshold (post contingency) Reactive Power Limits	Float
Maximum Threshold (post contingency) Reactive Power Limits	1) This field is required 2) Value must be >= Minimum Threshold (post contingency) Reactive Power Limits	Float

Minimum Voltage Threshold (100 MVA Base)	1) This field is required 2) Value must be <= Maximum Voltage Threshold (100 MVA Base) 3) The value may not exceed 345 3) The value must be > 0 4) Warn if Max / Min exceed 50% of one another	Float
Maximum Voltage Threshold (100 MVA Base)	1) This field is required 2) Value must be >= Minimum Voltage Threshold (100 MVA Base) 3) The value may not exceed 345 4) The value must be > 0 5) Warn if Max / Min exceed 50% of one another	Float

17.0 Series Device Data

The Series Device Data tab is used for registering all Series Devices. All Series Devices registered here are those owned by the Resource Entity.

Each Series Device registered must use the name as it appears in the ERCOT model.

Series Device Business Rules / Basic Validations
Use this section to pre-validate the information entered in the RARF.

RARF DATA FIELD	Business Rules/Basic UI validations	Datatype
Description of Change	1) This field is conditionally Required - If there is a change to a tab, the change must be described.	Alpha
Series Device Name	1) This field is required 2) Warn if >= 14 characters. First 14 characters must be unique 3) No special characters except and underscore	Alpha
ERCOT Station Name (Station Code or Station Mnemonic)	1) This field is required 2) Must match ERCOT records (unless new) 3) Must be <= 8 characters	Alpha
Voltage Level	1) This field is required 2) If the value >= 69kv it must be 69,138, or 345 3) The value may not exceed 345 4) The value must be > 0	Float
Side 1 - Connected Switching Device Name(s)	1) This field is required 2) May not be > than 17 characters 3) May not have duplicates within the TO or FROM Station 4) May not contain special characters except for an underscore "_" and a dash "-"	Alpha
Side 1 - Bus Number (PTI Bus Number)	1) This field is optional 2) This field must be between 1 - 99,999	Integer
Side 2 - Connected Switching Device Name(s)	1) This field is required 2) May not be > than 17 characters 3) May not have duplicates within the TO or FROM Station 4) May not contain special characters except for an underscore "_" and a dash "-"	Alpha

Side 2 - Bus Number (PTI Bus Number)	1) This field is optional 2) This field must be between 1 - 99,999	Integer
Resistance	1) This value is required 2) Value must be > 0	Float
Reactance	1) This value is required 2) Value must be > 0	Float
Continuous Rating	1) This field is required 2) Value must be <= 2-hr Emergency Rating 3) Value must be <= 15-min Rating	Float
2-hr Emergency Rating	1) This field is required 2) Value must be >= Continuous Rating 3) Value must be <=15-min Rating	Float
15-min Rating	1) This field is required 2) Value must be >= Continuous Rating 3) Value must be >= 2-hr Emergency Rating	Float

18.0 Load Data

The Load Data tab is used for registering Load as it defined in this section. All Load registered here are those owned by the Resource Entity.

Each Load registered must use the name as it appears in the ERCOT model. For equivalent Loads, it may be necessary to work with ERCOT to determine the naming.

Loads which are connected on a Bus greater than or equal to 60kV need to be modeled individually

Loads connected at less than 60kV may be aggregated into an “equivalent load” at the 69kV Bus

Auxiliary and Site Service Load may be combined
Note: Auxiliary load is defined as that which is only present when the generator is running

Load Business Rules / Basic Validations
Use this section to pre-validate the information entered in the RARF.

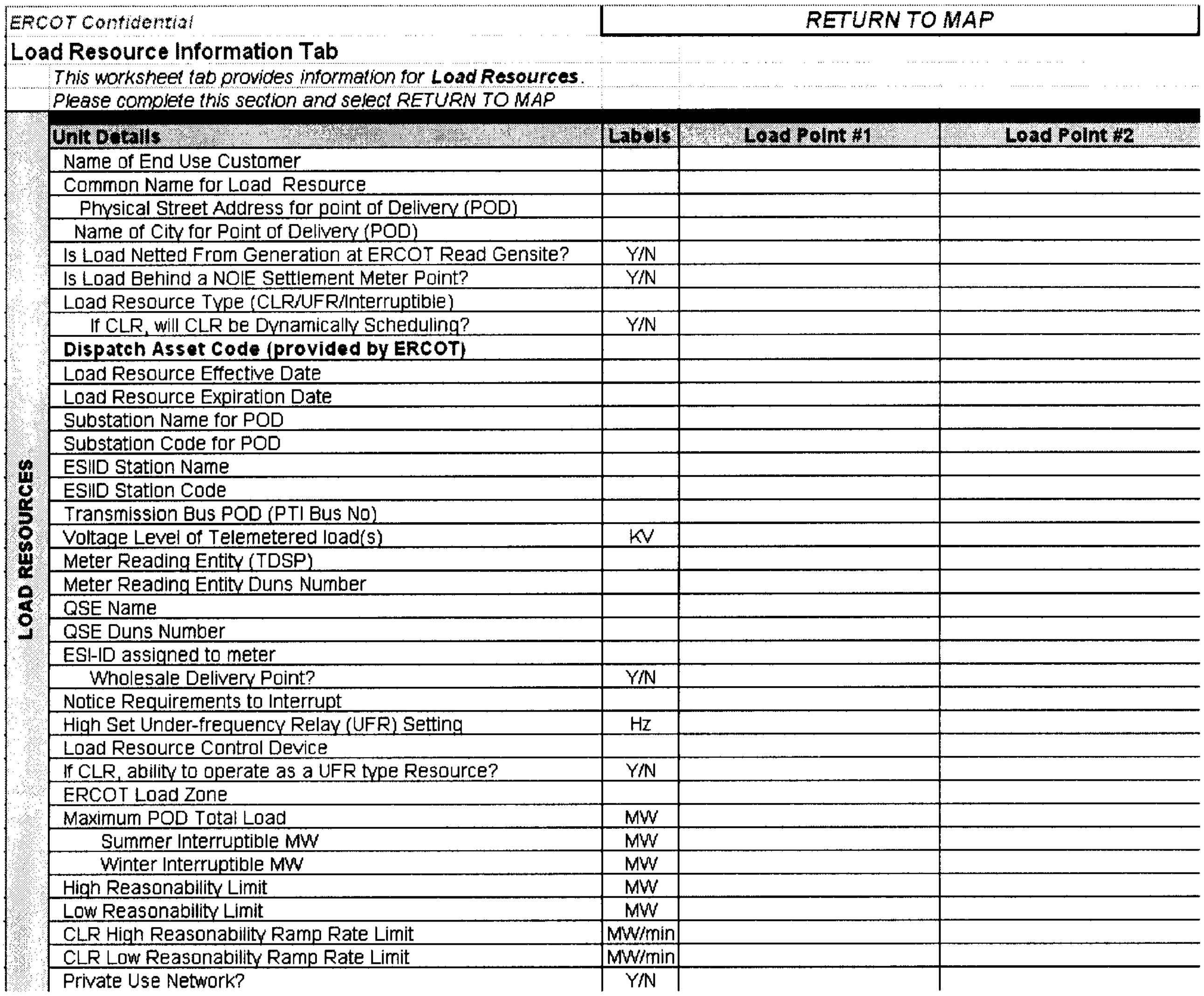
RARF DATA FIELD	Business Rules/Basic UI validations	Datatype
Load Voltage Level	1) This field is required 2) Value must be >= 0 3) If the value >= 69kv it must be 69,138, or 345	Float
PTI Bus Number	1) This field is optional 2) This field must be between 1 - 99,999	Integer
Device Name(s) - that this load is physically connected to	1) This field is required 2) Warn if >= 17 characters. First 14 characters must be unique 3) No special characters except an underscore or a dash	Alpha
Average MW Load Under Normal Operations	1) This field is required 2) Value must be > 0	Float
Average MVAR Under Normal Operations	1) This field is required	Float

	2) Value must be > 0	
General	This tab is conditionally required if Private Network - Private Network? = 'Y'	N/A

19.0 Load Resources

Load Resources must complete the General Information tab as well as the two tabs discussed here.

19.1 Load Resource Information



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RETURN TO MAP

Load Resource Information Tab

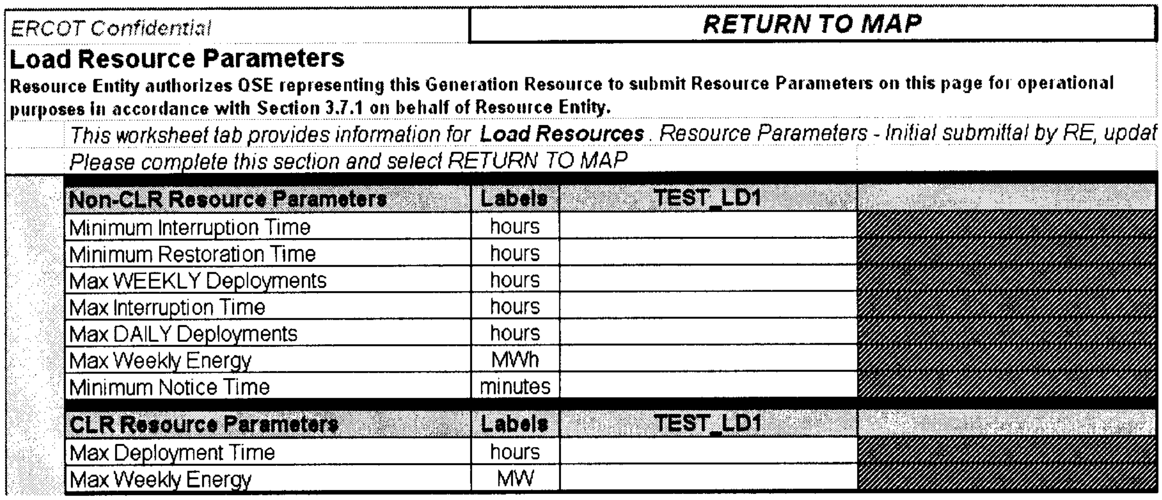
This worksheet tab provides information for ***Load Resources****.*

Please complete this section and select RETURN TO MAP

LOAD RESOURCES

Unit Details	**Labels**	**Load Point #1**	**Load Point #2**
Name of End Use Customer			
Common Name for Load Resource			
Physical Street Address for point of Delivery (POD)			
Name of City for Point of Delivery (POD)			
Is Load Netted From Generation at ERCOT Read Gensite?	Y/N		
Is Load Behind a NOIE Settlement Meter Point?	Y/N		
Load Resource Type (CLR/UFR/Interruptible)			
If CLR, will CLR be Dynamically Scheduling?	Y/N		
Dispatch Asset Code (provided by ERCOT)			
Load Resource Effective Date			
Load Resource Expiration Date			
Substation Name for POD			
Substation Code for POD			
ESIID Station Name			
ESIID Station Code			
Transmission Bus POD (PTI Bus No)			
Voltage Level of Telemetered load(s)	KV		
Meter Reading Entity (TDSP)			
Meter Reading Entity Duns Number			
QSE Name			
QSE Duns Number			
ESI-ID assigned to meter			
Wholesale Delivery Point?	Y/N		
Notice Requirements to Interrupt			
High Set Under-frequency Relay (UFR) Setting	Hz		
Load Resource Control Device			
If CLR, ability to operate as a UFR type Resource?	Y/N		
ERCOT Load Zone			
Maximum POD Total Load	MW		
Summer Interruptible MW	MW		
Winter Interruptible MW	MW		
High Reasonability Limit	MW		
Low Reasonability Limit	MW		
CLR High Reasonability Ramp Rate Limit	MW/min		
CLR Low Reasonability Ramp Rate Limit	MW/min		
Private Use Network?	Y/N		

19.2 Load Resource Parameters



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Load Resource Parameters

Resource Entity authorizes OSE representing this Generation Resource to submit Resource Parameters on this page for operational purposes in accordance with Section 3.7.1 on behalf of Resource Entity.

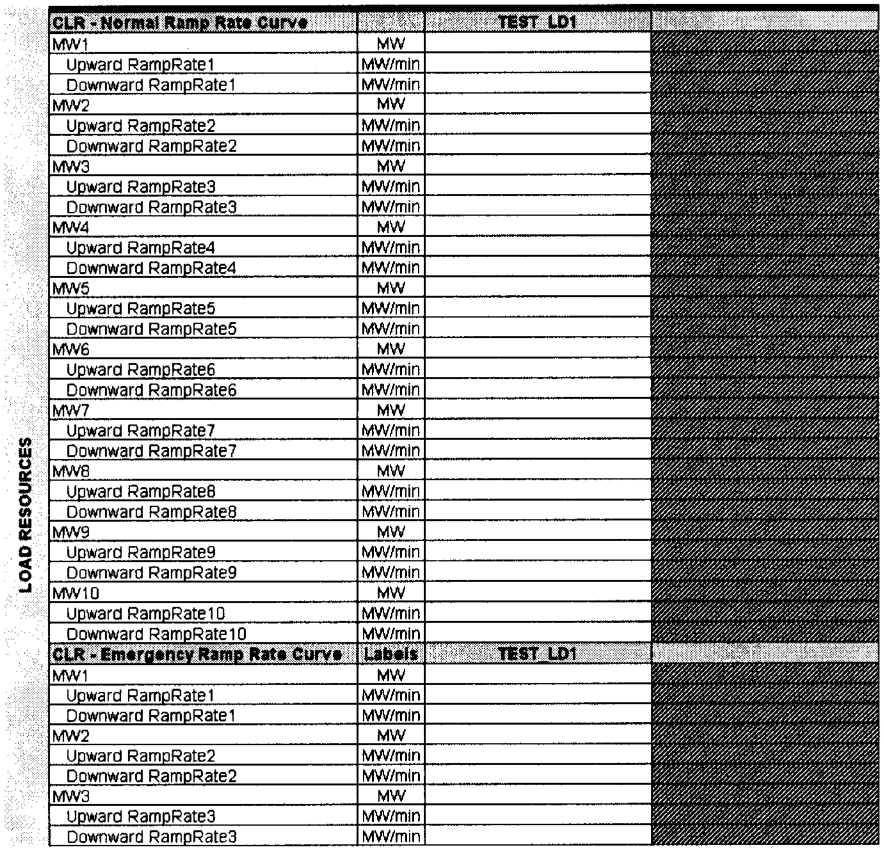
*This worksheet tab provides information for **Load Resources**. Resource Parameters - Initial submittal by RE, updat*

Please complete this section and select RETURN TO MAP

Non-CLR Resource Parameters	Labels	TEST_LD1	
Minimum Interruption Time	hours		
Minimum Restoration Time	hours		
Max WEEKLY Deployments	hours		
Max Interruption Time	hours		
Max DAILY Deployments	hours		
Max Weekly Energy	MWh		
Minimum Notice Time	minutes		
CLR Resource Parameters	**Labels**	**TEST_LD1**	
Max Deployment Time	hours		
Max Weekly Energy	MW		

19.3 CLR Ramp Rates

CLRs must provide Ramp Rate Curves. For information on building the curves, see section 7.4.



LOAD RESOURCES

CLR - Normal Ramp Rate Curve		TEST_LD1	
MW1	MW		
Upward RampRate1	MW/min		
Downward RampRate1	MW/min		
MW2	MW		
Upward RampRate2	MW/min		
Downward RampRate2	MW/min		
MW3	MW		
Upward RampRate3	MW/min		
Downward RampRate3	MW/min		
MW4	MW		
Upward RampRate4	MW/min		
Downward RampRate4	MW/min		
MW5	MW		
Upward RampRate5	MW/min		
Downward RampRate5	MW/min		
MW6	MW		
Upward RampRate6	MW/min		
Downward RampRate6	MW/min		
MW7	MW		
Upward RampRate7	MW/min		
Downward RampRate7	MW/min		
MW8	MW		
Upward RampRate8	MW/min		
Downward RampRate8	MW/min		
MW9	MW		
Upward RampRate9	MW/min		
Downward RampRate9	MW/min		
MW10	MW		
Upward RampRate10	MW/min		
Downward RampRate10	MW/min		
CLR - Emergency Ramp Rate Curve	**Labels**	**TEST_LD1**	
MW1	MW		
Upward RampRate1	MW/min		
Downward RampRate1	MW/min		
MW2	MW		
Upward RampRate2	MW/min		
Downward RampRate2	MW/min		
MW3	MW		
Upward RampRate3	MW/min		
Downward RampRate3	MW/min		

20.0 Additional Information

A Resource Entity and its assets must be registered separately, using the forms provided on the ERCOT Resource Entities Registration and Qualification webpage.
http://www.ercot.com/services/rq/re/

Each RE must also be represented by a Qualified Scheduling Entity (QSE), which establishes a control interface with ERCOT. If questions arise related to the completion of this or any other registration form, please contact your designated ERCOT Account Manager or email Wholesale Client Services at NodalMarketTransition@ercot.com.

EXHIBIT D

ERCOT
THE TEXAS CONNECTION

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

ERCOT has been notified by the QSE of the planned unit start-up testing for the Operating Day.

- Maximum capability and MVAR testing for the new unit will be planned in accordance with ERCOT procedures.

Attachment 1: Request to Commission Station Checklist

[RESOURCE ENTITY submits checklist to commission station]

RE Name:

Agent (optional):

Date form completed:

Proposed Station Energize Date:

* Actual date contingent on completion of requirements and approval from ERCOT.

Primary contact for Station Commissioning (Contacts may be RE's Agent):

Primary Contact Name:

Primary Contact Telephone Number:

Primary Contact E-mail Address:

Gen Site Name:	TDSP:	ESI ID:

Congestion Zone: Transmission Voltage:

Special Protection Scheme (SPS) Yes☐ No ☐

Can unit synchronously connect to another grid? Yes ☐ No☐

Identify the QSE/TDSP responsible for sending ERCOT station telemetry:

QSE primary contact (may be QSE's Agent):	TDSP primary telemetry contact:
Name:	Name:
Telephone Number:	Telephone Number:
E-mail Address:	E-mail Address:

By signing below I attest that information provided on this form (Attachment 1) is true, correct and complete, and that any substantial changes in such information will be provided to the Electric Reliability Council of Texas (ERCOT) in a timely manner.

Signature:

(RE Authorized Representative)

Printed Name:

(RE Authorized Representative)

Date Signed:

The QSE and Resource Entity are required to remain in compliance with ERCOT Protocol and Operating Guide upon initial day the interconnect becomes operational. The QSE will comply with telemetry requirements and procedures for operation of station to new Resource.

☐ Generation facility is in an ERCOT Control Area and is being reported by that RE's QSE to the ERCOT ISO in the manner as specified in Section 3 of the ERCOT Operating Guides, or any applicable ERCOT agreement requiring information on generation.

☐ Unit is greater than 10MW per ERCOT Operating Guide No. 3.1.4.

☐ Station telemetry from the facility's interconnecting station is in place and operational as of _____ (date) to QSE and TDSP (Optional) required under ERCOT Operating Guide No. 3.1.3.1 and ERCOT Operating Guide Attachment 8a. Enter specific comments about status of station telemetry in comment box on telemetry checklist below.

☐ RE's QSE has reliable voice communications for station operations to new Generating Facility, ERCOT Control Area, and TDSP (Optional) ERCOT Operating Guide No. 3.1.3.1.

☐ Resource Entity has provided ERCOT the technical equipment data to be used in modeling studies per ERCOT Operating Guide No. 3.1.4. **Comments:** _____

Station Telemetry

	Data	**Frequency**	**Mode**	**Reference/Comments**
☐	Station Switching Device status	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. (High side Typical TSP telemetry point; Low side typical QSE telemetry point) **RE Comment:**
☐	Station Breaker status	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision.(Typical QSE telemetry point) **RE Comment:**
☐	Generating Unit High Side bus voltage	10 sec	RTU/ICCP	Protocol Section 6.5.7, Voltage Support Service, May be supplied by the TDSP. (Typical TDSP telemetry point) or Low Side voltage with appropriate transformer model may be substituted.(Typical QSE telemetry point) **RE Comment:**
☐	Station Static Reactive Device(s) status	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision.(Typical QSE telemetry point) **RE Comment:**

	Data	Frequency	Mode	Reference/Comments
☐	Transmission Line Flow	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. (RE has confirmed that TSP is providing required points). **RE Comment:**

Attachment 2: Request for Initial Synchronization Checklist

[QSE submits checklist to request initial start-up]

QSE Name:

Agent (optional):

Date form completed:

* Proposed Initial Synchronization Date :

* Actual date contingent on completion of requirements and approval from ERCOT.

Primary and back-up contact personnel for Initial Synchronization (may be QSE's Agent):

Primary for Initial Synchronization Contact Name:

Primary Contact Telephone Number:

Primary Contact E-mail Address:

Back-Up Contact Name:

Back-Up Contact Telephone Number:

Back-Up Contact E-mail Address:

*If the unit is Split Metered:

Identify the QSE responsible for coordinating the start-up testing: ________________

Identify all of the QSE's that are sharing this unit: ________________

Identify all of the ESI ID's that are related to this unit: ________________

Projected Commercial Date (unit available for market and/or reliability commitment): ________________

By signing below I attest that information provided on this form (Attachment 2) is true, correct and complete, and that any substantial changes in such information will be provided to the Electric Reliability Council of Texas (ERCOT) in a timely manner.

Signature: ________________________
(QSE Authorized Representative)

Printed Name: ________________________
(QSE Authorized Representative)

Date Signed: ________________________

The QSE and Resource Entity are required to remain in compliance with ERCOT Protocol and Operating Guide upon initial day the interconnect becomes operational. The QSE will comply with procedures for new unit start-up testing, with initial synchronization schedule communicated to ERCOT Shift Supervisor.

If the new unit does not successfully synchronize to the ERCOT Transmission System within 30 days, as per **Procedure Step 2** above, the QSE will notify its ERCOT Client Representative of corrective measures and expected timelines for successful unit synchronization and unit testing.

☐ Generation facility is in an ERCOT Control Area and is being reported by that QSE to the ERCOT ISO in the manner as specified in Section 3 of the ERCOT Operating Guides, or any applicable ERCOT agreement requiring information on generation.

☐ Telemetry from the facility (station and generation) is in place and operational as of _____ (date) to QSE and TDSP (Optional). Enter specific comments about status of telemetry in QSE comment box on telemetry checklist on next page.

☐ QSE telemetry is being provided to ERCOT ISO (This information is summarized in Attachment 2 QSE New Generator Telemetry Checklist and is provided to assist Market Participants in identifying the telemetry required under ERCOT Operating Guide No. 3.1.3.1 and ERCOT Operating Guide Attachment 8a).

☐ QSE has reliable voice communications with the Generating Facility, ERCOT Control Area, and TDSP (Optional) ERCOT Operating Guide No. 3.1.3.1.

☐ Generation facility has automatic voltage regulators (in Voltage Control Mode) (AVR) and power system stabilizers (PSS) in service as of _____ (date) per ERCOT Operating Guide No. 3.1.4.5. AVR and PSS performance tests will be reported ERCOT within 30-days after start of commercial operations. **Comments:** _____

☐ The QSE is able to dispatch the reactive output (VARS) of this generation facility to maintain adequate transmission voltage at the point of Interconnection. (ERCOT Operating Guide 2.10.4.1 and 2.10.4.2). **Describe process for VAR dispatch**: _____

☐ QSE has submitted generation facility machine characteristics and plant design to incorporate the under frequency load shedding philosophy and criteria of ERCOT Operating Guide No. 3.1.4.6.

☐ Generation facility protective relaying is in place and operational, necessary to protect equipment from abnormal conditions consistent with the Control Area protective relaying criteria as described in ERCOT Operating Guide No. 3.1.4.6. **Comments:** _____

New Generator Telemetry Checklist

	Data	Frequency	Mode	Reference/Comments
☐	Real Time data accuracy			Real Time data for reliability purposes must be accurate to within three percent (3%). This telemetry may be provided from relaying accuracy instrumentation transformers. **QSE Comment:**
☐	Generating Unit gross and net MW output	2 sec	RTU	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. Net Generation is preferred. Otherwise, aux load should also be provided. **QSE Comment:**
☐	Generating Unit gross and net MVar output	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. Net Generation is preferred. Otherwise, aux load should also be provided. **QSE Comment:**
☐	Switching Device status other than reported in Attachment 1	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. **QSE Comment:**
☐	Breaker status other than reported in Attachment 1	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. **QSE Comment:**
☐	Generating Unit High Operating Limit	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. **QSE Comment:**
☐	Generating Unit Low Operating Limit	10 sec	RTU/ICCP	Protocol Section 6.5.1.1, Requirement for Operating Period Data for System Reliability and Ancillary Service Provision. **QSE Comment:**
☐	Generating Unit Automatic Voltage Regulator status	10 sec	RTU/ICCP	Protocol Section 6.5.7.2 QSE Responsibilities. Applies to units required to provide VSS. **QSE Comment:**
☐	Generating Unit Power System Stabilizer status			Protocol Section 6.5.7.2 QSE Responsibilities. Applies to units required to provide VSS. **QSE Comment:**

Wind-Generation Resource Only

	Additional Wind Resource Data	Frequency (sec)	Protocol Reference
☐	Wind Speed (Miles per Hour)	10	6.5.11 (7)
☐	Wind Direction (Degrees)	10	6.5.11 (7)
☐	Temperature (Celsius)	10	6.5.11 (7)
☐	Barometric Pressure (Millibars)	10	6.5.11 (7)

QSE Comment: _____

EXHIBIT E

From: Nodal Market Transition [mailto:NodalMarketTransition@ercot.com]
Sent: Friday, November 21, 2008 3:22 PM
To: Hayes, Brian; Freiman, Leslie
Cc: Daniel, Matthew; Hayes, Brian; Carmen, Travis; Nodal Market Transition; Middleton, Scott
Subject: Resource RARF Approval Notice - POST OAK WIND LLC- DUNS# 791082162

Resource Entities:

Your RARF submittal has passed all iterations of Nodal CIM business rules for Resource MMS and EMS parameters and is approved for loading into the Nodal CIM data base in December. We congratulate your staff for meeting and exceeding the time line in helping ERCOT reach the target for production quality data in time for the Critical Path CIM project.

Changes to Resource parameters you may need going forward are to be made using your last approved version and submitted on a TML Service Request as before by the Authorized Representative's digital certificate so ERCOT may properly document the change request.

For a revision initiated by the Resource Entity ERCOT will run an audit report upon receiving the updated RARF data to ensure that it is reviewed and validated against applicable business rules.

The next stage of RARF data submittals and validations ERCOT will initiate is planned for 2009 when the market will be transitioning to the single entry model.

For any assistance with resource registration please call or email your ERCOT Account Manager or email NodalMarketTransition@ercot.com.

Sincerely,

ERCOT Wholesale Client Services

Classification: ERCOT Confidential

EXHIBIT F

PRR Comments

PRR Number	830	**PRR Title**	**Reactive Power Capability Requirement**

Date	November 03, 2009

Submitter's Information	
Name	Matt Daniel
E-mail Address	Matthew.Daniel@horizonwind.com
Company	Horizon Wind Energy LLC
Phone Number	713-265-0350
Cell Number	
Market Segment	Independent Generator

Comments

Horizon Wind Energy appreciates this opportunity to comment on PRR 830, Reactive Power Capability Requirement. Horizon supports reliability and efforts to increase reliability on the ERCOT System, but PRR 830 will not provide additional reliability benefits. No study has been done to determine that any existing generation needs to retrofit to accommodate a reliability situation on the grid and neither ERCOT, nor any other party providing comments, has demonstrated that any reliability problem exists with the Wind-powered Generation Resources (WGRs) now connected to the grid. Despite this, existing WGRs are being asked to install retrofits on operating generation at significant expense. For Horizon alone, the costs are estimated to be tens of millions of dollars.

WGRs have sited thousands of megawatts of capacity in the ERCOT market. That capacity has Reactive Power capability consistent with the existing ERCOT Protocols and other guidance. That capability has been reported in asset registration forms. When interconnection studies showed the need, WGRs have installed additional reactive equipment.

Some commenters argue that WGRs shift costs because they only provide half of the "rectangle." This is simply not true. First, the requirement in the Protocols is to comply with a Reactive Power standard of the triangle. Many generators, in fact all built before 1999 (conventional generators), avoid the rectangle requirement because they are exempted. The argument that WGRs are shifting costs is made by the same generators who are largely exempt from these requirements for the bulk of their generation fleet. Yet WGRs are the only Market Participants asked to undergo retrofits. In actuality, instead of shifting costs to other Market Participants, WGRs have paid more to support system reliability by going above the Protocol requirements when the TDSP stated that additional reactive capability was necessary.

PRR Comments

Wind power has lowered the price of power in ERCOT, to the benefit of most Market Participants, particularly Load Serving Entities (LSEs) and ultimately to the consumers. PRR 830 would increase system costs without any real justification. WGRs would be required to increase investment in projects that have been operating for years, which costs would need to be recovered through higher prices. Further, it is possible that WGRs that provide power to the system will need to be taken off-line for these retrofits to be done. Removing wind generation or making wind generation more expensive will serve to benefit only the generators that would not otherwise be dispatched if the wind generation were running—gas-fired generators. A policy of requiring retrofits also increases costs by increasing investor uncertainty about additional costs that may be imposed on existing assets and even more so on new projects.

If the target is to get to the "rectangle" ERCOT-wide, all exemptions should be removed from the rectangle requirement. However, in the instant situation, there is no demonstrated need for the rectangle. PRR 830 also attempts to insert into the Protocols the requirement that Reactive Power capability be provided using more expensive dynamic equipment, instead of static devices that many WGRs now use. No study supports such action by ERCOT or such investment of potentially hundreds of millions of dollars by one segment of the generation market.

ERCOT has known the capability of WGRs in the ERCOT market for years. WGRs have supplied Generation Asset Registration Forms ("GARFs"), and Resource Asset Registration Forms ("RARFs") that clearly demonstrate the capability in the shape of a triangle and not the rectangle. Until recently, the Resource Asset Registration Guide even demonstrated by pictorial that the minimum requirement is the triangle, not the rectangle.

