Texas Renewables Integration Plan Quarterly Update for the 4-Month Period Ending September 30, 2009

Prepared by the Renewable Technologies Working Group of the ERCOT Technical Advisory Committee

October 2009

Texas Renewables Implementation Plan
Quarterly Update for the 4-Month Period Ending September 30, 2009

Status of Renewable Generation Resources in ERCOT

At the end of September 2009, ERCOT had 8,515 MW of "new" wind generation in operation, where "new" represents capacity added since September 1, 1999. In addition, there were approximately 1 MW of new solar, 37 MW of new biomass, 33 MW of new hydro and 74 MW of new landfill gas renewable generation in operation. Thus, the total new renewable capacity in ERCOT as of September 30, 2009 is approximately 8,660 MW.

For the four months ending September 30, 2009[1], the following new renewable resources became operational:

- Panther Creek III (200 MW in Sterling County)
- Papalote Creek I Wind (180 MW in San Patricio County)

Wind generation has provided 5.8% of the total energy produced in ERCOT from January 1, 2009 through September 30, 2009. The monthly ERCOT generation fuel mix is available at:

http://planning.ercot.com/reports/demand-energy/

In addition to wind generation capacity that is installed and operating, there are a substantial number of renewable generation projects in various stages of study by ERCOT as part of the Generation Interconnection Process as shown in Figure 1 below.

Project Description	Capacity (MW)		
	Wind	Solar	Biomass
Projects with Interconnect Agreement/Public Letter	7,092	0	145
Projects Under Full Interconnect Study	30,264	459	50
Confidential Projects	7,245	636	58
Total	44,601	1,195	243

Figure 1 – New Renewable Generation Capacity Under Study

There are fourteen wind generation projects and two biomass projects with Interconnect Agreements or public letters. In addition, there are 98 wind generation projects undergoing full interconnect studies. There are four solar projects and one biomass project undergoing full interconnect studies.

[1] This quarterly report covers a four-month period rather than a typical quarter because the previous report covered the period February through May 2009, which is not a conventional calendar quarter. For this report only, the period covered includes June through September to make the reports align with conventional calendar quarters.

For the 4-month period ending September 30, 2009, the following renewable resources signed Generation Interconnection Agreements:

- Rattlesnake Wind Farm (200 MW)(McCulloch County)
- Cedro Hill Wind (150 MW in Webb County)

The annual ERCOT installed wind generating capacities since 1999 are shown in Figure 2 below.

Figure 2 – ERCOT Installed Wind Generating Capacity (End of Year)

Significant Events

During the 4-month period ending September 30, 2009, ERCOT held its third Wind Workshop (on June 26, 2009), which was well-attended. The primary focus of the workshop was data requirements from wind generators for the upcoming ERCOT low voltage ride-through study and a discussion with ERCOT's vendor regarding the wind power output forecasts used by ERCOT in its day-ahead planning.

On August 20, 2009, the Public Utility Commission of Texas (PUCT) held a workshop in Docket No. 37339 – Commission Review of Market and Operating Issues Related to Wind Generating Capacity in ERCOT. This workshop was also well-attended and included panels of experts who discussed the following topics:

- Identification of challenges related to reliability

- Identification of reliability tools
- Identification of incentives to implement such tools
- Cost allocation issues

Specifically, ERCOT staff made a presentation related to issues that they have observed related to wind. These issues include: schedule or forecast error, intra-interval variability, and primary frequency response provided by wind generators (currently: none). ERCOT had analyzed its wind forecast and compared it to the wind forecasts produced by other reliability entities (e.g., Alberta Canada system operators, California and New York Independent System Operators (ISOs). ERCOT found that the wind forecasts provided by ERCOT's contractor, AWS Truewind, had a Mean Absolute Percent Error (MAPE) that was lower than any forecaster in the Alberta market but higher than the forecasts produced for the California and New York ISOs. ERCOT indicated at the workshop that it is developing a tool to evaluate the level of operational risk that can be used to determine the appropriate amounts of Non-Spin Reserve Service (NSRS) that it can procure in the day-ahead market to better manage wind output variability to maintain adequate system reliability.

Completed Issues

During the 4-month period ending September, 2009, the following Issues were completed:

- MD3 - Non-Spin Requirements
- SO2 - Nodal Tools to Integrate Wind Generation
- SO3 - Wind Generation Response and SCE
- WT2 - Wind Workshop III - Summer 2009
- WT4 - Wind in the Nodal Market

For a detailed list of all Issues and their current status, see the Appendix.

In addition, the following Protocol Revision Requests (PRRs) impacting renewable resources in the ERCOT zonal market, were approved and/or became effective:

- PRR 810 - Remove McCamey Congestion Management
- PRR 812 - Wind Generator Forecast Scheduling (formerly "Wind Generator Forecast for Scheduling Metric")

New Issues

During the 4-month period ending September 30, 2009, the RTWG began consideration the following issues related to the integration of renewable resources into the ERCOT market:

- SO34 - SCED Line Ratings (Increase the frequency of SCED's consideration of dynamic line ratings to better model current system conditions.)

Appendix

List of Market Design Issues

Issue Category	Issue No.	Title	Description	Current Group	Priority	Impact	Solution Implemented by	Revision Mechanism	Status
MD	1	Ancillary Services Cost Allocations Applicable to Wind	Develop any ancillary services cost allocations applicable to wind generation resources.	TAC	Near Term	Medium	Market Participants	PRR/NPRR	WMS to consider a new task force at its October 2009 meeting to address ancillary service cost allocation.
MD	4	New Ancillary Service Products Needed for Reliability	Determine if new ancillary services are needed to reliably integrate the large amounts of wind generation coming into the ERCOT market.	ROS	Long Term	Medium	ERCOT	PRR/NPRR	Dependent on results of SO-5
MD	5	Benefits of Storage Technologies	Determine benefit and potential applications of storage technologies in the ERCOT market.	RTWG	Long Term	Low	Market Participants	Other	Steve Isser will bring white paper to RTWG in November; a flywheel presentation was made at September RTWG meeting.
MD	7	Wind Generating Resources Providing Ancillary Services	Determine possible changes in the ERCOT Nodal Protocols to allow Wind Generation Resources to provide ancillary services.	QMWG	Long-Term	Medium	Market Participants	NPRR	List of issues has been circulated; Walter Reid will be developing a NPRR to address market facilitation issues
MD	8	Reactive and Voltage Requirements Applicable to Wind Generators	Review of current ERCOT Protocols to ensure reactive and voltage control requirements are applicable to all generating technologies, including wind generation.	WOTF	Near Term	Low	ERCOT	PRR	In Docket 36482, the deadline to request a hearing is Nov 6. Meanwhile, PRR 830 "Reactive Power Capability Requirement" is up for a vote at ROS on Oct 15. Additionally, PRR 835 "Reactive Capability Requirement", a competing proposal, is also up for a vote at ROS on Oct 15.
MD	9	Wind Generation Dispatch in the Nodal Protocols	Review of Nodal Protocols to ensure proper treatment of wind generation in regard to dispatch response.	QMWG	Near Term	Medium	Market Participants	NPRR	Under discussion at QMWG; a draft NPRR will be available for discussion by the QMWG in November.
MD	10	Wind Generation Performance Metrics in the Nodal Protocols	Review of Nodal Protocols to ensure proper treatment of wind generation in regard to performance metrics when negative pricing exists.	QMWG	Near Term	Medium	ERCOT	NPRR	Under discussion at QMWG.
MD	11	Wind Generation and Base Point Deviation in the Nodal Protocols	Review of Nodal Protocols to ensure proper treatment of wind generation in regard to Base Point deviation.	QMWG	Near Term	Medium	ERCOT	NPRR	Under discussion at QMWG.

