

ERCOT Nodal Transition Plan

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1 Purpose

- (1) The purpose of this document is to outline the orderly transition from the current ERCOT zonal market structure to the ERCOT nodal market structure. This document sets forth principles that should be applied throughout the transition process by ERCOT and the Market Participants, and it identifies the roles and responsibilities of ERCOT and Market Participants during the transition process. The term “Market Participants” includes: QSEs, LSEs, Resource Entities, TSPs, DSPs, TDSPs, Office of Public Utility Counsel (OPC), Consumer Representatives and any other Entities engaged in any activities governed by the ERCOT Protocols. This document also divides the tasks and subtasks necessary to a successful transition to the nodal market into four major tracks. Additionally, this document develops an initial timeline for each of the four major tracks. These timelines, which may be adjusted in the early planning stages of the transition process, include major milestones, including input opportunities and deadlines for Market Participants and deadlines for ERCOT. This document does not address any interim changes to the current system.
- (2) This document also addresses the development of the Market Readiness Criteria that must be satisfied before the nodal market is implemented for operational and settlement purposes. This document implements the System Migration white paper. In the event that there is a conflict with the System Migration white paper, this document controls.
- (3) This plan is intended to assist in an orderly transition that provides:
 - (a) Certainty about the market structure at the earliest possible time;
 - (b) A firm transition date; and
 - (c) Precise and timely execution of the market transition.
- (4) Throughout this document, the term “ERCOT” refers to the ERCOT Staff and the term “ERCOT Board” refers to the ERCOT Board of Directors.

2 Transition Planning Principles

The Transition Plan must incorporate the following principles:

- (a) Market Participants must have the opportunity to review and comment on documents at major steps in the transition process. ERCOT must consider all comments and will make the ultimate decision on the documents, subject to the Technical Advisory Committee’s Nodal Transition Plan Task Force (TPTF) approval for some documents as required in the next paragraph.
- (b) The TPTF has the right to approve or reject any documents or activities in the transition process that raise issues of compliance with the nodal Protocols.
- (c) No part of the nodal market may start operation until all the Market Readiness Criteria for that part of the nodal market have been met. Certification that all Market Readiness Criteria have been met must be made at least by each of the following: the TPTF, TAC, ERCOT, and the ERCOT Board.

- (d) Market Participant knowledge of the status of the transition process is very important, and ERCOT shall establish a process for providing that information to Market Participants. ERCOT will provide the opportunity for Market Participants to be involved in the transition process. During certain phases of the transition process ERCOT may request that Market Participants provide individuals with specific skill sets to assist in project activities. With the exception of security-related issues, all meetings involved in project activities will be open to the public and any decisions will be posted for review at a centralized location on the ERCOT website.
- (e) Market Participant training is very important, and ERCOT shall establish early and comprehensive training programs for Market Participants that will be completed in a timely manner.
- (f) ERCOT shall provide Market Participants with the specifications needed for systems interfaces, as soon as they are available.
- (g) Whenever practical, terminology used in the Protocols will be used in the requirements, design documents and descriptions, system implementation and extracts, and training.
- (h) ERCOT shall develop a process to identify areas where the design contemplated by the protocols is not feasible, cost effective, or the most effective. Urgent protocol revision requests (PRRs) shall be used as needed to address identified changes.

3 Transition Plan Management

- (1) ERCOT has the overall responsibility to carry out the transition from the current zonal market to the nodal market, including the project budget and timeline.
- (2) Each Market Participant has the responsibility to carry out its functions in the Transition Plan and to provide ERCOT with timely information about the status of its efforts.
- (3) ERCOT shall create a Transition Plan that follows an Outline approved by TAC that includes more detail about systems procurement and development, Market Participant training, and an ERCOT and Market Participant testing plan. The Transition Plan shall identify major and minor milestones and the timeframes affecting system development by ERCOT and by Market Participants. Any declaration of the accomplishment of a major milestone (business requirements, conceptual design, and successful completion of Market Participant testing) or a decision to proceed is contingent on the approval of both ERCOT and TAC.
- (4) Market Participant input to the Transition Plan will be provided through the TAC Transition Plan Task Force (TPTF). The Texas Nodal Team upon completion of its tasks and the filing of the Protocols with the Public Utility Commission of Texas shall be dissolved. The primary mission of the TPTF is to assist ERCOT and assure alignment between the requirements of the nodal Protocols and system design and implementation.
 - (a) The TPTF will consist of market participants from each of the seven market segments and an ERCOT representative. Each market participant will

acknowledge its willingness to participate in the TPTF prior to the first TPTF meeting. TPTF members are strongly encouraged to be present at each TPTF meeting in order to maintain continuity in the decision process. To be eligible to review plan and design documents, each member of the TPTF is required to sign nondisclosure agreements with ERCOT to the extent required by the vendor. The form of the nondisclosure agreement shall be consistent with the Public Information Act.