Despite claims to the contrary, ERCOT's current interpretation of the Reactive Power requirements in the Protocols remains in dispute. It is the subject of an appeal active at the Public Utility Commission of Texas (PUCT). PUCT Docket 36482, Appeal of Competitive Wind Generators Regarding the Electric Reliability Council of Texas' Interpretation of the Reactive Power Protocols, demonstrates that a serious controversy remains about required Reactive Power capability. The docket was initiated when a group of WGR owners (the Competitive Wind Generators) appealed ERCOT's November 2008 Legal Interpretation that the Protocols require all Generation Resources that are not otherwise exempt to provide the same amount of Reactive Power that they are capable of at their rated output at any level of output. This puts Generation Resources that had been approved for interconnection without that capability (except those exempted or grandfathered by the Protocols already) at risk of penalties for not complying with Protocol standards. For some Resources, the exposure would be three years of penalties, potentially levied on every wind turbine in WGR.

Throughout the appeal, ERCOT steadfastly maintained that the requirement had always been clear, and that WGRs should retrofit even without some demonstration of need. However, every Standard Generation Interconnection Agreement (SGIA), by contract in the form approved by the PUCT, requires that "unless exempt, the TSP shall timely request **ISO** and all regulatory approvals necessary to carry out its responsibilities." Moreover, before each of these WGRs, that had submitted GARFs or RARFs, depending on the timing, was energized, ERCOT specifically approved interconnection checklists, which include demonstration of Reactive Power capabilities prior to energization. As a System Operator, ERCOT knew exactly what the requirements were and exactly what the WGRs were connecting to the grid. To now state years later that the standard applicable to these WGRs, that have invested billions in the ERCOT market based on the rules in place at the time, is somehow different and that these WGRs are causing system reliability issues can mean only one of two things. Either 1) ERCOT did not pay attention to its own requirements in the Protocols and what it was connecting to the grid; or 2) ERCOT knew the standards were right and the WGRs were compliant, hence the compliance letters that WGRs met the standards.

What has changed between now and then? As discussed at the PRS meeting in response to the question by the Independent Market Monitor, the modeling for Competitive Renewable Energy Zone (CREZ) transmission evidently assumed that all WGRs were meeting a different standard than that in the Protocols—the full dynamic rectangle standard that ERCOT now claims all WGRs must meet. There is still no evidence that this standard is required to accommodate CREZ generation. However, ERCOT's response has not been to change the model, but to change the requirements so that ERCOT itself can state that it has complied with North American Electric Reliability Corporation (NERC_ requirements relating to planning.

ERCOT's description of PRR 830 says, in part: "This PRR clarifies the Reactive Power capability requirement for all Generation Resources, including existing WGRs". If ERCOT's interpretation of Reactive Power capability requirementsin the Protocols is indeed accurate, there should be no need to clarify the Protocols that ERCOT says are already clear. Leaving that aside, the reality on the ground proves that the Protocols have not been interpreted in practice by WGRs, ERCOT or Transmission and/or Distribution Service Providers (TDSPs) in the way ERCOT reads them now and is attempting to change them through PRR 830. Thousands of megawatts of wind resource capacity have interconnected with the ERCOT Transmission Grid without the capability that is supposedly clearly required by Protocols.

Paragraphs (3) and (4) of Protocol Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, are explicit about which Generation Resources are exempt from completely meeting the Reactive Power capability requirement. Since the end date of that exemption, over 40 WGRs with approximately 7,000 MW of capacity have interconnected with the ERCOT Transmission Grid. The vast majority of these WGRs do not meet ERCOT's interpretation of the required Reactive Power capability. This fact can be verified by reviewing the asset registration forms that ERCOT accepted from these WGRs, and from the results of an informal survey ERCOT undertook in the last half of 2008 of WGR capabilities and procedures. It is hard to comprehend how so many projects could be interconnected in derogation of ERCOT's interpretation of the Reactive Power requirements, particularly if such interconnections would create reliability problems—which has not been shown in actuality, only discussed hypothetically in the comments of ERCOT and Calpine.

As attendees of the October 22nd PRS meeting were reminded, Reactive Power is a local service; it does not travel well. Requiring all WGRs to install more equipment simply because the requirements are re-interpreted would only increase costs—long after the investment in the Texas market has been financed. There is no demonstrated nexus between the imposition of these extra costs and the improvement in system safety or reliability.

PRR Comments

A broader concern is that PRR 830 continues efforts to require retrofits without justification. The retrofit provisions in PRR 830 obviously hurt WGRs that have located in the ERCOT market—particularly given that the ERCOT interpretation of dynamic rectangle was not feasible by any wind turbine on the market at the time the Protocol language was drafted. Attempts to substantively change standards on a going-forward basis, as has always been the case in ERCOT, should be based on actual studies demonstrating need and/or benefits for the market. However, requiring retrofits from WGRs that met the ERCOT standards in effect at the time, and singling out one new generation technology on which the standards have been changed, while continuing to exempt older technologies, raises fairness issues and frustrates the investment-backed expectation of those generators that answered the call to invest in the ERCOT market.

The impact of WGRs on the ERCOT Transmission Grid has been to lower power prices. This result is not unique to ERCOT. Other regions with significant wind capacity are saving money, too. The impacts may be greater in ERCOT, however, given the installed generation fleet. Those impacts have been widely reported. Results of analysis by Bernstein Research showing that increased wind capacity in ERCOT has reduced power prices have appeared in a variety of publications, including a Wall Street Journal Blog[1] and Coal Power magazine[2]. The following excerpt summarizes the expected impact of lower power costs in general terms. For 2008 wind generation is calculated to have reduced the annual average price per MWh by $2.00.

> *"In ERCOT, the growth in wind generation is expected to push gas off the margin during certain off-peak hours and, during the hours when gas plants are operating, to reduce the marginal cost of supply by curtailing the hours run by higher cost combustion turbines."*[3]

It goes without saying that consumers benefit from lower prices. It's equally clear that this benefit comes by displacing high cost generation. As more wind capacity is installed, consumers will benefit while competing generators will see lower revenue. PRR 830 would shift this equation by imposing additional costs on both future and existing WGRs. The true impact analysis of PRR 830 is that it will raise prices in the ERCOT market, diminishing the benefits of wind generation the Texas Legislature and the PUCT have worked to achieve.

PRR 830 should be rejected.

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[1] "Will Wind Power Blow Texas Generators Away?" posted on Wall Street Journal's Environmental Capital Blog, August 10, 2009. http://blogs.wsj.com/environmentalcapital/2009/08/10/blown-away-wind-power-makes-electricity-cheaper-in-texas/

[2] "Texas Wind Boom Cutting into Fossil Generator Profits" in Coal Power magazine, October 8, 2009 http://www.coalpowermag.com/ops_and_maintenance/223.html

[3] P. 4, Bernstein Commodities & Power: The Impact of Wind on Power Prices and Coal and Gas Consumption, September 4, 2009

PRR Comments

Revised Proposed Protocol Language

None.

EXHIBIT G

PRR Comments

PRR Number	830	**PRR Title**	**Reactive Power Capability Requirement**

Date	October 8, 2009

Submitter's Information	
Name	Matt Daniel
E-mail Address	Matthew.Daniel@horizonwind.com
Company	Horizon Wind Energy LLC
Phone Number	713-265-0350
Cell Number	
Market Segment	Independent Generator

Comments

Horizon Wind Energy LLC appreciates the opportunity to offer comments on PRR830, Reactive Power Capability Requirement. Horizon believes that Market Participants have the responsibility to provide capabilities required by the market rules, and has ensured that our Wind-powered Generation Resources (WGRs) fulfill that responsibility.

The introductory comments for PRR830 say it is a clarification of Reactive Power requirements and is intended to be prospective, even a cursory review shows that it goes far beyond clarification. In addition to redefining the terms for Reactive Power service and adding new definitions for existing terms, it imposes new requirements on existing generation that can only be accomplished through significant capital investment in retrofits. This re-write of Reactive Power capability requirements occurs at the same time that the Public Utility Commission of Texas (PUCT) is hearing an appeal of an ERCOT Protocol Interpretation regarding the requirements for Reactive Power capability.

PRR830 broadly re-defines Reactive Power capability requirements for Generation Resources interconnected with the ERCOT Transmission Grid. For example, it changes the concept of Unit Reactive Limit (URL) and adds the requirement that all Reactive Power capability be dynamic. By doing so, it imposes new requirements on WGRs and requires retrofits to the majority of operating WGRs. These new requirements are contrary to existing Protocols and practice, and are proposed without any demonstration of need.

At the time the current Protocols were adopted, the technology for WGRs to perform as ERCOT interprets them did not exist. Only one vendor had even announced that their turbines could do so, as was pointed out in the discussions around their adoption. Clearly imposing a requirement now to reach back will penalize existing WGRs that invested in the market based on the market rules at the time. They will have to make substantial investments to implement these new Reactive Power requirements, without any study showing that doing so will improve system reliability.

If the true intent is to level the playing field with regard to Reactive Power capability, this PRR does not accomplish that objective. Instead it singles out one group, WGRs, to which this retroactive standard is applied. The current Reactive Power protocols exempt conventional generation pre-1999 from the Reactive Power requirements, and this PRR only seeks to place the retroactive "rectangle" requirements on WGRs, and not other types of generation to which the retroactive provisions could also be applied if the purpose was to make the playing field level—albeit at significant cost to those conventional generators as well.

Reconsideration of Reactive Power capability required by the ERCOT System, and of the most reliable and cost-effective way to provide it, will be a lengthy project, and should be a separate effort from this PRR as part of a study process—however Horizon does not support the retroactive application of Reactive Power requirements or other standards to existing generation once the capital investment has been made and the generator has no way to recover tens of millions of dollars in new, unanticipated capital outlays.

The background relating to Reactive Power is significant. WGRs have given ERCOT their Resource Asset Registration Forms (RARF & GARF) for years demonstrating compliance with the Reactive Power standards in the shape of the "cone." The RARF example clearly demonstrates what the minimum requirement is, and that is the "cone" as can be seen in the pictorial that accompanies it.

WGRs developed their projects on the understanding that ERCOT required, at most, Reactive Power be provided as shown by the "cone" plot, consistent with the rest of the country. However, PRR830 was precipitated by a new interpretation issued by ERCOT as part of its ERCOT Protocol Interpretation issued November 13, 2008 (Interpretation), which was also subsequently withdrawn as a result of defects in the adoption of the Interpretation. This matter is the subject of a contested case before the PUCT. The PUCT will decide the interpretation of the Protocols as applied to existing generation and has indicated its willingness to do so by twice refusing to grant ERCOT's Motions to Dismiss. Instead of embarking on a lengthy debate about re-defining Reactive Power capability requirements as applied to existing WGRs in the consideration of PRR830, Horizon recommends limiting this discussion to clearly defining what new WGRs need to provide. This will remove financial concerns for operating and prospective wind projects, that otherwise may have to make costly retrofits or install unnecessary equipment.

Reactive Power capability requirements for ERCOT are clear from Protocols and other binding documents. Those requirements are the maximum Reactive Power performance required in FERC Order 661A: WGRs are to maintain a power factor within the range of 0.95 leading to 0.95 lagging, measured at the point of interconnection. All WGRs must maintain at least this capability, using static and/or dynamic reactive equipment, as they decide is most cost-effective. WGRs should only be required to provide additional Reactive Power capability if needed for system reliability, as determined by the Transmission Service Provider (TSP) conducting the interconnection study. Review of the Protocols and of Other Binding Documents show consistent support for this requirement. Examples from those documents are provided below.

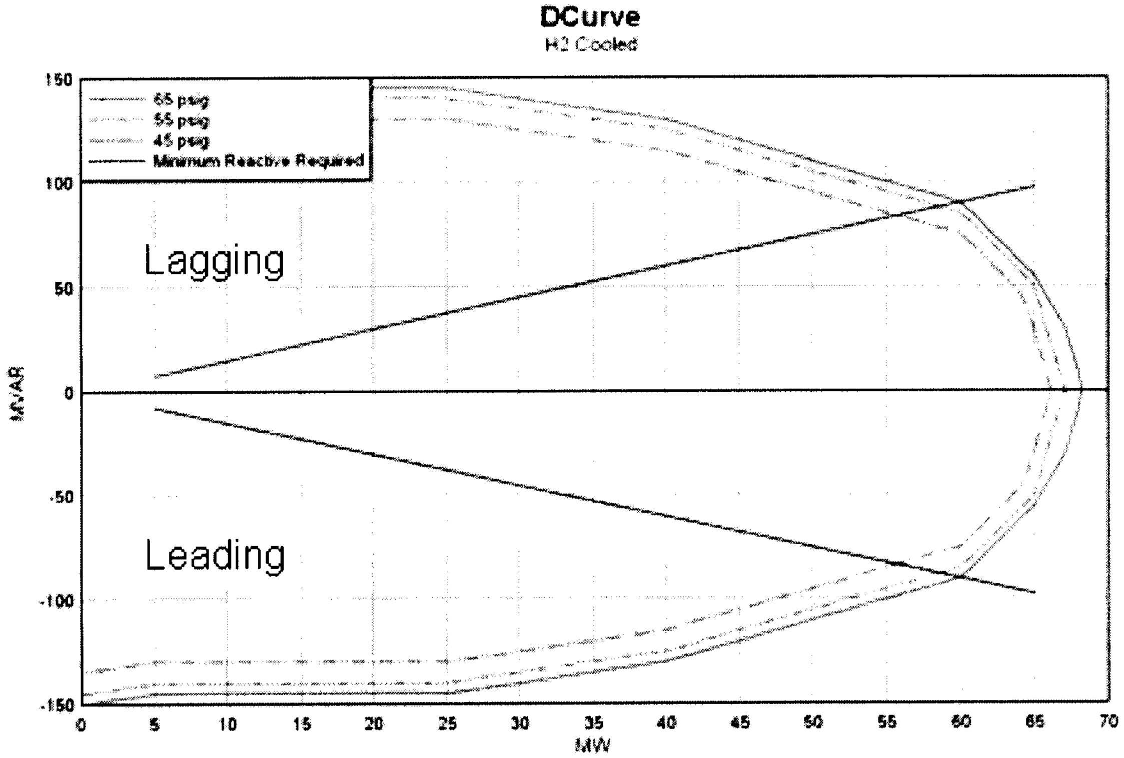
Existing WGRs interconnected with the ERCOT Transmission Grid with the understanding of Reactive Power requirements as described above. Their capabilities were clearly reported in their Interconnection Agreements and Registration Forms. The additional retroactive requirements PRR830 would impose have not been shown to be needed by any study. For all these reasons, in addition to the costly retrofits PRR830 would impose, Horizon recommends rejection of PRR830.

The current Protocols are clear that URL refers to Reactive Power produced when a Resource is operating at its rated capability, and that the required reactive capability varies with the Resource's real power production. At full output, a Resource must be capable of providing reactive power per its URL. There is no confusion there. The Protocols also say: "In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ***ratio*** of the lower active power output to the generating unit's continuous rated active power output..." (emphasis added). There should be no confusion that the Protocols intend for Reactive Power capability to vary with output.

This clear meaning is supported by ERCOT's actions and in Other Binding Documents. WGRs have clearly and repeatedly communicated their Reactive Power capability through the interconnection process, the asset registration process, the synchronization approval process, ERCOT surveys, and in response to request letters from ERCOT.

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

Resource Asset Registration Guide v4.03, Page 4 of 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

> dynamic voltage support in lieu of the power system stabilizer and automatic voltage regulation at the generator excitation system.[1]

There is still no requirement to provide Reactive Power using dynamic equipment in ERCOT's New Generator Commissioning Checklist. The version effective since April 07, 2009 includes a requirement for each Generation Resource to telemeter the status of its "Station Static Reactive Device(s)" status. Clearly ERCOT accepts that Generation Resources could reliably meet their Reactive Power capability requirements with static devices.

Revised Proposed Protocol Language

None.

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

EXHIBIT H

PRR Comments

PRR Number	830	**PRR Title**	**Reactive Power Capability Requirement**

Date	September 15, 2009

Submitter's Information	
Name	Matt Daniel
E-mail Address	Matthew.Daniel@horizonwind.com
Company	Horizon Wind Energy LLC
Phone Number	713-265-0350
Cell Number	
Market Segment	Independent Generator

Comments

Horizon does not agree with the changes proposed in Protocol Revision Request (PRR) 830, Reactive Power Capability Requirement. The PRR as drafted would require significant retrofitting by wind generators that have been providing service to the ERCOT market for years without justification. It would impose additional capital expenditures for existing generation many years after these assets have been financed. The substantial retrofit obligations to be placed on wind developers are tantamount to enforcement of and retroactive application of the ERCOT interpretation of Reactive Power capability requirements that has been withdrawn. Such requirements placed on a single segment of the generation market harms the investment-backed expectations of wind developers like Horizon who have invested hundreds of millions of dollars in the ERCOT market. PRR830 in its current form should be rejected.

The proposed language attempts to remove all Protocol language that conflicts with the legal interpretation ERCOT issued in its notice, M-D111308-01 Legal, issued November 13, 2008, and replace it with language supporting ERCOT's interpretation. This raises questions about the meaning of the deleted language. PRR830 also requires Wind powered Generation Resources (WGRs) to retrofit their equipment to comply with the new requirements in which the expense would be, for individual wind developers, in the tens of millions of dollars. Significantly, ERCOT has performed no studies that demonstrate that these large expenditures need to be made for any reason and has not shown reliability events that would require costly retrofits to existing generation.

The language proposed in PRR830 goes beyond removing Protocol language that conflicts with ERCOT's interpretation; it is contrary to ERCOT's introductory remarks, in that it is retrospective, not prospective. It would require Wind Generation Resources that commenced operation on or after February 16, 2004 and have a signed Interconnection Agreement on or before November 1, 2009 to take necessary actions to comply with ERCOT's interpretation, under a mitigation plan that meets ERCOT approval. There is no basis for this requirement. As discussed by the ERCOT Board in taking up Operating Guide Revision Request, (OGRR) 208, Voltage Ride-Through (VRT) Requirement, ERCOT should study whether there is a need for requirements that burden existing generation by retroactive application of new standards. It is also unclear whether reactive power requirements of the level intended by PRR830 will be at all useful to the market as the system is clearly functioning without these requirements, and the investment in retrofits may in fact be wasted capital investment. This is particularly troubling given that most projects are financed through a variety of means ultimately relying on the value of the asset and based on the capital investment associated with construction. These new and substantial capital outlays cannot be "added" into the financing years later.

There may be, in the future, situations when Market Participants need to provide additional services other than those originally contemplated -- including additional Reactive Power above required capability. Protocols now provide that conventional generation will do so – for compensation. However, the key is that such additional expenditures must be compensated in a market such that there is certainty and that investment backed expectations are met. This is not the case with PRR830. Although it singles out a specific technology for retrofits, this requirement is not supported by studies or independent reviews.

WGRs in general and Horizon, in particular, have been willing to modify their equipment and operating procedures when needed for system reliability. Examples include:

- Changing control systems to limit ramp rates in response to ERCOT Dispatch Instructions.
- Revising operating procedures to use ERCOT's Wind-powered Generation Resource Production Potential (WGRPP) forecast for their Day Ahead schedule instead of WGR's own forecasts.
- PRR811, Real Time Production Potential, which is likely to be approved, would require WGRs to provide their best estimate of production output at all times, in addition to its Resource Plan.

These changes do not reach the level of significance for unrecoverable cost that ERCOT is now asking one segment of the market to bear through PRR830. ERCOT has not shown the need for a change in the reactive requirement for WGRs and any changes to the Reactive Power requirements should truly be prospective in nature, not creating substantially increased costs for existing generation.

Revised Proposed Protocol Language

None.

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 retrofiting 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

Date	November 3, 2009

Submitter's Information	
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Comments

NextEra Energy Resources submits the following comments regarding PRR 830, Reactive Power Capability Requirement, for consideration by the TAC. The redline language proposed below is based upon the PRS Recommendation Report of October 22, 2009 and incorporates concepts and specific amendments proposed in comments submitted by LCRA (10/08/09), The Wind Coalition (10/21/09), ERCOT (10/29/09), and Invenergy (11/02).

NextEra's new compromise proposal below does not insert the PRR 835 approach, which was not endorsed by the ROS and which was rejected by the PRS on Oct. 22. Although NextEra still believes ERCOT's proposed Reactive Power capability standard as set forth in PRR 830 is potentially inefficient and wasteful, NextEra nonetheless respects the opinion of the ROS and the PRS regarding the minimum standards for the ERCOT System going forward. NextEra's proposal, therefore, utilizes the "rectangle" requirement for all technologies as proposed by ERCOT.

Summary of NextEra's proposal

1. Prospectively, the compromise proposal applies the exact Reactive Power capability requirement proposed by ERCOT, endorsed by the ROS, and recommended by the PRS.

2. It provides a means to accomplish ERCOT's Reactive Power capability modeling needs without the unintended consequences of ERCOT's proposed change to the definition of Wind-powered Generation Resource (WGR) in Sec. 2, which

would apply throughout the Protocols for many purposes other than that intended by ERCOT.

3. It sets aside the legacy issues applicable to existing units for resolution following a PUCT decision in the related contested case (Docket No. 36482) and/or through Alternative Dispute Resolution (ADR) processes pursuant to Commission order or pursuant to existing Protocols regarding ADR.

Explanation of each of NextEra's proposed amendments

1. Section 2.1: NextEra strikes ERCOT's proposed re-definition of Wind-powered Generation Resource (WGR) and inserts alternate language which comports with the way WGRs are interconnected to the ERCOT Transmission Grid. As discussed in more detail below, NextEra believes ERCOT's stated desire to more easily model the Reactive Power capability of Resources with multiple units can be achieved with amendments applicable only to Section 6.5.7.1(10) rather than inviting the unintended consequences of re-defining WGRs for all purposes throughout the Protocols.

2. Section 2.2: NextEra includes ERCOT's 10/29 correction to the acronym "GSU" and adopts The Wind Coalition's 10/21 proposed addition of the "WTG" acronym, which is used in the proposed amendment to Section 6.5.7.1(10) to address the Resource Reactive Power capability modeling concerns.

3. Section 6.5.7.1(1): NextEra incorporates ERCOT's 10/29 correction to "10 percent." NextEra also adds clarifying language that the requirement that WGRs disconnect from the grid when unable to support voltage at the POI is a "temporary" disconnection at ERCOT's instruction to address a Real Time condition and that the WGR is allowed to re-connect at ERCOT's instruction. NextEra further incorporates the concept advocated by the 10/08 LCRA comments that execution of ERCOT's instruction to disconnect from the ERCOT System to address a Real Time voltage event precludes a finding that the WGR violated Section 6.5.7.

4. Section 6.5.7.1(2): NextEra incorporates ERCOT's 10/29 correction striking "November" and inserting "December" to reflect the revised expected effective date of PRR 830. NextEra also strikes "February 17, 2004" and inserts "July 1, 2010" for the reasons identified below.

    a) Paragraph (2) specifically requires WGRs to meet the "rectangle" standard for Reactive Power capability. As drafted by ERCOT, this paragraph creates several problems. Despite ERCOT's claims to be only a clarification of existing language and a prospective application of the clarified standard, ERCOT's proposed paragraph (2) clearly requires retrofitting existing units with new equipment. The interpretation of the existing Protocol language and whether it historically required a "rectangle" is before the Public Utility Commission of Texas and is the subject of ADR processes that are ongoing. Therefore, these forums should be allowed to continue to address the issue rather than muddying the process with a Protocol revision that may be reversed by existing proceedings. NextEra's proposal does not eliminate the possibility that retrofitting existing units could be required in the future. However, it does reserve this issue for the appropriate jurisdictional entity, the PUCT. The prudent course of action is to address prospective standards and implement the terms of the PUCT final order on the legacy issues, whatever the PUCT determines, once a final order is issued.

b) Paragraph (2) as drafted by ERCOT also fails to meet the ERCOT Board's policy direction set with the adoption of Operating Guide Revision Request 208, Voltage Ride Through Requirement. In that decision, the Board made a sound policy decision that retroactive application of technical standards can be applied only when a body of evidence indicates such application is required to maintain system reliability. While ERCOT and the ROS have presented sufficient argumentation to support the refinement of the Reactive Power capability standard on a prospective basis, the lack of evidence demonstrating historical deficiencies and the lack of any study at all which would support spending tens of millions of dollars for unit retrofits is seriously troubling and invites scrutiny by policymakers.

c) NextEra's amendment to paragraph (2) keeps ERCOT's proposed effective date (as revised by its 10/29 comments) for signed Interconnection Agreements but proposes July 1, 2010 as the effective date for new units. The date is drawn from the historical record in which the ERCOT Board last approved substantive changes to this section of the Protocols. With the approval of PRR 473, Reactive Standards, the Board provided 15 months for new units to comply with the revised standard in order to not force immediate retrofit for units which had already been designed and for which equipment had already been procured. NextEra proposes less than half that amount of time – 7 months from the effective date of PRR 830.

d) Finally, NextEra strikes the ERCOT-proposed sentence establishing a Dec. 2010 deadline for retrofit for the same reasons outlined above. NextEra is unaware of a single PRR in the history of ERCOT which imposed tens of millions of dollars of equipment costs on any Market Participant or group of Market Participants without demonstration that the benefit would clearly outweigh the cost. PRR 830 should not be the first PRR to broach this slippery slope.

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

change is recommended for the reasons described above. Because paragraph (3) clearly references the revised standards set forth in paragraph (1), existing units should be held only to the existing Protocols requirement and their URLs submitted to ERCOT in accordance with the Operating Guides absent some compelling evidence to abandon previous policy on the retrofit issue. This change sets aside the legacy issues likely to delay implementation of PRR 830 and allows the PUCT to address the issues duly before it.

6. Section 6.5.7.1(4): NextEra proposes changing the two dates in accordance with the reasons set forth above.
7. Section 6.5.7.1(10) and (12): NextEra endorses the 10/21 comments of The Wind Coalition which provides ERCOT with the Real Time Reactive Power capability modeling information requested from WGRs but without the unintended consequences of changing the definition of WGR throughout the Protocols in Sec. 2. NextEra adopts The Wind Coalition's proposed language with minor modifications for clarity and to avoid redundancy. NextEra's revisions to paragraphs (10) and (12) are also consistent with ERCOT's 10/29 technical corrections.
8. Section 6.5.7.1(11): Delete the word "automatically".
9. Section 6.5.7.1(13): NextEra adopts Invenergy's 11/02 proposal in a new paragraph (13) to approximate the treatment of the Reactive Power obligation for other Resources which have multiple turbines located behind the POI.
10. Section 6.7.6(1)-(3): NextEra incorporates the technical corrections proposed in 10/29 ERCOT comments.
11. Section 6.7.6(5): NextEra rejects ERCOT's strikethrough of the existing paragraph(5), returning the blackline language of existing Protocols and offers an amendment to clarify this language only applies to existing units, as it does not comport with the new requirement established in ERCOT's proposed Section 6.5.7.1(1). The reinstated Sections are highlighted in yellow.
12. Section 6.7.6(6): NextEra renumbers due to reinsertion of deleted paragraph (5).

Response to ERCOT Comments of October 29 and request for new CEO Review and Impact Analysis

NextEra appreciates ERCOT's attempt to address the concerns of wind generators regarding the proposed change to the definition of WGR in its 10/29 comments. However, NextEra notes that while ERCOT addressed the uses of "WGR" in the Protocols, ERCOT did not address the more complex issue that WGRs are simply referred to as "Resources" and "generation units" throughout the Protocols and Guides when there is not a specific need to separately address WGRs and they are treated like all other Resources. It is precisely in this area where NextEra believes the unintended consequences of ERCOT's proposal will reveal themselves. The rapid timeline on which PRR 830 has advanced through the process has not afforded NextEra the opportunity to evaluate the hundreds of such references throughout ERCOT's controlling documents and so requests stakeholders re-evaluate the wisdom the WGR definition change and adopt NextEra's proposed methodology below to deliver the same results in a Section-specific way.

Additionally, NextEra points to ERCOT's 10/29 comments which state on page 2, "The proposed definition change may require some wind owners to form multiple WGRs instead of allowing only one depending on their equipment." NextEra agrees with this comment but questions whether the CEO Review and Impact Analysis consider the resource impacts of handling new RARF submissions in both zonal and nodal, whether new sub-QSEs would also need to be created, tested, and certified, or any other impacts on ERCOT Staff to process the changes associated with implementation of this change.

Finally, NextEra notes that the unnecessary WGR definition change would effectively preclude many activities which would benefit the ERCOT System and Texas consumers. NextEra often uses wind turbines in Texas as test models for various hardware and software enhancements to provide better unit control, power uprating, ramp rate control, etc. If each new technological application requires forming a new WGR and submitting RARF data, etc., then such activity becomes overly burdensome and may not be undertaken. A more beneficial approach would be to ensure that the section of the Protocols addressing Reactive Power requirements clearly places the burden on the generator to telemeter the Reactive Power capability to ERCOT, as proposed by NextEra, rather than forcing some definition on units which does not reflect the realities of their configuration in the field.

Conclusion

NextEra's proposal below delivers the full range of Reactive Power capability for all generation units sought by ERCOT and endorsed by ROS in a manner consistent with the application of ERCOT Protocols from the beginning of this market in 2001. NextEra strongly encourages TAC to weigh the policy and market implications of deviating from the market rules philosophy which has served Texas consumers well by continually encouraging major investment in new, more efficient, cleaner generation Resources across a variety of technology types for the past several years. NextEra does not believe the proposed language below in any way precludes addressing the legacy issues now under dispute at the PUCT. However, NextEra predicts serious harm to individual Market Participants, an entire segment of the electric power industry, overall faith in the stability of the ERCOT market rules, and efforts to fulfill state policy on renewable resources should PRR 830 be adopted in its current form.

