

**DOCKET NO. 33672**

<b>COMMISSION STAFF’S PETITION</b>	<b>§</b>	<b>PUBLIC UTILITY COMMISSION</b>
<b>FOR THE DESIGNATION OF</b>	<b>§</b>	
<b>COMPETITIVE RENEWABLE</b>	<b>§</b>	<b>OF TEXAS</b>
<b>ENERGY ZONES</b>	<b>§</b>	

**ERCOT’S INFORMATIONAL FILING OF THE GE ANCILLARY SERVICES STUDY**

COMES NOW, the Electric Reliability Council of Texas, Inc. (ERCOT) and respectfully notifies the Commission of the completion of the “Analysis of Wind Generation Impact on ERCOT Ancillary Services Requirements” prepared by General Electric International, Inc. (GE) under contract to ERCOT. The GE Executive Summary – Attachment A, and complete GE Study – Attachment B are appended.

**Key Conclusions of the GE Study**

- With 15,000 MW of installed wind capacity in ERCOT, the operational issues posed by wind generation will become a significant focus in ERCOT system operations. However, the impacts can be addressed by existing technology and operational attention, without requiring any radical alteration of operations.
- ERCOT’s Regulation procurement methodology can be improved by including wind forecast information and wind capacity growth.
- Inclusion of wind forecasting in operations planning is critical.
- ERCOT’s unit commitment may need to be altered to provide ancillary services.
- Variation of wind tends to be anti-correlated, or out of phase, with the daily load curve, but the errors in load and wind forecast are virtually independent. That means that it is improbable for the most severe load and wind forecast errors to occur in the same hour.
- Additional Regulation will be required in relatively small amounts (54 MW up and 48 MW down).
- Certain improvements to the Regulation procurement methodology are recommended.
- Energy production from wind tends to be offset primarily by reduction in production from combined-cycle natural gas plants.
- The cost of the additional ancillary services identified in the report will be small relative to the cost savings from the additional wind generation.

## **Background**

The GE Study objectives were to determine the level, type, and cost of additional ancillary services that might be required to maintain the reliability of the ERCOT System for increasing levels of wind generation, including an evaluation of ERCOT's existing process for determining ancillary services procurement requirements and recommendations for any needed improvements to that process. The Study was intended to inform both the current operation of the ERCOT System and the policy discussion associated with the Competitive Renewable Energy Zone (CREZ) process.

Because the study was begun prior to the issuance of the *Interim Order* in this docket, the levels and geographic location of the wind generation to be studied are similar, but do not exactly match the four scenarios in the *Interim Order*. The GE Study covers four scenarios: a 5,000 Megawatt (MW) scenario, two 10,000 MW scenarios with somewhat different distributions of wind generation, and a 15,000 MW scenario.

There are two other issues not covered in the GE Study but which impact the reliable operation of the ERCOT System with significantly increased levels of wind generation. These issues are associated with the frequency response of the system and with large drops in wind generation on the system.

## **Frequency Response Considerations**

The inertia associated with the large amount of spinning metal within thermal generating units that are operating on the power system tends to damp the changes in frequency that would otherwise occur as the load on the system changes from instant to instant. The inertia of these generating units also arrests the magnitude of the frequency decay during disturbances. If there is less inertia on the system, the dip in the frequency due to a disturbance will be more extreme.

In the past, there has typically been enough spinning inertia on the ERCOT system to arrest the dip in frequency, following the loss of a generating unit, quickly enough to prevent trips of the Load Acting as Resource (LAAR), which are set using under-frequency relays to

drop off the system if the frequency drops below 59.7 Hertz (Hz). Yet even with no wind generation on the system, this has not always been the case, especially when a large generator trips during minimum load periods (when fewer other generators and their spinning mass are on-line).

System inertia damps the spike in frequency for the first seconds of a disturbance. Steam valves on generators then open up and provide more steam to the turbines, which in turn provide more generation output and move the frequency back to a point closer to 60 Hz. This valve action, known as governor response, occurs within the first 10 to 15 seconds of an event.

Section 5.9.2.1 of the ERCOT Protocols describes the minimum primary frequency control response required for the ERCOT interconnect. The minimum combined response of the aggregate of all generation resources in the interconnect is currently set to 420 MW/0.1Hz. This value is set by ERCOT and the Reliability and Operations Subcommittee (ROS) of ERCOT's Technical Advisory Committee (TAC).

Because induction generation (wind) does not contribute to system inertia in the way that synchronous generation does, it may not be possible to maintain adequate primary frequency response during high wind penetration and low load periods unless ancillary service requirements are increased, to allow sufficient thermal generation to be brought on-line to provide inertial damping and governor response. This could require curtailment of wind generation. It is also possible that changes could be made to the requirements for wind generation so that these generators can provide inertial damping and governor response. Either of these approaches (or some combination thereof) should allow the reliability requirements of the system to be met.

### **Large Drops in Wind Production**

The GE Study includes an analysis of the probability of large drops of wind production under the 15,000 MW wind penetration scenario. Large drops in wind production over a short time period are an issue because of startup times and availability of off-line resources. If ERCOT is not able to replace the capacity lost from the drop in wind production quickly enough, then EECF events become more frequent and more severe. The Study states that there is an

expectation that a drop of 2,400 MW in less than 30 minutes will occur once per year. The Study also reports an expectation that a drop of 2,836 MW in less than 30 minutes will occur once every 3 to 5 years. GE suggests that there may be a need to introduce a 15-minute Non-Spin market in order to mitigate this risk. The study also states that there will be some increase in Regulation up and down requirements

### **Conclusion**

ERCOT generally finds the analysis and conclusions of the GE Study reasonable and believes that it is possible to integrate the levels of wind analyzed in the report without compromising reliability. At the same time, the Study is based on certain assumptions, including the assumptions of a static generation fleet and a broad geographic distribution of wind generation that were necessary to limit the scope of the study to a reasonable level. Both the generating fleet and the distribution of wind generation may change through time, and the impact of these changes on the ancillary services required to maintain the reliability of the ERCOT system will require continual re-evaluation.

The GE Study also notes that there are other considerations that will affect the operability of the ERCOT system that were not included in the report. ERCOT will discuss some of these considerations and requirements in the CREZ Transmission Optimization Study (CTO) Report.

ERCOT is also working with the stakeholders to resolve a number of wind-related issues that are being experienced at the level of wind generation that is installed today. A list of issues for discussion has been distributed to the Reliability and Operations Subcommittee (ROS) and the Wholesale Market Subcommittee (WMS), and is provided in Attachment B. ERCOT and stakeholders must resolve these issues regardless of the level of CREZ wind generation selected.

With respect to the range of issues raised in the GE Study for the levels of wind penetration studied, ERCOT believes that the question is not whether these issues can be resolved, but how they will be resolved.

Respectfully submitted,

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### **CERTIFICATE OF SERVICE**

I certify that a copy of this document was served on all parties of record in this proceeding on April 2, 2008, in the following manner: by email, first-class U.S. mailing or facsimile.

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