

Texas Renewables Integration Plan  
Quarterly Update for the 3-Month Period  
Ending March 31, 2010

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

April 2010

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**Status of Renewable Generation Resources in ERCOT**

At the end of March 2010, ERCOT had 9,117 MW of “new” wind generation in operation, where “new” represents capacity added since September 1, 1999. In addition, there were approximately 1.2 MW of new solar, 40.3 MW of new biomass, 33.1 MW of new hydro and 80.3 MW of new landfill gas renewable generation in operation. Thus, the total new renewable capacity in ERCOT as of March 31, 2010 is approximately 9,272 MW.

For the three months ending March 31, 2010, the following new renewable resources became operational:

- Penescal Wind Farm in Kenedy County (201 MW)

Wind generation provided 8.4% of the total energy produced in ERCOT from January 1, 2010 through March 31, 2010. 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	5,936	0	145
Projects Under Full Interconnect Study	31,983	489	50
Confidential Projects	6,915	489	58
<b>Total</b>	<b>44,834</b>	<b>978</b>	<b>253</b>

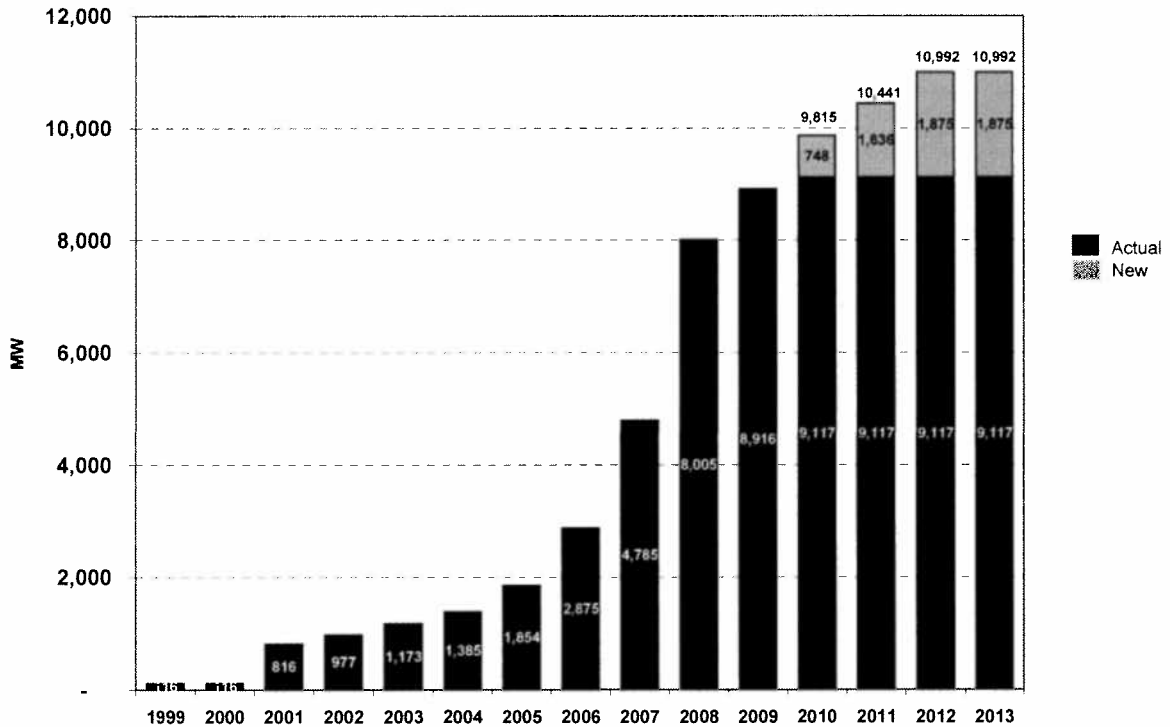
**Figure 1 – New Renewable Generation Capacity Under Study**

There are 9 wind generation projects and 2 biomass projects with Interconnect Agreements or public letters. In addition, there are 102 wind generation projects undergoing full interconnect studies. There are 5 solar projects and 1 biomass project undergoing full interconnect studies.