Revised Proposed Protocol Language

2.1 Definitions

Point of Interconnection (POI)
The location(s) where a Generation Entity's interconnection Facilities connects to the Transmission Facilities as reflected in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and a Transmission and/or Distribution Service Provider (TDSP).

Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind, which may consist of an aggregation of wind turbines connected to the ERCOT Transmission Grid through one Point of Interconnection (POI).~~. Wind turbines may be aggregated together to form a WGR if each turbine is the same model and size and located behind the same Generation Step Up Transformer (GSU).~~

2.2 Acronyms

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

6.5.7 Voltage Support Service

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

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

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

~~(2)~~ Generation Resources ~~required to provide VSS except as noted below in items (3) or (4),~~ shall ~~have and maintain a URL which~~ comply with the following Reactive Power requirements: ~~has~~ an over-excited (lagging) power factor capability of ninety-five hundredths (0.95) or less and an under-excited (leading) power factor capability of ninety-five hundredths (0.95) or less, both determined at the generating unit's maximum net power to be supplied to the ERCOT ~~t~~Transmission ~~g~~Grid and at the transmission system Voltage Profile established by ERCOT, and both measured at the ~~point of interconnection~~POI ~~to the TDSP~~. The Reactive Power requirements shall be available at all MW output levels and may be met through a combination of the Generation Resource's Unit Reactive Limit (URL), which is the generating unit's dynamic leading and lagging operating capability, and/or dynamic VAR capable devices. For Wind-powered Generation Resources (WGRs), the Reactive Power requirements shall be available at all MW output levels at or above 10 percent (10%) of the WGR's nameplate capacity. When a WGR is operating below 10% of its nameplate capacity and is unable to support voltage at the POI, ERCOT may require a WGR to temporarily disconnect from the ERCOT System. WGRs which comply with instructions to temporarily disconnect from the ERCOT System in accordance with this Section will not be found in violation of Section 6.5.7 Voltage Support Service. The Reactive Power requirements of this paragraph shall apply to all Generation Resources except as otherwise provided in paragraphs (2) through (4) below.

(2) WGRs that commenced operation on or after ~~February 17, 2004~~July 1, 2010, and have a signed Standard Generation Interconnection Agreement (SGIA) on or before ~~November~~December 1, 2009, must be capable of producing a defined quantity of Reactive Power to maintain a Voltage Profile established by ERCOT in accordance with the Reactive Power requirements established in paragraph (1) above. However, the Reactive Power requirements may be met through a combination of the WGR's URL and/or automatically switchable static VAR capable devices and/or dynamic VAR capable devices. ~~WGRs shall comply with the Reactive Power requirements of this paragraph by no later than December 31, 2010, unless it is known by July 31, 2010, that related retrofits are required by the Voltage Ride-Through study conducted in accordance with Operation Guide Section 3.1.4.6.1, Protective Relaying Requirement and Voltage Ride-Through Requirement for Wind-powered Generation Resources, in which event ERCOT may in its discretion modify the deadline for an affected WGR. ERCOT, in its sole discretion, also may grant an extension of time for other reasons.~~

(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before ~~February 17, 2004~~December 1, 2009, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the ~~URL as stated above~~Reactive Power requirements established in paragraph (1) above, will be required to maintain a ~~URL~~ Reactive Power requirement as defined by the ~~qualified renewable~~ Generation Resource's URL that was submitted to ERCOT and established per the ~~is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and~~ criteria ~~as described~~ in the Operating Guides.

(4) New generating units connected before ~~May 17, 2005~~July 1, 2010, whose owners demonstrate to ERCOT's satisfaction that design and/or equipment procurement decisions were made prior to ~~February 17, 2004~~December 1, 2009, based upon previous standards, whose design does not allow them to meet the ~~URL as stated above~~Reactive Power requirements established in paragraph (1) above, will be required to maintain a ~~URL~~ Reactive Power requirement as defined by the Generation Resource's URL that was

submitted to ERCOT and established per the ~~is limited to the quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and~~ criteria ~~described~~ in the Operating Guides.

(5) ~~Upon request to, and with the approval of ERCOT, multiple generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these URL requirements only.~~For purposes of meeting the Reactive Power requirements in paragraphs (1) and (2) above, multiple generation units including wind turbines shall, at a Generation Entity's option, be treated as a single Generation Resource or WGR if the units are connected to the same transmission bus.

(6) ~~Upon submission by a~~ Generation ~~Resource~~ Entities ~~required to provide VSS~~may submit to ERCOT ~~of a~~ specific proposals ~~for requirements~~ to ~~substitute for these URL~~meet the Reactive Power requirements established in paragraph (1) above by employing a combination of the URL and added VAR capability, provided that the added VAR capability shall be automatically switchable static and/or dynamic VAR devices.~~,~~ ERCOT ~~shall~~ may, at its sole discretion, either approve or deny a specific proposal, provided that in either case, ERCOT shall ~~such alternative requirements or~~ provide the submitter an explanation of its ~~objections to the proposal~~decision. ~~Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements.~~

(7) ~~An induction generator may elect to make a contribution in aide of construction in lieu of meeting the installed capacity VSS requirements contained herein. In order to comply with the VSS requirements under this paragraph (7), the generator must make payment to the interconnecting TDSP under its generation Interconnection Agreement in a manner similar to that used to collect payments for the direct assignment of interconnection Facilities under applicable Public Utility Commission of Texas (PUCT) rules. The level of payment shall reflect the cost to the TDSP of procuring, installing, operating, and maintaining any Reactive Power equipment required to replace the Reactive Power capability that otherwise would be necessary for the interconnection of the generator. In order for this paragraph (7) to be effective for VSS compliance, the TDSP shall certify to ERCOT that the induction generator has complied with these requirements.~~ A Generation Resource and Transmission and/or Distribution Service Provider (TDSP) may enter into an agreement in which the Generation Resource compensates the TDSP to provide VSS to meet the Reactive Power requirements of paragraph (1) above in part or in whole. The TDSP shall certify to ERCOT that the agreement complies with the Reactive Power requirements of paragraph (1) above.

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

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

(10) ~~WGRs must provide a Real Time SCADA point that communicates to ERCOT the number of wind turbines that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid.~~ Wind-powered Turbine Generators (WTGs) of the same model and size located behind the same Generator Step Up Transformer (GSU) must be aggregated to form a WTG aggregation. Effective June 1, 2010, ~~WGRs must also provide two other~~the following Real Time Supervisory Control and Data Acquisition (SCADA) points ~~that communicate~~must be communicated to ERCOT ~~the following~~for each WTG aggregation by the WGR's QSE, selected for this purpose:

(a) The number of ~~wind turbine~~WTGs that are not able to communicate and whose status is unknown; and

(b) The number of ~~wind turbine~~WTGs out of service and not available for operation; and

(c) The number of WTGs that are available for real power and/or Reactive Power injection into the ERCOT Transmission Grid. ~~WGRs must comply with these requirements by no later than six months after the effective date of this paragraph.~~

(11) For the purpose of complying with the Reactive Power requirements under this Section, Reactive Power losses that occur on privately-owned transmission lines behind the POI may be compensated by ~~automatically~~ switchable static VAR capable devices.

(12) ERCOT and the TSPs shall, at a minimum, represent WGRs in the ERCOT and TSP Real Time control systems and their off-line studies to include: GSUs, substation reactive devices, and the equivalent of the WTG aggregation connected to each GSU.

(13) The reactive power requirements for a WGR under this Section shall be reduced proportionally to the nameplate capacity of the WGR's WTGs that are out of service and not available for operation. Any WTG not able to produce more than 10% of its nameplate capacity shall be considered to be out of service and not available for operation for the purpose of the Reactive Power requirements under this Section.

6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or Transmission and/or Distribution Service Providers (TDSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional M~~m~~egavolt-A~~a~~mpere~~s~~ R~~r~~eactive (MVAR), nor will they be requested to operate on a voltage schedule outside the ~~Unit Reactive Limits (~~URL~~)~~ specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

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

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

(4) All Generation Resources required to provide VSS shall ~~maintain~~support the transmission voltage at the ~~point of interconnection~~POI to the ERCOT ~~t~~Transmission ~~g~~Grid, or at the transmission bus in accordance with paragraph (5) of Section 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability, as directed by ERCOT within the operating Reactive Power capability of the unit(s).

(5) At all times a Generation Resource unit which commenced operation before July 31, 2010, has a signed SGIA before December 1, 2009, and which is required to provide VSS is On-line, the URL must be available for utilization at the generating unit's continuous rated active power output, and Reactive Power up to the unit's operating capability must be available for utilization at lower active power output levels. In no event shall the Reactive Power available be less than the required installed reactive capability multiplied by the ratio of the lower active power output to the generating unit's continuous rated active power output, and any Reactive Power available for utilization must be fully deployed to support system voltage upon request by ERCOT, or a TSP.

(6) The QSEs providing V~~oltage Support Servic~~SS~~e~~ shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

Attachment B

PRR 835

PRR Number	835	PRR Title	Reactive Capability Requirement
Date Posted		September 30, 2009	

Protocol Section(s) Requiring Revision **(Include Section No. and Title)**	2.1, Definitions 2.2, Acronyms 6.5.7, Voltage Support Service 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability 6.5.7.4, Wind-powered Generation Resources Required to Provide VSS Installed Reactive Capability (new) 6.7.6, Deployment of Voltage Support Service
Requested Resolution **(Normal or Urgent, and justification for Urgent status)**	Urgent. Due to conflicting interpretations of Protocol Sections 6.5.7.1, Generation Resources Required to Provide VSS Installed Reactive Capability and 6.7.6, Deployment of Voltage Support Service, ambiguity exists as to what the requirements are for existing and future Wind-powered Generation Resources (WGRs) in providing Reactive Power and Voltage Support Service (VSS). This Protocol Revision Request (PRR) clarifies the Reactive Power and VSS requirements for WGRs, and provides a means for maintaining and ensuring reliability without unnecessarily burdening existing and future WGRs with the cost of installing supplemental reactive capability in locations where it will have little or no value. This PRR requires existing WGRs interconnected after May 17, 2005 to provide +/- .95 power factor at the Point of Interconnection (POI) over the full output range of the Resource which is consistent with the interpretation and criteria applied by the Transmission Service Providers (TSPs) at the time these Resources were interconnected. This PRR differentiates Reactive Power and VSS requirements for WGRs from other non-wind types of Resources primarily because of the unique characteristics of the ERCOT Transmission Grid where the majority of the wind Resources currently are, and will be, interconnected. The Western zone of ERCOT has very little Load as compared to the magnitude of installed and planned WGRs and therefore has very different Reactive Power requirements from other regions of ERCOT. The imposition of a "one size for all" approach, as proposed in PRR830, Reactive Power Capability Requirement, to all generating Resources for ensuring reliability is not economically efficient in that it will necessitate the installation of reactive Resources at locations where, as a practical matter, grid reliability benefits will not be realized or ensured. This PRR also provides for the imposition of additional Reactive

	Power capability to support VSS by WGRs if the TSP shows, through the System Impact Study, that such capability is required to ensure grid safety or reliability.
Revision Description	This PRR clarifies the Reactive Power capability requirement for WGRs by specifying +/- 0.95 power factor criteria as the minimum requirement, and the Generation Resources Unit Reactive Limit (URL) criteria as the maximum requirement contingent upon a System Impact Study by the TSP.
Reason for Revision	Clarification of requirements for Resources.
Overall Market Benefit	This PRR provides additional clarity to the reactive requirements for wind generation to ensure grid safety and reliability while avoiding the cost of additional equipment where it is not justified.
Overall Market Impact	None.
Consumer Impact	This PRR may cause the cost of energy generation to increase for WGRs, however, it provides a responsible, economically efficient and technically justified option for consumers should Market Participants find that WGRs should provide additional Reactive Power.
Credit Implications **(Yes or No, and summary of impact)**	Unknown.
Relevance to Nodal Market **(Yes or No, and summary of impact)**	Yes.
Nodal Protocol Section(s) Requiring Revision **(Include Section No. and Title, and submit NPRR if applicable)**	To be determined based upon final resolution of this issue in the Zonal Protocols.

Quantitative Impacts and Benefits			
Assumptions	1	***Additional 10,000 MW of wind generation in Competitive Renewable Energy Zones (CREZs) and unknown amount of existing affected wind Resources under the proposed PRR830.***	
	2	***Avoidance of unnecessary cost impacts to existing wind generators assumed to be $10k/MW installed.***	
	3	***Avoids installation of additional reactive capability not justified for reliability.***	
	4		
Market Cost		**Impact Area**	**Monetary Impact**
	1	*WGRs.*	*Potentially $100M.*
	2		
	3		
	4		
Market Benefit		**Impact Area**	**Monetary Impact**

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

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Market Segment	Independent Generator

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Proposed Protocol Language Revision

2.1 Definitions

Point of Interconnection (POI)

The location(s) where a Generation Entity's interconnection Facilities connect to the Facilities of the Transmission and/or Distribution Service Provider (TDSP) as specified in the Standard Generation Interconnection Agreement (SGIA) between a Generation Entity and the TDSP.

Wind-powered Generation Resource (WGR)
A Generation Resource that is powered by wind, which may consist of an aggregation of wind turbines connected to the ERCOT Transmission Grid through one Point of Interconnection (POI).

P_{max}
A wind power generation facility's revised maximum output submitted in Real Time via SCADA based on the number of wind turbine generators that our out of service.

2.2 Acronyms

POI	Point of Interconnection
SGIA	Standard Generation Interconnection Agreement

6.5.7 Voltage Support Service

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

6.5.7.1 Generation Resources, Other Than Wind-powered Generation Resources, Required to Provide VSS Installed Reactive Capability

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

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

~~(3) Qualified renewable Generation Resources (as described in Section 14, State of Texas Renewable Energy Credit Trading Program) in operation before February 17, 2004, required to provide VSS and all other Generation Resources required to provide VSS that were in operation prior to September 1, 1999, whose current design does not allow them to meet the URL as stated above, will be required to maintain a URL that is limited to the~~

~~quantity of Reactive Power that the Generation Resource can produce at its rated capability (MW) as determined using procedures and criteria as described in the Operating Guides.~~

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

(~~5~~3) Upon request to, and with the approval of ERCOT, multiple generating units connected to the same transmission bus may be treated as a single generating unit for the purposes of these URL requirements only.

(~~6~~4) Upon submission by a Generation Resource required to provide VSS to ERCOT of a specific proposal for requirements to substitute for these URL requirements, ERCOT shall either approve such alternative requirements or provide the submitter an explanation of its objections to the proposal. Alternative requirements may include supplying additional static and/or dynamic Reactive Power capability as necessary to meet the area's Reactive Power requirements.

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

(~~8~~5) For Generation Resources required to provide VSS, no unit equipment replacement or modification shall reduce the capability of the unit below the requirements to be met by that unit prior to the replacement/modification, unless specifically approved by ERCOT.

(~~9~~6) Generation Resources required to provide VSS shall not reduce high reactive loading on individual units during abnormal conditions without the consent of ERCOT (conveyed by way of their QSE) unless equipment damage is imminent.

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

(1) WGRs are required to provide VSS and must be capable of operating at a power factor of +/- .95 or less over the full (MW) net power output range of the Resource, supplied to the ERCOT Transmission Grid, and measured at the POI to the TDSP in order to maintain a Voltage Profile established by ERCOT. This requirement is graphically depicted in Figure 1. The quantity of Reactive Power measured at the full rated capability of the Resource is the URL.

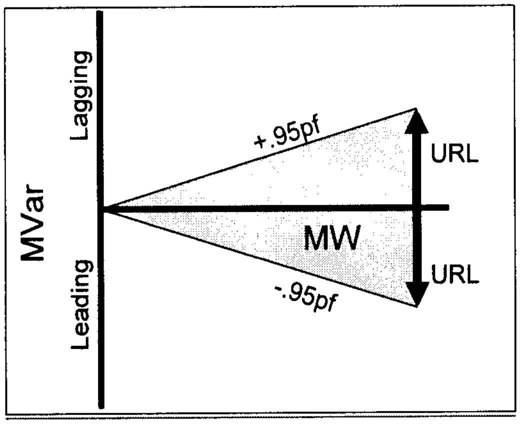


Figure 1. +/- .95 Power Factor Criteria

(2) WGRs may be required to provide VSS beyond what is required in paragraph (1) above only if the TSP or ERCOT shows, through a System Impact Study, that such capability is required to ensure grid safety or reliability. The amount of additional reactive capability required to be provided by the Resource shall not exceed the URL specified in paragraph (1) above and be available at all MW output levels over the full output range of the Resource. This requirement is graphically depicted in Figure 2. This additional reactive capability may be provided through any combination of automatically switchable static reactive devices (i.e. switched shunts) and/or dynamic reactive devices (i.e. SVC, Statcom, etc.) so long as the requirement to ensure safety and reliability is met.

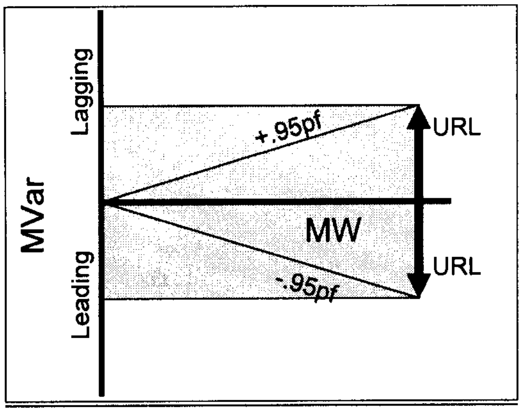


Figure 2. Fixed URL Criteria (based on +/- .95 Power Factor)

(3) Demonstration and measurement of reactive capability will be based on system Voltage Profile criteria specified by ERCOT. This Voltage Profile criteria will consist of a low system voltage V_{sys-l}, where the wind Resource will be operating in a lagging power mode to produce the required amount of Reactive Power to support system voltage, and V_{sys-h}, where the wind Resource will be operating in a leading mode to absorb the required amount of Reactive Power to suppress system voltage. The scheduled system voltage under normal conditions should fall somewhere in between V_{sys-l} and V_{sys-h}.

(4) WGRs capable of remaining On-line at low output levels considered outside of their net power output range where VSS can not be provided at the POI shall be capable of operating such that they appear "VAR Neutral" at the POI. The amount of allowable deviation from unity (1.0) power factor will be specified by the TDSP. WGRs that cannot meet the "VAR neutrality" requirement may be required to disconnect from the ERCOT System.

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

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

(7) WGRs connected after May 17, 2005 are required to provide VSS as described in paragraph (1) above.

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

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

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

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

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

(13) WGRs must provide Real Time Supervisory Control And Data Acquisition (SCADA) points that communicate to ERCOT the Facility's available P_{max} and revised URL values reflecting the amount of installed turbine capacity that is out of service.

6.7.6 Deployment of Voltage Support Service

(1) ERCOT, or Transmission Service Providers (TSPs) designated by ERCOT, will instruct Generation Resources required to provide Voltage Support Service (VSS) to make adjustments for voltage support within the Unit Reactive Limit (URL) capacity limits provided by the QSE to ERCOT. Generation Resources providing VSS will not be requested to reduce megawatt output so as to provide additional ~~megavolt~~Megavolt ~~amperes~~ Ampere ~~reactive~~Reactive (MVAR), nor will they be requested to operate on a

voltage schedule outside the ~~Unit Reactive Limits (~~URL~~)~~ specified by the QSE without a Dispatch Instruction requesting unit-specific Dispatch or an OOME instruction.

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

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

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

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

(~~6~~5) The QSEs providing ~~Voltage Support Service~~VSS shall meet the deployment performance requirements specified in Section 6.10.4, Ancillary Service Deployment Performance Measures.

Attachment C

PRR 835 presentation to ROS

NEXTera ENERGY RESOURCES

PRR835 – Reactive Power Capability Requirement

Peter Wybierala

Regional Director of Transmission & Interconnects

Presentation to the ERCOT Reliability and Operations Subcommittee (ROS)

October 15, 2009

The current ERCOT Protocol on reactive power capability requirements is obsolete

Ancillary Services Section 6.5.7 needs to be revised

- **All generators are not the same**
  - Synchronous generators have their own inherent reactive power characteristics
  - The reactive capability of wind generators is evolving
    - -- Early machines were Type 1and 2 induction generators with no reactive capabilty
    - -- Type 3 machines consist of a Doubly Fed Induction Generator (DFIG)
    - -- Type 4 machines employ a full bridge converter design coupled to either an induction or synchronous machine
- **Other technologies such as solar and energy storage will have their own unique characteristics**
- **The imposition of a "one size fits all" approach to reactive power capability requirements will result in economic inefficiency and create barriers to entry for the adoption of new technologies**

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

Ancillary Services Section 6.5.7 needs to be revised

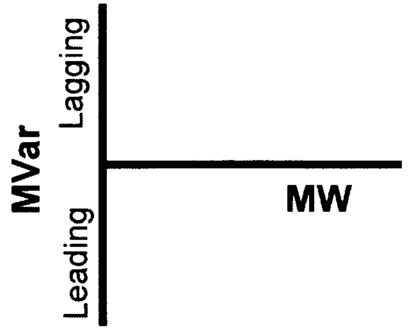
- **Protocol 6.5.7.1 (2) states that…**

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

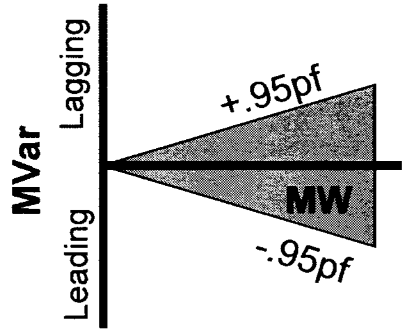
- **Does "shall have and maintain" mean going forward in time or does it mean over the output range of the unit?**
- **PRR830, if adopted, would require a wind generator interconnected after February 17, 2004 to maintain a URL over the output range of the unit.**

Wind turbine generator technology continues to evolve

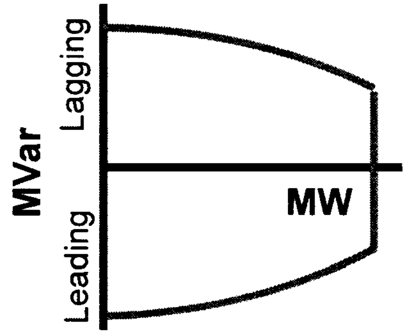
- Type 1 and 2 induction generators – no inherent reactive production capability



- 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)

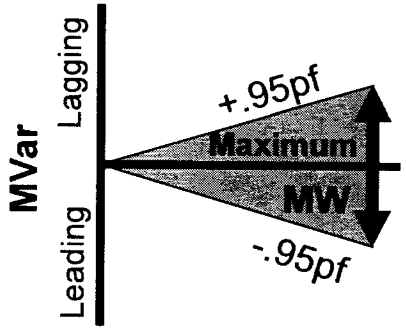


PRR835 does several things...

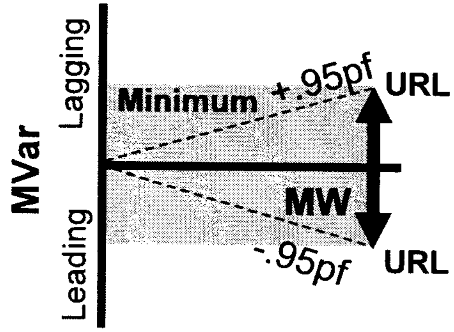
- It carves out a separate section for the reactive power requirements of Wind Generating Resources and requires a +/- 0.95 power factor range as the minimum requirement
- It provides for the imposition of additional reactive requirements consistent with PRR830 where it can be demonstrated through a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

Comparision of PRR835 to PRR830 and FERC Order 661-A

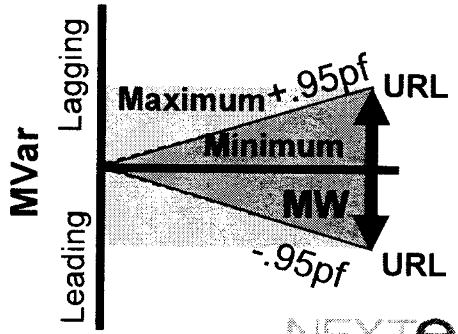
- FERC Order 661-A
  - Adopts +/- 0.95PF range as the maximum requirement
  - Requires wind plants to maintain the required power factor range only if the Transmission Provider shows, through the System Impact Study, that such capability is required of the plant to ensure safety and reliability



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



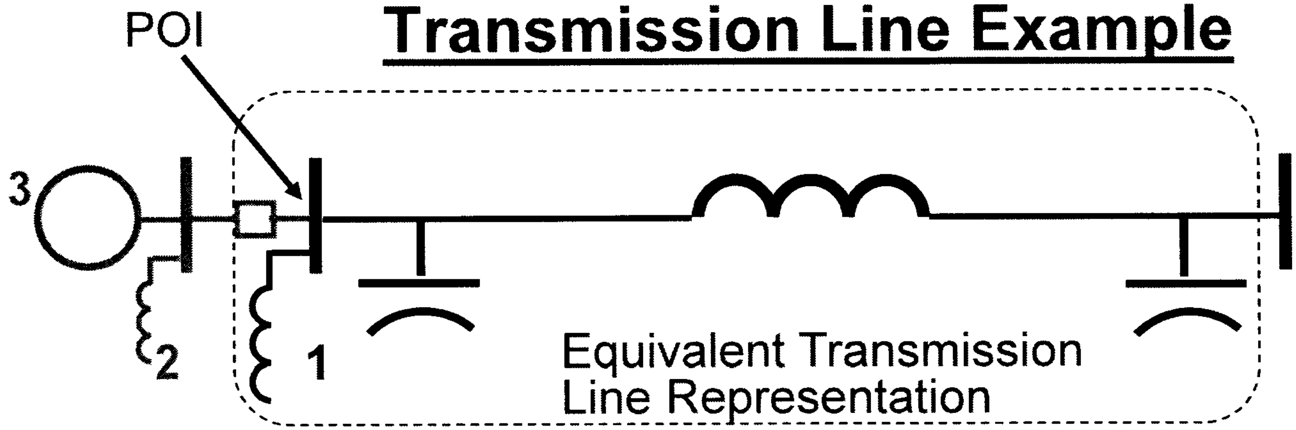
- PRR835
  - Adopts +/-0.95PF as the minimum reactive capability
  - May require URL over the full operating range of the plant only if the Transmission Provider demonstrates it is needed to ensure safety and reliability through a System Impact Study



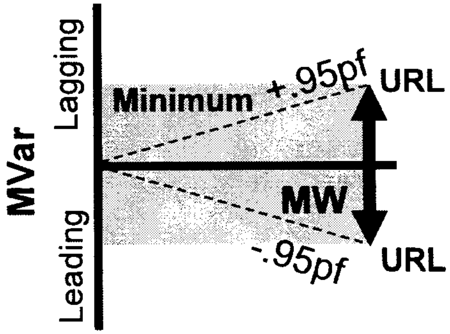
NEXTera ENERGY RESOURCES

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

Transmission Line Example



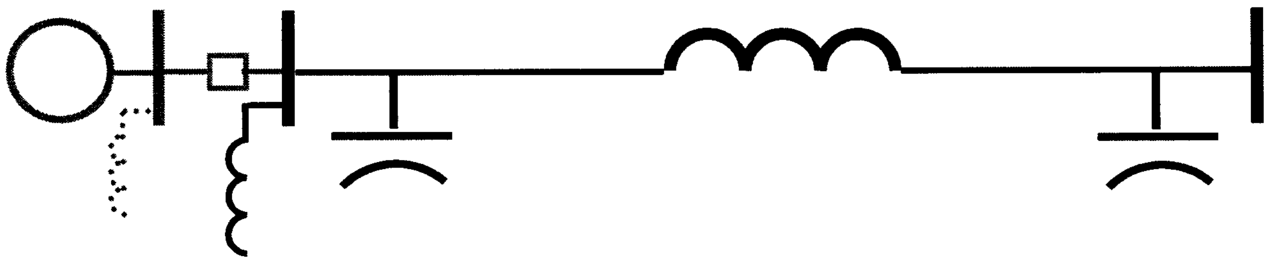
1. Transmission Owner must provide shunt reactors to offset line charging when wind is calm and generator is not generating
2. PRR830 would have the Generator install an additional shunt reactor to meet its URL requirement for leading reactive capability over its range of output
3. Inherent Generator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



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

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)

Preliminary results indicate that voltage violations are not the issue for the current Western ERCOT system

Results

- **AC contingency analysis**
  - ERCOT contingency file (9,000+ cat. B and cat. C contingencies)
- **Few post-contingency voltage violations**
  - Generally unrelated to the wind generation dispatch
  - Also unrelated to reactive power capability at the wind farms
- **Thermal violations**
  - Existing system configuration → restrictions to dispatch of West Texas wind generation
  - Significant overloads already identified before reaching full power output of wind generation in West Texas

Thermal overloads are the limiting factors. No condition has been identified that shows the need for additional reactive power capability from wind farms

NEXTera ENERGY RESOURCES

Generator reactive capability requirements are driven by system topology and the imbalance between generation and load in Western ERCOT. This trend will become further exaggerated with CREZ implementation

- **Current ERCOT System**
  - West Zone load – approximately 4,000 MW
  - West Zone Generation – approximately 8,000 MW
- **ERCOT System post CREZ**
  - West Zone load – approximate 4,400 MW
  - West Zone Generation – 18,000 MW
- **WGR lagging reactive capability will need to increase with MW output to compensate for transmission line reactive losses.**
- **WGR leading reactive capability will have little value since shunt reactors will be required to offset transmission line charging anyway when the wind is calm.**

CREZ doesn't make things worse but amplifies the consequences of adopting PRR830!

