



Understanding: Texas Nodal Market Readiness

The ERCOT Nodal Transition Plan, approved by the Technical Advisory Committee (TAC), organizes transition activities into four tracks, which require participation from both ERCOT and market participants (MPs). The Texas Nodal Program designed four early delivery system (EDS) testing sequences to meet the requirements of the transition plan. This document presents a high-level view of these transition activities, mapped to time frames and market participant roles, so market participants can more easily plan for the transition.

Before each EDS sequence, ERCOT will distribute detailed information, tailored for each market participant role, that explains what will be required in the testing sequence. ERCOT will follow up with kick-off sessions to review the testing sequences and answer any questions that may arise throughout the nodal implementation.

TRANSITION PLAN TRACKS

These tracks are defined in detail in the Nodal Transition Plan. Below is a brief status for each track, highlighting market participant activities in each.

1 Systems Specification, Procurement and Development – ERCOT

With selected vendors on board since June 2006, nearly all of the business requirements and most of the conceptual system design documents have now been approved by the Nodal Transition Plan Task Force (TPTF).

Most of the projects are currently producing detail system design documents, which must be reviewed by TPTF. ERCOT strongly encourages market participants to review these documents, because they define detailed operations of the future nodal market.

Future activities include posting use cases and providing updates on progress of software releases.

2 Systems Procurement and Development – Market Participant

All market participants with systems that interface with ERCOT for power system operation and wholesale market operations will have to create or modify their programs and processes to accommodate the nodal market protocols. Market participants are responsible for updating ERCOT on their progress.

3 Market Training

This track calls for ERCOT to develop a comprehensive training program that prepares market participants to operate in the nodal market. The plan also calls for market participants to ensure that appropriate personnel complete applicable training courses.

The nodal training curriculum has been developed by ERCOT and market participants and approved by TPTF. To date, ERCOT is currently delivering five courses:

- ERCOT Nodal 101: The Basics
- Economics of LMP
- Transition to Nodal Market and Start-up Testing
- Load Serving Entity 201
- Basic Training Program

These nodal market training courses are being delivered as instructor-led classroom sessions, web-based training sessions or both. Market participants may review available courses, register, and access web-based training courses through the ERCOT learning management system (LMS), available on the ERCOT nodal website.

To learn about how to plan and register for courses, see the Training section on page 12 of this document.

The Nodal Transition Plan identifies four tracks of transition activities to be completed by ERCOT and market participants:



1. Systems Specification, Procurement and Development (ERCOT)
2. Systems Procurement and Development (Market Participants)
3. Market Training
4. Systems Testing and Nodal Market Implementation



Coming soon . . .

ERCOT is currently delivering these courses:

- ERCOT Nodal 101: The Basics
- Economics of LMP
- Transition to Nodal Market and Start-Up Testing
- Load Serving Entity 201
- Basic Training Program
- NOIE QSE Operations
- Network Model Management System
- Congestion Revenue Rights
- Settlements 301
- Generation 101

The following courses are scheduled to be available in the second quarter of 2008:

- Generation 201
- Generation 301
- Transmission 101
- ERCOT 101 for Wind Generation
- Market Information System

Training

Market participants may now review a wide curriculum of nodal market courses, including those currently available and those still under development. Training courses are being developed for delivery as instructor-led classroom sessions and self-directed web-based instruction.

Information on the nodal training curriculum, applicable attendees for training readiness and schedule of course offerings may be found on the nodal website: <http://nodal.ercot.com/training/readiness/index.html/>.

Training readiness will be tracked and reported as one of the readiness criteria for market participants and ERCOT staff.

Resources

ERCOT and market participants can communicate about the nodal implementation in the following ways:

On the web . . .

Visit the Texas Nodal Market Implementation website (<http://nodal.ercot.com>) for all nodal information, including the following:

- Documents currently in review by TPTF
- Training schedule, curriculum and registration
- Test environments and machine-to-machine interfaces
- Nodal protocols
- Readiness materials

Visit the ERCOT public website (www.ercot.com) to view the TPTF meeting calendar, agendas and meeting materials.