- (b) ERCOT shall chair and provide administrative and technical support to, the TPTF.
- (c) The TPTF shall meet as needed. Meetings are open to all of the following who have signed an appropriate nondisclosure agreement:
 - (i) ERCOT corporate members;
 - (ii) PUCT Staff and delegates;
 - (iii) Independent Market Monitor (IMM);
 - (iv) OPC Staff; and
 - (v) TAC Consumer Members.
- (d) A motion of the TPTF will be approved when two-thirds or more of the sum of all fractional votes are in favor of a motion. A quorum consists of four segments and is required for decision-making. Each market segment shall have one vote. Except for the Consumer segment, the fractional vote for each Member shall be equal to one divided by the number of Members present and voting in their segment. For example, if a segment has ten Members present and voting, then each Member would have a fractional vote equal to one-tenth.

Abstentions do not count in the total number of votes. If the TPTF cannot reach the required passing vote of the members present on any issue voted on, then the TPTF will send the issue to TAC for resolution. If a timely answer is not received from TAC, then ERCOT will determine how to proceed. All decisions of the TPTF may be appealed to TAC.

The Consumer segment will be grouped into three sub-segments - Residential, Commercial and Industrial. Members in each sub-segment shall have fractional votes adding up to one divided by the number of sub-segments present and voting. The fractional vote for each Member shall be based on the number of Members present and voting in their sub-segment. For example, if all three sub-segments are present and voting and if a sub-segment has three Members present and voting, then each Member of that sub-segment would have a fractional vote equal to one-ninth.

- (e) The TPTF shall provide the TAC with a report of its activities at each regularly-scheduled TAC meeting. ERCOT must sponsor routine information sharing meetings open to all Market Participants to report the progress of, and changes to, the Transition Plan.

4 Implementation Timeline

The implementation timeline will be posted and updated beginning with a decision to proceed until the start of nodal market operations and settlement.

5 Transition Plan Tracks

The Transition Plan must include the following tracks:

- Systems Specification, Requests for Interest (RFI), Requests for Proposal (RFPs), Procurement and Development – ERCOT
- Systems Procurement and Development – Market Participant
- Market Training – ERCOT, the IMM, and Market Participant
- Systems Testing and Nodal Market Implementation

5.1 *Systems Specification, Procurement and Development Track – ERCOT*

- (1) This track includes tasks related to systems specification, procurement, and development of RFIs, RFPs, subsequent statements of work, design documents, standards for interface with Market Participants and the IMM, and building the systems. ERCOT shall manage this track, including without limitation the RFP process, vendor selection, contract management, financial settlement with vendors, the development and specification of communications interfaces and communication protocols, the development of data dictionaries, and the designation of digital certificates. ERCOT shall encourage vendors to identify design requirements that create feasibility or cost issues (value engineering).
- (2) Throughout the planning phase of the transition process, Market Participants, PUCT Staff and delegates, the IMM, OPC Staff, and TAC Consumer Members that have signed a nondisclosure agreement with ERCOT may review, to the extent it is required by the vendor, and provide input on the documents specified below:
 - (a) **Business Requirements** – Document that describes the goals, assumptions, user functionality and business rules needed to accomplish the business functionality. This document is the basis for creating conceptual design, functional testing and training documents. The final version of each requirements document, before it is used, must be approved by the TPTF as being in compliance with applicable protocols.
 - (b) **Conceptual System Design document** – Document that describes the method of accomplishing the requirements, including user interaction with the system and interfaces within the system itself. This document is the basis for creating the detail design document. The TPTF will approve these documents and comment on any possible compliance issues with applicable protocols. ERCOT shall review the comments and make appropriate corrections to the document.
 - (c) **Detail System Design document** – Document that provides the full details of the components in the system and how they interact with each other to implement the conceptual design. The TPTF will review these documents and comment on any

- possible compliance issues with applicable protocols. ERCOT shall review the comments and make appropriate corrections to the document.
- (d) **RFIs** –requests for interest for each system. The TPTF will review these documents and comment on any possible compliance issues with applicable protocols. ERCOT shall review the comments and make appropriate corrections to the document.
 - (e) **RFPs** - proposal requests for each system. The TPTF will review these documents and comment on any possible compliance issues with applicable protocols. ERCOT shall review the comments and make appropriate corrections to the document.
 - (f) **ERCOT/Market Participant interface standards** - the design of interfaces between ERCOT and Market Participants for the relevant systems, whether developed in-house by ERCOT or through an RFP. The final design of each interface, before the interface is built, must be approved by the TPTF as being in compliance with applicable protocols.
 - (g) **Value engineering** - suggestions made by each vendor or system developer that may be based upon technical feasibility, cost-effectiveness, or prior market experience. The TPTF will either approve or reject these vendor or developer suggestions. Approval of the vendor suggestions must be based on compliance with the applicable Protocols.
 - (h) **Protocols interpretation decisions** –ERCOT will log decisions that require interpretation of the nodal protocols. Each final decision, before it is used, must be approved by the TPTF as being in compliance with applicable protocols.
 - (i) **Answers to vendor questions** – proposed answers to vendor questions related to interpretation of the protocols. The final version of each interpretation, before it is given to the vendor, must be approved by TPTF as being in compliance with applicable protocols. Responses and questions that are not confidential or proprietary will be posted by ERCOT.
- (3) ERCOT and TSPs shall establish the network model to be used for initial testing of the new systems and make it available to Market Participants for testing. This network model should include a working and stable State Estimator that provides estimates of all loads where nodal prices will be calculated before nodal market testing periods for at least six months. After testing, the network model must be approved by the TPTF before initial nodal price testing for the settlements process.
 - (4) As early as practical, ERCOT shall begin posting of LMPs to Market Participants based on test Resource offer curves submitted to ERCOT by the QSEs to measure the accuracy and stability of the SCED. The minimum time for this posting should be at least six months but may be longer as approved by the TPTF.
 - (5) ERCOT shall communicate the plan for settlement of nodal testing periods and submit PRRs needed to support that settlement before implementation of the nodal market and Protocols. ERCOT shall provide Notice to the market of all scheduled market changes.

- (6) It is anticipated that the current zonal market settlement process will be required beyond the implementation of the nodal market to support Invoices and open disputes. ERCOT shall develop a plan to address the issues that arise because there will be one nodal settlements process in production and a legacy settlements process preserved for the purpose of dealing with former market design true-ups and dispute resolution.

5.2 System Procurement and Development Track – Market Participant

- (1) This track includes tasks related to systems modification and acquisition, interfaces with ERCOT, and modifying and building the systems.
- (2) ERCOT shall establish a technical forum for QSE system development and implementation.
- (3) Using the ERCOT/Market Participant interface documents, each Market Participant shall develop systems necessary to operate in the new nodal market, in accordance with the milestone dates for such development in the Transition Plan. Each Market Participant must be able to demonstrate the ability to operate its systems effectively in the old zonal market and its systems in the new nodal market at the same time, with the ability to switch back and forth between the two when requested by ERCOT without negative impact to the market at large. Each Market Participant must give ERCOT, upon request or on a schedule promulgated by ERCOT, a status report on the Market Participant's progress in developing its nodal market systems.

5.3 Market Training Track

- (1) ERCOT shall develop basic training information for interested parties and conduct training programs for Market Participants and ERCOT.
- (2) As soon as practical after approval of the nodal Protocols by the PUCT, ERCOT shall make training information available to interested parties explaining how the nodal market will function.
- (3) As soon as practical after development of the nodal system specifications ERCOT shall develop a comprehensive program of training requirements covering both Market Participant and ERCOT roles in the nodal market. These activities should be timed in conjunction with the System Testing and Nodal Market Implementation Track. All trainings are to be offered in sufficient number and completed with adequate time prior to any test sequence implementation that requires working knowledge of training subject matter. The program shall consist of mandatory, highly recommended, and recommended subject matter modules that, when fully developed, will be repeatable and clearly defined as to the applicable market participant role it targets. ERCOT's development of the training subject matter shall attempt to leverage as much as possible the technical delivery systems ERCOT currently uses such as web casting and conference bridging.
- (4) Each Market Participant has the responsibility to cause appropriate personnel to complete applicable training programs. ERCOT may require that Market Participants entities complete certain training modules to participate in the nodal market.