Highlights of PRR835

- Sets minimum requirement of +/-0.95 Power Factor at the Point of Interconnection
- May require additional reactive requirements when supported by a System Impact Study
- Addresses the "Cone" versus "Rectangle" debate
- Wind generator reactive requirements and VSS are distinguished from non-wind generators
- Requires wind generators to provide real-time reactive capability through SCADA
- Does not unnecessarily limit aggregation of wind turbine generators based on size and type as does PRR830
- Grandfathers WGRs interconnected after May 17, 2005 and before the adoption of PRR835 in meeting the +/- 0.95 PF requirement

What differentiates PRR835 from PRR830 is that it provides superior economies while ensuring system safety and reliability where justified and needed!

NEXTera ENERGY RESOURCES

GENERATION INTERCONNECTION OR CHANGE REQUEST PROCEDURE

August, 2004

ERCOT
System Planning, Transmission Services
2705 West Lake Drive
Taylor, Texas 76574-2136
Main Office Phone (512) 248-3000

PURPOSE

The primary purpose of this procedure is to facilitate the interconnection of new and changes to existing generating units/plants to/in the Electric Reliability Council of Texas, Inc. (ERCOT) transmission system. Through the review of all interconnection or change requests, the following objectives will be accomplished:

a) Identify electric system security concerns with interconnecting new or changed generation
b) Increase communications between the Generating Entity (GE), Power Generation Company (PGC), Transmission Service Providers (TSP) and ERCOT
c) Provide information on future capacity additions for use in reviewing projected total ERCOT capability, demand and reserve
d) Provide accurate/appropriate data to help identify possible future transmission constraints, maintain reliability of the ERCOT System and propose related transmission projects

INTRODUCTION

A GE or PGC requesting transmission interconnection for new generation, adding additional generating capacity (more than 10 MW within a year) at an existing plant or changing the connection of an existing plant must submit an application to ERCOT. The application shall include information necessary to allow timely development, design, and implementation of electric system enhancements needed to serve the generation entity requirements. The information must include sufficient detail for use in establishing transfer capabilities, operating limits (including stability) and planning margins to provide both reliability and operating efficiency, designing future system facility additions, and facilitating coordinated planning. Applicable ERCOT and North American Electric Reliability Council (NERC) standards, protocols, guides and/or procedures for accurate system representation and modeling shall be followed.

The Public Utility Commission of Texas (PUCT) Substantive Rules (§25.191) require a TSP to build facilities to interconnect a new generating plant. The rules indicate that the interconnection planning will include transmission line interconnection and grid upgrades. The TSPs shall provide transmission service including the construction of the transmission line and upgrading the transmission grid within reasonable efforts considering economics and good utility practice.

The building of interconnection facilities and/or grid upgrades may or may not require a Certificate of Convenience and Necessity (CCN), depending upon the circumstances specific to the individual project, and are addressed in the appropriate sections of the PUCT rules. The generation owner should identify expected markets, and ERCOT along with the TSPs would identify known transmission constraints that impair the generator's ability to reach those markets (without employing the congestion management system). In many instances, additional transmission lines may be needed to enable the generator to reach the desired markets. When ERCOT identifies specific transmission expansions that will facilitate the competitive market while mitigating constraints, ERCOT will develop proposed transmission additions using the ERCOT Power System Planning Charter and Processes. ERCOT's evaluation of need in the regional planning process is important, but the PUCT (via the CCN process) will ultimately decide whether the transmission line should be built.

Both new transmission line construction and some line reconstruction require the approval of the PUCT, granted in the form of a CCN. The present PUCT rules allow the PUCT up to 12 months for processing a CCN. The need to use a consultant to route future transmission lines and the TSP to hold public meetings also adds around 12 months to the time required to certificate and build a new transmission line. In most new transmission projects, the acquisition of right-of-way and construction will take 10 to 18 months after a CCN is granted by the PUCT. Therefore, if the GE or PGC desires full transfer capability when generation is first available for transfer to the grid, **it is recommended that firm commitments be made by the GE or PGC at least three years ahead of required in-service dates for the related transmission line projects. Moreover, the GE or PGC should recognize that some projects might require commitments four to eight years in advance of system needs.**

STUDY TIME TABLE

Every interconnection may be different and unique to the particular project. A timetable for studies will be developed and included in the study scope. Major improvements to the transmission system resulting from interconnection requests should be identified early in the process so project validity can be considered before going ahead with extensive studies. Adjustments to the completion date of review may be necessary for the study scope. If adjustments are necessary for the study scope, ERCOT shall provide notice as soon as practicable to both the GE and the TSP indicating the revised expected completion date. Some of these procedures may be done in parallel with others; for example, in some cases, the Facilities Study can be initiated upon completion of the Steady State Study, although the results of the Short Circuit Study and Stability Study may change the scope of the study. The TSP and the GE are encouraged to optimize the process to reduce the time necessary for the studies. The timely completion of all studies is dependent upon the availability of relevant data and appropriate study assumptions. The GE should ensure that ERCOT and the TSPs performing the studies receive all required data in order to establish study models that provide meaningful results and recommendations for interconnection.

Sample Study Time Table (calendar days):

Security Screening Study – ERCOT Staff	
Review of Request, Fee and Acknowledgement	1 to 7 days
Performs Steady State Security Screening Study	3 to 90 days
GE or PGC Agrees to Proceed, Model Fee, Deposit and Proof of Site Control Received	**180-day time limit after completion of Security Screening Study**
Full Interconnection Study – TSPs and ERCOT Staff	
Notify and Set Up Meeting	1 to 14 days
Propose Study Scope (at or after meeting)	1 to 14 days
Complete Study Scope and Sign Study Agreement	**60-day time limit to go forward**
Perform Full Interconnection Study	
Steady State & Transfer Analysis Study	10 to 90 days
System Protection Analysis	10 to 30 days, **after Steady State Study**
Dynamics Analysis	10 to 90 days, **after System Protection**
Facilities Study	10 to 90 days
Study Report Review	5 to 15 days after completion of study
Complete Interconnection Agreement with TSP	**180-day time limit after completion of Full Interconnect Study**
Typical Time	**90 to 270 days**
Total Range of Possible Time	**52 to 440 days**

FEE SCHEDULE

ERCOT Security Screening Study and Full Interconnection Study Fees are charged to entities filing generation interconnection requests to add new or additional generation capacity to the ERCOT System. These fees are based on the total plant capacity associated with the request because the capacity determines the amount of work necessary to complete the study. The ERCOT Security Screening Study fee is a nonrefundable fee and ranges from $1,000 to $5,000 per study as shown below. Generation Interconnection Requests are for each individual interconnection location, in-service date, and total plant capacity at this interconnection location.

ERCOT Security Screening Study Fee

Total Capacity	**Fee**
10 MW to 74 MW	$1,000 Not Refundable
75 MW to 149 MW	$2,000 Not Refundable
150 MW to 249 MW	$3,000 Not Refundable
250 MW to 499 MW	$4,000 Not Refundable
500 MW and above	$5,000 Not Refundable

The ERCOT Full Interconnection Study Fee consists of two parts. The first part of the fee is a charge of $15 per megawatt of total capacity (nonrefundable) which is used to develop stability models for generation units and to continually update the current models as new equipment changes are made. Providing this modeling fee to ERCOT **does not release** the GE or PGC from the obligation to provide accurate/appropriate stability models and data (including load) for their plant.

The second part of the fee is a deposit of $15,000 or $30,000 based upon total plant capacity, from which ERCOT will fund the study. Any unused portion of the deposit will be returned. The TSP will invoice the GE or PGC for any additional work that is necessary and creates charges exceeding the amount of the deposit, and ERCOT will refund any portion of the deposit not used to perform the study.

Both fees along with proof of site control must be received at ERCOT within 180 days after completion of the security screening study before a full interconnection study is started.

ERCOT Full Interconnection Study Fees

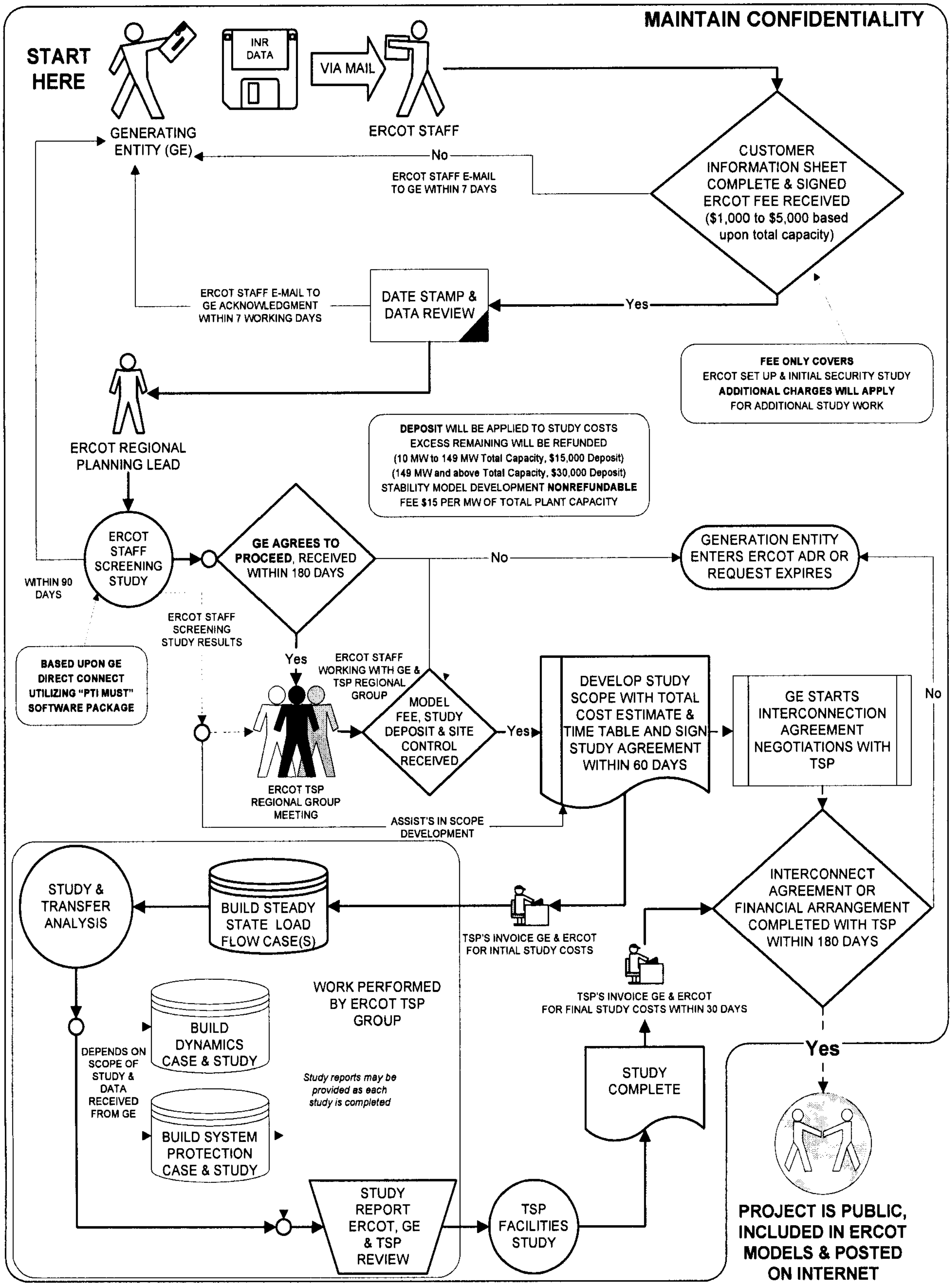
Total Capacity	**Fee**
10 MW to 149 MW	$15 per MW of total capacity, not refundable $15,000 deposit
150 MW and above	$15 per MW of total capacity, not refundable $30,000 deposit

INTERCONNECTION AGREEMENTS

ERCOT is the proper place to submit the request for generation interconnection. However, the negotiation of an interconnection agreement shall be conducted directly between the GE and TSP. ERCOT does not arrange interconnection agreements.

Municipals and/or coops developing generation projects do not require interconnection agreements to connect to their transmission systems. Generation interconnection requests will remain confidential until an interconnection agreement or financial agreement for transmission construction is completed with a transmission owner. An official letter from a municipal utility or electric cooperative will also serve as a public commitment. At that time, the generation project will be regarded as a confirmed project and will be posted on the ERCOT Internet website along with copies of generation interconnection impact studies and related proposed transmission projects.

ERCOT Generation Interconnection Process



ERCOT AND TSP PROCESS

After receiving an interconnection request and the associated security screening study fee (reference "Fee Schedule" in document) and preliminary data, ERCOT will date stamp the request. This date stamp is not a reservation of transmission capacity. ERCOT will acknowledge the request via email and notify the GE or PGC of missing data for the security screening study within seven days. ERCOT staff will then perform a steady state security screening study (including power flow and transfer studies) in the in-service year to determine the feasibility of the site for interconnection selected by the GE or PGC. This study will indicate the level at which the generator can expect to operate simultaneously with other known generation in the area before significant transmission additions may be required.

Based upon the security screening study, ERCOT will make a preliminary estimate of future transmission additions needed to effect full transfer of the new generation. This information will be presented to the GE or PGC requesting interconnection or change to the total output capability. ERCOT will also inform the GE or PGC about any basic system additions required for security and reliability. Based on this information, the GE or PGC can decide whether it wants to request interconnection or withdraw the application. If the GE or PGC decides to go forward at the named site, ERCOT will then initiate a full interconnection study in coordination with the transmission service providers in the appropriate regional planning group.

Unless ERCOT receives notice from the GE or PGC of its decision to go forward with the proposed project, ERCOT will not initiate a full interconnection study. Such notice must be received by ERCOT within 180 days after completion of the security screening study. If such notice is not received within 180 days, the request for interconnection will be considered cancelled and no longer valid. If the GE or PGC wishes to proceed after 180 days, they must begin the process again starting with a new security screening study.

When notice is received from the GE or PGC to go forward with a full interconnection study, ERCOT will schedule a meeting with the study group made up of only ERCOT Staff and TSPs in the respective Regional Planning Group. At this meeting, the project will be presented and general discussion of the study required will be proposed with general timelines. Deposit and cost requirements will also be determined at this meeting.

All TSPs within the appropriate regional planning group shall be part of the study group usually with the primary interconnecting TSP as facilitator of the study. All studies, data and related information shall be communicated to this whole group and ERCOT in performance of this work. The TSPs are most aware of the actual physical circumstances in the project area that can support or counter the interconnection or change in generation. The assistance of more than one TSP may be required in areas where transmission facilities are provided by multiple entities. ERCOT will maintain the lead role in this study and may include additional steady state, transient stability, system protection and facilities analysis.

Before a full interconnection study starts, the GE or PGC must submit to ERCOT the model fee (Reference "Fee Schedule" in document), deposit (if needed) and proof of site control. The GE or PGC must demonstrate proof of site control and maintain control of the site on which the generator is to be constructed. The applicant must demonstrate, through an affiliated company, through a trustee or directly in its name that: (a) it is the owner in fee simple of the real property to be utilized by the facilities for which new interconnection is sought; or (b) that it holds a valid written leasehold interest in the real property to be utilized by the facilities for which new interconnection is sought; or (c) that it holds a valid written option to purchase or obtain a leasehold interest in the real property to be utilized by the facilities for which new interconnection is sought; or (d) that it holds a duly executed written contract to purchase or obtain a leasehold interest in the real property to be utilized by the facilities for which new interconnection is sought. Site control must be maintained throughout the duration of the study until the establishment of an Interconnection Agreement. Otherwise, the request for interconnection will be deemed withdrawn as of the date of loss of site control, unless the applicant can show within 30 days that it has re-established site control or has established control of a new site which would not result in the material modification of any study requested under these procedures.

The model fee is $15 per megawatt of total capacity, nonrefundable, and is used to develop stability models for generation units and to continually update the current models as new equipment changes are made. Provision of this modeling fee to ERCOT **does not release** the GE or PGC from the obligation to provide accurate/appropriate stability models and data (including load) for their plant.

The deposit will be applied toward study costs. The TSP will invoice the GE or PGC for any study costs exceeding the amount of the deposit, and it will refund any remaining funds not used to perform in the study.

The GE or PGC and TSPs must complete (reach agreement on) the study scope within 60 days after the full interconnection study meeting. The agreement shall include assumptions, timetable, study cost estimate(s) and determination of requirements for interconnection. If the GE or PGC does not agree to a study scope within 60 days, the request for interconnection will be considered cancelled and no longer valid. If the GE or PGC wishes to proceed after such a cancellation, they must begin the process again starting with a new security screening study. The study scope developed may be minimal, very detailed or a phased study. The ERCOT security screening study and other preliminary studies provided by the GE or PGC shall be considered when developing the study scope. These studies may reduce the work and/or the time necessary for the full interconnection studies. The full interconnection study can be phased/separated in several sections with notice to proceed from the GE required for each section. This can limit the GE's costs if the project is not viable at the selected location.

The generation entity requesting interconnection is responsible for all costs of the full interconnection study. The study deposit (if needed) will be used to make payments to the TSPs. TSP costs greater than the deposit amount should be directly billed to the GE. A payment methodology and cancellation provision should be included in the full interconnection study agreement. If the GE or PGC cancels the generating project during the study, they are required to immediately notify ERCOT and all the TSPs in the study group. **The GE or PGC is responsible for all costs associated with any work performed or non-cancelable commitments made prior to the termination date.**

When the full interconnection study is completed, the GE and study group shall examine the results and append any comments within ten working days. The final study report shall be provided to the GE and all TSPs in the study group. When an interconnection agreement is completed or a financial arrangement with a TSP for transmission construction is effected within 180 days of completion of the full interconnection study, the project will be regarded as a confirmed project.

If the GE or PGC does not complete an interconnection agreement or a financial arrangement with a TSP for transmission construction is not completed within 180 days after the full interconnection study, the request for interconnection will be considered cancelled and no longer valid. If the GE wishes to proceed after the request has been deemed invalid, it must begin the process again starting with a new security screening study.

Generation interconnection requests will remain confidential until an interconnection agreement with a TSP or financial agreement for transmission construction is completed. An official letter from a municipal utility or electric cooperative will also serve as a public commitment. At that time, the generation project will be regarded as a confirmed project and will be posted on the ERCOT Internet website along with copies of generation interconnection impact studies and related proposed transmission projects.

GENERATION PLANT DESCRIPTION & DATA REQUIREMENTS

The acquisition of data to realistically simulate the electrical behavior of system components is a fundamental requirement for the development of a reliable interconnected transmission system, accurate studies, the prevention of outages and protection of generation equipment. Therefore, the GE or PGC is required to submit specific information regarding the electrical characteristics of their proposed facilities with their request. Failure to supply the required data will result in delay of the study, and may adversely influence reliability or result in damage to generation equipment. Ongoing data updates and reviews are necessary throughout the service life of the plant.

The most current facility data or expected performance data should be submitted to ERCOT with the initial study request. Data submitted for stability models shall be compatible with ERCOT standard models (Shaw/PTI PSS/E and Powertech Labs Inc TSAT, VSAT and SSAT). If there is no compatible model(s), the GE or PGC is required to work with a consultant and/or software vendor to develop and supply accurate/appropriate models along with associated data. It is recommended that generation owners and developers encourage manufacturers and software vendors to work together to develop/maintain these important models. ERCOT recommends wind generation owners and/or developers join the modeling efforts of the Utility Wind Interest Group (UWIG, www.uwig.org).

Prior to start of construction, the GE or PGC shall inform ERCOT and TSP of any significant design changes in the generators or main power transformers to ensure compatibility with the transmission system.

Prior to commercial operation of a facility, the GE or PGC shall supplement the initial data submissions with any and all as-built facility data or as-tested performance data which differs from the initial submissions or, alternatively, written confirmation that no such differences exist.

Subsequent to commercial operation of a new facility and during continuing operation of existing facilities, the GE shall provide ERCOT and the TSP with any data changes made appropriate by equipment replacement, repair, or adjustment. The GE shall provide such data not later than 60 days after the date of the actual change in equipment characteristics. This requirement also applies to all future owners of a project/plant throughout the service life of the plant.

Each request should include the following information or best estimate about the generating facility when submitting a request to ERCOT.

- ✓ REQUIRED FOR SECURITY SCREENING STUDY
  - o Signed Generation Entity Information Sheet (included with procedure)
  - o Generation Summary (MS Excel Workbook)
- ✓ REQUIRED FOR FULL INTERCONNECTION STUDY
  - o Any and All Updates to the Data Above
  - o Detailed Generation Information - By Unit For Each Unit
  - o Generator Data For Transient Stability Studies – By Unit For Each Unit
  - o Electrical network drawing including all transformers, capacitors and electrical equipment
  - o 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.

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: ____________________

ONCOR

Reactive Discussion

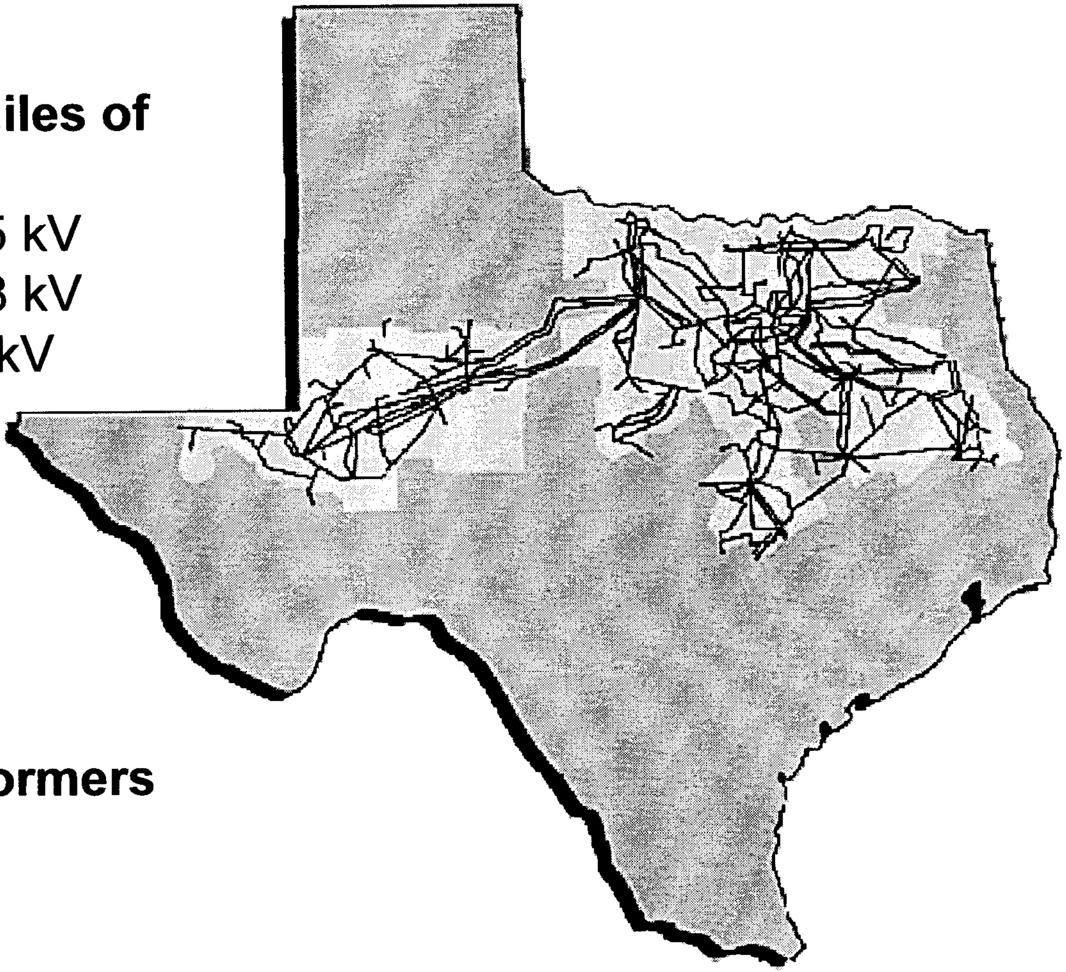
Kenneth A. Donohoo, P.E.
Director, System Planning
Distribution and Transmission
Oncor Electric Delivery Company LLC

Presentation to ERCOT ROS
October 15, 2009
Austin, TX

ONCOR SYSTEM

ONCOR

- **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**



ERCOT ROS Meeting - KAD

10/15/2009

RELIABILITY REQUIREMENTS

ONCOR

- **Planning Standards and Criteria**
  - Normal Condition
  - First Contingency Condition
  - Second Contingency Condition, with adjustment
- **Operations Constraints**
  - Maintenance and construction feasibility
  - Complexity
  - Outages and clearances
  - Constantly changing

TYPES OF PROBLEMS

- **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 condensor option rare)
  - Decrease reactive power losses in the network
    - Add series capacitors to lines
    - Add Static Synchronous Series Compensator (SSSC, FACTS device) to lines
    - Add Superconducting Magnetic Energy Storage (SMES) device

PERMANENT SOLUTIONS CONSIDERED

- **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 suppled by Generator to ERCOT
- **3.1.4.3.2:**
  - Non-coordinated Testing...QSE must schedule reactive verification tests with ERCOT
- **3.1.4.3.3:**
  - Coordinated testing: discusses testing
- **3.1.4.3.4:**
  - ERCOT implementation: ...ERCOT to review results of tests. Reactive tests to be reviewed by ERCOT to determine if they fall within 90% of CURL curve.
- **3.1.4.3.5:**
  - Enforcement of Unit Reactive Capability Testing....details of enforcement of reactive testing can be found on Compliance Template on ERCOT Compliance Web Page.

REACTIVE CAPABILITY TESTING

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.

Board Agenda Item 12b – Appeal of PRR830 – Oncor EDC LLC

See Additional Materials at:
http://www.ercot.com/calendar/2009/11/20091117-BOD

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.

PRR Comments

PRR Number	**830**	**PRR Title**	**Reactive Power Capability Requirement**

Date	November 10, 2009

Submitter's Information	
Name	Ken Donohoo
E-mail Address	kdonoho1@oncor.com
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 is exceeded, short circuits (faults), radio interference, and noise may occur. Also, transformers and other equipment at stations and/or customer facilities may be damaged or destroyed. Minimum voltage constraints also exist based on the power requirements of the customers and lack of reactive reserve. Low voltages cause inadequate operation of equipment and may damage motors.

Voltage on a transmission line tends to "drop" from the sending end to the receiving end and varies based upon the flow. The voltage drop along the AC line is almost directly proportional to reactive power flows and line reactance (impedance). The line reactance increases with the length of the line. Capacitors and inductive reactors are installed, as needed, on lines and in stations to, in part; control the amount of voltage drop or rise. This is important because voltage levels and current levels determine the power that can be delivered to the customers.

A variety of reactive power (Mvar) producing equipment exists. They can generally be broken down into two categories; "Dynamic Resources" and "Static Resources". The total production of reactive power must equal customer demand plus losses under normal, fault and contingency conditions.

Small Mvar production shortages will result in degradation of grid voltage, while larger Mvar production shortages lead to severe low voltage or collapse. Over production Mvar results in high voltage with possible long term damage to grid facilities, generation equipment and customer facilities. Reactive power must be constantly produced/absorbed locally and cannot be transported over long distances. Reactive energy (Mvar) cannot be transmitted as far as real energy (MW). This is primarily due to the bulk electric transmission line impedances which have a naturally large X to R ratio usually in the range of 5 to 25.

High voltage transmission lines are a local source of shunt reactive energy (line charging). This local reactive energy source is similar to a fixed static capacitor connected to each end of the line. However, reactive Mvar losses on heavily loaded transmission lines often exceed the local static reactive energy produced by line charging. Large X to R ratios produces significant difference in MW losses compared to Mvar losses. Due to this X to R ratio Mvar losses are typically 5 to 25 times higher than MW losses and are constantly varying.

Generators, static var compensators (SVCs), static compensators (STATCOMs), other Flexible AC Transmission Systems (FACTS) and synchronous condensers provide dynamic reactive power with various time responses to quickly changing system conditions.

Under low voltage conditions, static capacitors used in stations (and line charging) do not produce maximum reactive power as reliably as dynamic self excited power equipment because capacitor reactive power output depends on substation voltage. Capacitor reactive power output changes in proportion to the square of voltage magnitude. For example if substation voltage declines from 100% to 90% of nominal voltage, static reactive power output declines from 100% of capability to 81%. Low voltage also increases Mvar needed by motor loads further degrading the voltage.

Dynamic reactive resources are used to adapt to rapidly changing conditions on the transmission system, such as faults, sudden loss of generators or transmission facilities. In contrast switched static devices are typically used to adapt to slowly changing system conditions such as daily and seasonal load cycles and changes to scheduled transactions.

Static capacitor resources have lower capital cost than dynamic devices, and from a systems point of view, static capacitors are used to provide normal or intact-system voltage support. Locating static capacitors and dynamic reactive devices near to reactive load/losses, increases their effectiveness. Dynamic reactive resources are used to adapt to rapidly changing conditions on the transmission system, such as sudden loss of generators, faults or transmission facilities.

An appropriate combination of both static and dynamic resources is needed to ensure reliable operation of the transmission system under normal and changing conditions.