For the 3-month period ending March 31, 2010, no renewable resources signed Generation Interconnection Agreements.

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

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

**Significant Events**

At the March 11, 2010 Public Utility Commission of Texas (PUCT) Open meeting, the Commissioners discussed voiding the award of construction rights on the two 345 transmission lines previously awarded to the Lower Colorado River Authority (LCRA) in PUCT Project No. 36802 (which is a project related to the 345 kV transmission lines related to the Competitive Renewable Energy Zones – CREZ) and awarding them to a joint venture between the City of Garland and the South Texas Electric Cooperative (STEC). This was in response to a successful appeal by the City of Garland and STEC to the state District Court related to the Commission’s original order in Project No. 35665 (Commission Staff’s Petition for Selection of Entities Responsible for Transmission Improvements Necessary to Deliver Renewable Energy from Competitive Renewable Energy Zones). PUCT Chair Smitherman expressed hope that STEC and Garland could develop the joint venture agreement by the April 1st Open Meeting and hoped that it would be possible to set a new CCN deadline for the subsequent projects in early May, 2010. A new docket, Docket No. 38045, was established to address potential assignment of joint responsibility for two specific transmission line projects: the McCamey A to Odessa 345 kV line (single circuit on double circuit capable

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structures) and the McCamey C to McCamey A 345 kV line (single circuit on double circuit capable structures).

On March 31, 2010, the Public Utility Commission of Texas held a workshop in Project No. 35792 – Rulemaking Related to the Goal for Renewable Energy. The workshop was well attended and the participants heard several presentations on the following topics:

- PUC Rulemaking Authority
- Solar Energy
- Co-Firing, Landfill Gas and Biomass
- Distributed Renewable Generation
- Energy Storage
- Public Interest Issues
- Compliance with REC Requirements
- Implementation Issues

The Commission staff will use the input received from the workshop to revise and update their proposed draft rulemaking on the 500 MW non-wind Renewable Portfolio Standard (RPS). A revised draft rule is likely to be published for public comment during the second quarter of 2010.

### **Completed Issues**

During the 3-month period ending March 31, 2009, no Issues were completed by the RTWG.

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

In addition, the following Protocol Revision Request (PRR) impacting renewable resources in the ERCOT zonal market was approved and/or became effective during the first quarter of 2010:

- PRR 841 - Revise Total ERCOT Wind Power Forecast (TEWPF)

### **New Issues**

During the 3-month period ending March 31, 2010, the RTWG began consideration of the following new issues related to the integration of renewable resources into the ERCOT market:

- WT 5 – Wind Workshop IV
- WT 6 – Solar Workshop
- WT 7 – Storage Workshop

## **Appendix**

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**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	Task Force has reported to TAC and TAC has forwarded the issue on to the ERCOT Board for discussion at its March 23, 2010 meeting.
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 has prepared a white paper to address this issue that will be provided to the RTWG. White paper will be discussed at the March 29th 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	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	An NPRR has been developed and will be posted shortly.
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.

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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 not occur until after Nodal Go-Live. ROS will be asked to address the list of items of data for post Go-Live implementation.
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	Steve Isser will develop a white paper to be presented to RTWG.
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	Whitepaper was discussed in early 2010; this issue will be discussed in the updated TRIP.
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-3 (follow up with John Dumas about ERCOT testing procedure).
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	PRR 833 is under discussion by various groups. PRR 824 has been approved, a new OGRR 238 - WGR Primary Frequency Response - has been posted for review by ERCOT stakeholders
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 reactive study of West Texas is scheduled for completion by 2nd quarter 2010. ABB will be providing a status report at the March RPG meeting.
SO	14	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	23	Impact of Advanced Meters/Smart Grid on Integration of Renewable Resources	Examine impact of advanced metering / Smart Grid capabilities on integration and deployment of renewable resources and demand-side management technologies.	DSWG	Long Term	Low	Market Participants	PRR/NPRR	Steve Isser to develop a white paper to be presented to RTWG.
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.
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 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	Pending potential Market Participant project submissions