Each training module shall follow a standard format consisting of a minimum of:

- (a) Introduction
 - (b) Objectives
 - (c) Materials, Pre-requisites and Competencies Required
 - (d) Course Material
 - (e) Self Quiz or Proctored Interactive Quiz to Measure Achievement of Objectives with feedback
 - (f) Automated Method for Recording Participation and Completion
- (5) ERCOT shall keep a running inventory of each person and the aggregate of each Market Participant's training progress and shall post for the information of the market at large by segment to show the status of the ERCOT market's readiness for cutover.
- (6) The following Table 1 - ERCOT Texas Nodal Training Program contains samples of training curriculum to be developed by ERCOT and provided to all Market Participants, PUCT staff, and ERCOT employees. Specific courses may be completed in less than one day or last up to 5 days of classroom instruction to assure complete coverage of the subject. All course curriculums shall be reviewed by the TPTF for completeness and applicability.

Table 1 - ERCOT Texas Nodal Training Program Sample
M = Mandatory; HR = Highly Recommended; R = Recommended

| Typical Courses | Web Training Materials | Virtual w/live Instruction | In-Person Classroom | QSE | LSE | PM/Trader | TSPs & DSPs | General Knowledge |
|---|------------------------|----------------------------|---------------------|-----|-----|-----------|-------------|-------------------|
| ERCOT 101: The Basics | ● | ● | ● | M | M | M | M | M |
| NOIE QSE Operations | ● | ● | ● | R | R | R | R | R |
| Basic Training Program | ● | ● | ● | M | R | R | M | |
| Extended Training Class System Dynamics | | ● | ● | HR | | | HR | |
| LMP 101 | ● | ● | ● | HR | HR | HR | R | HR |
| Start-up Testing | ● | ● | ● | M | M | HR | M | HR |
| Market Settlements 301 | | ● | ● | R | R | R | | |
| Load Serving Entity 201 | ● | ● | ● | R | M | M | | R |
| Generation 101 | ● | ● | ● | M | | R | R | |
| Generation 201 | | ● | ● | M | | | R | |
| Generation 301 | | ● | ● | M | HR | | R | |
| Real Time Operations 101 | ● | ● | ● | M | R | HR | M | |
| System Operator Seminar | | ● | ● | M | R | | M | |
| Transmission 101 | ● | ● | ● | HR | | R | M | |
| Scenario-Based Training for Generation Owners | | ● | ● | M | | HR | | |
| Scenario-Based Training for Load Serving Entities | | ● | ● | | M | HR | | |
| Scenario-Based Training for TSPs and DSPs | | ● | ● | | M | HR | | |
| Transactions 201 | ● | ● | ● | | | M | | |
| CRRs, PCRRs, and Supply Hedging | ● | ● | ● | M | M | M | HR | HR |
| ERCOT 101 for Wind Generation | ● | ● | ● | M | | M | | R |

5.4 System Testing and Nodal Market Implementation Track

This track includes tasks related to the testing and startup of Real-Time Network Security Analysis, the Day-Ahead Market (DAM), and Reliability Unit Commitment (RUC) including the settlement systems affected by those processes. The Real-Time Network Security Analysis, the DAM, and the RUC are all described in detail in the nodal Protocols.

5.4.1 Data and Telemetry Testing Requirements

- (1) To support ERCOT SCADA and ERCOT Network Model database development and data acquisition field testing, the RFP should require the vendor to deliver and configure test computer system hardware and software Early Delivery System (EDS) such that ERCOT may generate test databases, build and verify computer graphic displays of all substations and transmission lines, build and verify displays of all Resources, and verify actual telemetry from TSPs and QSEs, similar to Figure 1, Dual System Configuration

Concept. ERCOT must complete these efforts before the testing of other systems begins.¹

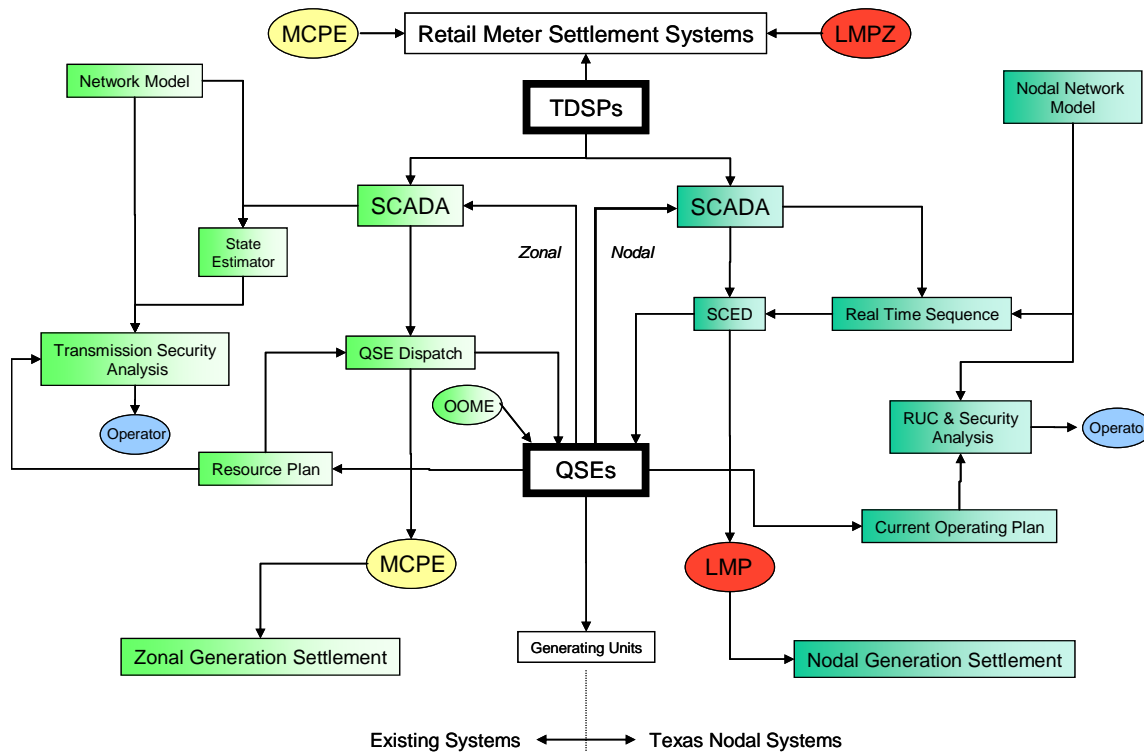


Figure 1 - Dual Systems Configuration Concept

- (2) ERCOT shall develop procedures for setup and data implementation requirements applicable to TSPs and QSEs. ERCOT shall with the assistance of TSPs and QSEs:
 - (a) Verify that all data and telemetry requirements specified in the nodal Protocols Section 3.10, Network Operations Modeling and Telemetry, have been met and that all data submittals are complete and represent an accurate model of the ERCOT System;
 - (b) Review and check for accuracy all constraints on transmission elements;
 - (c) Verify that TSP calculations according to the Nodal Protocols for any transmission constraints likely to be binding in the SCED;
 - (d) Verify the operability of the redundant communications systems required in the nodal Protocols; a detailed test will be developed by ERCOT to test systems and

¹ The first delivery of hardware systems and software suites from the vendor for the EDS is typically the vendor's system prior to modifications and data population.

data telemetry to assure accurate representation of each data element that is available to a TSP's dispatch operator or a QSE's operator is also properly represented in all ERCOT systems and graphical displays;

- (e) Verify that all telemetry meets the update performance requirements specified in the nodal Protocols;
- (f) Verify that all alarm processors operate properly when used to provide notice to ERCOT operators for changes in status of any transmission element, generator or load including the change in Resource Status made by a QSE;
- (g) Verify that all alarm processors used to provide notice to ERCOT operators for limit violations (overload, voltage high/low, tap position limit, etc.) operate properly, including limit change notices for Resources;
- (h) Verify for proper operation the functions of the Outage Scheduler;
- (i) Verify that ERCOT operators are able to determine if the Outage of a Transmission Facility had been scheduled in the Outage Scheduler or is a Forced Outage;
- (j) Verify the acquisition of real-time weather information needed to support the Dynamic Rating Processor works properly; and
- (k) Verify that all telemetry meets the criteria required in the nodal Protocols in Section 3.10.7.4, Telemetry Criteria.

5.4.2 State Estimator Implementation

- (1) ERCOT shall verify that the requirements developed under Section 3.10.9, State Estimator Performance Standard, are sufficient. ERCOT may request further input data requirements for the necessary level of State Estimator performance, including redundancy, defined locally as well as globally, and redundancy of the communication system to ensure State Estimator availability to meet the standards defined in Section 3.10.9.
- (2) ERCOT shall require the vendor to add hardware and software to the EDS as early in the project delivery as possible to support trial operation of the State Estimator. ERCOT shall require the vendor to supply the Network Topology Builder and the Bus Load Forecast functions and assist ERCOT in the startup of the State Estimator. ERCOT shall begin trial operation of the State Estimator as early in the transition process as possible. Trial operation should be based on input data from the live data acquisition processes and calculated data as necessary. ERCOT will work with TSP's and QSE's dedicated personnel to tune the State Estimator, correct data acquisition errors, calibrate field measurements, and correct network modeling parameters until the State Estimator reliably meets the performance criteria specified in the nodal Protocols, Section 3.10.9, State Estimator Performance Standard.
- (3) On stable operation of the State Estimator, as determined by ERCOT, ERCOT shall begin trial operation of the Topology Consistency Analyzer to verify that TSPs and QSEs are in compliance with Section 3.10.7.4.1, Continuous Telemetry of the Status of Breakers and Switches, of the nodal Protocols.

- (4) Once the accuracy and reliability criteria for the State Estimator have been met, ERCOT will begin continuous operation of data acquisition and State Estimator in parallel with all other existing ERCOT wholesale market systems. ERCOT shall post information required in Section 6.3.2, Activities for Real-Time Operations, of the nodal Protocols to the extent that information and data is available and shall clearly indicate the source of the test information.

5.4.3 Real-Time Network Security Analysis Implementation

- (1) On satisfactory completion of testing and verification of stability and accuracy of the State Estimator, ERCOT shall begin preparation for trial operation of Network Security Analysis. ERCOT shall develop a test list of transmission contingencies initially limited to major transmission elements. The vendor shall upgrade the EDS to provide a test environment for the Network Security Analysis sequence. Such upgrades shall be designed to represent as closely as possible the expected operations environment of the real time sequence executing in the final configuration of ERCOT's energy management system.
- (2) ERCOT operations staff shall compare the trial Network Security Analysis results to results from other ERCOT real-time computations. As testing proceeds, additional contingencies will be added to the Contingency List and the Contingency Screening application will be enabled. Additionally, the Dynamic Ratings Processor will be enabled and verified for proper operation.
- (3) ERCOT will continuously monitor the EDS during normal working hours Monday through Friday. ERCOT shall involve system operators in the EDS process for training purposes when practical. As the Network Security Analysis process identifies constraints, ERCOT will begin performing the functions of transmission constraint management as described in nodal Protocols, Section 6.5.7.1.11, Transmission Constraint Management.

5.4.4 Security Constrained Economic Dispatch

- (1) ERCOT, the IMM, and Market Participants shall, with the concurrence of the TPTF, develop a method for Market Participants to create and provide individual Resource offer curves to SCED.
- (2) To support trial operation of the SCED on the EDS to ensure that the pre-requisite component relationships are working, as well as to evaluate the quality of the LMPs produced, ERCOT shall implement the capability for QSEs to enter individual Resource offer curves to SCED.
- (3) The vendor shall upgrade as necessary, the EDS to provide a test environment for the SCED. ERCOT shall verify that the information and telemetry specified in Nodal Protocols, Section 6.5.7.1.12 Resource Limits and Section 6.5.7.1.13, Data Inputs and Outputs for the Real-Time Sequence and SCED, are available. Once QSEs are providing sufficient information, ERCOT shall begin trial operation of SCED and calculation of Resource Base Points. The LMPs calculated by SCED shall be verified for reasonability. Once general reasonability has been achieved as determined by ERCOT, ERCOT shall

begin posting LMPs and other data available on the EDS if such posting is required in Nodal Protocols, Section 6.3.2, Activities for Real-Time Operations.

- (4) The Site-Acceptance Test will be performed by ERCOT. Any revised design documentation resulting from Site Acceptance Test will be provided to the TPTF.
- (5) On completion of the vendor Site Acceptance Testing required of the RFP, the vendor shall re-configure the EDS into the final environment, Texas Energy Management and Control System (TXMACS), to support all remaining functions required to meet the requirements of the Nodal Protocols. SCADA, Network Security Analysis, Transmission Constraint Management and SCED will be retested in this final configuration

5.4.5 Trial Operation of Congestion Revenue Rights Auction

- (1) ERCOT shall provide potential CRR auction Market Participants with a detail test plan describing each step of trial operation testing. This plan will initially require authorized Market Participants to create test bids for CRRs on Transmission Elements. ERCOT shall execute a trial auction of monthly, seasonal and annual CRRs. Market Participants shall be assigned test CRRs/PCRs to be used for trial operation of DAM and trial operations testing of the settlement systems.
- (2) Any CRRs or TCRs that may have been auctioned to Market Participants for periods of time prior to completion of start-up may be subject to refund to the Market Participants.

5.4.6 Trial Operation of Day Ahead Market

- (1) ERCOT shall provide potential DAM Market Participants with a detail test plan describing each step of trial operation testing. This plan will initially require authorized Market Participants to create offers for physical Resources and bids for Load based on best estimate of physical demand that can be used by ERCOT in testing DAM. After convergence of DAM using physical bids and offers, ERCOT shall expand testing to allow Market Participants to submit virtual offers and bids for any settlement point on the ERCOT Transmission Grid.
- (2) ERCOT shall test the operation of DAM to procure Ancillary Services according to the protocols using test offers from Market Participants.
- (3) DAM trial operation testing shall continue for seven consecutive Operating Days. On detection of any significant error of DAM, ERCOT and the Vendor will correct the problem and re-start the DAM trial operations test, until DAM operates properly for seven consecutive days.
- (4) ERCOT shall provide QSEs with test DAM settlement statements for the seven consecutive Operating Days. The test DAM settlement statements will use calculated LMPs and MCPCs from the DAM and to the extent possible, show the effect of real time operations simulation from TXMACS. QSEs shall review the test settlement statements for errors and provide feedback to ERCOT for resolution.

5.4.7 Trial Operation of Reliability Unit Commitment

- (1) Following a declaration by ERCOT, QSEs and ERCOT shall begin market trials for RUC in parallel with the DAM testing. Such testing shall initially include using test offers for Resources from the DAM.
- (2) ERCOT shall provide Market Participants with a detail test plan describing each step of trial operation testing. This plan will initially require authorized Market Participants to create offers for physical off-line Resources that can be used by ERCOT in testing RUC.
- (3) ERCOT shall provide QSEs with test settlement statements for the Operating Day. The test settlement statements will include commitments of Resources from RUC, including to the extent possible, statements showing the effect of real time operations from TXMACS. QSEs shall review the test settlement statements for errors and provide feedback to ERCOT for resolution.

5.4.8 Load Frequency Control Testing

- (1) ERCOT shall verify all data requirements of Section 6.5.7.6, Load Frequency Control, have been met for each QSE that is qualified to provide either Reg-Up, Reg-Down, or Responsive Reserve Services. On completion of all communication systems testing, ERCOT shall verify the proper operation of the Load Frequency Control functions.
- (2) The calculation of Area Control Error on the TXMACS and the existing control systems shall be continuously compared for accuracy for seven days. After accuracy has been verified, ERCOT shall begin testing of individual QSEs to provide Regulation control and Dispatch Instructions for manual Responsive Reserve deployment dispatch through actual deployment of regulation energy. Such test deployments shall be considered Dispatch Instructions and not subject the QSE to any performance charges. Responsive Reserve deployment energy will be limited to a minimum to verify proper operation. QSEs will only be required to accept control signals at any one time from either the existing control system or the TXMACS.
- (3) ERCOT shall test one QSE at a time verifying proper operation of each QSE. ERCOT shall also verify the QSE's ability to operate on constant frequency as required under Protocol Section 8.1.2.2.2, Regulation Service.
- (4) On reasonable completion of trial operations testing of DAM and RUC, and a majority of QSEs completing testing of (1), (2), and (3) above, ERCOT, with the approval of the TPTF, may declare the system ready for the 168 Hour Test.

5.4.9 168-Hour Test and Trial Real Time Settlement

- (1) ERCOT shall develop real time dispatch market readiness criteria that will include a systems stability test. The systems stability test generally will require the real time systems performing SCADA, Network Security Analysis, Transmission Constraint Management, SCED, RUC and LFC to operate without significant error for at least 168 continuous hours. On detection of any significant error of the operations systems (non-settlement), ERCOT and the Vendor will correct the problem and re-start the 168-Hour Test.

- (2) On completion of the 168-Hour Test, ERCOT shall provide QSEs with test settlement statements for each Operating Day of the 168 Hour Test. The test settlement statements for each Operating Day will use calculated dispatches and LMPs from SCED and actual meter data. QSEs shall review the test settlement statements for errors and provide feedback to ERCOT for resolution. ERCOT will work with Market Participants to resolve any settlements issues identified during the 168-Hour Test prior to beginning Real-Time Operations.

5.4.10 Transmission Element and Resource Outages

- (1) ERCOT shall 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.
- (2) The ERCOT plan to limit transmission element outages shall consider allowances for long term construction schedules requiring outages with limitations placed on switching equipment in and out of service. Limitations may also restrict high risk (as determined by ERCOT) outages entirely.
- (3) ERCOT, TSPs and QSEs shall synchronize use of the Outage Scheduler for Transmission Elements and Resource outages, described in Protocols Section 3.1, to schedule outages such that both the existing outage scheduling tools and the TXMACS systems are properly updated.