Revised Proposed Protocol Language

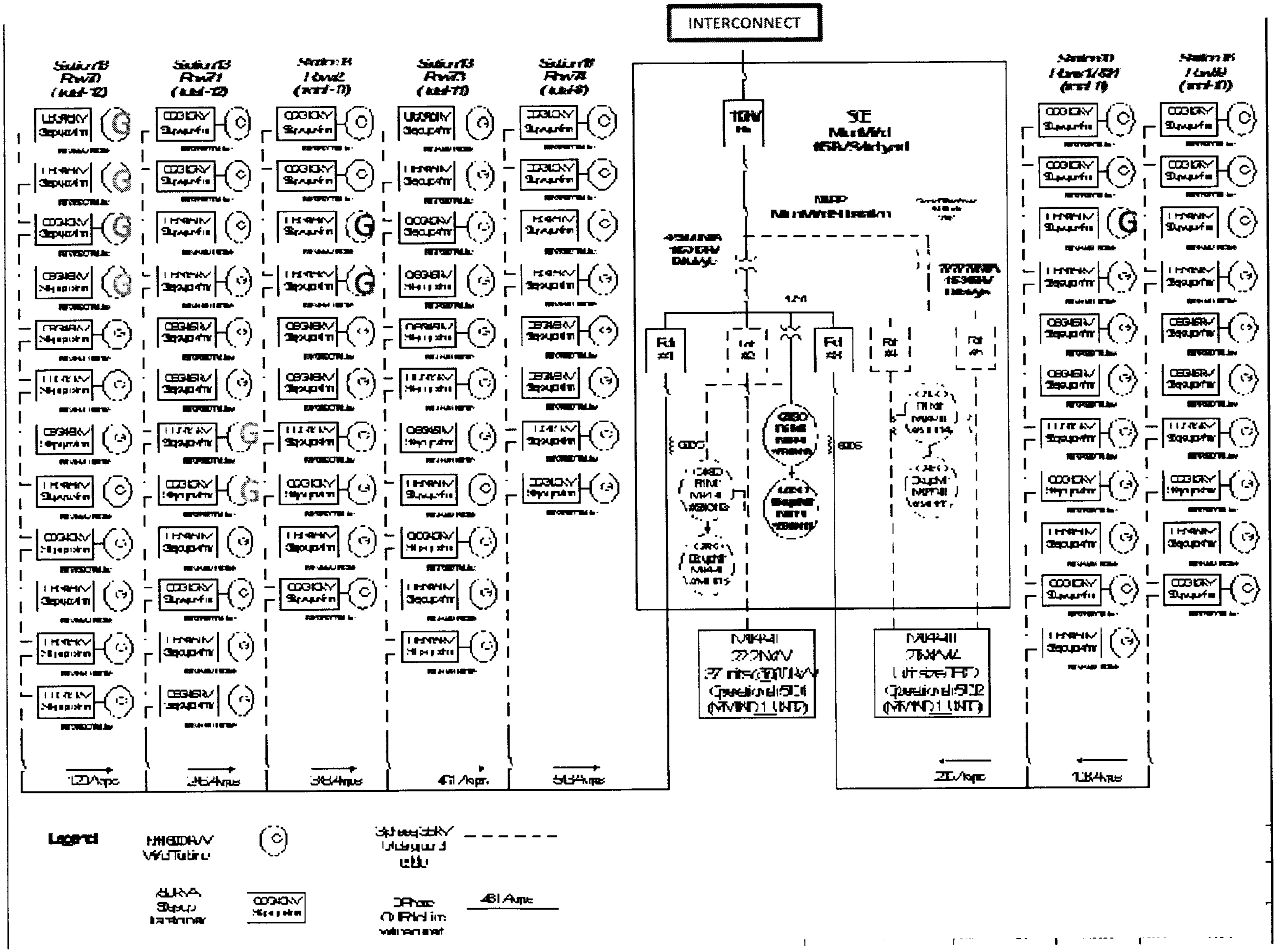
None proposed

PRR 830 ISSUES

- “VIRTUAL” UNITS DO NOT MAKE SENSE

"VIRTUAL" UNITS
DO NOT MAKE SENSE

- NEW WGR DEFINITION CREATES AGGREGATIONS OF ACTUAL WIND-POWERED TURBINES OF THE SAME TYPE FOR MODELING PURPOSES
  - THE WIND COALITION SUPPORTS THE MODELING
  - BUT THE REDEFINITION WILL MAKE WGRs "UNITS" FOR ALL PURPOSES
    - NO METER POINT
    - ALL PROTOCOL AND GUIDE PROVISIONS APPLYING TO "UNITS" AND TO "RESOURCES" NOW APPLY TO THIS VIRTUAL POINT


INTERCONNECT
Legend

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”

MEMORANDUM

To: **ERCOT Board of Directors and Segment Alternates**

From: **Mike Grable, ERCOT Vice President and General Counsel**

Date: **10 November 2009**

Re: **Agenda Items 12(a) and (b): Protocol Revision Request (PRR) 830, *Reactive Power Capability Standards*: Technical Advisory Committee (TAC) Referral for Approval, and NextEra Energy Resources (NextEra) Appeal of Same**

Greetings:

On November 5, 2009, TAC voted to recommend that the Board approve PRR830. Because this PRR has urgent status, it was placed on this month's Board agenda. The following day, NextEra filed an appeal of the TAC action, urging rejection or, in the alternative, amendment of the PRR. These items are Board agenda items 12(a) and 12(b), respectively.

Following TAC Chair Mark Bruce's decision to recuse himself from naming a TAC Advocate in order to remove any appearance of conflict in that process, TAC Vice Chair Shannon McClendon named John Houston of CenterPoint Energy Houston Electric (CenterPoint) as the TAC Advocate yesterday evening. Mr. Houston provided a brief position statement that is included in this Packet; a more complete statement will be forwarded if and when it is received.

Position statements from the following parties have been included in the Board Packet following this memorandum; they are provided in alphabetical order:

- AES Corporation (Robert L. Sims)
- American Electric Power Service Corp. (Kip Fox)
- CenterPoint Energy Houston Electric (John Houston, TAC Advocate)
- ERCOT (Kent Saathoff)
- Horizon Wind Energy LLC (Brian Hayes)
- NextEra Energy Resources (Mark J. Bruce)
- Oncor Electric Delivery Company LLC (Ken Donohoo)
- Wind Coalition (Walter Reid)

Thank you for your attention to this matter, and I look forward to discussing this PRR with you next week.

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

Transcript of ERCOT Board Meeting

TRANSCRIPT OF PROCEEDINGS

BEFORE THE

ELECTRIC RELIABILITY COUNCIL OF TEXAS

AUSTIN, TEXAS

BOARD OF DIRECTORS MEETING

TUESDAY, NOVEMBER 17, 2009

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

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AFTERNOON SESSION

TUESDAY, NOVEMBER 17, 2009

(1:18 p.m.)

12. TECHNICAL ADVISORY COMMITTEE REPORT

(a) PRR830

(b) APPEAL OF PRR830

CHAIRMAN NEWTON: Okay. I believe that we're back on the webcast, and I'm going to reopen our open session of the Board meeting this afternoon. I'm going to handle these next couple of items a little bit differently than what's outlined on the agenda. What we have on our agenda is a presentation on PRR 830, and then we have next an appeal of that PRR. This is a little unusual in terms of process, but we have a number of parties who have asked to make comments relative to this PRR.

If this is all right with the Board -- and I will be open for suggestions -- but rather than us discussing and voting on PRR 830 and then hearing all the comments relative to the appeal, what I would like to do is let's open up the discussion on PRR 830 and let's hear the TAC position, and then let's go through the various parties who have comments so that the Board has the benefit of all the comments before we ask the Board to vote on the PRR, rather than having us vote and then hear and have to potentially make a different decision.

So I'm seeing some heads nod, but I would open it for any concerns if that causes anyone any concerns relative to process.

Okay. Seeing none, with that, Mark, would you kind of kick this off and kind of step us through how we're going to try to approach this from this point?

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

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

The impact analysis shows only minor

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

So as you mentioned, there will be a presentation next by the TAC advocate. I just wanted to mention that, number one, I recused myself as Chair from selecting the advocate of the TAC position. I was the opposing vote to the PRR, and it's my client NextEra Energy Resources, that filed the appeal. So the vice chair, Shannon McClendon, who abstained from the vote, selected Mr. Houston of CenterPoint Energy, who actually made the motion to recommend approval of the PRR.

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

CHAIRMAN NEWTON: Thank you, Mark.

MR. HOUSTON: Can everyone hear me?

CHAIRMAN NEWTON: Yes.

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

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

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

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

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

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

On November 5th we again took up this -- we at TAC then took up this revision. And after considerable discussion -- as Mark just mentioned, we had considerable discussion at TAC -- and it was approved. I believe the vote was 23 to 1, and Mark did recuse himself from selecting the TAC advocate.

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

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

So that adds the certainty that generators look for with regard to they can build the generating plant at its location, and they can achieve meeting the requirements for their output and their interconnection, in particular in this case their reactive requirements.

Incremental needs that the system may

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

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

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

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

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

As previously noted, the requirements for generators are fixed. I think that's a good thing if I was a generator. I think that would be appropriate for my ability to finance projects and be -- my ability to have certainty about what my performance requirements were. They don't vary over time. Those needs for the dynamic support of the system are provided by the transmission providers after significant studies.

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

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

Now, if -- that plan has resulted in us making decisions about investments in the transmission system to enable reliable operation of ERCOT, the ERCOT grid. We're about to embark on a significant study of the reactive requirements associated with the many billions of dollars associated with the CREZ investment. It's intended that if this protocol is passed that that will give certainty to those decisions that need to be made with regard to the dynamic reactive compensation that needs to be added in CREZ by the transmission providers who are constructing the transmission assets that will bring this large amount of wind power to loads.

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

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

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

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

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

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

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

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

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

CHAIRMAN NEWTON: Well, actually what I

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

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

MR. SIMS: Yes.

CHAIRMAN NEWTON: Oh. Thank you.

And before we start the comments, if I could, I want to be sure that everyone has an opportunity to be heard on this. The Board had put together procedures to handle appeals and so forth, and I appreciate the companies that have tried to adhere to those procedures. But we do want to provide an opportunity for the Board to hear any comments from any parties. However, in the sake of time, because this is -- could be fairly lengthy, I would ask that as the presentations are made that we not hear the same comments repeated over and over again. So I would ask that the presenters try to kind of keep that in mind as you go through your comments so that you will be presenting new ideas to the Board. And if you choose to endorse a prior-made comment, that's fine, but not to just restate the same positions over and over if possible.

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

Basically, in 2005 and 2006, a considerable amount of work was performed by a large and broad group of grid operators and stakeholders, including wind generators, and ultimately this work lead to FERC issuing Order 661A, which is included in Exhibit G to the FERC Large Generator Interconnection Agreement. That's now the standard and required agreement across most of the USA. It's used by all investor-owned utilities under FERC jurisdiction, and it's been adopted by a lot of non-FERC jurisdictional entities in many regions of the country.

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

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

So following on to that, September 2004, FERC hosted a technical conference on requirements for the interconnection of wind generators. The conference was broadly attended. It was in Denver. I was there. It went on for a full day with the FERC commissioners there hearing positions about the requirements for wind turbines. That was followed a few months later in December 2004 NERC created the Wind Generation Task Force. And they were chartered with "review the bulk electric system reliability implications and concerns of wind generation." So under NERC, under the Transmission Working Group, their group looked at this issue. They looked at power factor. They looked at low voltage ride through. And they looked at other aspects of integrating large amounts of wind energy into the bulk power system. That group began a series of regular working meetings.

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

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

That was finally followed in December of 2005 when FERC issued Final Order 661A and the final Exhibit G, the requirements for wind generator plants. Under the 661A process, there were a large number of parties that participated. I put together a list here from the FERC filing of all the parties that participated in that process. CenterPoint was the only one from the ERCOT region. Otherwise you see many of the grid operators here: ISO New York, midwest ISO, NERC themselves, New York ISO. A large working group that participatend in this project -- PJM, Southern California Edison, et cetera, Xcel Energy.

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

Most wind turbine manufacturers then, based on the ruling in 2005, designed wind turbines for deployment in the United States based on this requirement, and that is now what's available through most of the country. So we now have a situation where ERCOT is asking for high level -- higher level of reactive support than required by FERC and NERC under the standardized large generation interconnection agreement, without really any technical basis or studies to demonstrate that need for a higher standard.

Thank you.

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

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

Dr. Patton?

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

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

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

MR. SIMS: Sure.

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

MR. SIMS: It really doesn't. It

doesn't say triangle.

MR. PATTON: Thank you.

MR. SIMS: Questions?

Thanks.

CHAIRMAN NEWTON: Andrew?

MR. DALTON: In have one quick question. This kind of relates to the 661A and how we're looking at FERC -- I mean, kind of more globally as, you know, some support for what we're doing here in ERCOT on wind. I know back when we had the LBRT discussion several months ago, I think the wind generation community took the position that 661A, even though it had standards for LBRT, that didn't apply in ERCOT, it never happened in ERCOT, and now here you seem to be taking the opposite position that, well, FERC set a standard, so we should go with it.

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

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

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

MR. DALTON: All right.

CHAIRMAN NEWTON: Mike Grable --

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

Oh, yeah. And you'll notice, if you read through, which I have on my screen now, read through 661A, you'll see all sorts of protests from the industry, mostly having to do with low voltage ride-through. So we never really got around to all of the issues and then FERC just went ahead and passed it anyway. So I don't think using 661A as a basis for an argument is really something that's going to gain a lot of traction within my circles.

MR. SIMS: Well, I do agree that most of the discussion was around the low voltage ride-through. I don't think there was much discussion at all as far as the power factor requirement.

CHAIRMAN NEWTON: Anything else for Robert?

Yes, Mike?

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

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

MR. SIMS: The very last?

MR. GRABLE: Yeah, asking for a higher level than that required by FERC and ERCOT. I think whether it's higher that that required by FERC is debatable, and 661A can be interpreted. But it's the end NERC part of this that troubles me a little bit. NERC did express grave reservations with the wind position in 661A, and Chairman Kelliher pointed that out, that NERC was troubled. So I don't think it's quite right to say that NERC was signed on to your version of the approach here. But I just want to highlight that.

MR. SIMS: Okay. Very well.

CHAIRMAN NEWTON: Okay. Thank you,

Robert.

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

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

And as the Board considers this alternative and this PRR, we need to understand that there are operational things out in the field that we're almost at the point that we can't handle anymore. It should be -- it's not a reliability crisis right now, but it's growing. And we see this more in ERCOT than we do at AEP in some of the other RTOs that we operate where there's wind available.

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

CHAIRMAN NEWTON: Thank you. Any questions for AEP?

Okay. Thank you very much.

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

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

And back in August, John Dumas made a presentation where he stated the rectangle requirement was what the protocol required, which is that generators are to provide a constant source of reactive power over their entire operating range, which is based on the plus or minus .95 at their maximum power level. That was followed subsequently by a market notice to that effect.

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

Back in June, we contacted -- we reviewed the resource asset registration forms that were filed earlier last year, and contacted those generators that, you know, appeared not to meet the reactive requirement in the protocol based on that information. And the resource asset registration forms, which is mentioned in other comments and I'm sure will be mentioned later, their purpose was really not compliance. Their purpose is for us to get accurate data on what is out there in real life so we can appropriately model it. So they weren't established for checking protocol compliance.

But nevertheless, we did go back and look at them and see if the information reflected there showed compliance with the rectangle, and we contacted those that it appeared that they didn't meet that requirement and to get additional information -- or additional reactive resources that aren't reflected in your RARF, and, you know, we got various responses.

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

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

CHAIRMAN NEWTON: Okay. Any questions for Kent?

Yes.

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

MR. SAATHOFF: No, the RARF --

MR. BIVENS: The RARF --

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

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

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

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

MR. SAATHOFF: You know, frankly, it didn't come to our attention, and I assume everybody thought they knew what it meant. And apparently there is a difference of opinion on what it meant.

MR. BIVENS: Okay.

CHAIRMAN NEWTON: Andrew?

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

MR. SAATHOFF: You know, I don't have that information at hand. The 1999 for conventional generators, and February 2004 for wind generators, that was established in the protocol. The -- from 2004 to now and future, that's at issue right now. But the protocol just had those two groups.

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

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

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

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

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

MR. SAATHOFF: Well, we really only became aware that there was an issue back last summer. As a result of discussions with wind generators and other parties, we did the review of the resource registration -- of the RARFs last summer -- excuse me, this summer, back in June.

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

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

MR. DALTON: Okay.

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

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

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

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

MR. GRABLE: Kent, do you mind if I

answer this one? I think it's a procedural question.

MR. SAATHOFF: Okay.

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

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

CHAIRMAN NEWTON: Mike?

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

MR. SAATHOFF: No, there were 16.

MR. GENT: 16 that could --

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

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

MR. SAATHOFF: Of the 16, five

apparently meet the requirement with the generator. Apparently they have some of the newer generators that can provide a full dynamic requirement. Six met it after they provided additional information that was not reflected in the their RARF. Four met it with essentially the way PRR 830 says, that you can meet it by the addition of additional static and dynamic devices in addition to the generation. And one submitted a mitigation plan committing to do that in the future.

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

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

CHAIRMAN NEWTON: Is that all, Mike?

MR. GENT: Yes. Thank you.

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

MR. HELTON: Just real quick question,

Kent. Is there a problem then with our procedures for connecting to the grid itself? And what models -- I know whenever we turned in all of our data for our generation units we had to have every model and every test and everything we did turned in to both planning and operations. Is there a different process or did we just do that and that's -- it's not in the procedure that you actually review that against the OGRs -- you know the operating guides protocol requirements? I'm trying to figure out where there may be a hole where we could catch something like this --

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

I think we also had some miscommunication here between the TSPs and ERCOT. And I don't want to speak for them or our staff or get into who knew what or who thought what, but you've heard from the TSPs -- you've heard from one and you'll hear from -- well, you've heard from two and you'll hear from a third today as we go through this list -- that they believe it's the rectangle, that were there interconnection agreements signed up where the generator is going to tell us they should have known we were talking about the triangle here, you know, yeah. So there clearly are some communication issues we need to work on.

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

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

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

CHAIRMAN NEWTON: Did you have another question?

Okay. Dee?

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

MR. SAATHOFF: Last year.

MR. PATTON: What flagged that to you?

MR. SAATHOFF: Well, there were a couple of events early last year where we had some high voltage in the west and we -- we called on some wind generators involved to deploy their reactive to lower the voltage, and that couldn't be done. So the transmission operator, to avoid equipment damage, opened up the line. So that was the first hint we got.

But then as we went to the wind workshops and discussions on this issue, you know, we were certainly aware it was an issue at that point last summer.

CHAIRMAN NEWTON: Danny?

MR. BIVENS: This may be a question for I think every speaker, but one of the issues today is probably going to be whether we vote this thing up or down or whether it gets remanded back to TAC for further study or more looking at. And there's a statement in Mr. Houston's comments of November 10th and it's also on his slides. He basically says he -- the reactive capability requirements for generators and load are fixed and that if there's any variance at all, then that's going to be done by the transmission owners.

So with respect to whether studies are needed, he makes a statement, "Studies are performed to identify the variable transmission owner requirements," so it's on the transmission owner. And I -- my question is -- I mean, probably everybody -- do you agree that there are no -- there's no need for any further studies? And I think you said the same thing in your comments as well.

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

CHAIRMAN NEWTON: Yes, John?

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

So, yes, we do make those, and we would not go back to the generators. That would basically be every few years, if the study indicated it, instead of building $25 million worth of dynamic reactive I would have had to go back to the local generators and say how about producing .9? How about producing .85? I wouldn't hear that millions and millions and millions of dollars comment many times over.

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

CHAIRMAN NEWTON: Dee?

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

CHAIRMAN NEWTON: Bob?

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

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

MR. HELTON: Right.

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

MR. HELTON: Right. So if something happens and somebody decides that that's not the case, what would the actual change be, and say that somebody said it was the triangle, then you would need -- knowing that, what that would change is the calculation on what the TDSPs would have to do to ensure stability. Correct?

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

MR. HELTON: Right. Okay. Thanks.

CHAIRMAN NEWTON: Dee?

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

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

CHAIRMAN NEWTON: Okay. Any other questions for Kent?

Oh, Mike?

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

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

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

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

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

MR. HAYES: Okay. So before I get started, I just wanted to first thank you guys. I appreciate the time to come and present our side of the story on this and, you know, just to give you a little background. So horizon is active in the ERCOT market. We have a 400-megawatt plant in Albany, Texas just outside of Abilene. And it's been in operation since 2006 and 2007 is when it came on line. So it was post the 2004, you know, that we're talking about here. And, you know, I just want to let you guys know, the reason I'm here today is because reliability is, you know, paramount to us and to, I would say, almost any wind generator in the room. So it's not a thing about concern about -- so we are concerned about reliability.

But the concern that's been raised through this PRR is just the methodology that we're going through to require the retrofitting of facilities to have this -- to meet this rectangle for the wind generators, which I'll go through and discuss why our interpretation of the protocols at the time of interconnect was not the rectangle. And it's going to be -- so it's a cost for us as a generator that will in turn get passed on to consumers. So I just want to make sure that ERCOT and the community is doing the prudent practices to make sure that we're going at this in the right way before we subject to a large investment.

So let me just tell you a little bit about how we interconnected just to give the story on how it worked for us. So as I said, our plant came online in 2006. We did, you know, numerous studies with the TSP to -- providing them all the information of our plant, what the generators were, what the equipment they were going to have in addition to that.

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

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

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

And, you know, I will say also that, you know, all the parties were involved with this. So as the -- after the studies were completed, we completed the GARF, which, you know, now they're on the RARF. Right? But at the time this was the GARF, the Generation Asset Resource Form, that was completed and went through and submitted and approved. And then on the day the plant was energized, there was ERCOT on the line -- I believe it was Oncor and then ourselves ensuring that the plant was interconnected and working as it was designed to do.

So all these things have been checked. And then, as you know, which was discussed previously, then in August of last summer, there was -- there was actually a conflicting message which I think wasn't discussed prior, that in the morning ERCOT sent out a page that basically shows that this is the -- this is how a wind generator resource provides reactive support. And you see the triangle. And then on the top is what a conventional does which is more similar to the rectangle. And I will say that this was not presented. This was sent out to all the people who were going to go to the workshop in the morning. And then by the afternoon, the chart on the bottom right had changed to the rectangle.

But I will point out that the -- actually the example did not change. And so when you can see the second bullet point it says, "Wind generation output equals zero megawatts and the megavar requirement is zero megavars," which is the exact same definition that we're saying here, that it -- as your output goes down to zero, you stay at zero; whereas, the protocol change that is in discussion is effectively trying to get us to provide the reactive support at the highest levels, even when we're at zero.

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

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

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

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

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

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

So anyway, those are my comments, and I

appreciate any questions.

CHAIRMAN NEWTON: Are there any comments or questions?

Kent?

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

MR. HAYES: Yes. Yes.

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

MR. HAYES: Right.

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

MR. HAYES: Yes.

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

MR. HAYES: No, it is not.

MR. SAATHOFF: Okay. Thank you.

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

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

CHAIRMAN NEWTON: Okay. Mike?

MR. GENT: Yes. In your background

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

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

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

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

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

MR. HAYES: Yes.

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

MR. HAYES: -- no problem --

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

MR. HAYES: Going forward prospectively.

CHAIRMAN NEWTON: Thank you.

Yes, Miguel.

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

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

CHAIRMAN NEWTON: Okay. Andrew?

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

MR. HAYES: That is correct.

MR. DALTON: Okay.

CHAIRMAN NEWTON: Okay. Any other comments for Brian?

Okay. Thank you, Brian.

Next we have NextEra.

MR. MARKARIAN: Good afternoon. We actually brought this appeal. I'm Dave Markarian, managing attorney for NextEra Resources for litigation and state regulatory, and we appear most respectfully before this body because we believe that reinterpreting existing protocols and applying them retroactively is a bad idea.

We believe we too are a reliability leader. And we understand and take this very seriously and we seek to do the right thing. But we also believe that we're being entirely reasonable here, and we fear that we're straying a little bit from common sense, which is why we're here.

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

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

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

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

So we began to ask a lot of questions. We couldn't get from ERCOT staff any dates, no descriptions, no analysis of these events, where they were, when they were. But we did our own investigation and determined that not a single event related to voltage -- not a single event related to voltage in 2009 in West Texas was reported in the system operations reports to reliability and operations subcommittee or the Board of Directors or in ERCOT public operations reports. We asked about any events and were told as recently as two days ago that there has been no technical analysis that's been fully performed by ERCOT staff as to these events. No analysis as to the cause of events, no study. Most importantly, that the procedures you're being urged to adopt today would be the proper action to take and would avoid these events.

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

The TAC advocate in its presentation told you that this requirement has been in place for several years. But if you look at PRR, it has been entirely rewritten. The red in the center of this document reflects everything new. The red on the outside of these documents reflects everything deleted, striking entire existing paragraphs, inserting entirely new paragraphs, inserting new technical standards and inserting new compliance deadllines and plan approval processes. These are clearly not the same thing. Moreover, as we just went over, ERCOT has produced documents -- I think someone said it best this afternoon, there might be a communication problem. I think that's probably the best you can say about it.

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

And on the page that you were focused on earlier, look at this. Shown to the right are the reactive capability curves for a conventional generator and a wind turbine. It points you to this D curve, and it points the wind generator to what we have commonly called the triangle. Despite what ERCOT might be saying today, just last year they were not saying the triangle was bad. They were not saying it had to be applied retroactively. They called it, in this document, the requirement.

So regardless of whether you call this confusion or a communication issue, one thing it is not is clear. We knew that because wind farms don't just spring up. Wind farms are built and interconnected in conjunction with the very best engineering minds in this state and from outside of the state that operate in this state. That is the TSPs play a key role. And even though we've heard some of them come up today and say they approve of PRR 830, they in fact have approved interconnection of wind farms with something less than a rectangular configuration and have taken a slightly different position today.

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

And I know very well that ERCOT would not approved anything that adversely affected reliability either implicitly or tacitly and allow it to continue for three or four years and only discover 17 or 20 months earlier that there was some reliability event and, therefore, a problem, and then failed to study it, failed to bring that study before you, but urge action on a matter that would be so costly, ultimately those costs being borne by those we're here to protect.

25.361 says shall, "ERCOT shall accept and supervise all requests for interconnection, shall plan the transmission system." We've heard excuses, or at least explanations, to be a little more polite, but clearly what was known to ERCOT was that at least 80 RARFs were submitted to -- I should say this, it's been set forth by the opponents of this protocol revision review -- at least 80 RARFs have been submitted to and approved by ERCOT. I think the explanation was given to us today that ERCOT has these, but they don't use them for the particular purpose the statute suggests is their obligation.

These RARFs demonstrate, if you examine them and use them, look at them, that wind was not designed to meet the rectangle, the rectangle at least in many, many instances. Local TSPs, some of the best minds in the business, performed interconnection studies based upon the triangle. No problems with the triangle have been identified. And probably most significantly, where there was an additional reactive component necessary, it was imposed upon the wind generators. They put those components in, and did so based upon the studies.

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

The real question we have with regard to this proposal is retroactivity because it sets bad precedent. It can be imposed on anyone literally under any situation. It imposes huge regulatory risk on future business decisions, affecting again anyone. And if you look at the long view, a matter that should be of grave concern and something we shouldn't rush to judgment on. Again, the NextEra position is if a study justifies something beyond the triangular configuration, we'll step up, pay for it and implement it.

And third, we have to look at the long

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

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

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

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

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

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

More importantly, there's no study that

suggests that what's being proposed here will fix the problem. And although it's been stated that there was a lot of analysis of this, we really believe that there was a rush to judgment. This was not assigned to a working group. There was no task force assigned to it. There were several amendments, even some supported by ERCOT staff, that were never voted on.

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

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

MR. MARKARIAN: I think we stated that

we would support it going forward.

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

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

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

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

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

MR. MARKARIAN: That's correct.

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

Yes, Clifton?

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

MR. MARKARIAN: Our estimated number for our system would be about $27 million. And I think some of our competitors are -- if you will, sister wind companies -- have indicated that in addition to our expenditures it would total industry-wide $100 million.

MR. KARNEI: How much?

MR. MARKARIAN: 100.

MR. KARNEI: Okay. Thank you.

CHAIRMAN NEWTON: Charles?

MR. JENKINS: I'd like to understand a little bit more about your offer. You said if a study shows that something else is needed, you would be glad to go back and install that on your existing farms --

MR. MARKARIAN: We absolutely have taken that position.

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

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

CHAIRMAN NEWTON: Is that all, Charles?

MR. JENKINS: Yes. Sorry.

CHAIRMAN NEWTON: Dee.

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

CHAIRMAN NEWTON: Prospectively.

MR. PATTON: -- period, I guess?

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

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

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

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

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

MR. MARKARIAN: I think it's preferable to know that everything we do has a purpose and makes sense. But so much of this -- I mean, I know that ERCOT is a quasi-public body. But so much of this is compromise. And although we might from an engineering perspective have one view, we also recognize that the reality is we all have to work together to try and do the very best we can. And I think what you see in that position is not some sort of hypocrisy but a recognition that we all have to work together and sometimes make compromises.

MR. PATTON: Thank you.

CHAIRMAN NEWTON: Andrew?

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

CHAIRMAN NEWTON: Okay. Mike?

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

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

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

MR. MARKARIAN: No, what I'm guessing -- and it's purely a guess -- is that those are probably units that opted for a particular technology. And as technology marched forward -- you probably know that in and around 2000 I don't think there was a wind turbine capable of producing reactive power, and as technology evolved there were options. And although I don't know the specifics of what the gentleman spoke of, that would be my guess.

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

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

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

CHAIRMAN NEWTON: Bob?

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

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

MR. HELTON: -- I'm not sure what that question meant and what that answer meant. Because if we're looking at prospectively saying we're going to do the triangle, then that is what would be from that point forward. So I'm not sure what you were asking and I'm not sure what your answer meant.

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

MR. HELTON: Okay.

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

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

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

MR. HELTON: Okay. So in other words, what you're saying if he -- you're not -- if you do agree to go with the triangle and not the rectangle, then you're basically saying that they need to take over -- the question was would you take over the responsibility the TDSPs generally take over after the original interconnection is done?

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

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

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

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

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

What Charles is talking about is saying if you agree to do a triangle, are you also agreeing that any upgrades that happen after that point, which traditionally would be taken care of and paid for through TCOS, that you're going accept that responsibility was what I understood. And I understood that you agreed with that? Isn't that right, Charles?

MR. JENKINS: Yeah.