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**List of System Operations Issues**

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	Complete. PRR 811 was approved by the Board in February 2009. Additional follow-up activity is necessary to address issues associated with the re-definition of WGR in PRR 830 and to evaluate the utility of such information to ERCOT.
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	The portion of PRR 830 related to reporting of status has been approved and will be in effect on June 1, 2010 pending resolution of the appeal of PRR 830 to the PUCT.
SO	34	SCED Line Ratings	Increase the frequency of SCED's consideration of dynamic line ratings to better model current system conditions.	ROS	Long Term	Medium	ERCOT	Other	Changed priority to Medium since it cannot be implemented for Nodal Go-Live, to be discussed at a later RTWG meeting.



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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	Phase I of the study has been completed and Phase II is underway.
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	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	Phase I of the study was reported to ROS in December 2009, all study results due to ROS no later than June 2010.
SP	9	Wind Turbine Model Validation	Validation of wind turbine non-steady-state planning models - WECC/EPRi has done some work in this area that might be useful to examine.	RTWG	Near Term	Medium	ERCOT	Unknown	Project 173 was approved at EPRi in February, field measurements will be done on 4 different wind turbines; looking for partners for tests (esp. ERCOT)

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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 to work with ROS to add Wind Operator Training in the Nodal Market to the ERCOT Operator Training Session of 2011.
WT	5	Wind Workshop IV	Workshop to focus on turbine vendors and facility engineers and requirements in ERCOT that might impact their products and/or facilities.	RTWG	Short-Term	Medium	Market Participants	N/A	Walter Reid will develop a tentative agenda, list of topics and speakers to discuss at the April RTWG meeting.
WT	6	Solar Workshop	Workshop to focus on existing market rules and how those rules might impact particular solar technologies. Target audience: manufacturers, developers, operators, other ISOs that have solar on-line. Schedule: First Quarter 2011	RTWG	Short-Term	Medium	Market Participants	N/A	Mark Bruce will develop a tentative list of topics/speakers to discuss at the April RTWG meeting.
WT	7	Storage Workshop	Workshop to focus on existing market rules and how those rules might impact particular storage technologies. Target audience: manufacturers, developers, operators, other ISOs that have storage. Schedule: 2nd Quarter 2011	RTWG	Short-Term	Medium	Market Participants	N/A	Suzi McClelland will develop a tentative list of topics/speakers to discuss at the April RTWG meeting.

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**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	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	COMPLETE: PRR 830 "Reactive Power Capability Requirement" has been approved by the ERCOT Board.
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	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	COMPLETE: OGRR 226 "Generation Resource Response Time Requirements" was approved by TAC in December 2009.
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	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	COMPLETE: OGRR 226 "Generation Resource Response Time Requirements" was approved by TAC in December 2009
SO	16	Wind Generation Ramp Limits	Develop appropriate ramp rate limits for wind farms	ROS	Complete	Medium	Market Participants	PRR	COMPLETE: PRRs 771 and 786 approved by the ERCOT Board

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List of All Completed Issues**

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: RFG 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.
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	COMPLETE: OGRR 224 has been approved by TAC in September, 2009
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
WT	2	Wind Workshop III - Summer 2009	Develop list of topics and speakers for the ERCOT Wind Workshop III to be held in the summer of 2009.	RTWG/ERCOT Operations	Near Term	Low	Market Participants	Other	COMPLETE: Workshop held on June 26, 2009
WT	4	Wind in the Nodal Market	Develop presentation for use in the Wind Workshop explaining how wind generation will be treated in the Nodal Market design.	RTWG/ERCOT Operations	Complete	Low	Market Participants	Other	COMPLETE: Presentation included in ERCOT On-Line Training Course for Wind