List of System Operations Issues

Issue Category	System Ops Issue No.	Title	Description	Current Group	Priority	Impact	Solution Implemented by	Revision Mechanism	Status
SO	1	Inventory of Wind Generation Facilities	Develop forms and collect wind turbine data from Wind Generation Resources to improve ERCOT's modeling and operations databases.	ERCOT/Consultant	Near Term	Low	ERCOT	Other	Much of the data from wind farms has been collected and reviewed. Changes to the RARF to accommodate new wind farm data will be done by ERCOT in the near future.
SO	4	Smart Grid Implications for Renewable Resources	Determine how development of a "smart grid" could benefit and improve integration of renewable resources into the ERCOT grid.	RTWG	Long Term	Low	Market Participants	Other	Eric Goff and Steve Isser will develop a white paper
SO	5	Operational Studies Related to Wind Generation	Operational studies re: Wind (ramp rate, low load situations, forecasting) to identify if new ancillary services are needed.	RTWG	Long Term	Medium	ERCOT	NPRR	Finalize list of recommendations at November RTWG meeting to be provided to TAC
SO	6	Testing Reactive Capability of Wind Generation	Determine the appropriate testing methodology to measure the reactive capability of wind generation	ERCOT Operations	Near Term	Medium	ERCOT	OGRR	See MD-8
SO	7	Wind Generation and High System Frequency	Determine impact of wind generation on high system frequency events and develop possible solutions	WOTF	Near Term	Medium	Market Participants	PRR/NPRR	PRR824 "Primary Frequency response" is at PRS for IA review PRR 833 - Primary Frequency Response Requirement from Existing WGRs up for a vote at the October PRS meeting
SO	9	SCADA Control of Generator Circuit Breakers	Develop guidelines for better control of generator circuit breakers via SCADA.	OGRR TF	Near Term	Low	Market Participants	OGRR	OGRR 226 "Generation Resource Response Time Requirements" was approved by OWG on 9/15 and endorsed by WMS on 9/16, and is now up for consideration by ROS on 10/15.
SO	10	Voltage Management Practices Applicable to Wind Generation	Develop appropriate voltage management practices for ERCOT and Transmission Service Providers that would apply to wind generation resources.	ERCOT	Near Term	High	ERCOT/TSPs	NPRR	ERCOT has selected a vendor for a reactive study of West Texas but funding issues by TSPs are still being discussed
SO	14	Impact of Transmission Outage Planning on Wind Generation	Examine possible ways to improve transmission outage planning to better coordinate with wind generation operations	RPG	Long Term	High	ERCOT/TSPs	PRR	PRR 795 was approved by the Board - Policy issues still open
SO	15	Communications between Wind Farms and TSPs	Examine possible improvements in real-time communications between wind farms and transmission service providers (TSPs)	WOTF	Near Term	Medium	Market Participants	OGRR	OGRR 226 "Generation Resource Response Time Requirements" was approved by OWG on 9/15 and endorsed by WMS on 9/16, and is now up for consideration by ROS on 10/15.
SO	23	Impact of Advanced Meters on Integration of Renewable Resources	Examine impact of advanced metering capabilities on integration and deployment of renewable resources and demand-side management technologies.	DSWG	Long Term	Low	Market Participants	PRR/NPRR	2009 Goal for WMS, on-going in DSWG
SO	25	Generator Governor Response for Wind Generators	Determine proper generator governor response requirements for wind generators in the Nodal Market design.	WOTF	Short Term	Medium	Market Participants	NPRR	See SO-7
SO	26	Impact of Solar Generation on System Operations	Determine potential impact of new solar generation on ERCOT system operations through appropriate studies of solar ramp rate capabilities, forecasting of solar energy production, voltage and reactive control capabilities.	RTWG	Long Term	Medium	Market Participants	NPRR	Steve Isser to develop a white paper to be presented to RTWG by December 2009

List of System Operations Issues

Issue Category	System Ops Issue No.	Title	Description	Current Group	Priority	Impact	Solution Implemented by	Revision Mechanism	Status
SO	28	SPS Actuation for N-0 Conditions	Determine possible changes to eliminate actuation of special protection systems (SPS) caused by variable output of wind farms.	CMWG	Near Term	Medium	ERCOT	OGRR	OGRR 224 has been approved by TAC in September, 2009
SO	29	Transmission Outage Planning for CREZ	Determine ways to accommodate large amounts of transmission outages associated with the CREZ buildout while still providing adequate transmission service to existing wind farms and maintaining adequate system reliability.	RPG	Near Term	High	ERCOT	Other	Under active discussion and development by the RPG
SO	30	Application of Wind Generation Forecast to PASA	Determine how the ERCOT wind generation output forecast could be used to improve the Projected Assessment of System Adequacy (PASA)	ERCOT Operations	Near Term	Medium	ERCOT	Other	To be discussed at a future RTWG meeting
SO	31	Tension Monitors on Transmission Lines	Determine the need (if any) to install tension monitors on certain existing transmission lines that will be affected by construction of CREZ transmission facilities.	RPG	Near Term	Low	Market Participants	Other	At the June RPG meeting, ERCOT indicated that they would consider dynamic line ratings
SO	32	Real-Time Wind Generation Capacity	Determine the value of having a real-time value of available wind generating capacity for use by ERCOT operations.	QMWG	Near Term	Medium	ERCOT	PRR	PRR 811 going to the Board in October with an anticipated effective date of December 1 OGRR 223 have been approved by WMS and is under discussion at ROS.
SO	33	Real-Time Wind Turbine Availability	Determine the value of having a real-time indication of the availability of each wind turbine for use by ERCOT operations	QMWG	Near Term	Medium	ERCOT	PRR	ERCOT testing a temporary method with volunteers. QMWG is developing a PRR to make a permanent process
SO	34	SCED Line Ratings	Increase the frequency of SCED's consideration of dynamic line ratings to better model current system conditons.	ROS	Long Term	High	ERCOT	Other	To be discussed at a future RTWG meeting

List of System Planning Issues

Issue Category	Issue No.	Title	Description	Current Group	Priority	Impact	Solution Implemented by	Revision Mechanism	Status
SP	2	Wind Turbine Computer Models	Collect and verify accuracy of computer models for each type of wind turbine installed on the ERCOT grid.	ERCOT Planning	Near Term	Low	ERCOT	Other	Included in ERCOT's VRT Study
SP	3	Wind Turbine Fault Tolerance	Prepare a study of the fault tolerance of wind turbines installed on the ERCOT grid.	ERCOT Planning	Near Term	Medium	ERCOT	OGRR	Included in ERCOT's VRT Study
SP	4	Voltage Transient and Small Signal Stability Study	Update ERCOT voltage transient and small signal stability study and prepare a West Zone to North Zone transfer study.	ERCOT Operations	Near Term	Medium	ERCOT	Other	Limited study is underway, the study design is still under discussion at RPG
SP	5	Impact of Wind Turbines on System Inertia	Determine the potential impact on system reliability of large amounts of wind turbine generating capacity on ERCOT's system inertia requirements.	ERCOT Planning	Long Term	Medium	ERCOT	Other	Will be undertaken following completion of VRT study
SP	6	Variable Frequency Transformers	Determine potential for variable frequency transformers (VFTs) to solve stability problems caused by the addition of large amounts of remotely-located generation capacity (e.g., wind generation).	RTWG	Long Term	Low	Market Participants	Other	Walter Reid/Paul Hassink to develop white paper
SP	7	Voltage Control Process	Develop a process to better control voltage in areas with large amounts of wind generation.	ERCOT Planning	Long Term	Medium	ERCOT	OGRR/NOGRR	See SO-10
SP	8	Voltage Ride-Through (VRT) Study	Prepare a study of the system reliability and associated requirements applicable to all generators for voltage ride-through capability.	ERCOT Planning	Near Term	High	ERCOT	Other	Draft of Phase 1 of the study is being reviewed by TSPs, all study results due to ROS no later than June 2010

List of Workshop/Training Opportunities

Issue Category	Issue No.	Title	Description	Current Group	Priority	Impact	Solution Implemented by	Revision Mechanism	Status
WT	1	Resource Plan and Schedule Update Process	Determine potential improvements to the Resource Plan and Resource Schedule update process to improve performance and reliability	RTWG/ERCOT Operations	Undetermined	Low	Market Participants	Other	Potential topic for future Wind Workshop
WT	3	Wind Turbine Operator Training	Develop list of topics for use in development of a training session for wind turbine generator operators.	ROS	Long Term	Low	Market Participants	Other	RTWG will raise the issue at November TAC meeting