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

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

MR. HELTON: Well, it wasn't my question. I'm just trying to figure out what you agreed to. But what -- the way traditionally things are done is whenever I hook up one of my units and it's hooked up through the typical rectangle situation, I'm on the system. As topology changes and things happen on the system that create different needs for voltage support and studies are done by the TDSP and/or ERCOT, and they have to -- and they say, oh, we've got a stability problem here and so they will go to the TDSP. The TDSP will put in whatever dynamic or static devices need to go in to ensure voltage control in that area. And what Charles' question was, was if you're going to do -- or would you agree that if you're doing the triangle, that any changes therefore that came about on the system for whatever reason around those assets, that you would take the cost of upgrading those devices.

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

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

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

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

MR. SCHAFER: Matt Schafer.

CHAIRMAN NEWTON: Are you with NextEra?

MR. SCHAFER: Yes.

CHAIRMAN NEWTON: Okay. Andrew?

MR. DALTON: I think this question --

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

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

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

MR. MARKARIAN: Essentially, yes.

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

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

MR. DALTON: Okay. With regard to this retroactivity issue that you're raising, I mean, am I correct to read the PRR that the standard doesn't kick in until December of 2010, December 31st, 2010?

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

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

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

This is a proposed adjustment to your business going forward. You may not agree with it, but it's not in any case I think retroactive. And I think that's an unhelpful path to discuss. I think there are other realistic points that we need to debate and consider as a Board. I know I too am concerned about having any group of parties in the market have to pay $100 million that may or may not have significant benefits, but the idea that this is retroactive I think is unhelpful.

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

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

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

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

Mike, did you have something else?

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

There were two comments related to ERCOT staff and either their nonresponsiveness or their statements against interest, and I just want to respond to those very briefly. Regarding the two reliability events, Dave, sometimes as you know events can happen that -- for example, a nuclear event in South Florida can ripple the frequency through the entire Eastern Interconnect. That's going to be public. Other times events are more confidential and they may be referred to Texas Regional Entity here, for example. So there may be reasons that staff is not communicating with a party who wasn't involved in those events. I don't want to dispute your conclusion, but I did want to respond to that point.

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

And I'm not going to go through his

whole email, but, you know, there is not exactly confusion on that point. We did send out an incorrect slide and it did refer to the triangle as the requirement. But that mistake was corrected hours later the same day, and I don't think there can be confusion 5:10 p.m. last August 21st as to what at least ERCOT staff believes is required. So I just wanted to clarify those two points and thank you for joining us.

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

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

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

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

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

didn't intend to make a presentation. We'll just stand by the comments. I will observe that I've interviewed our transmission planners and I've interviewed our staff that does the work on generation interconnection, and there's been no uncertainty in their mind that they've been planning for the wind farms to have a rectangular-type configuration since 2004.

CHAIRMAN NEWTON: Thank you, Charles.

The Wind Coalition, Walter Reid?

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

Okay. Got it. That's me.

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

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

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

But I guess the point I'd like to make here is that we do need clarification. Because we've got so many folks that have already apparently interpreted it one way, we can't allow the next 8,000 megawatts that are about to sign up relative to CREZ to not have some clear direction of what it is that we really intended to say. So we may not have meant what is in those protocols. Maybe we meant something different. And if that's true, we need to make it clear.

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

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

The new definition that ERCOT is putting forward creates fictitious subunits. We have great support for the idea of the modeling. We needed to do that years ago. So I'm thrilled with us doing this. But the problem that we're running into is WGR, as written today, before 830 is adopted, WGR applies to that interconnect point, that big red rectangle up there. And all of these wind turbines -- there's 70 wind turbines in this diagram -- are feeding in via some transformers up to that interconnect point, maybe a transmission line between the substation for the wind generator and the interconnect point with the transmission service provider.

The new definition of WGR says that

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

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

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

By taking the WGR definition and moving it from there and saying all of these blue -- these six blue ones -- are now WGR No. 1, these three red ones are WGR No. 2. And, of course, the rest are WGR No. 3. We have all of a sudden created fictitous things that don't have meter points. And, as a result, we're going to treat them just like units. And if you look in the protocols, the word resource and units occurs in the protocols and the guides over 2,000 times. Now all of those don't apply to WGR no matter how you define them. But all of a sudden what we've been using and interpreting at this interconnect points has now got to be applied here.

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

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

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

CHAIRMAN NEWTON: Very quickly.

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

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

MR. DUMAS: Yes.

MR. DALTON: Could you explain that to me?

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

If you lump those together in 40

turbines to form one unit, our models require one reactive curve. So how are you going to design or draw one reactive curve that represents 40 units with very dissimilar capability?

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

Now, a couple of points I want to make here. The point of interconnect, where that meter -- that red meter that Walter has drawn -- is talking about -- I assume he's referring to the EPS meter, the poll settlement meter, it's very common on conventional units that we may have -- I can think of one case where we've got five different power lines coming into a power plant and there's an EPS meter for those five lines, but the individual units have realtime telemetry provided from an RTU of their individual megawatt output, their individual limits provided through SCADA. So, I mean, that's a common practice and that's how it's done with, you know, almost all of our units with -- providing telemetry that's from -- either from our control system or from a transducer that's out at the field.

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

MR. DALTON: Just follow up on that --

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

MR. DALTON: I'm okay with the concept

of the telemetry and why you want the telemetry on the units. But it would seem to me that from a grid reliability perspective, what you really want is wherever they're connected to the grid to know what capability they're expected to deliver at that point of interconnection -- I mean, if the generators, for whatever reason, can't deliver because there are some units down, that should be on them. And if they create a violation or if they create a grid problem, you know, the TRE or someone is going to come calling on them for that. That's for them to deal with as opposed to trying to -- I'm worried that creating these little subunits inside of a single interconnection potentially creates more reliability issues for the grid than it solves, or am I wrong in that assumption?

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

MR. DALTON: Okay.

MR. DUMAS: You've got to have a reactive curve that represents the capability of that unit, where it can go to. At the point of interconnect, each unit has a -- what's called a voltage schedule where they're trying to hold the voltage. And the way they hold the voltage is they supply either more vars or absorb vars if the voltage is high.

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

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

You also -- if you have any devices in the substation such as cap banks, reactors, stack house, whatever the device is, you model those separately. So they all contribute, but it's very important that you know what the capability of that units is. It's not just the realtime output of the unit. It's what it can do when you simulate these contingencies.

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

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

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

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

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

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

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

MR. DALTON: I'll yield.

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

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

So we're totally supportive of this. I've been on about this for over a year, maybe even two years, that we need this kind of detail in load flow and operations, totally supportive, just don't redefine WGR in the process.

I would footnote that we've taken more time here at the Board to discuss this one issue than at all the committees or subcommittees that have discussed this PRR to date. And I can discuss the flow of this. It's 30 days since this was first discussed that it came to here.

The other things that I'd like to mention and be a little cutesy on it, but what we have here is a failure to communicate. We've got a whole bunch of folks out there that I think were trying to do the best job they could, whether they were transmission service providers or wind generators or ERCOT.

And my analysis of this over now -- over a year of being involved in it, is we've just had people talking in conventional generator terms and people talking in wind generator terms. If you look at the forms that they were asked to fill out, if they didn't fill them out, they weren't going to get interconnected. If they did fill them out, they had to use a lot of engineering judgment, because what they were asked to respond to doesn't fit their hardware and their systems. So you've got a lot of issues that were just very difficult, and we're all learning on this.

The voltage issues that we've had, the one that I'm aware of, that I think was -- highlighted here was a communication issue, as I recall it, where various parties were trying to make something happen. This was, what, over a year ago -- in fact more than a year ago. And as a result of that in some of the workshops we had a lot of discussion. I applaud AEP and Oncor. Oncor sent their operators, every single shift operator from Oncor went to a wind ranch to understand what they're doing, how they're built, how they operate. I believe Ross Phillips gave them a questionnaire to go get answered when you go out to the field so that all those operators understood.

We've got a history in ERCOT of all the folks really working well together. And when they get on the phone or they see a typed message or an automatic display on their computer, they've all had a lot of communication together. They all understand what we're saying. We tend to speak in short words, take shortcuts on our communication.

We've got a new industry that's trying to integrate. I think everybody has been working real hard to do it. We're all running together. I really encourage you to please do what we need to make it clear for the new generators. And the generators that are there, they're there today, they're there tomorrow, they're there next month. Let's take the time it takes to figure out how we're going to handle that. And I don't want to get into discussing from my point of view what the right way to do that is. It's certainly not in this forum. Thank you for your time.

CHAIRMAN NEWTON: Okay. Thank you. Did the Wind Coalition take a position about this prospective and retroactive piece?

MR. REID: Yes. And I say the Wind Coalition, we have not had a vote on it. And, as I say, we have 30 members. And I think someone when they were speaking from -- one of the Wind Coalition members -- used the word competitor. So getting all these guys in the same boat much less paddling in the same direction is a challenge --

CHAIRMAN NEWTON: That's okay. If the answer is just no, that's fine.

MR. REID: So most of those guys have all agreed that this rectangle is definitely where we need to go, and I know of no one that is going to oppose it.

CHAIRMAN NEWTON: On a prospective

basis?

MR. REID: On a prospective basis.

CHAIRMAN NEWTON: Okay. Thank you very much.

Okay. Do we have any other comments or people who would like to make any comments?

Okay. Please identify yourself and who you're representing.

MR. R. JONES: Thank you, Madam Chairman. My name is Randy Jones. I'm with Calpine Corporation, and we're in the independent generator segment. I have the unique privilege of serving this year on ROS, WMS, PRS and TAC. And I can certify to you that you have not met longer today than all those groups have on this issue. Trust me on that.

I come at this issue with a fairly deep background in system operations, although I'm not an engineer. I worked in realtime operations and managed realtime operations for TNP for 13 years, both on a control air generation side as well as the wire side, managing voltage support and reactive compensation.

Our view at Calpine is that voltage support is a community service. No one gets paid for it. And as you're all aware, in the area of discipline of market design, the biggest enemy to any community service is a free rider. It always creates problematic areas.

We view voltage support as an obligation, one that we all share as generating resources. And we believe that there have been enough provisions made in the protocols that everybody can carry their fair share.

As I look around the room, I can also tell you that I'm probably the only person here who participated in the Interim Voltage and Reactive Standards Task Force many years ago that ROS put together. And in at least one of those meetings at the old HL&P building, I asked the question not once but twice: Does this mean that generators can provide a proportional amount of reactive output at lower real power levels? And the resounding answer I got both times was no. I think maybe one time it was hell no -- excuse my French.

But I was disabused of the idea of a system, particularly one operating in the shoulder months at very low loads, where generators would only provide the triangular reactive capability. I still to this day believe that the folks who participated in that group understood very clearly what the requirements had to be. And if developers of wind facilities would have asked any of us, I'm certain they would have gotten the same answer. It's a rectangle, folks.

We believe that PRR 830 has been fully vetted. The debate has been beyond vigorous at times. Despite what you've heard, we think that the time that the stakeholders have had to evaluate this PRR has been more than adequate.

It's a fundamental component of system reliability and security. And the idea that you can take a snapshot and do a study today and that's good enough to determine what a generator ought to provide we believe is a huge myth. Over the life cycle of a unit you just can't continue to perform studies. And I think you saw the fallacy in that kind of approach when Charles Jenkins asked that question. There was a lot of trepidation about how you would approach that. That's why we believe there's a standard; that all resources ought to meet it. And once they meet it going forward, there's no question about where the rest of the reactive compensation has to come from.

We would ask that you affirm the work of the stakeholders, recognize the overwhelming votes for PRR 830 through the stakeholder community, and affirm the work of TAC in denying the appeal of NextEra and approving PRR 830. Thank you.

CHAIRMAN NEWTON: Any questions? Comments?

Okay. I think where that takes us -- oh, I'm sorry. I didn't see her. We do need need to take a very brief break after this presentation because we've got our court reporters here that her fingers are probably about to fall off. I tried to assure them I would try not to go more than two hours and we are already past it, both this morning and this afternoon. So after this presentation, we are going to take just a two- or three-minute break.

I would ask for people not to go real far -- I'll say five minutes, but be back. Okay? So that's a forewarning ahead of time.

Excuse me. Now you can go ahead.

MS. DIFFEN: That's okay. I'm going to make this really short. I'm Becky Diffen representing Duke Energy. In the interest of time and as requested I'm not going to repeat any of the comments made today. But Duke owns several hundred megawatts of wind generation in ERCOT, and we would just like the Board to know we support the comments made today and filed previously by Horizon, NextEra, AESCS and the Wind Coalition. That's all.

CHAIRMAN NEWTON: That was very brief. Thank you.

Anyone else?

I'm not trying to cut anyone off. We'll come back and take further comments. I would just like a hands up or notification.

Okay. Five minutes and we'll come back.

(Recess: 3:20 p.m. to 3:27 p.m.)

CHAIRMAN NEWTON: Okay. I'm going to go ahead and get started. I think we've got enough Board members in the room, at least, and hopefully they will be in their seat shortly.

I think what I'd like to do right now is before we actually discuss the path forward for the board, there has been some nuances and discussions regarding some of the other activities relative to this issue that have been at the Commission. So, Mike, can you touch on those?

MR. GRABLE: Yeah, I'll be real brief and try to be neutral. John Dumas touched on that there have been a lot of staff and wind generator and TSP interactions, that this wasn't a blank slate that began with PRR 830. One of the things that's been occurring is we actually got an interpretation request, which is a little known protocol where you can ask ERCOT legal to issue an interpretation of the protocols, came from an interested party who was looking at building generation, and we replied to it and published an interpretation, and it said this is what we think the PRR -- the protocols existing protocols mean.

Wind generators took that, appealed it to the PUC, requested relief, essentially stating that the triangle was the appropriate -- or the cone was the appropriate interpretation, and we kind of went back and forth on that. We both mutually updated it, tried to resolve the issues. We were unable to do so.

That docket has been dismissed, and the dismissal was upheld by the Commissioners. On a procedural basis, you know, I can't discuss any pending ADRs or whether there will be a future commission action. I also can't discuss any referrals to Texas Regional Entity and whether or not there is or may ever be an enforcement action related to any of this, but there's nothing public at this point in time on those fronts.

CHAIRMAN NEWTON: I appreciate that. I think it's important for the Board to understand kind of all of the activities that are going on relative to these issues.

Okay. We've had a lot of discussion. What I'll do at this point is bring up the recommendation by TAC for approval of PRR 830 and see if we have any further discussion among the Board members, and then I will see whether there will be a motion for approval.

So, Bob, do you want to start?

MR. HELTON: Yeah, I can start. I'm sure cards are going to come up all over here in a minute.

From listening to all this -- and I know there's been a lot of confusion, there's been a lot of miscommunications, and a lot of what I was sitting here and watching and saw what we had going on was it was basically -- I felt like I was an appellate Judge there for a while on making a decision, and that's kind of the way I felt about it. Are the protocols right or wrong is really a lot of what I heard today.

So what I see is in 830, so I'll talk about that first. 830 sits out there and says here is -- as John and Kent have said, "Here is what the requirement was, and here is a way to comply," and says there's people out there that do not comply.

My problem with that is, if we have people out there that aren't complying with the protocols, as written, as you guys define them, you need to be filing notices of violations. Okay? That needs to be done, referred to -- or not ERCOT do that. They are referred to the TRE for that. I'll get the procedure correct, and the TRE takes that.

As part of the NOV process, you figure out who is right, who is wrong, what those are. And then if there's mitigation that needs to take place, that's done through that process to get people to where the protocols are -- or tell you you have to be, and if that's retrofit, that's retrofit.

What I think that 830 does for the retrofit piece is circumventing that process. I understand what it was trying to do. It was trying to give people an avenue out there in the protocols to do that, but it also looks like ERCOT is changing the rules and trying to make entities retrofit, and I think doing this process takes that away. Let that be thought out through the NOV process, who is right, who is wrong and then what has to takes place. That would be my suggestion, let the process work instead of circumventing it with a 30 on the retrofit.

The other side going forward, if we feel the need, which I think we might want to ensure that from this point forward it needs to be clarified to say it is the rectangle, then we can do that. But, you know, my first thought when I first saw this whole thing was 830 isn't needed. If you say that this is what the protocols say, that's what they say. Everybody has to comply, period. And then if there's a disagreement with that, there are processes to take care of that. You don't have to -- you would not need this at all for retro or moving forward. But I can see with everything going on we might want to go ahead and push 830 back to do -- make sure that it addresses only the going forward part and letting the NOV ADR processes take their place and let the process work rather than circumventing it. So that's kind of where I would kind of throw out right now.

CHAIRMAN NEWTON: So can I put that in other words? I think what you're saying is you're recommending that the Board remand back the prospective decision, that the rectangle applies to everyone, all generation types, but remand it back from some period of time so it can come back to be explicit about the prospective piece --

MR. HELTON: Be prospective, right.

CHAIRMAN NEWTON: -- but not to address the retroactive piece, let that go through the NOV process?

MR. HELTON: We've already heard from ERCOT staff, from the TAC representative that that's what they believe the requirements were, were rectangle. So protocols in their eyes and what they said are there. There are processes to get that taken care of, which is, you turn it over to the TRE, the TRE makes a determination, and then they fight it out wherever -- in whatever venues that is, and whoever wins, wins. If there's retrofit, then retrofit takes place through mitigation plans that are done through that process. It takes us from being looking like that we are turning around and changing the rules and making retrofits. It allows the process to work, and I think this circumvents it the way it's written.

CHAIRMAN NEWTON: Okay. Brad?

MR. COX: Yeah, I think, you know, we've seen the split into the two pieces obviously, the prospective piece and what do we do with the existing system and the existing wind farms, and I'm fine with -- and it seems like everyone that's spoke is fine with having this requirement on a prospective basis for new facilities, I guess.

So the question is, what do we do with the system as it exists today, and the thing that concerns me is I would -- you know, I would really like to see some type of a study that says, "Here are the problem areas, and here is the most cost-effective way to deal with those." And I don't -- I don't think we have that, at least I haven't heard or seen anything about that, that type of an analysis.

You know, I think Bob makes a good point about letting the ADR process play itself out. I don't have a problem with that, but I would -- you know, if we decide to go down that path, let's go ahead and figure out what the circumstances are and what needs to be done and what's the most cost-effective way to -- you know, if there are changes that need to be made so that we don't, you know, lose time, you know, in respect to that. That's -- you know, after listening to all the discussion and reading the materials, that's where -- it seems to me the most reasonable approach.

CHAIRMAN NEWTON: Charles?

MR. JENKINS: I was going to talk on a slightly different issue, and that was the WGR definition issue that Walter Reid brought up. And if we do end up sending this back to TAC, I guess I would encourage them to address the point he made. I think it was a pretty valid one.

If we go the direction Bob is suggesting of just letting the ADR process -- those that are appealing 830 are sort of rolling the dice. Right now they've been offered somewhat of an "It's okay," and you've just got to get in compliance by this date out, and so the mitigation is sort of already worked out and it's known.

If we just let it go, what does the existing rule require, and if it's determined that it does require something different than what they can deliver today, you know, I don't know what the mitigation is going to be. It may be worse or better than what's in 830 today.

So I sort of don't know how -- how to deal with that. I don't like the position that the Board is in on this matter. I think we need to remand at least on the issue that Walter raised. I'm still -- I'm still not sure where I am on the broader issue.

CHAIRMAN NEWTON: Okay. Mark?

MR. ARMENTROUT: I'd just like to point out that Chairman Smitherman is not in the room for a reason, and that reason is that the Commission will rule on the retroactive issues, so just to put a leveling agent and how much time we want to put in to voting that piece.

The second point I wanted to make -- and Charles has made some comments that made me rethink this, but I'll say it anyway. We could do what you said, Bob, here in this meeting right now without remanding it to TAC. I'm not recommending it. I'm just pointing it out.

CHAIRMAN NEWTON: John?

MR. DUMAS: Just one comment on the -- something that Brad said about studies. Obviously I think John Houston made the point earlier that we have standards that apply to generators and apply to loads, and we've studied the transmission system to determine what variability, what variable equipment we need there.

I think we don't want to get in the position where in the future -- you know, the system is dynamic, the system changes, the needs change all the time. I think Charles alluded to that earlier. Needs are constantly changing. We don't want to be in a position where the standard gets challenged and we're asked, "Well, okay, show me a study where I have to put this in or I have to meet this standard." That's a bad position for ERCOT to be in, number one.

Number two, we are making some assumptions. We have been making some assumptions about the capability of resources in all our planning studies going forward. We will be doing the CREZ reactive study, and we will be making assumptions in that study as to what the capabilities are of generators moving forward. So it's important that, you know, we make the right assumptions and don't have to go back and redo some of those analysis.

CHAIRMAN NEWTON: Mike?

MR. GRABLE: Yeah, I first want to say something real quick that I should have said at the beginning, and that is I think you-all know I wear two hats when I sit here, one is as counsel to the corporation and this Board, and the another is an officer of ERCOT similar to the other officers sitting at the table. I think you understand I've spoken today as an ERCOT staff member and on behalf of the ERCOT staff a proponent of PRR 830, but I just want to be absolutely clear on that, except for asking people to give a business card to the court reporters.

Bob, I want to go back to why we filed this PRR and explain why, from a staff perspective, we would have concerns with sending this back to TAC to be rewritten to be prospective. I'm certainly glad the wind generators are okay with prospective for new units rather.

But I kind of had three thoughts in mind. One was create a grace period for compliance for the generators that we know today are not compliant with our version of how things should be, and we understand there are major capital investments that would be facing them to get compliant.

The second was to clarify and increase the flexibility that we already have, but to kind of spell it out a little better, to help wind generators who can't do fuel dynamic with a mix of dynamic and static or other alternatives to more better explain the process by which we will be open to negotiations on alternative compliance.

And third, do our best, as John Dumas just said, to avoid erroneous assumptions flowing into the CREZ studies, fully understanding that the Commission and possibly beyond the Commission are the ultimate decisionmakers on all of these points. We do want to try to get it right, if we can.

To do any of those three things, we have to understand what the protocols require today. If the protocols do not support -- you know, if the Board does not share our sense of the protocols, we can't accomplish any of the goals for which this PRR was filed. So that would be my concern with that approach, and obviously NOVs from TRE or PUC enforcement, there are none that I know of today and PUC appeals on this or other matters, ADRs and the like are certainly not precluded.

CHAIRMAN NEWTON: Bob, do you want to address that?

MR. HELTON: Yeah, I do actually because there's actually something you said there that concerns me greatly, and I'll address just 2 and 3 first.

I think that it's great to increase -- part of what 830 and looking forward, I think it's great to increase that flexibility of the mix of what they could do to comply with the protocols, and you're absolutely right, you need to avoid. And I think you're looking at this wrong. I think that if -- if the Board says, "Let the NOV process work," we're not disagreeing with you. We're saying, "You said the protocols are that, go file and put that over to the TRE and do what the protocols say."

My problem with No. 1 is, is I don't believe ERCOT has the leeway on any compliance issue to create a grace period. You find a protocol violation, you file and turn it in, and then you let the TRE and the process work. I'm really concerned about the grace period piece because then you're making it to where I'm saying, "Well, you, I'm going to give you a grace period." "You, no, I'm not giving you a grace period on this assumption," and I have a real issue with that.

That's why I'm saying -- for right now I could say I agree with your interpretation even though I know that's going to be challenged. I could say it right now if I wanted to. I agree with where you're at. Go file with the TRE and say you have protocol violations. Let that process work. That's why I'm saying that 830 -- and I understand what you're trying to do. You're trying to help.

The wind -- you know, talking about what Charles was talking about, this is -- there's a roll of the dice. The winds are -- the wind group says "We're right, they are wrong." Let them have their day in court, go through the process.

By doing this, I think you're trying to help it with them, but you're boxing them in and circumventing that NOV process. I think we need to let the process work, and there is no grace period, as far as I'm concerned. That's the only reason I was trying to push that out there.

MR. GRABLE: Yeah, respectfully I think

you misunderstood --

MR. HELTON: I was hoping I did.

MR. GRABLE: -- what my intent was and really what I said. If this protocol revision request passes today and creates a 12-month, or whatever the time period is, timeline for compliance could -- you know, was the protocol what it was in November, October, September? Yes. Could Texas Regional Entity or PUC enforcement and oversight bring an action based on noncompliance in October of 2009, you know, if they agree with ERCOT staff's position? Yes. Does it color their evaluation of whether to do so if we have a plan for compliance and ERCOT operations have signed off on it as acceptable down the road? Yes.

So don't misunderstand. I'm not offering on behalf of staff or anyone else carte blanche for interpretation of the existing protocol. I'm just suggesting that it would -- that's our plan, is to develop a path to meet them over time, granted with our interpretation, and I think that that would color any enforcement decision. I don't think it's a given that NOVs must come first.

CHAIRMAN NEWTON: Okay. Danny?

MR. BIVENS: This may have been covered already, but I just -- you know, to the extent that there's been a circumvention of a process that's already in place, you know, I kind of thought the same thing at first, but as many of you in the room -- my background comes from a lot of years of just being in the regulatory world, and that world, to try these things on a case-by-case basis instead of coming up with a rule, and in this case protocol, that would apply to all so that everyone applies with the same rules of the road, I think is always superior.

And I don't know what ERCOT's thinking was in coming up with this protocol, but, you know, when you go to doing the NOV process and start taking each one of these -- and how many of those generators are noncompliant? What was the number? You know, you start doing that, you know, everyone is going to be done on a different timeline. You're going to expend a lot of resources, and December 2010 gets here, which is the date that's in the protocol, you're not even going to be close. So I don't know, for whatever that's worth. I don't prefer piecemeal or a piece-by-piece approach to a rule.

CHAIRMAN NEWTON: Andrew?

MR. DALTON: Yeah, Kent, I have kind of a question for you or for John. We're talking about potentially having the wind folks spend a nontrivial sum of money. We already have the LVRT study underway. Would it be even possible to add the reactive power issues to the LVRT study without delaying the LVRT study? Is that a possibility, or is that not a possibility?

MR. SAATHOFF: Let me get Dan up here. He's more familiar with the LVRT study.

MR. WOODFIN: Yeah, I think at this point we've made a lot of the assumptions about what the characteristics of the units are and those kinds of things. As a part of that process, they are gathering the information. It's going to be a dynamic study. So it's going to include -- essentially it's looking at the actual requirements, the actual capabilities, I believe, in that study from a dynamic perspective, so -- and it's only studying the timeframe. It's studying a topology that's pre-CREZ, and that was specified in how the study was set up.

So it may study kind of the in between now and CREZ requirements. I don't think it would be that difficult to actually address that issue in the LVRT study for that timeframe. It will not cover the ongoing needs of the system post-CREZ. We'd have to include that in as an additional work item somehow to the CREZ reactive study to look at kind of the incremental needs if the -- that generation doesn't -- isn't able to meet the protocol requirements.

MR. DALTON: What's the timeframe for the CREZ study, the reactive study?

MR. WOODFIN: The current scope of it is intended to be completed mid July of next year.

MR. DALTON: July 2010?

MR. WOODFIN: Yes.

MR. DALTON: So it's basically on a similar timeframe as the LVRT study.

MR. WOODFIN: A little longer, yes.

MR. DALTON: A little longer, okay.

CHAIRMAN NEWTON: Okay. Nick?

MR. WOODFIN: Okay. Thank you.

MR. FEHRENBACH: And this has indeed been a nice, long discussion, and it's always good to see energetic discussion on an issue. And, you know, I listened to all the presentations, and the one thing I was looking for is really an explanation from the wind resources on why they thought this triangle or cone applied. When you get down to it and you read the actual existing protocol language that's been there since 2004, I concur with ERCOT that it's a rectangle, and it's always been a rectangle.

I have a problem if we decide to remand

this or pass on it or drag this out further that, you know, we have a group of entities that have essentially been in noncompliance with the protocols. And should we send an NVI? Probably. And even if we pass this PRR, we can still do the notice of violation for October or prior months, and that certainly can be done. Do they have -- if they are complying with this timeframe or window to get in compliance, that would probably be a good defense to the NVI, but it shouldn't -- it doesn't stop the process from going through.

But, you know, the only explanation people could say why they misinterpreted is some errant slide that may or may not have been in an ERCOT presentation that was corrected or some other language dealing with deployment rather than the actual requirement, and to me that's not compelling, and I think the protocols were clear that it should have been a rectangle. I'm sorry if that costs money to, you know, the wind generation folks to retrofit, but the protocols have been there since 2004. It shouldn't be a retrofit. It should have been stalled initially, and I think it's time to move forward. If through the ADR process or NV --

MR. DALTON: NOV.

MR. FEHRENBACH: -- NOV process, you know, people seek to get some other mitigation, they can certainly do that, and they can do that even if we adopt this and -- just to see if we can get a second and move forward, I will move that we adopt PRR 830 and reject the appeal.

MR. DOGGETT: I'll second.

CHAIRMAN NEWTON: Okay. We have a motion from Nick Fehrenbach, and we have a second from Trip Doggett. Charles?

MR. MANNING: I was just going to say I'm going to support that motion.

CHAIRMAN NEWTON: And I'm sorry to interject. Just for clarification, it was kind of a double motion. It was a motion to approve the PRR and reject the appeal. Correct?

MR. FEHRENBACH: Which I think actually by approving the PRR we pretty much reject the appeal, but I just wanted to make it clear that we were doing both.

(inaudible)

CHAIRMAN NEWTON: I think we probably need to do both. We have them both noted for vote.

MR. JENKINS: I think the quickest path to resolution on this is for us to put this PRR forward. I agree with Mark the decision is going to be made down the street, and kicking it back to TAC is not going to accomplish anything other than spend more time.

CHAIRMAN NEWTON: Dan?

MR. WILKERSON: I just wanted to say I support the motion. I believe reactive capability curves are a standard, and you don't really mess with standards. If it's going to be messed with, it needs to be done down the street, and that's -- kicking it back to the technical folks who sent it to us with an overwhelming majority doesn't accomplish anything.

CHAIRMAN NEWTON: Okay. Trip?

MR. DOGGETT: I was going to clarify that I would be flexible on the -- Walter's issue of WGR if there was an interest in a friendly amendment to ask TAC to revisit that issue. I talked to Walter and John out in the hall, and I think there might be an opportunity to have further discussion on that issue.

