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, web-based self-directed instruction and webcast.

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 items 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:

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

By e-mail . . .

- Subscribe to Texas Nodal News, a biweekly newsletter containing TPTF updates, nodal activities at TAC and the 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 exploder list, to receive documents for review. To subscribe, go to http://lists.ercot.com and select "tptf."
- Contact the Nodal Transition Service 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 Service Center.

In person . . .

Participate in market readiness seminars beginning later this year. 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 Service Center

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

The service 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.

Still have questions?

If you have questions, suggestions or feedback, you can contact the Texas Nodal team at this address:

TexasNodal@ercot.com

We will respond to all questions.

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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. The Texas Nodal Program designed four Early Delivery System (EDS) 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, 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 web-based kick-off meetings 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:

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.

Systems Procurement and Development – Market Participant

All market participants having systems that interface with ERCOT for power system operation and wholesale market operations will have to change their systems and processes to accommodate new rules in the market. They are responsible for updating ERCOT on their progress.

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 training curriculum has been developed and approved by TPTF. To date, ERCOT is currently delivering two courses:

- ERCOT Nodal 101: The Basics
- Economics of LMP

ERCOT recently launched online testing for ERCOT Nodal 101. ERCOT also developed a Learning Management System (LMS) that allows market participants to review available courses and register, as well as access web-based training.

The following courses are being developed and will be available in the summer of 2007:

- Basic Training Program
- LSE 201
- NOIE QSE Operations

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

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

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

Did you know. . .

More than 800 have attended ERCOT Nodal 101- The Basics.

More than 170 have attended Economics of LMP

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 and websites 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
	•	Participate in TPTF review of design documents	X	X	X	X	X	X
	•	Review overall timeline	X	X	X	X	X	X
	•	Review registration approach document	X	X				
	•	Review market trials approach document	X	X	X	X	X	X
	•	Review market readiness advisor's proposed readiness metrics	X	X	X	X	X	X
Training	•	Determine what staff must take training	X	X	X	X	X	X
	•	Create accounts in LMS	X	X	X	X	X	X
Tasks	•	Designate accountable executive	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
	•	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
	•	Contact account manager to set expectations for communication	X	X	X	X	X	X
	•	Verify connectivity with market participant sandbox	X	X	X	X	X	X

Legend for Market Participant Roles

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

EDS 4 ACTIVITIES

	X Required / X Recommended	Q	QR	TD	LSE	CRR	E
Release 8							
•	Submit virtual 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			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	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
•	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
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

		Q	QR	TD	LSE	CRR	E
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 ensue grid stability						X
•	Critical mass of MPs demonstrate ability to operate in nodal market	X	X	X	X	X	X

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EDS 4: DAY-AHEAD MARKET

January, 2008 - October, 2008

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 (MCPC)), 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

Market Management System (MMS) - Real-Time Settlements Interface, Settlements and Billing (S&B), Enterprise Integration (EIP), Enterprise Data Warehouse (EDW)

Release 9

MMS - All markets, Outage Scheduler
EMS - Load Forecast, Outage Evaluation
NMMS, S&B, EIP, EDW

PREREQUISITES

X Required
X Recommended

		Q	QR	TD	LSE	CRR	E
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	• Generation 101		X				X
	• Generation 201	X	X				X
	• Generation 301		X				X
	• Transmission 101			X			X
	• CRRs, PCRRs and Supply Hedging	X	X		X	X	X
	• ERCOT 101 for Wind Generation		X	X			
	• Network Model Management		X	X			X
	• Market Information System	X	X	X	X	X	X
Tasks	• Designate resources providing ancillary services		X				X
	• Attest for ancillary services qualification of resources		X				X
	• Create virtual 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			

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REGISTRATION AND QUALIFICATION

June, 2007 - December, 2008

OBJECTIVES

- Complete registration documentation
- Participate in qualification activities

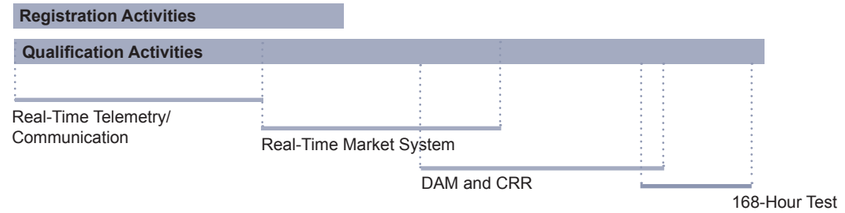
Market Participants can register and qualify to participate in multiple roles, including:

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

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.