List of All Completed Issues

Issue Category	Issue No.	Title	Description	Current Group	Priority	Impact	Solution Implemented by	Revision Mechanism	Status
MD	2	Ancillary Services Procurement Optimization for 2009	Develop any ancillary services cost allocations applicable to wind generation resources (see also MD-6).	QMWG	Complete	Medium	ERCOT	Other	**COMPLETE**: ERCOT Board approved the 2009 Ancillary Services Procurement methodology at the February Board Meeting
MD	3	Non-Spin Requirements	Determine if additional Non-Spin Service procurements are required to accommodate increased amounts of wind generation in ERCOT	WMS	Complete	Medium	ERCOT	Other	**COMPLETE**:
MD	6	Ancillary Service Procurement Methodology	Determine impact and possible changes in amounts of ancillary services to be procured to ensure reliability with increasing amounts of wind generation being installed in the ERCOT market.	WOTF	Complete	Medium	ERCOT	Other	**COMPLETE**: WOTF reviewed draft procedure method and made comments that were incorporated in the AS methodology approved for 2009
MD	12	Wind Generation Resource LSL as a Percentage of HSL	Establish a minimum percentage for the Low Sustained Limit (LSL) of the High Sustained Limit (HSL) for a wind generation resource.	QMWG	Complete	Medium	Market Participants and ERCOT	PRR	**COMPLETE**: PRR 773 approved by the ERCOT Board
MD	13	Use of State of the Art Wind Forecast	Requires Wind Generation Resources to use of a state-of-the-art wind production forecast (AWS Truewind) in their daily resource plan submittals	N/A	Complete	Medium	Market Participants	PRR	**COMPLETE**: PRR 763 approved by the ERCOT Board
SO	2	Nodal Tools to Integrate Wind Generation	Determine tools applicable to the Nodal Protocols to successfully integrate wind generation into the ERCOT markets.	RTWG	Complete	Medium	Market Participants and ERCOT	NPRR	**COMPLETE**: (pending completion of Nodal market trials) - open issues are addressed in other specific issues. Review and discussion of the Nodal Protocols indicates that wind is addressed adequately
SO	3	Wind Generation Response and SCE	Determine proper wind generation response to down balancing instructions from ERCOT and also address SCE issues	QMWG	Near Term	Low	Market Participants	PRR	**COMPLETE** - PRR 812 has been approved by BOD and went into effect on October 1
SO	8	Wind Generation and System Inertia	Determine impact of wind generation on system inertia and develop possible solutions.	PDCWG	Complete	Low	Market Participants	Other	**COMPLETE**: PDCWG report to ROS in October 2008
SO	11	Technology-Specific Procedures and Protocols Changes	Develop renewable technology-specific changes in existing ERCOT Protocols, Operating Guides, Interconnection Agreements and interconnection procedures to recognize unique characteristics of various renewable generation technologies	ROS	Near Term	Low	Market Participants	Other	**COMPLETE** - This issue is covered by other individual issues in System Operations, Market Design and System Planning
SO	12	Low-Voltage-Ride-Through for Wind Generators	Develop low-voltage-ride-through requirements for wind generators	N/A	Complete	Medium	Market Participants	OGRR	**COMPLETE**: ROS approved OGRR 208
SO	13	Performance Metrics for Wind Generation	Develop appropriate operational performance metrics for wind generation.	QMWG	Complete	Medium	Market Participants	PRR	**COMPLETE**: PRR793 approved by the ERCOT Board
SO	16	Wind Generation Ramp Limits	Develop appropriate ramp rate limits for wind farms	ROS	Complete	Medium	Market Participants	PRR	**COMPLETE**: PRRs 771 and 788 approved by the ERCOT Board
SO	17	Mid-Term and Short-Term Load Forecast Weather Sensitivity	WOTF determined that this was not a determining factor in the February 26, 2008 event	WOTF	Complete	Low	Market Participants and ERCOT	Other	**COMPLETE**: Issue resolved as result of ERCOT Operations response to SDWG comments. WOTF recommended no further action
SO	19	Improve Competitively Sensitive Constraints (CSC) Process	Evaluate increasing the frequency of ERCOT CSC studies to more accurately determine congestion problems that affect wind generation.	WOTF	Complete	Medium	Market Participants and ERCOT	Other	**COMPLETE**: ERCOT implemented hourly limits effective June 10, 2008
SO	20	Dynamic Transmission Line Ratings	Evaluate cost and benefits of using dynamic transmission line ratings in ERCOT's planning processes to allow more efficient use of transmission lines serving wind farms.	WOTF	Complete	Low	Market Participants	Other	**COMPLETE**: RPG has agreed to consider dynamic line rating solutions to congestion problems
SO	21	Evaluate Emergency Electric Curtailment Plan (EECP) Steps	Determine if the existing EECP steps need to be modified to take into account the increasing amount of variable wind generation in the ERCOT system.	OWG	Complete	Low	Market Participants	PRR/NPRR	**COMPLETE**: PRR 769 approved by BOD and NPRR 142 at January 20 BOD meeting
SO	24	Settlement of Advanced Meters in the Nodal Market	Determine appropriate settlement timeline to accommodate use of advanced meters in the Nodal Market design	AMIT	Complete	Medium	Market Participants	Other	**COMPLETE**: Go-live date is November 2009, all provisioned advanced meters will be settled on a 15-minute basis
SO	27	Manual Curtailment of Wind Generation to Resolve Local Congestion	Determine if changes can be made in the existing zonal systems to allow for automating curtailment of wind to resolve local congestion problems	CMWG	Complete	High	ERCOT	Other	**COMPLETE**: ERCOT Operations discussed this issue extensively at February 2009 CMWG meeting, no reasonable, timely or cost-effective solution is available in the existing zonal market, issue is resolved by the Nodal market design
SP	1	Verify Wind Turbine Technical Data	Create and maintain an inventory of installed wind turbine characteristics	ERCOT Operations	Complete	Medium	ERCOT	Other	**COMPLETE**: Survey has been completed