CHAIRMAN NEWTON: Okay. Before we continue with comments, Nick, you made the motion. Would you be amenable to that friendly amendment?

MR. FEHRENBACH: I don't have issue with that --

CHAIRMAN NEWTON: Okay.

MR. FEHRENBACH: -- if, you know, we want to fix that little piece of it.

CHAIRMAN NEWTON: Okay. We'll continue. Bob?

MR. HELTON: Yeah, just real quickly I agree that sending it back to TAC is not the right thing to do. It was just one of the thoughts I had. We could fix it like you had talked about, Mark, doing that prospectively here.

And I understand what's trying to be done. I'm having a problem. I still believe that the retrofitting piece in this, while I understand the full thing, I think it is a circumvention of the process, and I don't think I can support it for that reason. But I also know that this is a faster way of getting it over to the Commission because no matter what we do here, it's going to get there. I was just trying to get it through a process that when they get over there it's not going to be kicked back over an appeal on a procedural issue because it didn't go through the right process, like they had on the other side whenever they tried to circumvent the process to get it over there the first time. And I'm concerned that by doing that, it could end up back again over --

over a procedural issue. So that's my concern with that.

CHAIRMAN NEWTON: Okay. Bob Thomas?

MR. THOMAS: Thank you. I'm going to support Nick's motion. I think the Board is good at setting policy and rules, but it's not good at resolving legal and factual disputes that we have in front of us. We need to get this out of here up to the Commission and let them apply their process to the dispute.

One thing I'll be listening for in that proceeding is the following: Very clear positions that the requirement has been set for a number of years, and I guess one question that hasn't been answered today that I'm going to be listening for is why would -- if it's so clear, why would anyone spend all that money knowing they were making a mistake?

CHAIRMAN NEWTON: Andrew?

MR. DALTON: Yeah, I guess I have kind of a more pragmatic concern to address. I mean, it seems any way you look at this PRR, we were going to potentially give wind until December 31, 2010 to kind of build in to compliance. We have two studies underway right now that might be able to give us a very good picture of what compliance really ought to look like from a standpoint of total system reliability.

You know, we're going to have a lot of issues integrating more and more wind through the CREZ process, integrating the wind that's on there now as we increase our transmission capabilities to move that wind to market. In doing so, it's going to cost money to wind generators, to everybody else on the system to make that.

Before we would embark on spending a hundred million dollars or anything in that ballpark, I would like to know that we are spending that money in the most wise and efficient manner possible to the ultimate benefit of the grid long term. If there is a way to address this type of issue in the ongoing studies without prejudicing whatever this PRR does, I would strongly recommend to ERCOT staff to take that into consideration because I don't think whatever -- when this gets over to the Commission, this isn't going to be resolved by April or May. We're going to have these studies coming out June and July. They might give us the picture of what the grid really ought to look like going forward, and we ought to be working towards that as a solution because the Commission solution isn't going to help us fix the way the grid ought to look and what wind generators ought to do going forward.

We've been talking about getting the right metrics and the right requirements for wind for the better part of a year now. I think we have an opportunity to work that in, regardless of what we do with this PRR, and I think we should take it.

CHAIRMAN NEWTON: All right. Thank you, Andrew?

Clifton?

MR. KARNEI: Yeah, I support the motion, but I guess my question is a little bit different, and it's to Grable. Since it's clear that ERCOT staff has a position in this and since Trip is technically an ERCOT staff member, I question whether he should be the second on the motion and should vote on this or possibly recuse himself. I'm just raising that as a procedural thing for the second to the motion and would like your comments on that, Mike.

MR. PATTON: I'll second that.

MR. KARNEI: If Trip withdraws his motion -- I'm not one to put Trip on the spot. I'm just saying --

MR. GRABLE: There's no distinction really in terms of importance between being the second and being a voting person. Let's say it were a Brazos line and you were either an affirmative vote, say, ten to five vote, and you were either the second or just an affirmative vote, it would be a problem either way.

I will say that the duties with which ERCOT staff are charged are public interest and reliability duties, and although Trip is an ERCOT staffer and is voting in alignment with those interests, I do not read any of our conflict rules or any general ethical dictate to require that the ERCOT CEO recuse himself because ERCOT staff is a proponent. The ERCOT CEO has voted on countless ERCOT staff-sponsored PRRs, OGRRs, everything. If you were to set that precedent, you might as well just decree -- you might as well -- we've got the bylaws coming up in a bit. You might as well make the CEO a nonvoting member because any action this Board votes on almost by definition has an impact on ERCOT staff.

MR. KARNEI: I'll withdraw my comment. Thank you.

CHAIRMAN NEWTON: All right. Brad?

MR. COX: Yeah, I'm largely in agreement with the direction we're headed. I'll tell you the one thing that I'm hung up on, and it's similar to what Andrew discussed earlier, is, you know, it's less than certain -- I mean, if we didn't have some ambiguity here, we wouldn't be spending all this time discussing what the requirement is in the protocols as they are written today. And the concern I have is that if the -- you know, if whatever procedural route this takes after it leaves here the -- you know, if the Commission determines that, yeah, there is ambiguity or whatever, you know, it would seem to me there ought to be, again, the flexibility to deal with the existing system as opposed to imposing a blanket requirement over the existing system, so I -- because there may be more cost-effective ways to remedy, you know, whatever problems may exist.

I doubt that my request for that type of flexibility as a friendly amendment would be entertained. I'll throw it out and make -- make that request, Nick, and see what your thoughts are. Do you understand what I'm saying? It's -- they were getting pretty complicated here, but I'm just -- the track we're on right now really will put all of these resources on a -- on this rectangle standard with a grace period. Is that -- would you agree?

MR. FEHRENBACH: I would concur, but, of course, I also think that under the current protocols they should already be there.

MR. COX: Right. And, you know, I'm only trying to leave enough flexibility to -- you know, if circumstances are such that that flexibility is warranted to allow for a more cost-effective solution down the road, and I'm -- this would be -- I'm having a difficult time communicating this perhaps, but that's the one issue I have left with where we're headed.

MR. FEHRENBACH: And, you know, in reading 830 the way it was written, one of the things that I thought was sort of innovative, and Bob Helton would probably say is one of those problematic things, that it allowed the wind generators to come in compliance by actually paying the T&D utility to install devices to make them compliant. And that's sort of a stretch for us because I don't think we've done that in the past, let entities pay someone else to install devices to make them compliant, but -- and I thought that was innovative, and that probably gets into a cost-effective solution for some of those entities, but even that, you'll probably have people not wanting to go that route and possibly going through one of these other processes that are open to them under law.

CHAIRMAN NEWTON: Okay. So I'm assuming

that that is not an acceptable friendly amendment.

MR. FEHRENBACH: And again, I'm not sure exactly what the friendly amendment would be. So I can't really accept it.

CHAIRMAN NEWTON: Okay. John, your card has been up -- down there for a while. I've been trying to take the Board members first.

MR. HOUSTON: Yes. No, and I appreciate that, madam Chairman, and I just wanted to add my view that we really need to address the issue of what is the standard. This Board needs to take a position, if nothing else, for future generators who are walking in the door asking to connect. It needs to be clear. Certainty needs to be taken, and I think our whole compliance regime of both ERCOT and participants is at risk if we do anything other than approve this going forward.

CHAIRMAN NEWTON: Well, I've been relatively quiet here, and I'm speaking as just a Board member myself here, but after listening to the debate, that's where I fall out, is that I specifically asked most of the commenters, and everyone seems to be in agreement, that prospectively everyone getting on the same page relative to this requirement is critical. And based upon that, it looks like the big issue, in my mind, is the retroactive piece.

I fully understand the heartburn that creates for the wind generators from an investment perspective. However, it looks like this thing is going to get resolved, and the fastest way to get that piece resolved is for us to move forward. So I will be supporting it as an independent Board member.

Dee?

MR. PATTON: Madam, I call the question.

CHAIRMAN NEWTON: Okay. I've got one other card, Dee. Can I -- can I just get Miguel's? He's been pretty quiet, too.

MR. PATTON: I call the question.

CHAIRMAN NEWTON: Okay.

(Laughter)

MR. GRABLE: That's a motion that requires a second and would have to be voted on to determine if Miguel is heard or not. So is there a second for the calling?

CHAIRMAN NEWTON: Miguel --

MR. ESPINOSA: Thank you.

CHAIRMAN NEWTON: -- real quickly lets --

MR. ESPINOSA: I support the motion as

proposed. A, it seems to me like we should have been there already, and we're not. I'm heartened by the fact that nobody has gotten up and spoken against the prospective issues for us. And if the looking back the issue has to be resolved at 17th and Congress, sobeit.

CHAIRMAN NEWTON: Okay. We have a motion. We have a second. Everyone clear on the motion?

(No response)

CHAIRMAN NEWTON: And with the friendly amendment. Okay?

MR. GRABLE: And, Madam Chair, let me -- was there a second friendly amendment?

CHAIRMAN NEWTON: No, just -- no, he's talking about the motion included --

(Simultaneous discussion)

MR. GRABLE: Oh, I see, right. The two pieces being approval under Item 12(a) of the protocol revision request and rejection of the appeal under 12(b). And I want to ask Mr. Doggett so we're perfectly clear, his friendly amendment was to clarify that the PRR 830 would be approved "as is" but a separate instruction given to TAC to revisit the WGR issue.

MR. DOGGETT: That's affirmative.

CHAIRMAN NEWTON: Okay. I won't repeat that. We now have a motion and a second for approval of PRR 830 and rejection of the appeal to that PRR.

MR. ESPINOSA: And I accept Dr. Patton's calling of the order.

(Laughter)

CHAIRMAN NEWTON: All in favor?

(All those in favor of the motion so responded)

CHAIRMAN NEWTON: Opposed? We have one -- two oppositions, one from Andrew Dalton and one from Bob Helton.

Abstentions?

(No response)

CHAIRMAN NEWTON: The motion passes.

Andrew?

MR. DALTON: One final point. I would sincerely hope that no one who is a generator comes forward after this meeting today and expresses any confusion or concern that everyone expects the rectangle will be implemented on a going-forward basis.

(Laughter)

MR. DALTON: And if it comes up, we're

going to pull this transcript out.

MR. HELTON: Yes.

CHAIRMAN NEWTON: Okay. Thank you very much.

All right. Mr. Bruce, it's back to you.

MR. BRUCE: Thank you, Madam Chairman. That completes all of the PRRs for Board discussion today.

12(c). LOAD PROFILING GUIDE REVISION REQUEST 035

MR. BRUCE: That leaves us with a Load Profile Guide Revision Request No. 35. This guide revision request is on the agenda for Board approval because it does have system impacts. This load profile guide revision request will allow the addition of time of use schedules to profiles for IDR meter-type data codes for the advanced meter implementation project.

The impact analysis has minor impact -- cost impacts to be managed under the O&M budgets of the affected departments. It's a low impact, but there is an update to the Loadstar table that's required. It does not have any code changes, though. This is proposed to be effective upon Board approval, but there is a 150-day market notice that's required. So that notice would expire in mid April of next year,

CERTIFICATE

STATE OF TEXAS)
COUNTY OF TRAVIS)

We, Lou Ray and Kim Pence, Certified Shorthand Reporters in and for the State of Texas, do hereby certify that the above-mentioned matter occurred as hereinbefore set out.

WE FURTHER CERTIFY THAT the proceedings of such were reported by us or under our supervision, later reduced to typewritten form under our supervision and control and that the foregoing pages are a full, true, and correct transcription of the original notes.

IN WITNESS WHEREOF, we have hereunto set our hand and seal this 24th day of November 2009.

KIM PENCE
Certified Shorthand Reporter
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PURA provisions cited in the appeal

PURA PROVISIONS CITED IN APPEAL

SEC. 31.001. LEGISLATIVE FINDINGS; PURPOSE OF SUBTITLE.

(c) The wholesale electric industry, through federal legislative, judicial, and administrative actions, is becoming a more competitive industry that does not lend itself to traditional electric utility regulatory rules, policies, and principles. As a result, the public interest requires that rules, policies, and principles be formulated and applied to protect the public interest in a more competitive marketplace. The development of a competitive wholesale electric market that allows for increased participation by electric utilities and certain nonutilities is in the public interest.

SEC. 35.004. PROVISION OF TRANSMISSION SERVICE.

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

SEC. 35.006. RULES RELATED TO WHOLESALE TRANSMISSION SERVICE, RATES, AND ACCESS.

(a) The commission shall adopt rules relating to wholesale transmission service, rates, and access. The rules:

(2) may not be contrary to federal law, including any applicable decision, rule, or policy statement of a federal regulatory agency having jurisdiction;

SEC. 39.001. LEGISLATIVE POLICY AND PURPOSE.

(c) Regulatory authorities, excluding the governing body of a municipally owned electric utility that has not 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.

(d) Regulatory authorities, excluding the governing body of a municipally owned electric utility that has not 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, shall authorize or order competitive rather than regulatory methods to achieve the goals of this chapter to the greatest extent feasible and shall adopt rules and issue orders that are both practical and limited so as to impose the least impact on competition.

SEC. 39.151. ESSENTIAL ORGANIZATIONS.

(a) A power region must establish one or more independent organizations to perform the following functions:

(1) ensure access to the transmission and distribution systems for all buyers and sellers of electricity on nondiscriminatory terms;

(2) ensure the reliability and adequacy of the regional electrical network;

(3) ensure that information relating to a customer's choice of retail electric provider is conveyed in a timely manner to the persons who need that information; and

(4) ensure that electricity production and delivery are accurately accounted for among the generators and wholesale buyers and sellers in the region.

(c) The commission shall certify an independent organization or organizations to perform the functions prescribed by this section. The commission shall apply the provisions of this section and Sections 39.1511, 39.1512, and 39.1515 so as to avoid conflict with a ruling of a federal regulatory body.

SEC. 39.1511. PUBLIC MEETINGS OF THE GOVERNING BODY OF AN INDEPENDENT ORGANIZATION.

(b) The bylaws of the independent organization and rules of the commission must ensure that a person interested in the activities of the independent organization has an opportunity to obtain at least seven days' advance notice of meetings and the planned agendas of the meetings and an opportunity to comment on matters under discussion at the meetings. The bylaws and commission rules governing meetings of the governing body may provide for a shorter period of advance notice and for meetings by teleconference technology for governing body meetings to take action on urgent matters. The bylaws and rules must require actions taken on short notice or at teleconference meetings to be ratified at the governing body's next regular meeting. The notice requirements may be met by a timely electronic posting on the Internet.

SEC. 39.904. GOAL FOR RENEWABLE ENERGY.

(a) It is the intent of the legislature that by January 1, 2015, an additional 5,000 megawatts of generating capacity from renewable energy technologies will have been installed in this state. The cumulative installed renewable capacity in this state shall total 5,880 megawatts by January 1, 2015, and the commission shall establish a target of 10,000 megawatts of installed renewable capacity by January 1, 2025. The cumulative installed renewable capacity in this state shall total 2,280 megawatts by January 1, 2007, 3,272 megawatts by January 1, 2009, 4,264 megawatts by January 1, 2011, 5,256 megawatts by January 1, 2013, and 5,880 megawatts by January 1, 2015. Of the renewable energy technology generating capacity installed to meet the goal of this subsection after September 1, 2005, the commission shall establish a target of having at least 500 megawatts of capacity from a renewable energy technology other than a source using wind energy.

(l) 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.

PUCT Rules cited in appeal

§25.501. Wholesale Market Design for the Electric Reliability Council of Texas.

(a) **General**. The protocols and other rules and requirements of the Electric Reliability Council of Texas (ERCOT) that implement this section shall be developed with consideration of microeconomic principles and shall promote economic efficiency in the production and consumption of electricity; support wholesale and retail competition; support the reliability of electric service; and reflect the physical realities of the ERCOT electric system. Except as otherwise directed by the commission, ERCOT shall determine the market clearing prices of energy and other ancillary services that it procures through auctions and the congestion rents that it charges or credits, using economic concepts and principles such as: shadow price of a constraint, marginal cost pricing, and maximizing the sum of consumer and producer surplus.

(b) **Bilateral markets and default provision of energy and ancillary capacity services.** ERCOT shall permit market participants to self-arrange (self-schedule or bilaterally contract for) energy and ancillary capacity services, except to the extent that doing so would adversely impact ERCOT's ability to maintain reliability. To the extent that a market participant does not self-arrange the energy and ancillary capacity services necessary to meet its obligations or to the extent that ERCOT determines that the market participant's self-arranged ancillary services will not be delivered, ERCOT shall procure energy and ancillary capacity services on behalf of the market participant to cover the shortfall and charge the market participant for the services provided.

(c) **Day-ahead energy market.** ERCOT shall operate a voluntary day-ahead energy market, either directly or through contract.

(d) **Adequacy of operational information.** ERCOT shall require resource-specific bid curves for energy and ancillary capacity services that it competitively procures in the day-ahead or operating day, and ERCOT shall use these bid curves or ex-ante mitigated bid curves to address market failure, as appropriate, in its operational decisions and financial settlements.

(e) **Congestion pricing.**

(1) ERCOT shall directly assign all congestion rents to those resources that caused the congestion.

(2) ERCOT shall be considered to have complied with paragraph (1) of this subsection if it complies with this paragraph. ERCOT shall settle each resource imbalance at its nodal locational marginal price (LMP) calculated pursuant to subsection (f) of this section; each load imbalance at its zonal price calculated pursuant to subsection (h) of this section; and congestion rents on each scheduled transaction for a resource and load pair at the difference between the nodal LMP at the resource injection location calculated pursuant to subsection (f) of this section and the zonal price at the load withdrawal location calculated pursuant to subsection (h) of this section.

(f) **Nodal energy prices for resources.** ERCOT shall use nodal energy prices for resources. Nodal energy prices for resources shall be the locational marginal prices, consistent with subsection (e) of this section, resulting from security-constrained, economic dispatch.

(g) **Energy trading hubs.** ERCOT shall provide information for energy trading hubs by aggregating nodes and calculating an average price for each aggregation, for each financial settlement interval.

§25.501 continued

(h) **Zonal energy prices for loads.** ERCOT shall use zonal energy prices for loads that consist of an aggregation of either the individual load node energy prices within each zone or the individual resource node energy prices within each zone. Individual load node or resource node energy prices shall be the locational marginal prices, consistent with subsection (e) of this section, resulting from security-constrained, economic dispatch. ERCOT shall maintain stable zones and shall notify market participants in advance of zonal boundary changes in order that the market participants will have an appropriate amount of time to adjust to the changes.

(i) **Congestion rights.** ERCOT shall provide congestion revenue rights (CRRs), but shall not provide physical transmission rights. ERCOT shall auction all CRRs, using a simultaneous combinatorial auction, except as otherwise ordered by the commission for any preassigned CRRs approved by the commission. CRRs shall not be subject to "use-it-or-lose-it" or "schedule-it-or-lose-it" restrictions and shall be tradable.

(j) **Pricing safeguards.** ERCOT shall apply pricing safeguards to protect against market failure, including market power abuse, consistent with direction provided by the commission.

(k) **Simultaneous optimization of ancillary capacity services.** For ancillary capacity services that it competitively procures in the day-ahead or operating day, ERCOT shall use simultaneous optimization and shall set prices for each service to the corresponding shadow price.

(l) **Multi-settlement system for procuring energy and ancillary capacity services.** For any energy and ancillary capacity services that it competitively procures in the day-ahead or operating day, ERCOT shall set a separate market clearing price for each procurement of a particular service.

(m) **Development and implementation.** ERCOT shall use a stakeholder process to develop a wholesale market design that complies with this section. ERCOT shall also contract for an independent cost-benefit analysis of options. These options may include an option, or options, that would involve modification of the existing ERCOT wholesale market design. For each of the options, the cost-benefit analysis shall include the estimated net benefits of the option in comparison to the current market design. The cost-benefit analysis shall be prepared with sufficient detail to provide the stakeholders and the commission with the necessary information to modify or delete specific items or categories of expenses. The cost-benefit analysis shall be filed by ERCOT by December 31, 2004. ERCOT shall also file with the commission draft protocols that implement an option analyzed in the independent cost-benefit analysis and draft energy load zones that comply with subsection (h) of this section by March 18, 2005. ERCOT shall fully implement the requirements of this section by October 1, 2006.

Subchapter M. PROCEDURES AND FILING REQUIREMENTS IN PARTICULAR COMMISSION PROCEEDINGS.

§22.251. Review of Electric Reliability Council of Texas (ERCOT) Conduct.

(a) **Purpose.** This section prescribes the procedure by which an entity, including the commission staff and the Office of Public Utility Counsel, may appeal a decision made by ERCOT or any successor in interest to ERCOT.

(b) **Scope of complaints.** Any affected entity may complain to the commission in writing, setting forth any conduct that is in violation or claimed violation of any law that the commission has jurisdiction to administer, of any order or rule of the commission, or of any protocol or procedure adopted by ERCOT pursuant to any law that the commission has jurisdiction to administer. For the purpose of this section, the term "conduct" includes a decision or an act done or omitted to be done. The scope of permitted complaints includes ERCOT's performance as an independent organization under the PURA including, but not limited to, ERCOT's promulgation and enforcement of procedures relating to reliability, transmission access, customer registration, and accounting for the production and delivery of electricity among generators and other market participants.

(c) **Requirement of compliance with ERCOT Protocols.** An entity must use Section 20 of the ERCOT Protocols (Alternative Dispute Resolution Procedures, or ADR), or Section 21 of the Protocols (Process for Protocol Revision), or other Applicable ERCOT Procedures, before presenting a complaint to the commission. For the purpose of this section, the term "Applicable ERCOT Procedures" refers to Sections 20 and 21 of the ERCOT Protocols and other applicable sections of the ERCOT protocols that are available to challenge or modify ERCOT conduct, including participation in the protocol revision process. If a complainant fails to use the Applicable ERCOT Procedures, the presiding official may dismiss the complaint or abate it to give the complainant an opportunity to use the Applicable ERCOT Procedures.

(1) A complainant may present a formal complaint to the commission, without first using the Applicable ERCOT Procedures, if:
    (A) the complainant is the commission staff or the Office of Public Utility Counsel;
    (B) the complainant is not required to comply with the Applicable ERCOT Procedures; or
    (C) the complainant seeks emergency relief necessary to resolve health or safety issues or where compliance with the Applicable ERCOT Procedures would inhibit the ability of the affected entity to provide continuous and adequate service.

(2) For any complaint that is not addressed by paragraph (1) of this subsection, the complainant may submit to the commission a written request for waiver of the requirement for using the Applicable ERCOT Procedures. The complainant shall clearly state the reasons why the Applicable ERCOT Procedures are not appropriate. The commission may grant the request for good cause.

(3) For complaints for which ADR proceedings have not been conducted at ERCOT, the presiding officer may require informal dispute resolution.

(d) **Formal complaint.** A formal complaint shall be filed within 35 days of the ERCOT conduct complained of, except as otherwise provided in this subsection. When an ERCOT ADR procedure has been timely commenced, a complaint concerning the conduct or decision that is the subject of the ADR procedure shall be filed no later than 35 days after the completion of the ERCOT ADR procedure. The presiding officer may extend the deadline, upon a showing of good cause, including the parties' agreement to extend the deadline to accommodate ongoing efforts to resolve the matter informally, and the complainant's failure to timely discover through reasonable efforts the injury giving rise to the complaint.

(1) The complaint shall include the following information:

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(A) a complete list of all complainants and the entities against whom the complainant seeks relief and the addresses, and facsimile transmission numbers and e-mail addresses, if available, of the parties' counsel or other representatives;

(B) a statement of the case that ordinarily should not exceed two pages and should not discuss the facts. The statement must contain the following:

  (i) a concise description of any underlying proceeding or any prior or pending related proceedings;

  (ii) the identity of all entities or classes of entities who would be directly affected by the commission's decision, to the extent such entities or classes of entities can reasonably be identified;

  (iii) a concise description of the conduct from which the complainant seeks relief;

  (iv) a statement of the ERCOT procedures, protocols, by-laws, articles of incorporation, or law applicable to resolution of the dispute and whether the complainant has used the Applicable ERCOT Procedures for challenging or modifying the complained of ERCOT conduct or decision (as described in subsection (c) of this section) and, if not, the provision of subsection (c) of this section upon which the complainant relies to excuse its failure to use the Applicable ERCOT Procedures;

  (v) a statement of whether the complainant seeks a suspension of the conduct or implementation of the decision complained of; and

  (vi) a statement without argument of the basis of the commission's jurisdiction.

(C) a detailed and specific statement of all issues or points presented for commission review;

(D) a concise statement without argument of the pertinent facts. Each fact shall be supported by references to the record, if any;

(E) a clear and concise argument for the contentions made, with appropriate citation to authorities and to the record, if any;

(F) a statement of all questions of fact, if any, that the complainant contends require an evidentiary hearing;

(G) a short conclusion that states the nature of the relief sought; and

(H) a record consisting of a certified or sworn copy of any document constituting or evidencing the matter complained of. The record may also contain any other item pertinent to the issues or points presented for review, including affidavits or other evidence on which the complainant relies.

(2) If the complainant seeks to suspend the conduct or the implementation of the decision complained of while the complaint is pending and all entities against whom the complainant seeks relief do not agree to the suspension, the complaint shall include a statement of the harm that is likely to result to the complainant if enforcement is not suspended. Harm may include deprivation of an entity's ability to obtain meaningful or timely relief if a suspension is not entered. A request for suspension of the conduct or enforcement of a decision shall be reviewed in accordance with subsection (i) of this section.

(3) All factual statements in the complaint shall be verified by affidavit made on personal knowledge by an affiant who is competent to testify to the matters stated.

(4) A complainant shall file the required number of copies of the formal complaint, pursuant to §22.71 of this title (relating to Filing of Pleadings, Documents, and Other Materials). A complainant shall serve copies of the complaint and other documents, in accordance with §22.74 of this title (relating to Service of Pleadings and Documents), and in particular shall serve a copy of the complaint on ERCOT's General Counsel, every other entity from whom relief is sought, the Office of Public Utility Counsel, and any other party.

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(e) **Notice.** Within 14 days of receipt of the complaint, ERCOT shall provide notice of the complaint by email to all qualified scheduling entities and, at ERCOT's discretion, all relevant ERCOT committees and subcommittees. Notice shall consist of an attached electronic copy of the complaint, including the docket number, but may exclude the record required by subsection (d)(1)(H) of this section.

(f) **Response to complaint.** A response to a complaint shall be due within 28 days after receipt of the complaint and shall conform to the requirements for the complaint set forth in subsection (d) of this section except that:

- (1) the list of parties and counsel is not required unless necessary to supplement or correct the list contained in the complaint;
- (2) the response need not include a statement of the case, a statement of the issues or points presented for commission review, or a statement of the facts, unless the respondent contests that portion of the complaint;
- (3) a statement of jurisdiction should be omitted unless the complaint fails to assert valid grounds for jurisdiction, in which case the reasons why the commission lacks jurisdiction shall be concisely stated;
- (4) the argument shall be confined to the issues or points raised in the complaint;
- (5) the record need not include any item already contained in a record filed by another party; and
- (6) if the complainant seeks a suspension of the conduct or implementation of the decision complained of, the response shall state whether the respondent opposes the suspension and, if so, the basis for the opposition, specifically stating the harm likely to result if a suspension is ordered.

(g) **Comments by commission staff and motions to intervene.** Commission staff representing the public interest shall file comments within 45 days after the date on which the complaint was filed. In addition, any party desiring to intervene pursuant to §22.103 of this title (relating to Standing to Intervene) shall file a motion to intervene within 45 days after the date on which the complaint was filed. A motion to intervene shall be accompanied by a response to the complaint.

(h) **Reply.** The complainant may file a reply addressing any matter in a party's response or commission staff's comments. A reply, if any, must be filed within 55 days after the date on which the complaint was filed. However, the commission may consider and decide the matter before a reply is filed.

(i) **Suspension of enforcement.** The ERCOT conduct complained of shall remain in effect until and unless the presiding officer or the commission issues an order suspending the conduct or decision. If the complainant seeks to suspend the conduct or implementation of the decision complained of while the complaint is pending and all entities against whom the complainant seeks relief do not agree to the suspension, the complainant must demonstrate that there is good cause for suspension. The good cause determination required by this subsection shall be based on an assessment of the harm that is likely to result to the complainant if a suspension is not ordered, the harm that is likely to result to others if a suspension is ordered, the likelihood of the complainant's success on the merits of the complaint, and any other relevant factors as determined by the commission or the presiding officer.

- (1) The presiding officer may issue an order, for good cause, on such terms as may be reasonable to preserve the rights and protect the interests of the parties during the processing of the complaint, including requiring the complainant to provide reasonable security, assurances, or to take certain actions, as a condition for granting the requested suspension.
- (2) A party may appeal a decision of a presiding officer granting or denying a request for a suspension, pursuant to §22.123 of this title (relating to Appeal of an Interim Order and Motions for Reconsideration of Interim Orders Issued by the Commission).

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(j) **Oral argument.** If the facts are such that the commission may decide the matter without an evidentiary hearing on the merits, a party desiring oral argument shall comply with the procedures set forth in §22.262(d) of this title (relating to Commission Action After a Proposal for Decision). In its discretion, the commission may decide a case without oral argument if the argument would not significantly aid the commission in determining the legal and factual issues presented in the complaint.

(k) **Extension or shortening of time limits.** The time limits established by this section are intended to facilitate the expeditious resolution of complaints brought pursuant to this section.

(1) The presiding officer may grant a request to extend or shorten the time periods established by this rule for good cause shown. Any request or motion to extend or shorten the schedule must be filed prior to the date on which any affected filing would otherwise be due. A request to modify the schedule shall include a representation of whether all other parties agree with the request, and a proposed schedule.

(2) For cases to be determined after the making of factual determinations or through commission ADR as provided for in subsection (n) of this section, the presiding officer shall issue a procedural schedule.