By e-mail . . .

- Subscribe to Texas Nodal News, a biweekly newsletter containing TPTF updates, nodal activities at TAC and the ERCOT Board of Directors, program updates and links to detailed information on the website. To subscribe, go to <http://lists.ercot.com> and select “texasnodalnews.”
- Subscribe to the TPTF mail list to receive documents for review. To subscribe, go to <http://lists.ercot.com> and select “tptf.”
- Contact the Nodal Transition Readiness Center with questions, suggestions or feedback at TexasNodal@ercot.com

By phone . . .

Contact your account manager, or call (512) 248-3900 to speak with a representative from the Nodal Transition Readiness Center.

In person . . .

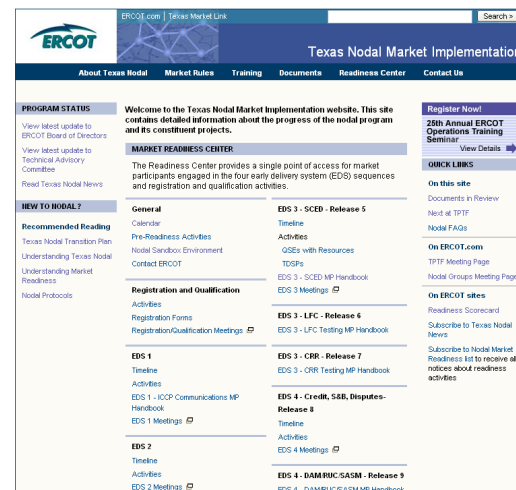
Participate in market readiness seminars. The seminars serve as a forum for discussion, feedback and Q&A. Topics will vary from business processes to systems development to overall market readiness.

Nodal Transition Readiness Center

ERCOT formed the Nodal Transition Readiness Center to be the primary point of contact to help market participants navigate and manage through readiness materials, schedules and activities.

The readiness center encompasses ERCOT Client Services, a network of nodal market subject matter experts and website assistance.

The readiness center web page (<http://nodal.ercot.com/readiness>) will be updated regularly with helpful links and information about readiness resources as they become available.



4 Systems Testing and Nodal Market Implementation

This final track includes tasks related to the testing and startup of core nodal systems. These tasks are organized into four EDS sequences. The following chart maps each requirement to an EDS.

	EDS 1	EDS 2	EDS 3	EDS 4
Data and Telemetry Testing Requirements				
State Estimator (SE) Implementation				
Real-Time Network Security Analysis (NSA) Implementation				
Security Constrained Economic Dispatch (SCED)				
Trial Operation of Congestion Revenue Rights (CRR) Auction				
Trial Operation of Day-Ahead Market (DAM)				
Trial Operation of Reliability Unit Commitment (RUC)				
Load Frequency Control (LFC) Testing				
168-Hour Test and Trial Real-Time Settlement				
Transmission Element and Resource Outages				
Real-Time Operation and Settlement				
Performance and Compliance Measurement				
Market Information System (MIS)				
Supplemental Ancillary Services Market (SASM)				
Daylight Savings Time				
Emergency Electric Curtailment Plan (EECP)				

PRE-EDS ACTIVITIES

Market participants are encouraged or required to complete the following tasks prior to EDS activities. Refer to the nodal website (<http://nodal.ercot.com/readiness>) for links to access the documents listed below:

		X Required	X Recommended	Q	QR	TD	LSE	CRR	E
Reading	• Review the nodal protocols. Refer to the recommended reading list on the nodal website to determine what sections apply to each role	X	X	X	X	X	X	X	X
	• Review Nodal Transition Plan	X	X	X	X	X	X	X	X
	• Participate in TPTF review of design documents	X	X	X	X	X	X	X	X
	• Review overall timeline	X	X	X	X	X	X	X	X
	• Review registration approach document	X	X						
	• Review market trials approach document	X	X	X	X	X	X	X	X
	• Review market readiness advisor's proposed readiness metrics	X	X	X	X	X	X	X	X
Training	• Determine what staff must take training	X	X	X	X	X	X	X	X
	• Create accounts in LMS	X	X	X	X	X	X	X	X
Tasks	• Designate accountable executive	X	X	X	X	X	X	X	
	• Designate project manager	X	X	X					
	• Review TPTF agendas and become involved in specific areas of interest	X	X	X	X	X	X	X	X
	• Sign up for preassigned congestion revenue rights (PCRRs)			Muni/Coops					
	• Determine "gap analysis" for existing systems, business processes and resources for deployment of nodal	X	X	X	X				X
	• Contact account manager to set expectations for communication	X	X	X	X	X	X	X	X
	• Verify connectivity with market participant sandbox	X	X	X	X	X	X	X	X

Legend for Market Participant Roles

Qualified Scheduling Entity (QSE) without resources
 Qualified Scheduling Entity (QSE) with resources
 Transmission/Distribution Service Provider (TSP, DSP)
 Load Serving Entity (LSE)
 CRR Account Holder
 ERCOT
 X Required
 X Recommended

EDS 4 ACTIVITIES

	X Required	X Recommended	Q	QR	TD	LSE	CRR	E
Release 8								
• Submit energy-only offers and bids for any settlement point on the ERCOT transmission grid	X	X						X
• Synchronize use of the outage scheduler for transmission elements and resource outages		X		X				X
• Download and verify real-time settlements statements	X	X					X	X
Release 9								
• Perform upload of bids and offers using MIS user interface	X	X						
• Perform upload of bids using machine-to-machine interface	X	X						
• Review the test settlement statements for errors and provide feedback (DAM, RUC)	X	X				X	X	
• Create offers for physical offline resources that can be used by ERCOT in testing RUC		X		X				
• Download and verify DAM settlements statements	X	X					X	
• Perform 168-hour test								X
• Participate in the 168-hour test	X	X	X	X	X	X	X	X
• Provide/review QSEs with test settlement statements for each operating day of the 168-hour test	X	X						X
• Submit settlements disputes	X	X					X	
• Work with MPs to resolve any settlements issues identified during the 168-hour test prior to beginning real-time operations	X	X	X	X	X	X	X	X
Go-Live Activities								
• Develop a plan, approved by TAC, to limit transmission element outages during the initial operation of real-time systems to only those necessary to maintain reliability								X

EXIT CRITERIA

Release 8								
• MP acceptance of settlement statements and resolution of settlements issues	X	X						X
Release 9								
• Successful completion of seven days' operation of DAM and DAM settlements	X	X						X
• Successful 168-hour run of DAM, RUC, SASM and real-time operations	X	X	X					X
• Development of plan to limit transmission outages during initial operation of real-time systems to ensure grid stability								X
• Critical mass of MPs demonstrate ability to operate in nodal market	X	X	X	X	X	X	X	X

OBJECTIVES

- Create offers for resources and bids for load
- Demonstrate co-optimization of energy and ancillary services (AS) in the DAM
- Provide bids and offers to support the operation of DAM for seven consecutive days
- Conduct trials for RUC using test offers for resources from the DAM
- Conduct trials for SASM systems
- Test shadow settlement statements for the seven consecutive operating days
- Test DAM settlements (generate using LMPs and market clearing prices for capacity), to the extent possible showing the effect of real-time operations simulation
- Deliver settlements statements for the operating day that includes commitments of resources from RUC
- Verify the outage scheduler function
- Demonstrate satisfactory operation of all nodal systems and markets for 168 consecutive hours
- Calculate settlements based on LMPs generated during operating day and actual meter data

SCHEDULED RELEASES

JAN 08 | FEB 08 | MAR 08 | APR 08 | MAY 08 | JUN 08 | JUL 08 | AUG 08 | SEP 08 | OCT 08 | NOV 08 | DEC 08

Release 8
Settlements

Release 9
Day-Ahead Market

PREREQUISITES

		X Required	Q	QR	TD	LSE	CRR	E
		X Recommended						
Reading	• Section 3: Management Activities for the ERCOT System		X	X	X			X
	• Section 4: Day-Ahead Operations		X	X			X	X
	• Section 5: Transmission Security Analysis and RUC		X	X			X	X
	• Section 6: Adjustment Period and Real-Time Operations		X	X				X
Training	• Market Settlements 301 (by EDS 4 Release 8)		X	X			X	X
	• Load Serving Entity 201 (by EDS 4 Release 8)		X			X		X
	• Generation 101 (by EDS 4 Release 8)			X				X
	• Generation 201 (by EDS 4 Release 8)			X				X
	• Generation 301 (by EDS 4 Release 8)			X				X
	• Transmission 101 (by EDS 4 Release 9)				X			X
	• ERCOT 101 for Wind Generation (by EDS 4 Release 9)			X	X			
	• Market Information System (by EDS 4 Release 9)		X	X	X	X	X	X
Tasks	• Designate resources providing ancillary services			X				X
	• Attest for ancillary services qualification of resources			X				X
	• Create energy-only offers and bids for any settlement point on the ERCOT grid		X	X				
	• Complete registration and qualification process		X	X	X	X	X	X
	• Schedule time to participate in EDS		X	X	X			

OBJECTIVES

- Complete registration documentation
- Participate in qualification activities

Market participants can register and qualify to participate in multiple roles, including the following:

- Congestion Revenue Rights (CRR) Account Holder
- Load Serving Entity (LSE)
- Qualified Scheduling Entity (QSE)
- Resource Entity
- Transmission Service Provider (TSP)
- Distribution Service Provider (DSP)
- Renewable Energy Credit (REC) Account Holder

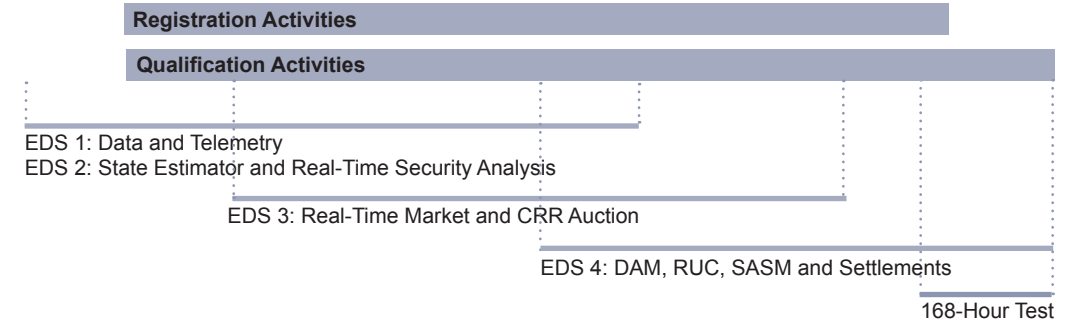
Registration activities for transitioning to the nodal market started June 2007 and are ongoing. New and updated applications are available to support these activities. Existing registered participants will not be required to completely re-register with ERCOT; however, there will be incremental documentation requirements. Designating a counter-party for market participants with registered QSE and/or CRR account holder is accomplished by completing the ERCOT Standard Form Agreement in effect as of August 2007. Resource entities are required to provide additional resource characteristics for the nodal market.

The registration process for CRR account holders is new and being established for entities seeking ownership of CRRs, including cooperatives and municipally owned utilities eligible for PCRRs and wind generation resources eligible for McCamey Area flowgate rights (MCFRIs). The processes for valid acquisition and transacting of CRRs are detailed in nodal protocols section 7.1, Function of Congestion Revenue Rights.

Qualification activities will be conducted within the four EDS testing sequences, whereby ERCOT will monitor and track the individual market participant activities to ensure all applicable transactions can be successfully demonstrated. Upon successful completion of the applicable qualification activities, the MP will be granted access to the nodal production systems.