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
X Recommended

	Q	QR	TD	LSE	CRR	E
• Sign new standard form market participant agreement	X	X	X	X	X	X
• Complete new registration application for CRR account holders					X	X
• Complete incremental resource registration application		X				X

QUALIFICATION ACTIVITIES

	Q	QR	TD	LSE	CRR	E
• 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 EDSs	X	X	X		X	X
• Participate in 168-hour test	X	X	X		X	X

EDS 1: DATA AND TELEMETRY

April, 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
Alarm Processing

Release 2
ICCP Upgrade

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
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

	Q	QR	TD	LSE	CRR	E
• 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

	Q	QR	TD	LSE	CRR	E
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

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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				X
• Download and review SCED base points for resources through MIS user interface or machine-to-machine interfaces	X	X				X
• Review LMPs	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
• Participate in trial annual and monthly CRR auction					X	X
• Obtain results from trial auctions using MIS user interface					X	X
• Submit bilateral trades of CRRs					X	X

EXIT CRITERIA

	Q	QR	TD	LSE	CRR	E
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				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
• Reasonable LMPs attained	X	X	X	X	X	X
Release 6: LFC						
• Area Control Error (ACE) accuracy standards met						X
• Successful completion 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
Download mock settlement statements for CRR and SCED	X	X			X	X

EDS 3: REAL-TIME MARKET

July, 2007 - July, 2008

OBJECTIVES

- SCED
  - Verify SCED inputs from real-time operations
  - Verify that QSEs are capable of submitting offer curves
  - Produce locational marginal prices (LMPs) and base points calculated by SCED
  - Attain "reasonable" LMPs
- LFC
  - Verify data requirements for LFC, for each QSE qualified to provide either reg-up, reg-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 MP's ability to submit test bids for CRRs on transmission elements
  - Execute trial auction for monthly and annual CRRs
  - Assign trial PCRRs/CRRs to MPs for DAM and real-time operations testing of settlement systems during EDS 4

SCHEDULED RELEASES

JUL 07 | AUG 07 | SEP 07 | OCT 07 | NOV 07 | DEC 07 | JAN 08 | FEB 08 | MAR 08 | APR 08 | MAY 08 | JUN 08 | JUL 08 | AUG 08

Release 5
SCED

Release 6
LFC

Release 7
CRR

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	X	X	X	X	X	X
	• Basic Training Program	X	X	X		X	X
	• Non-Opt in Entity (NOIE) QSE Operations		X				X
	• Economics of LMP (optional)	X	X	X	X	X	X
	• Market Settlements 301	X	X			X	X
	• Load Serving Entity 201				X		X
Tasks	Release 5: SCED						
	• Define methodology for resource offer curve creation and submission						X
	• Produce energy offer curves and submit to ERCOT using sandbox	X	X				X
	• Identify representative to support market trials	X	X				
	• Submit output schedules and offers according to defined methodologies	X	X				X
	• Schedule time to participate in and be accessible during trials	X	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	
	• Establish CRR account credit limit					X	
	• Request CRR digital certificate					X	