5.4.11 Real Time Operation and Settlement

- (1) Once reasonable assurance of stable and accurate operation of the SCADA, Network Security Analysis, Transmission Constraint Management, SCED, LFC, DAM, RUC, and real time settlement system can be declared, ERCOT with the concurrence of the ERCOT Board, shall appoint a time and date for either start-up of Real-Time operations, or start-up of Real-Time operations and RUC or start-up of Real-Time operations including DAM and RUC and settlement of all systems. Cutover shall begin at a predefined time by enabling all QSEs to take control actions from the TXMACS simultaneously. For start-up of Real-Time operations alone, Ancillary Services shall be provided by QSEs who self-scheduled or were awarded supply obligations from the existing zonal market systems.
- (2) ERCOT may judge TXMACS to be unstable or not performing properly and instruct QSEs to return control functions to the existing computer control system until problems with TXMACS real time functions can be corrected.
- (3) ERCOT shall continuously provide notice and computer systems status information to all Market Participants on the MIS Secure Area. Once reasonable stability of TXMACS has occurred and been declared, ERCOT should not switch control back to its existing control systems, except in circumstances where ERCOT determines that system stability may be compromised.

5.4.12 Performance and Compliance Measurement

ERCOT shall develop a detailed plan to test the monitoring of the performance of TDSPs, QSEs and its own operations according to the requirements of Section 8, Performance Monitoring and Compliance. Sample performance and compliance reports shall be provided to Market Participants for review and comment.

5.4.13 Market Information Systems

ERCOT shall develop a detailed plan to demonstrate its compliance with the requirements of the MIS.

5.4.14 Supplemental Ancillary Services Market

ERCOT shall develop procedures and conduct the tests of the SASM systems.

5.4.15 Daylight Savings Time

ERCOT shall develop procedures and conduct the tests for the proper transition of systems to and from daylight savings time.

5.4.16 Emergency Electric Curtailment Plan (EECP)

ERCOT shall develop procedures and conduct the tests for the proper operation of the system under EECP conditions.

6 Market Readiness

6.1 Market Readiness Criteria

ERCOT shall develop detailed Market Readiness Criteria that must include at least the following:

- (a) LMPs calculated and disseminated according to plan;
- (b) Ancillary Services tested successfully live;
- (c) Base Points tested successfully live (SCED);
- (d) RUC tested successfully live;
- (e) Network model tested successfully and delivered;
- (f) Training complete for ERCOT and Market Participants according to Section 6.2;
- (g) Settlement testing successfully completed;
- (h) DAM testing successfully completed;
- (i) TCR to CRR transition plan implemented;
- (j) Zonal and nodal coordinated settlements implemented;
- (k) New combined QSE/CRR Account Holder agreements signed;

- (l) Credit calculations of credit exposure tested successfully and ready. The calculation of credit exposure is intended to use information from market settlement systems both before and after the Texas Nodal Market Implementation Date, regardless of how information is included on an Invoice. Invoices from the “old” market (before the Texas Nodal Market Implementation Date) will be used to calculate EAL until an Invoice that includes Initial Settlement Statements for a full seven days is generated under the “new” market (after the Texas Nodal Market Implementation Date). ERCOT shall base resettlement credit exposure on estimates from both settlement systems and shall take into consideration how much credit exposure is expected under each system. Notwithstanding the above, Financial Security required from each Counter-Party for the first six weeks from the date of conversion to the “new” market is equal to or greater than the Financial Security held on behalf of any Counter-Party at the date of conversion to the “new” market.
- (m) ERCOT and the Market Participants shall develop protection mechanisms to be implemented for a limited period after market opening, such as ensuring against price excursions that may occur as a result of computer system or market design limitations.

6.2 Market Participant, the IMM, and ERCOT Personnel Readiness

ERCOT shall develop a set of criteria to evaluate market participant and ERCOT personnel readiness that gauges both market systems and personnel training completion. ERCOT shall advise the market of the criteria developed and apprise the market on a regular basis of the market’s achievements.

6.3 Market Readiness Declaration

On completion of all testing, including those tests specifically required of this section and testing of ERCOT’s compliance with the requirements of the then established Protocols, ERCOT shall make a public declaration to describe the operational readiness of its systems to perform according to the protocols. Any systems not meeting the requirements of the protocols as determined by ERCOT and the TPTF shall be clearly delineated in the declaration.