SCHEDULED RELEASES

APR 07 | JUN 07 | AUG 07 | OCT 07 | DEC 07 | FEB 08 | APR 08 | JUN 08 | AUG 08 | OCT 08 | DEC 08



REGISTRATION ACTIVITIES

	X Required	Q	QR	TD	LSE	CRR	E
	X Recommended						
• Sign new standard form market participant agreement		X	X	X	X	X	X
• Complete new registration process for CRR account holders						X	X
• Complete resource asset registration form			X				X
• Declare load zone designation (Non Opt-In Entities)				X	X		

QUALIFICATION ACTIVITIES

• Complete creditworthiness qualification						X	X
• Establish real-time telemetry/communication connectivity			X	X			X
• Connect to real-time systems		X	X	X			X
• Connect to day-ahead market and CRR auction		X	X			X	X
• Participate in EDS sequence testing		X	X	X		X	X
• Participate in 168-hour test		X	X	X		X	X

EDS 1: DATA AND TELEMETRY June 2007 - September 2007

- OBJECTIVES**
- Alarm Processing
 - Implement ERCOT configuration that organizes and prioritizes messages
 - Inter-Control Center Communication Protocol (ICCP) Communications
 - Verify TSP/QSE ICCP
 - Verify ERCOT ICCP
 - Point-to-Point
 - Verify ICCP/SCADA mapping for each TSP and QSE
 - Identify issues and request TSPs and QSEs to submit changes
 - Place network model data under full change control process

SCHEDULED RELEASES MAR 07 | APR 07 | MAY 07 | JUN 07 | JUL 07 | AUG 07 | SEP 07 | OCT 07 | NOV 07 | DEC 07

Release 1
Point-to-Point Alarm Processing
Release 2
Point-to-Point Telemetry

PREREQUISITES

	X Required X Recommended	Q	QR	TD	LSE	CRR	E
Reading							
• Section 3.10: Network Operations Modeling and Telemetry	X	X	X				X
• Section 6: Real-Time and Adjustment Period	X	X	X				X
Training							
• Transition to Nodal Market and Start-Up Testing	X	X	X	X	X	X	X
Tasks							
• Participate in network model telemetry data clean-up effort			X				X
• Create redundant ICCP feeds		X	X				X
• Switch from Remote Terminal Unit (RTU) to ICCP		X	X				
• Verify point-by-point telemetry		X	X				X
• Dual feed of telemetry into zonal and nodal energy management system (EMS)		X	X				X
• Prepare for one-line verification of station topology			X				X

EDS 1 ACTIVITIES

• Install systems, build and verify graphic displays for all substations, verify actual telemetry from TSPs and QSEs		X	X				X
• Verify redundant communications		X	X				X
• Verify alarm processing for changes in status		X	X				X
• Verify alarm processing for limit violations		X	X				X
• Verify telemetry meets protocol 3.10.7.4 (failover, scan rates)		X	X				X

EXIT CRITERIA

Release 1							
• The alarm configuration design is approved by ERCOT							X
• The alarm configuration has been implemented on EMS							X
• ERCOT operators have verified the configuration and have signed off							X
Release 2							
• Verification that all substation one-lines for all TSPs and QSEs match ERCOT's one-lines		X	X				X
• Verification of displays of all resources for QSEs		X					X
• Verifications of telemetry mapping for all supervisory control and data acquisition (SCADA) points for TSPs and QSEs, including additional nodal data		X	X				X
• Network model data under full change control process							X

EDS 3 ACTIVITIES

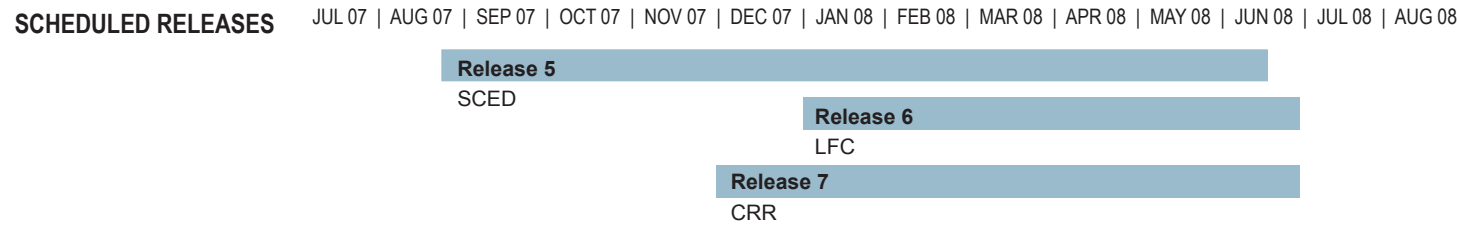
	X Required X Recommended	Q	QR	TD	LSE	CRR	E
Release 5: SCED							
• Submit and adjust energy offer curves and resource output schedules using MIS user interface or machine-to-machine interfaces			X				X
• Download and review SCED base points for resources through MIS user interface or machine-to-machine interfaces			X				X
• Review LMPs	X	X	X	X	X	X	X
Release 6: LFC							
• Compare ACE for seven days							X
• Complete LFC testing from nodal systems of all resources available for regulation or responsive reserve services			X				X
Release 7: CRR							
• Nominate PCRR prior to CRR auction						X	X
• Submit test bids on transmission elements	X					X	X
• Participate in trial annual and monthly CRR auction	X					X	X
• Obtain results from trial auctions using MIS user interface	X					X	X
• Submit bilateral trades of CRRs	X					X	X

EXIT CRITERIA

Download mock settlement statements for CRR and SCED	X	X					X	X
Release 5: SCED								
• Assign trial PCRRs and CRRs to MPs for DAM and real-time operations testing of settlements system							X	X
• Successful submission and adjustment of energy offer curves using MIS user interface or machine-to-machine interfaces			X					X
• Real-time functionality and market results verified	X	X						X
• Successful download and review of SCED base points for resources through MIS user interface or machine-to-machine interfaces			X					X
• Publication of LMPs	X	X	X	X	X	X	X	X
Release 6: LFC								
• ACE accuracy standards met								X
• Successful completion of load frequency control testing from nodal systems of all resources available for regulation or responsive reserve services			X					X
Release 7: CRR								
• Successful submission of test bids on transmission elements							X	X
• Successful execution of trial annual and monthly CRR auction							X	X
• Obtained results from trial auctions using MIS user interface							X	X

OBJECTIVES

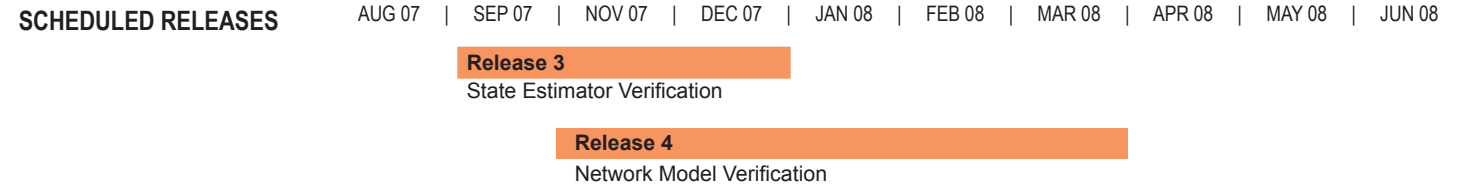
- SCED
 - Verify SCED inputs from real-time operations
 - Verify that QSEs are capable of submitting offer curves
 - Publish locational marginal prices (LMPs) and base points calculated by SCED
 - Begin LMP publication
- LFC
 - Verify data requirements for LFC, for each QSE qualified to provide either regulation up, regulation down or responsive reserve services
 - Compare area control error (ACE) on EDS environment and existing control systems for seven days
 - Verify each QSE's ability to provide regulation control and dispatch instructions for manual responsive reserve deployment dispatch
- CRR
 - Verify market participant's ability to submit test bids for CRRs
 - Execute trial auction for monthly and annual CRRs
 - Assign trial PCRRs/CRRs to market participants for DAM and real-time operations testing of settlement systems during EDS 4



PREREQUISITES		X Required	X Recommended	Q	QR	TD	LSE	CRR	E	
Reading	• Section 5: Transmission Security Analysis and RUC				X	X			X	
	• Section 6: Real-Time and Adjustment Period		X	X	X				X	
	• Section 7: Congestion Revenue Rights							X	X	
Training	• ERCOT Nodal 101: The Basics (by EDS 3 Release 5)		X	X	X	X	X	X	X	
	• Basic Training Program		X	X	X			X	X	
	• Non-Opt In Entity (NOIE) QSE Operations (by EDS 3 Release 6)			X					X	
	• Economics of LMP (optional) (by EDS 3 Release 6)		X	X	X	X	X	X	X	
	• Congestion Revenue Rights (CRR) (by EDS 3 Release 7)							X		
Tasks	Release 5: SCED									
	• Define methodology for resource offer curve creation and submission									X
	• Create three-part offer curves and submit to ERCOT using sandbox			X						X
	• Identify representative to support market trials			X						
	• Create and submit current operating plan, output schedules and offers according to defined methodologies			X						X
	• Schedule time to participate in and be accessible during trials			X				X		
	• Submit resource-specific verifiable costs			X						X
	Release 6: LFC									
	• Complete EMS nodal system changes									X
	• Complete QSE ancillary service qualification			X						
	Release 7: CRR									
	• Complete CRR account holder registration process		X						X	
	• Establish CRR account credit limit		X						X	
	• Request CRR digital certificate		X						X	

OBJECTIVES

- Verify telemetry performance
- Verify SE performance
- Verify NSA functions
- Verify network operations model and network operations model change request (NOMCR) process
- Restructure load model to improve bus load forecasting
- Develop/update procedures for nodal SE, NSA and network operations model



PREREQUISITES

PREREQUISITES		X Required	X Recommended	Q	QR	TD	LSE	CRR	E
Reading	• Section 3.10			X	X	X			X
Training	• Network Model Management (by EDS 2 Release 4)				X	X			X
Tasks	• Access MIS portal				X	X			
	• Retrieve telemetry and SE performance reports via the MIS portal				X	X			
	• Electronically submit data changes using the NOMCR user interface and Common Information Model (CIM) -compliant format for data exchange						X		
	• Receive NOMCR acknowledgement of submittals, verifications and confirmation of data posting						X		

EDS 2 ACTIVITIES

• Verify all data and telemetry submittals meet protocol section 3.10				X					X
• Verify accuracy of all transmission element constraints									X
• Verify TSP calculations for transmission constraints likely to be binding in SCED									X
• Verify SE performance meets protocol section 3.10.9									X
• Verify trial of SE test based on live SCADA to resolve errors to meet performance criteria and verify bus load forecast functionality									X
• Test business processes using NMMS						X			X
• Begin continuous operation of SCADA and post information to TSPs and QSEs, meeting Section 6.3.2									X
• Continuously monitor Monday - Friday, meeting protocol section 6.5.7.1.11									X

EXIT CRITERIA

Release 3									
• TSP/QSE data points conform to telemetry and SE performance criteria		X	X						X
• Network security analysis functions are verified									X
• ERCOT SE is tuned and meets performance criteria									X
• Load modeling has been restructured, load adaptation has been verified, and bus load forecast changes have been verified									X
Release 4									
• ERCOT is ready to fully utilize the NOMCR process for all TSP data change requests						X			X
• MPs submit data changes via the NOMCR process, TSP service requests are terminated						X			X
• ERCOT utilizes a "single-entry model" that maintains both nodal and zonal network operations model databases									X
• NMMS is the database of record for the network operations model database									X
• Network operations model is under full change control									X
• ERCOT is building CIM-generated models									X

Early Delivery System Sequence Timeline