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EDS 2: STATE ESTIMATOR AND REAL-TIME SECURITY ANALYSIS

August, 2007 - January, 2008

OBJECTIVES

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

SCHEDULED RELEASES

AUG 07 | SEP 07 | NOV 07 | DEC 07 | JAN 08 | FEB 08 | MAR 08 | APR 08 | MAY 08 | JUN 08

Release 3
SE, Telemetry, NSA

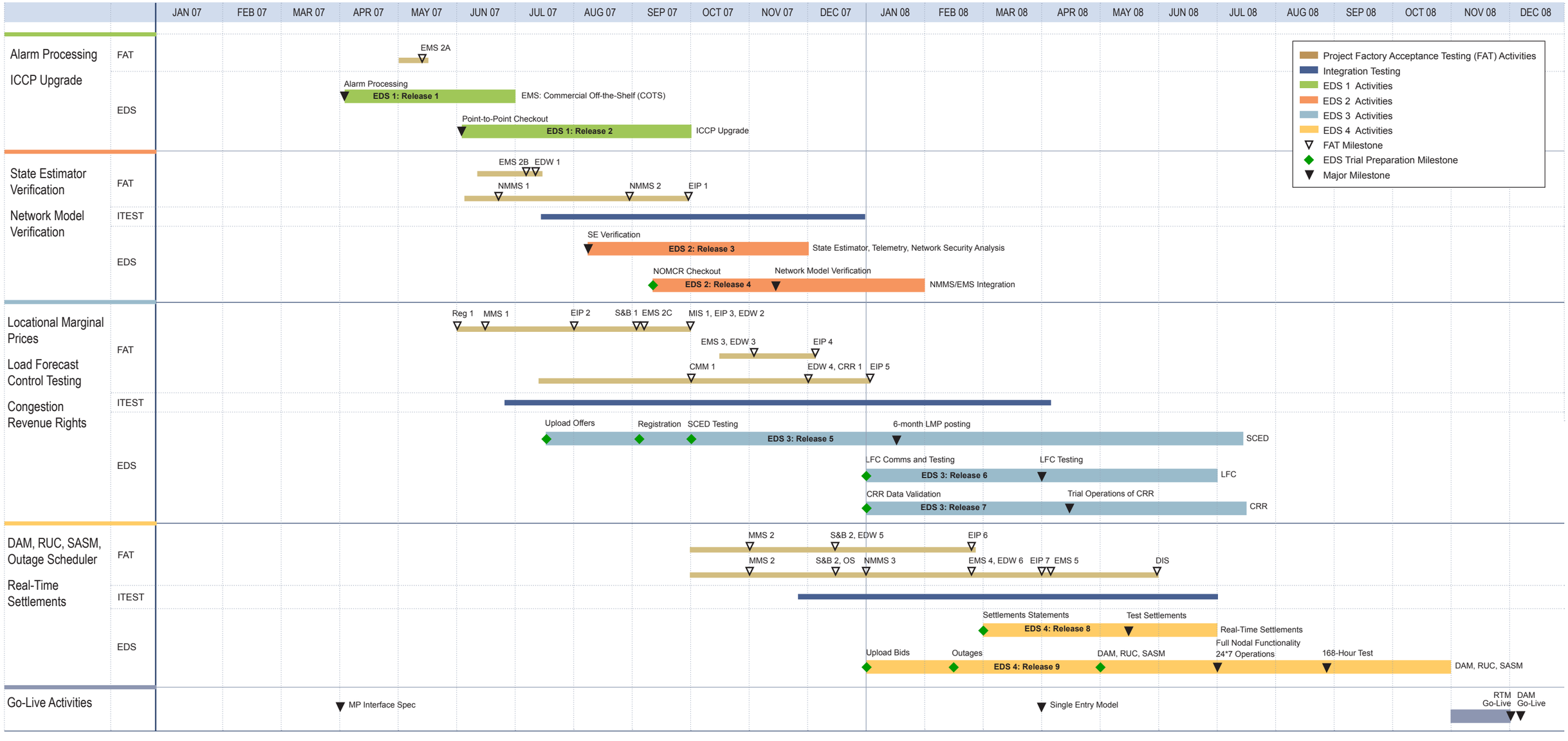
Release 4
Network Model Management System (NMMS)/EMS Integration

PREREQUISITES

X Required
X Recommended

		Q	QR	TD	LSE	CRR	E
Reading	• Section 3.10	X	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 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 3.10.9						X
	• Verify trial of SE test based on live SCADA, resolving errors to meet performance criteria, and to verify bus load forecast functionality						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 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			X			X
	• ERCOT utilizes a "single entry model" that maintains both nodal and zonal NOM databases						X
	• NMMS is the database of record for the NOM database						X
	• NOM is under full change control						X

Early Delivery System Sequence Timeline



EDS 1 Release 1:
Alarm Processing

EDS 1 Release 2:
ICCP Upgrade

EDS 2 Release 3:
EMS
- SE Perf. Standards
- Network Security Analysis
- SPS/RAP
- SCADA
- Dyn. Ratings - Single Model
- Telemetry Perf Standards

EDW
SE Statistics

EDS 2 Release 4:
NMMS
- Network Model
- NOMCR

EMS
- EMS/NMMS Interface

EIP

EDS 3 Release 5:
MMS
- SCED

EMS
- NSA
- RLC

COMS
- Settlements and Billing (S&B), FIP, FOP, Verifiable Costs
- Registration

Enterprise Integration Project (EIP)
Market Information System (MIS)
Enterprise Data Warehouse (EDW)

EDS 3 Release 6:
EMS
- LFC

EIP, EDW

EDS 3 Release 7:
CRR
COMS
- CMM

EDW
EIP

EDS 4 Release 8:
MMS
- All Markets
- Outage Scheduler

EMS
- Load Forecast, Outage Evaluation

NMMS
S&B
EIP, EDW

EDS 4 Release 9:
MMS
- RT Settlements Interface
- S&B

EIP, EDW

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