(l) **Standard for review.** If the factual determinations supporting the conduct complained of have not been made in a manner that meets the procedural standards specified in this subsection, or if factual determinations necessary to the resolution of the matter have not been made, the commission will resolve any factual issues on a *de novo* basis. If the factual determinations supporting the conduct complained have been made in a manner that meets the procedural standards specified in this subsection, the commission will reverse a factual finding only if it is not supported by substantial evidence or is arbitrary and capricious. The procedural standards in this subsection require that facts be determined:

(1) In a proceeding to which the parties have voluntarily agreed to participate; and

(2) By an impartial third party under circumstances that are consistent with the guarantees of due process inherent in the procedures described in the Texas Government Code Chapter 2001 (Administrative Procedure Act).

(m) **Referral to the State Office of Administrative Hearings.** If resolution of a complaint does not require determination of any factual issues, the commission may decide the issues raised by the complaint on the basis of the complaint and the comments and responses. If factual determinations must be made to resolve a complaint brought under this section, and the parties do not agree to the making of all such determinations pursuant to a procedure described in subsection (n) of this section, the matter may be referred to the State Office of Administrative Hearings for the making of all necessary factual determinations and the preparation of a proposal for decision, including findings of fact and conclusions of law, unless the commission or a commissioner serves as the finder of facts.

(n) **Availability of alternative dispute resolution.** Pursuant to Texas Government Code Chapter 2009 (Governmental Dispute Resolution Act), the commission shall make available to the parties alternative dispute resolution procedures described by Civil Practices and Remedies Code Chapter 154, as well as combinations of those procedures. The use of these procedures before the commission for complaints brought under this section shall be by agreement of the parties only.

(o) **Granting of relief.** Where the commission finds merit in a complaint and that corrective action is required by ERCOT, the commission shall issue an order granting the relief the commission deems appropriate, including, but not limited to:

(1) Entering an order suspending the conduct or implementation of the decision complained of;

(2) Ordering that appropriate protocol revisions be developed;

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(3) Providing guidance to ERCOT for further action, including guidance on the development and implementation of protocol revisions; and

(4) Ordering ERCOT to promptly develop protocols revisions for commission approval.

(p) **Notice of proceedings affecting ERCOT.** Within seven days of ERCOT receiving a pleading instituting a lawsuit against it concerning ERCOT's conduct as described in subsection (b) of this section, ERCOT shall notify the commission of the lawsuit by filing with the commission, in the commission project number designated by the commission for such filings, a copy of the pleading instituting the lawsuit. In addition, within seven days of receiving notice of a proceeding at the Federal Energy Regulatory Commission in which relief is sought against ERCOT, ERCOT shall notify the commission by filing with the commission, in the commission project number designated by the commission for such filings, a copy of the notice received by ERCOT.

NERC Standards

A. Introduction

1. **Title:** **System Operating Limits Methodology for the Planning Horizon**

2. **Number:** FAC-010-2

3. **Purpose:** To ensure that System Operating Limits (SOLs) used in the reliable planning of the Bulk Electric System (BES) are determined based on an established methodology or methodologies.

4. **Applicability**

   4.1. Planning Authority

5. **Effective Date:** July 1, 2008

B. Requirements

R1. The Planning Authority shall have a documented SOL Methodology for use in developing SOLs within its Planning Authority Area. This SOL Methodology shall:

R1.1. Be applicable for developing SOLs used in the planning horizon.

R1.2. State that SOLs shall not exceed associated Facility Ratings.

R1.3. Include a description of how to identify the subset of SOLs that qualify as IROLs.

R2. The Planning Authority's SOL Methodology shall include a requirement that SOLs provide BES performance consistent with the following:

R2.1. In the pre-contingency state and with all Facilities in service, the BES shall demonstrate transient, dynamic and voltage stability; all Facilities shall be within their Facility Ratings and within their thermal, voltage and stability limits. In the determination of SOLs, the BES condition used shall reflect expected system conditions and shall reflect changes to system topology such as Facility outages.

R2.2. Following the single Contingencies[1] identified in Requirement 2.2.1 through Requirement 2.2.3, the system shall demonstrate transient, dynamic and voltage stability; all Facilities shall be operating within their Facility Ratings and within their thermal, voltage and stability limits; and Cascading or uncontrolled separation shall not occur.

R2.2.1. Single line to ground or three-phase Fault (whichever is more severe), with Normal Clearing, on any Faulted generator, line, transformer, or shunt device.

R2.2.2. Loss of any generator, line, transformer, or shunt device without a Fault.

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[1] The Contingencies identified in R2.2.1 through R2.2.3 are the minimum contingencies that must be studied but are not necessarily the only Contingencies that should be studied.

R2.2.3. Single pole block, with Normal Clearing, in a monopolar or bipolar high voltage direct current system.

R2.3. Starting with all Facilities in service, the system's response to a single Contingency, may include any of the following:

R2.3.1. Planned or controlled interruption of electric supply to radial customers or some local network customers connected to or supplied by the Faulted Facility or by the affected area.

R2.3.2. System reconfiguration through manual or automatic control or protection actions.

R2.4. To prepare for the next Contingency, system adjustments may be made, including changes to generation, uses of the transmission system, and the transmission system topology.

R2.5. Starting with all Facilities in service and following any of the multiple Contingencies identified in Reliability Standard TPL-003 the system shall demonstrate transient, dynamic and voltage stability; all Facilities shall be operating within their Facility Ratings and within their thermal, voltage and stability limits; and Cascading or uncontrolled separation shall not occur.

R2.6. In determining the system's response to any of the multiple Contingencies, identified in Reliability Standard TPL-003, in addition to the actions identified in R2.3.1 and R2.3.2, the following shall be acceptable:

R2.6.1. Planned or controlled interruption of electric supply to customers (load shedding), the planned removal from service of certain generators, and/or the curtailment of contracted Firm (non-recallable reserved) electric power Transfers.

R3. The Planning Authority's methodology for determining SOLs, shall include, as a minimum, a description of the following, along with any reliability margins applied for each:

R3.1. Study model (must include at least the entire Planning Authority Area as well as the critical modeling details from other Planning Authority Areas that would impact the Facility or Facilities under study).

R3.2. Selection of applicable Contingencies.

R3.3. Level of detail of system models used to determine SOLs.

R3.4. Allowed uses of Special Protection Systems or Remedial Action Plans.

R3.5. Anticipated transmission system configuration, generation dispatch and Load level.

R3.6. Criteria for determining when violating a SOL qualifies as an Interconnection Reliability Operating Limit (IROL) and criteria for developing any associated IROL T_v.

R4. The Planning Authority shall issue its SOL Methodology, and any change to that methodology, to all of the following prior to the effectiveness of the change:

- **R4.1.** Each adjacent Planning Authority and each Planning Authority that indicated it has a reliability-related need for the methodology.
- **R4.2.** Each Reliability Coordinator and Transmission Operator that operates any portion of the Planning Authority's Planning Authority Area.
- **R4.3.** Each Transmission Planner that works in the Planning Authority's Planning Authority Area.

R5. If a recipient of the SOL Methodology provides documented technical comments on the methodology, the Planning Authority shall provide a documented response to that recipient within 45 calendar days of receipt of those comments. The response shall indicate whether a change will be made to the SOL Methodology and, if no change will be made to that SOL Methodology, the reason why.

C. Measures

M1. The Planning Authority's SOL Methodology shall address all of the items listed in Requirement 1 through Requirement 3.

M2. The Planning Authority shall have evidence it issued its SOL Methodology and any changes to that methodology, including the date they were issued, in accordance with Requirement 4.

M3. If the recipient of the SOL Methodology provides documented comments on its technical review of that SOL methodology, the Planning Authority that distributed that SOL Methodology shall have evidence that it provided a written response to that commenter within 45 calendar days of receipt of those comments in accordance with Requirement 5.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Monitoring Responsibility

Regional Reliability Organization

1.2. Compliance Monitoring Period and Reset Time Frame

Each Planning Authority shall self-certify its compliance to the Compliance Monitor at least once every three years. New Planning Authorities shall demonstrate compliance through an on-site audit conducted by the Compliance Monitor within the first year that it commences operation. The Compliance Monitor shall also conduct an on-site audit once every nine years and an investigation upon complaint to assess performance.

The Performance-Reset Period shall be twelve months from the last non-compliance.

1.3. Data Retention

The Planning Authority shall keep all superseded portions to its SOL Methodology for 12 months beyond the date of the change in that methodology and shall keep all documented comments on its SOL Methodology and associated responses for three years. In addition, entities found non-compliant shall keep information related to the non-compliance until found compliant.

The Compliance Monitor shall keep the last audit and all subsequent compliance records.

1.4. **Additional Compliance Information**

The Planning Authority shall make the following available for inspection during an on-site audit by the Compliance Monitor or within 15 business days of a request as part of an investigation upon complaint:

1.4.1 SOL Methodology.

1.4.2 Documented comments provided by a recipient of the SOL Methodology on its technical review of a SOL Methodology, and the associated responses.

1.4.3 Superseded portions of its SOL Methodology that had been made within the past 12 months.

1.4.4 Evidence that the SOL Methodology and any changes to the methodology that occurred within the past 12 months were issued to all required entities.

2. **Levels of Non-Compliance for Western Interconnection: (To be replaced with VSLs once developed and approved by WECC)**

2.1. **Level 1:** There shall be a level one non-compliance if either of the following conditions exists:

2.1.1 The SOL Methodology did not include a statement indicating that Facility Ratings shall not be exceeded.

2.1.2 No evidence of responses to a recipient's comments on the SOL Methodology.

2.2. **Level 2:** The SOL Methodology did not include a requirement to address all of the elements in R2.1 through R2.3 and E1.

2.3. **Level 3:** There shall be a level three non-compliance if any of the following conditions exists:

2.3.1 The SOL Methodology did not include a statement indicating that Facility Ratings shall not be exceeded and the methodology did not include evaluation of system response to one of the three types of single Contingencies identified in R2.2.

2.3.2 The SOL Methodology did not include a statement indicating that Facility Ratings shall not be exceeded and the methodology did not include evaluation of system response to two of the seven types of multiple Contingencies identified in E1.1.

2.3.3 The System Operating Limits Methodology did not include a statement indicating that Facility Ratings shall not be exceeded and the methodology did not address two of the six required topics in R3.

2.4. **Level 4:** The SOL Methodology was not issued to all required entities in accordance with R4.

3. Violation Severity Levels:

Requirement	Lower	Moderate	High	Severe
R1	Not applicable.	The Planning Authority has a documented SOL Methodology for use in developing SOLs within its Planning Authority Area, but it does not address R1.2	The Planning Authority has a documented SOL Methodology for use in developing SOLs within its Planning Authority Area, but it does not address R1.3.	The Planning Authority has a documented SOL Methodology for use in developing SOLs within its Planning Authority Area, but it does not address R1.1. OR The Planning Authority has no documented SOL Methodology for use in developing SOLs within its Planning Authority Area.
R2	The Planning Authority's SOL Methodology requires that SOLs are set to meet BES performance following single and multiple contingencies, but does not address the pre-contingency state (R2.1)	The Planning Authority's SOL Methodology requires that SOLs are set to meet BES performance in the pre-contingency state and following single contingencies, but does not address multiple contingencies. (R2.5-R2.6)	The Planning Authority's SOL Methodology requires that SOLs are set to meet BES performance in the pre-contingency state and following multiple contingencies, but does not meet the performance for response to single contingencies. (R2.2 –R2.4)	The Planning Authority's SOL Methodology requires that SOLs are set to meet BES performance in the pre-contingency state but does not require that SOLs be set to meet the BES performance specified for response to single contingencies (R2.2-R2.4) and does not require that SOLs be set to meet the BES performance specified for response to multiple contingencies. (R2.5-R2.6)
R3	The Planning Authority has a methodology for determining SOLs that	The Planning Authority has a methodology for determining SOLs that	The Planning Authority has a methodology for determining SOLs that	The Planning Authority has a methodology for determining SOLs that is

Requirement	Lower	Moderate	High	Severe
	includes a description for all but one of the following: R3.1 through R3.6.	includes a description for all but two of the following: R3.1 through R3.6.	includes a description for all but three of the following: R3.1 through R3.6.	missing a description of four or more of the following: R3.1 through R3.6.
R4	One or both of the following: The Planning Authority issued its SOL Methodology and changes to that methodology to all but one of the required entities. For a change in methodology, the changed methodology was provided up to 30 calendar days after the effectiveness of the change.	One of the following: The Planning Authority issued its SOL Methodology and changes to that methodology to all but one of the required entities AND for a change in methodology, the changed methodology was provided 30 calendar days or more, but less than 60 calendar days after the effectiveness of the change. OR The Planning Authority issued its SOL Methodology and changes to that methodology to all but two of the required entities AND for a change in methodology, the changed methodology was provided up to 30 calendar days after the effectiveness of the change.	One of the following: The Planning Authority issued its SOL Methodology and changes to that methodology to all but one of the required entities AND for a change in methodology, the changed methodology was provided 60 calendar days or more, but less than 90 calendar days after the effectiveness of the change. OR The Planning Authority issued its SOL Methodology and changes to that methodology to all but two of the required entities AND for a change in methodology, the changed methodology was provided 30 calendar days or more, but less than 60 calendar days after the effectiveness of the change. OR The Planning Authority issued its SOL Methodology	One of the following: The Planning Authority failed to issue its SOL Methodology and changes to that methodology to more than three of the required entities. The Planning Authority issued its SOL Methodology and changes to that methodology to all but one of the required entities AND for a change in methodology, the changed methodology was provided 90 calendar days or more after the effectiveness of the change. OR The Planning Authority issued its SOL Methodology and changes to that methodology to all but two of the required entities AND for a change in methodology, the changed methodology was provided 60 calendar days or more, but less than 90 calendar

Requirement	Lower	Moderate	High	Severe
			and changes to that methodology to all but three of the required entities AND for a change in methodology, the changed methodology was provided up to 30 calendar days after the effectiveness of the change.	days after the effectiveness of the change. OR The Planning Authority issued its SOL Methodology and changes to that methodology to all but three of the required entities AND for a change in methodology, the changed methodology was provided 30 calendar days or more, but less than 60 calendar days after the effectiveness of the change. The Planning Authority issued its SOL Methodology and changes to that methodology to all but four of the required entities AND for a change in methodology, the changed methodology was provided up to 30 calendar days after the effectiveness of the change.

R5	The Planning Authority received documented technical comments on its SOL Methodology and provided a complete response in a time period that was longer than 45 calendar days but less than 60 calendar days.	The Planning Authority received documented technical comments on its SOL Methodology and provided a complete response in a time period that was 60 calendar days or longer but less than 75 calendar days.	The Planning Authority received documented technical comments on its SOL Methodology and provided a complete response in a time period that was 75 calendar days or longer but less than 90 calendar days. OR The Planning Authority's response to documented technical comments on its SOL Methodology indicated that a change will not be made, but did not include an explanation of why the change will not be made.	The Planning Authority received documented technical comments on its SOL Methodology and provided a complete response in a time period that was 90 calendar days or longer. OR The Planning Authority's response to documented technical comments on its SOL Methodology did not indicate whether a change will be made to the SOL Methodology.

E. Regional Differences

1. The following Interconnection-wide Regional Difference shall be applicable in the Western Interconnection:

   1.1. As governed by the requirements of R2.4 and R2.5, starting with all Facilities in service, shall require the evaluation of the following multiple Facility Contingencies when establishing SOLs:

   1.1.1 Simultaneous permanent phase to ground Faults on different phases of each of two adjacent transmission circuits on a multiple circuit tower, with Normal Clearing. If multiple circuit towers are used only for station entrance and exit purposes, and if they do not exceed five towers at each station, then this condition is an acceptable risk and therefore can be excluded.

   1.1.2 A permanent phase to ground Fault on any generator, transmission circuit, transformer, or bus section with Delayed Fault Clearing except for bus sectionalizing breakers or bus-tie breakers addressed in E1.1.7

   1.1.3 Simultaneous permanent loss of both poles of a direct current bipolar Facility without an alternating current Fault.

   1.1.4 The failure of a circuit breaker associated with a Special Protection System to operate when required following: the loss of any element without a Fault; or a permanent phase to ground Fault, with Normal Clearing, on any transmission circuit, transformer or bus section.

   1.1.5 A non-three phase Fault with Normal Clearing on common mode Contingency of two adjacent circuits on separate towers unless the event frequency is determined to be less than one in thirty years.

   1.1.6 A common mode outage of two generating units connected to the same switchyard, not otherwise addressed by FAC-010.

   1.1.7 The loss of multiple bus sections as a result of failure or delayed clearing of a bus tie or bus sectionalizing breaker to clear a permanent Phase to Ground Fault.

   1.2. SOLs shall be established such that for multiple Facility Contingencies in E1.1.1 through E1.1.5 operation within the SOL shall provide system performance consistent with the following:

   1.2.1 All Facilities are operating within their applicable Post-Contingency thermal, frequency and voltage limits.

   1.2.2 Cascading does not occur.

   1.2.3 Uncontrolled separation of the system does not occur.

   1.2.4 The system demonstrates transient, dynamic and voltage stability.

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

1.2.6 Interruption of firm transfer, Load or system reconfiguration is permitted through manual or automatic control or protection actions.

1.2.7 To prepare for the next Contingency, system adjustments are permitted, including changes to generation, Load and the transmission system topology when determining limits.

1.3. SOLs shall be established such that for multiple Facility Contingencies in E1.1.6 through E1.1.7 operation within the SOL shall provide system performance consistent with the following with respect to impacts on other systems:

1.3.1 Cascading does not occur.

1.4. The Western Interconnection may make changes (performance category adjustments) to the Contingencies required to be studied and/or the required responses to Contingencies for specific facilities based on actual system performance and robust design. Such changes will apply in determining SOLs.

Version History

Version	Date	Action	Change Tracking
1	November 1, 2006	Adopted by Board of Trustees	New
1	November 1, 2006	Fixed typo. Removed the word "each" from the 1st sentence of section D.1.3, Data Retention.	01/11/07
2	June 24, 2008	Adopted by Board of Trustees; FERC Order 705	Revised
2		Changed the effective date to July 1, 2008 Changed "Cascading Outage" to "Cascading" Replaced Levels of Non-compliance with Violation Severity Levels	Revised

A. Introduction

1. **Title:** **Steady-State Data for Modeling and Simulation of the Interconnected Transmission System**

2. **Number:** MOD-010-0

3. **Purpose:** To establish consistent data requirements, reporting procedures, and system models to be used in the analysis of the reliability of the Interconnected Transmission Systems.

4. **Applicability:**

   4.1. Transmission Owners specified in the data requirements and reporting procedures of MOD-011-0_R1

   4.2. Transmission Planners specified in the data requirements and reporting procedures of MOD-011-0_R1

   4.3. Generator Owners specified in the data requirements and reporting procedures of MOD-011-0_R1

   4.4. Resource Planners specified in the data requirements and reporting procedures of MOD-011-0_R1

5. **Effective Date:** April 1, 2005

B. Requirements

R1. The Transmission Owners, Transmission Planners Generator Owners, and Resource Planners (specified in the data requirements and reporting procedures of MOD-011-0_R1) shall provide appropriate equipment characteristics, system data, and existing and future Interchange Schedules in compliance with its respective Interconnection Regional steady-state modeling and simulation data requirements and reporting procedures as defined in Reliability Standard MOD-011-0_R1.

R2. The Transmission Owners, Transmission Planners, Generator Owners, and Resource Planners (specified in the data requirements and reporting procedures of MOD-011-0_R1) shall provide this steady-state modeling and simulation data to the Regional Reliability Organizations, NERC, and those entities specified within Reliability Standard MOD-011-0_R1. If no schedule exists, then these entities shall provide the data on request (30 calendar days).

C. Measures

M1. The Transmission Owner, Transmission Planner, Generator Owner, and Resource Planner, (specified in the data requirements and reporting procedures of MOD-011-0_R1) shall have evidence that it provided equipment characteristics, system data, and Interchange Schedules for steady-state modeling and simulation to the Regional Reliability Organizations and NERC as specified in Standard MOD-010-0_R1 and MOD-010-0_R2.

D. Compliance

1. Compliance Monitoring Process

   1.1. Compliance Monitoring Responsibility

   Compliance Monitor: Regional Reliability Organizations.

   1.2. Compliance Monitoring Period and Reset Timeframe

As specified within the applicable reporting procedures (Reliability Standard MOD-011-0_R2-M1). If no schedule exists, then on request (30 calendar days.)

1.3. Data Retention

None specified.

1.4. Additional Compliance Information

None.

2. Levels of Non-Compliance

2.1. Level 1: Steady-state data was provided, but was incomplete in one of the seven areas identified in Reliability Standard MOD-011-0_R1.

2.2. Level 2: Not applicable.

2.3. Level 3: Steady-state data was provided, but was incomplete in two or more of the seven areas identified in Reliability Standard MOD-011-0_R1.

2.4. Level 4: Steady-state data was not provided.

E. Regional Differences

1. None identified.

Version History

Version	Date	Action	Change Tracking
0	April 1, 2005	Effective Date	New

A. Introduction

1. **Title:** **Maintenance and Distribution of Steady-State Data Requirements and Reporting Procedures.**

2. **Number:** MOD-011-0

3. **Purpose:** To establish consistent data requirements, reporting procedures, and system models to be used in the analysis of the reliability of the interconnected transmission systems.

4. **Applicability:**

   4.1. Regional Reliability Organization

5. **Effective Date:** April 1, 2005

B. Requirements

R1. The Regional Reliability Organizations within an Interconnection, in conjunction with the Transmission Owners, Transmission Planners, Generator Owners, and Resource Planners, shall develop comprehensive steady-state data requirements and reporting procedures needed to model and analyze the steady-state conditions for each of the NERC Interconnections: Eastern, Western, and ERCOT. Within an Interconnection, the Regional Reliability Organizations shall jointly coordinate the development of the data requirements and reporting procedures for that Interconnection. The Interconnection-wide requirements shall include the following steady-state data requirements:

R1.1. Bus (substation): name, nominal voltage, electrical demand supplied (consistent with the aggregated and dispersed substation demand data supplied per Reliability Standards MOD-016-0, MOD-017-0, and MOD-020-0), and location.

R1.2. Generating Units (including synchronous condensers, pumped storage, etc.): location, minimum and maximum Ratings (net Real and Reactive Power), regulated bus and voltage set point, and equipment status.

R1.3. AC Transmission Line or Circuit (overhead and underground): nominal voltage, impedance, line charging, Normal and Emergency Ratings (consistent with methodologies defined and Ratings supplied per Reliability Standard FAC-004-0 and FAC-005-0) equipment status, and metering locations.

R1.4. DC Transmission Line (overhead and underground): line parameters, Normal and Emergency Ratings, control parameters, rectifier data, and inverter data.

R1.5. Transformer (voltage and phase-shifting): nominal voltages of windings, impedance, tap ratios (voltage and/or phase angle or tap step size), regulated bus and voltage set point, Normal and Emergency Ratings (consistent with methodologies defined and Ratings supplied per Reliability Standard FAC-004-0 and FAC-005-0.), and equipment status.

R1.6. Reactive Compensation (shunt and series capacitors and reactors): nominal Ratings, impedance, percent compensation, connection point, and controller device.

R1.7. Interchange Schedules: Existing and future Interchange Schedules and/or assumptions.

R2. The Regional Reliability Organizations within an Interconnection shall document their Interconnection's steady-state data requirements and reporting procedures, shall review those data requirements and reporting procedures (at least every five years), and shall make the data requirements and reporting procedures available on request (within five business days) to Regional Reliability Organizations, NERC, and all users of the interconnected transmission systems.

C. Measures

M1. The Regional Reliability Organization shall have documentation of its Interconnection's steady-state data requirements and reporting procedures and shall provide the documentation as specified in Reliability Standard MOD-011-0_R2.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Monitoring Responsibility

Compliance Monitor: NERC.

1.2. Compliance Monitoring Period and Reset Timeframe

Periodic review of data requirements and reporting procedures: at least every five years.

1.3. Data Retention

None specified.

1.4. Additional Compliance Information

None.

2. Levels of Non-Compliance

2.1. **Level 1:** Data requirements and reporting procedures for steady-state data were provided, but were incomplete in one of the seven areas defined in Reliability Standard MOD-011-0_R1.

2.2. **Level 2:** Data requirements and reporting procedures for steady-state data were provided, but were incomplete in two of the seven areas defined in Reliability Standard MOD-011-0_R1.

2.3. **Level 3:** Not applicable.

2.4. **Level 4:** Data requirements and reporting procedures for steady-state data were not provided, or the data requirements and reporting procedures provided were incomplete in three or more of the seven areas defined in Reliability Standard MOD-011-0_R1.

E. Regional Differences

1. None identified.

Version History

Version	Date	Action	Change Tracking
0	April 1, 2005	Effective Date	New

RARF Approvals

Sullivan, Patrick

From: ERCOT Registration [ercotregistration@ercot.com]
Sent: Monday, November 09, 2009 12:53 PM
To: Hayes, Brian; Freiman, Leslie
Cc: Nodal Market Transition; Carmen, Travis; Daniel, Matthew
Subject: RARF Passed Programattic Screening Audit - MESQUITE WIND LLC (LNCRK) - DUNS# 784353448

Resource Entities:

Your RARF submittal has passed Nodal CIM business rules currently in effect for Transmission, Planning and Resource parameters. This data is now accepted for loading into the next scheduled Nodal CIM database load.

ERCOT Network Model Support staff performs additional review of data as it is prepared for entry into the Network Model Management System (NMMS) in which case if additional issues are discovered it may require an updated RARF with corrections be resubmitted.

Future modifications to your Registered Resource, Transmission and Planning parameters shall be made using your last accepted version and submitted on a TML Service Request by the Authorized Representative's digital certificate.

For any assistance with resource registration please call or email your ERCOT Account Manager or email ercotregistration@ercot.com.

Sincerely,

ERCOT Wholesale Client Services

Classification: ERCOT Confidential

Sullivan, Patrick

From: ERCOT Registration [ercotregistration@ercot.com]

Sent: Friday, December 04, 2009 8:25 AM

To: Hayes, Brian; Freiman, Leslie

Cc: Nodal Market Transition; Carmen, Travis; Daniel, Matthew

Subject: Resource RARF Accepted Notice - POST OAK WIND LLC (LNCRK2) - DUNS# 791082162

Resource Entities:

Your RARF submittal has passed Nodal CIM business rules currently in effect for Transmission, Planning and Resource parameters. This data is now accepted for loading into the next scheduled Nodal CIM database load or upon reaching Single Entry Go-Live.

Future modifications to your Registered Resource, Transmission and Planning parameters shall be made using your last accepted version and submitted on a TML Service Request by the Authorized Representative's digital certificate.

Also note that for the Nodal model, additional testing will take place as modifications are implemented from updated RARF's. In some cases, this testing may uncover additional issues, requiring ERCOT to contact RE's again to assist with resolving.

For any assistance with resource registration please call or email your ERCOT Account Manager or email ercotregistration@ercot.com.

Sincerely,

ERCOT Wholesale Client Services

Classification: ERCOT Confidential

ERCOT Information Request Letter

ERCOT

2705 West Lake Drive
Taylor, Texas 76574

June 5, 2009

Mr. Brian Hayes
Authorized Representative
Horizon Wind Energy
808 Travis Street Suite 700
HOUSTON TX, 77002

RE: LNCRK G83, LNCRK2 G871 and LNCRK2 G872

Dear Mr. Hayes:

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

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

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[1] Protocol Section 6.5.7.1(2) states the following:

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

[2] Protocol Section 6.5.7.1(6) states:

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

4. If you have additional reactive switching devices, are these devices capable of automatically switching in order to follow the voltage set point? Are they capable of being remotely controlled through SCADA? Please provide a list of the devices, their sizes, and a detailed description of how the devices are controlled / operated.
5. To the extent your Generation Resource(s) cannot comply with Protocol Section 6.5.7.1(2), please submit a mitigation plan no later than Monday, June 15, 2009, that describes how and when you intend to bring the Generation Resource(s) into compliance with the Reactive Power requirements.

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

Sincerely,

Kent Saathoff

Kent Saathoff
Vice President, System Planning and Operations

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

Enclosures:

2705 West Lake Drive
Taylor, Texas 76574

June 5, 2009

Mr. David Barnes
Authorized Representative
Babcock and Brown Renewable Holdings Inc
2 Harrison Street, 6th Floor
SAN FRANCISCO CA, 94105

RE: STWF T1, SWEETWN2 WND2, SWEETWN2 WND24, SWEETWN3 WND3, SWEETWN4 WND4A, SWEETWN4 WND4B, SWEETWN4 WND5, SWEETWND WND1, TGW T1 and TGW T2

Dear Mr. Barnes:

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

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

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[1] Protocol Section 6.5.7.1(2) states the following:

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[2] Protocol Section 6.5.7.1(6) states:

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

Electric Reliability Council of Texas, Inc.

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

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

4. If you have additional reactive switching devices, are these devices capable of automatically switching in order to follow the voltage set point? Are they capable of being remotely controlled through SCADA? Please provide a list of the devices, their sizes, and a detailed description of how the devices are controlled / operated.
5. To the extent your Generation Resource(s) cannot comply with Protocol Section 6.5.7.1(2), please submit a mitigation plan no later than Monday, June 15, 2009, that describes how and when you intend to bring the Generation Resource(s) into compliance with the Reactive Power requirements.

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

Sincerely,

Kent Saathoff

Kent Saathoff
Vice President, System Planning and Operations

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

Enclosures:

ERCOT

2705 West Lake Drive
Taylor, Texas 76574

June 5, 2009

Mr. James Holly
Authorized Representative
BP Alternative Energy
700 Louisiana St 33rd Floor
HOUSTON TX, 77002

RE: FLTCK SSI [redacted]

Dear Mr. Holly:

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

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

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Sincerely,

Kent Saathoff

Kent Saathoff
Vice President, System Planning and Operations

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

Enclosures: