



Texas Nodal Market Implementation
ERCOT Board of Directors Meeting

Nodal Overview & Status Briefing

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Ron Hinsley, Chief Information Officer

rhinsley@ERCOT.com

- **Market Participant Engagement & Readiness Package**
 - One of two initial value engineering proposals adopted by TPTF
 - Presented the first nodal training class, ERCOT Nodal 101: The Basics
 - Updated “Understanding Texas Nodal Market Implementation” handout
- **Integrated Testing Package**
 - Started build of Test Lab
 - Started review of requirements for testability; completed initial review of 7 EMS requirements documents
- **Commercial Systems Package**
 - Received TPTF approval of the first two Commercial Operations Business Requirement Documents
 - Established integrated ERCOT/ROME team for planning and requirements definition, completed first deliverable (product integration protocol)
- **NMMS/Network Model Package**
 - Established integrated ERCOT/Siemens team for planning and refinement of initial activity diagrams and use cases
 - Completed initial assessment of model integration with Nexant (CRR) and ABB (MMS)
- **EMS/OS Package**
 - Signed SOW with AWS True Wind for Renewable Potential Production (RPP) project
 - Established ERCOT/ABB team for planning, requirements gathering and definition of the Outage Scheduler project
 - Drafted requirements for EMS applications (LFC, and Network Security Analysis); target is TPTF requirement approval for EMS end August
- **MMS/SCED Package**
 - Established integrated ERCOT/ABB team and joint Phase 1 plan
 - Achieved agreement on Protocols and requirements boundaries between MMS and other projects; protocols annotated to reflect agreements
 - Validated commitment for TPTF requirement submission mid-September
- **Program Control Package**
 - Selected vendor for independent audit of Nodal Control and Quality Assurance Policy and Procedures
 - Initiated Change Control Board to impact assess first 2 internal Change Requests
- **CRR Package**
 - Drafted initial set of requirements for internal review; target is TPTF requirement approval mid September
 - Drafted conceptual system design for internal project review
- **IDA Package**
 - Presented Nodal Process Timeline document to TPTF for review
 - Drafted High Level Architecture documents for internal review
 - Started population of protocol/requirements traceability model; completed entry of Protocols and first 2 CS documents
- **Infrastructure Package**
 - Assigned technical architects to individual projects to establish overall hardware requirements
 - Drafted specification for initial FAT environment
- **ERCOT Readiness & Transition Package**
 - Started Nodal impact assessment by ERCOT directors
 - Completed first of series of employee readiness surveys
 - Completed Early Delivery System strategy

Overall program status is **red**, based on feasibility of 1/1/09 delivery *Program plan to be baselined 9/19/06*

Business requirements are the short-term critical path challenge:

- Scale of effort required to achieve necessary quality and approval is not yet understood
- Mobilization and productivity levels behind expectations
 - Contracting took longer than planned
 - Vendors requiring more time to assemble their experts
- NPRRs will be impacted through the Nodal Change Control post 9/19/06 baseline

The combined NODAL team is driving to complete business requirements by October 30

The means to accelerate the production of a coherent Nodal work product is dependant upon key MP protocol experts being dedicated to the Nodal Program

Staffing is not yet fixed:

- Resources for business requirements are the priority; toughest challenge is securing/growing “Texas Nodal” experts
- EMS business SMEs most acute problem; recourse to contractors has yet to yield required results
- Key leadership areas vacant – Integration and MP Readiness

A comprehensive staffing model is now being deployed, utilizing ERCOT staff, short-term staff augmentation, contractors and consultants

The size, complexity and risk of the program is not yet contained:

- The common network model (NMMS), CRR and DAM are subject to significant uncertainty
- Expectations for extensive fork-lifting must be tempered by the fact of unique Texas Nodal Protocols
- Budgetary implications are not firm

Resolution of issues top Nodal priority

Scenario analyses will form options for substantial de-risking of custom Texas Nodal software and integration

Independent Audit to validate Nodal Market Implementation Program controls

- Selected IBM Global Services
- Focus will be on Nodal program control plans and control execution for the Program Management Office

The project will be separated into two segments:

- Program Controls & QA Initial Assessment with Recommendations (Sept 2006)
- Program Controls Progress Reporting Reviews over the life of the project (8 reports, Oct 2006 and every 6 months thereafter until project completion).

Spending year to date

❑ O&M (,000)	
▪ Internal labor	\$ 1,925 ¹
▪ Equipment, tools, supplies	25
▪ Outside services	1,820
▪ Facilities and Utilities	170
▪ Employee expenses	22
▪ Interest and fees	56
▪ <u>Other</u>	<u>4</u>
▪ Total O&M:	\$4,023
❑ Capital	
▪ <u>Total Capital</u>	<u>\$ 1,908</u>
❑ Total spending through June	\$5,931 ²

Notes:

¹ Lower than previous report following reclassification of internal labor costs from O&M to capital

² Total spending through June \$4,354K

Preliminary* Key Dates

- ~~6/7/06~~ Preferred vendors selected
- ~~7/5/06~~ Start joint requirements, use cases, test cases was 6/30/06
- ~~7/6/06~~ EDW Roadmap complete
- ~~7/10/06~~ Market Participant readiness activities list
- 8/15/06 MIS & Integration Roadmaps complete was 7/30/06; missed due to resource constraints
- 8/15/06 Integration vendor selected was 8/4/06; Bidders proposals not acceptable

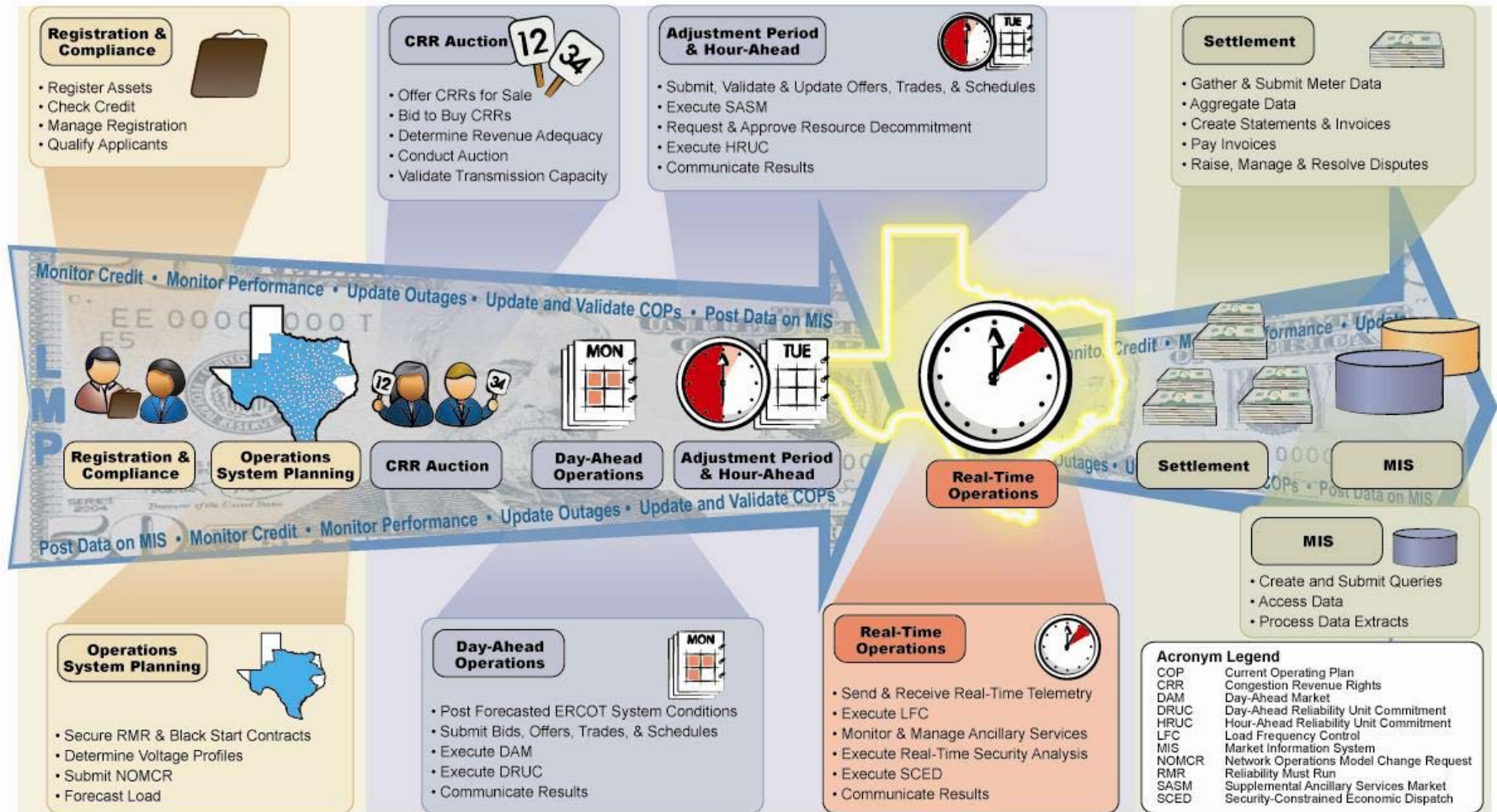
» Scenario Development and Choices by 9/1

- 9/19/06 ERCOT Board of Directors meeting (commitment: date and dollars)
- 10/30/06 Requirements complete and approved * requires TPTF approval
- 3/31/07 Market Participant interface specs complete * requires TPTF approval
- 4/1/07 EMS FAT begins
- 1/1/08 Market Participant SCED offers begin (EDS3)
- 7/1/08 Market systems, Market Participant offers (EDS4)

* Preliminary dates; pre-baselined program plan

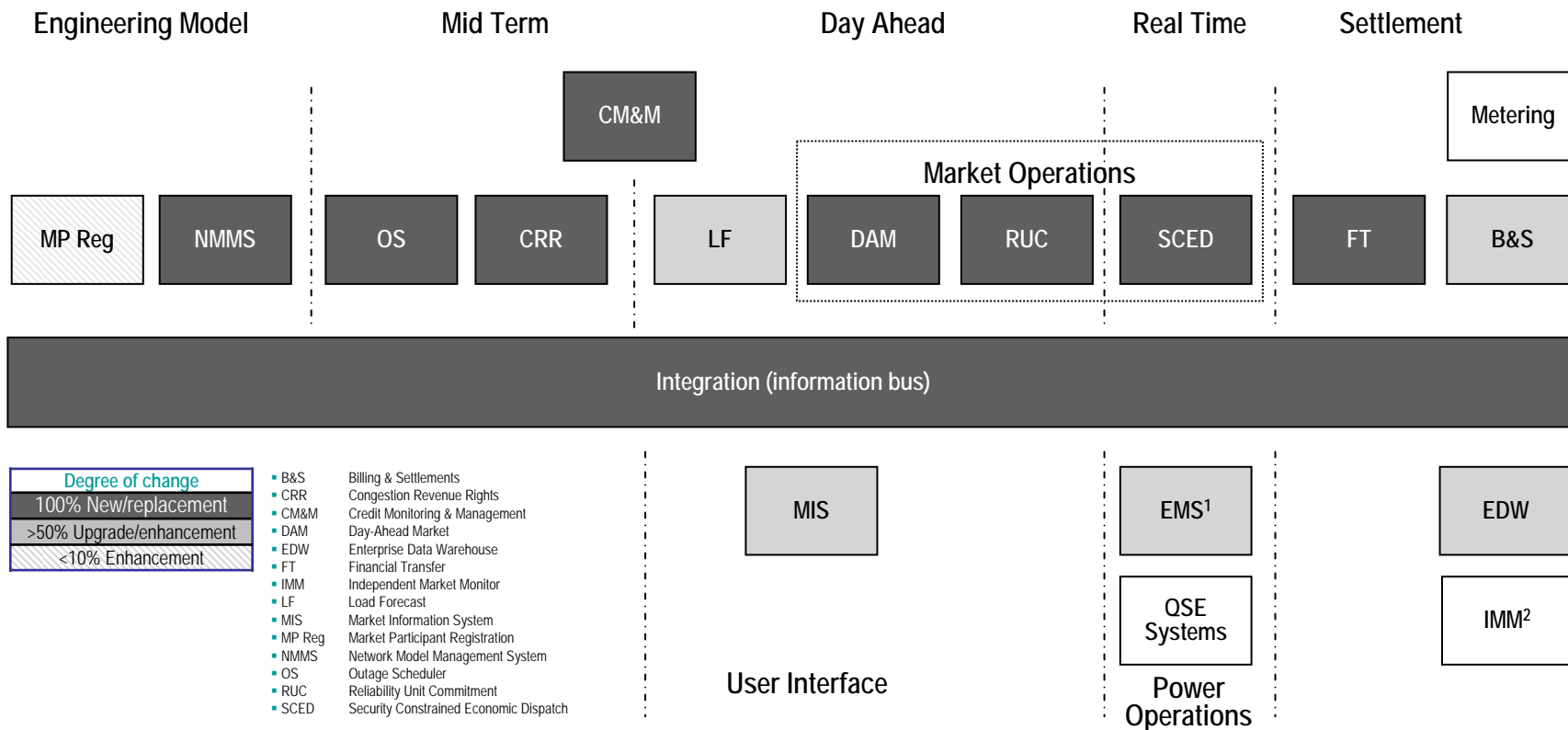
- **Texas Nodal Market Overview**
- **Systems Overview**
- **Vendor Overview**
- **Program Overview**

Nodal Market Overview



DISCLAIMER – This overview of the Texas Nodal Market is not intended to substitute for the ERCOT Nodal Protocols, as amended from time to time. If any conflict exists between this overview and the ERCOT Nodal Protocols, then the ERCOT Nodal Protocols shall control in all respects.

Nodal Systems Overview – significant change to most wholesale market, network model and power operations systems

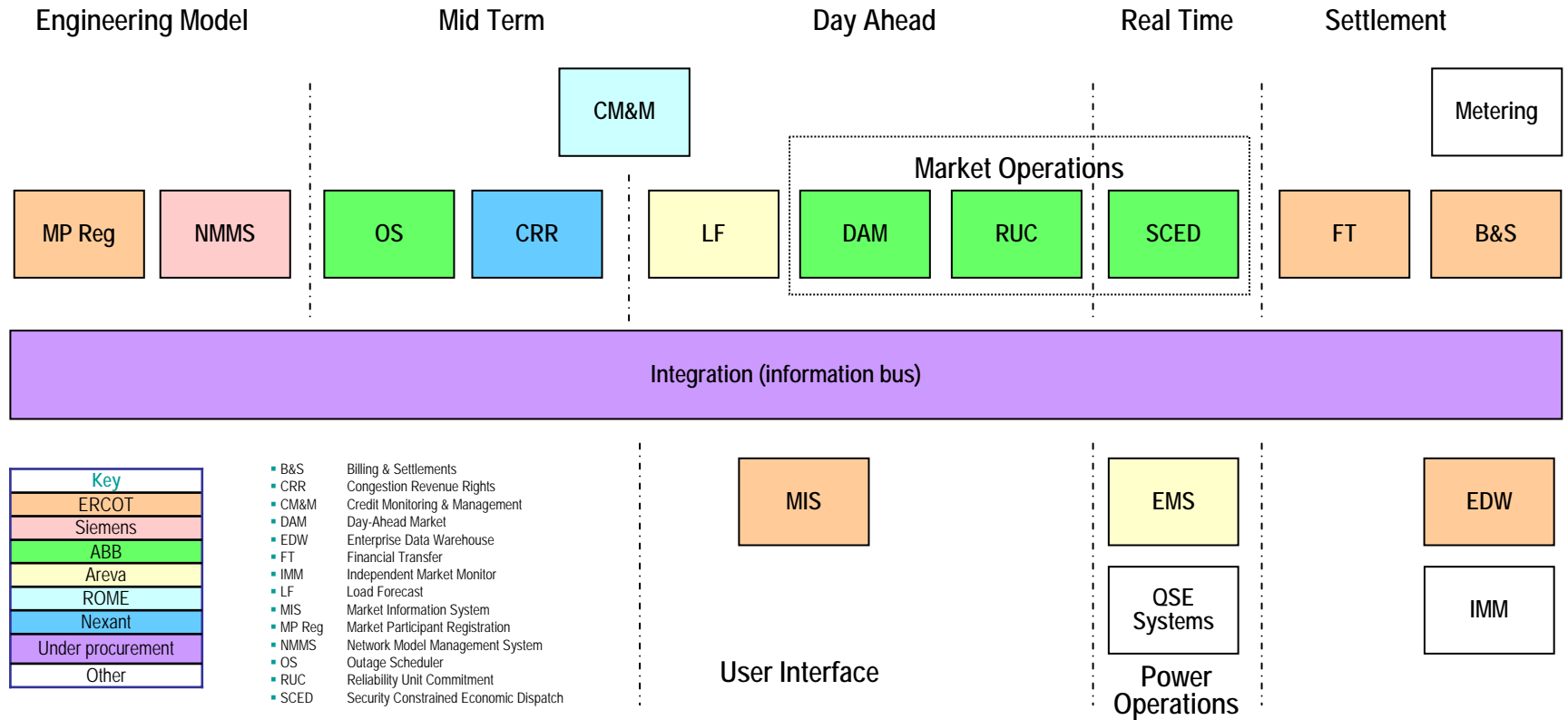


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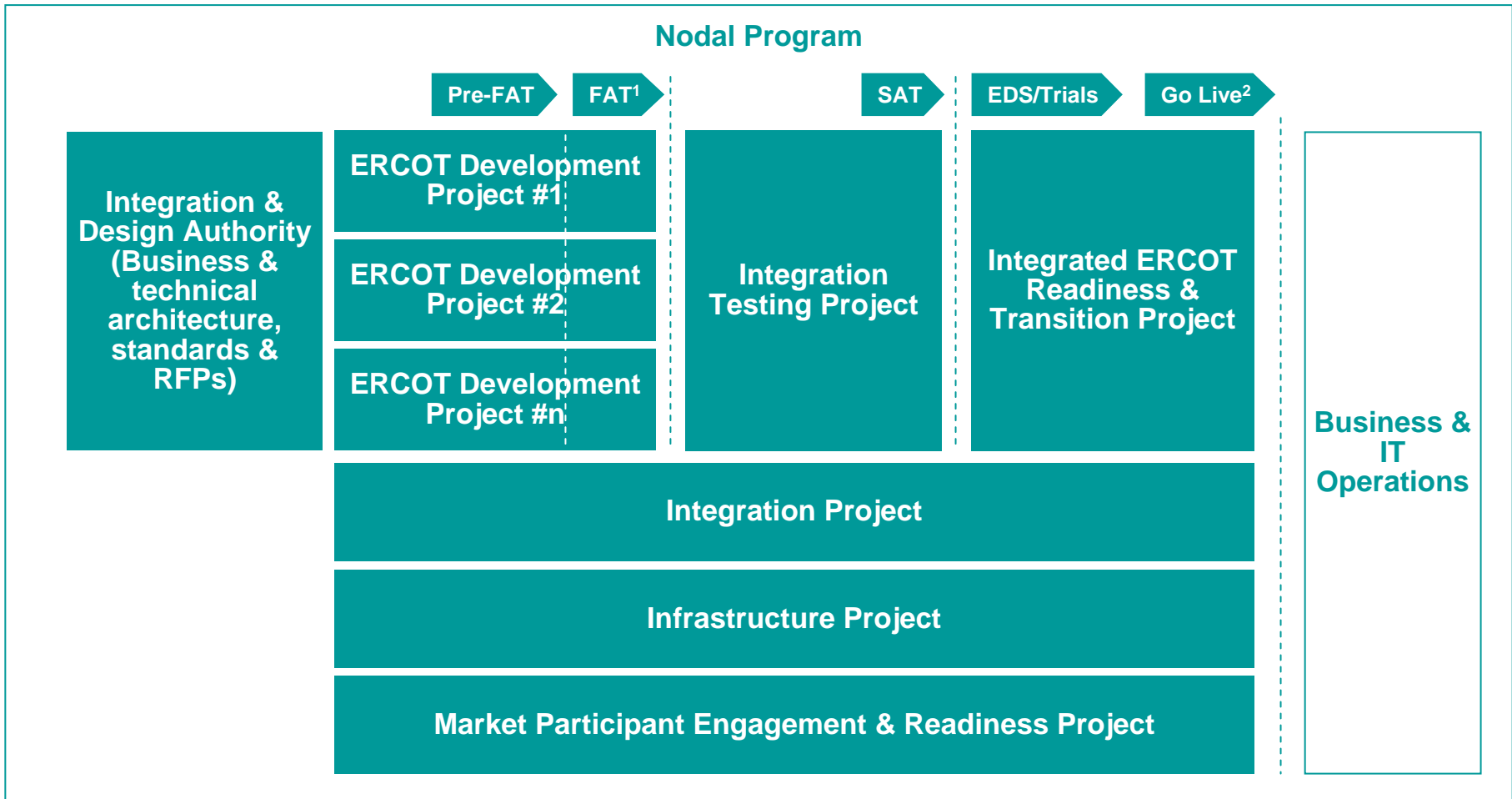
¹ Includes State Estimator and Telemetry Criteria

² To satisfy section 17.3 of the Nodal protocols, ERCOT will deploy COGNOS and SAS to provide PUCT with the ability to generate reports

Nodal Vendor Overview – a best of breed approach



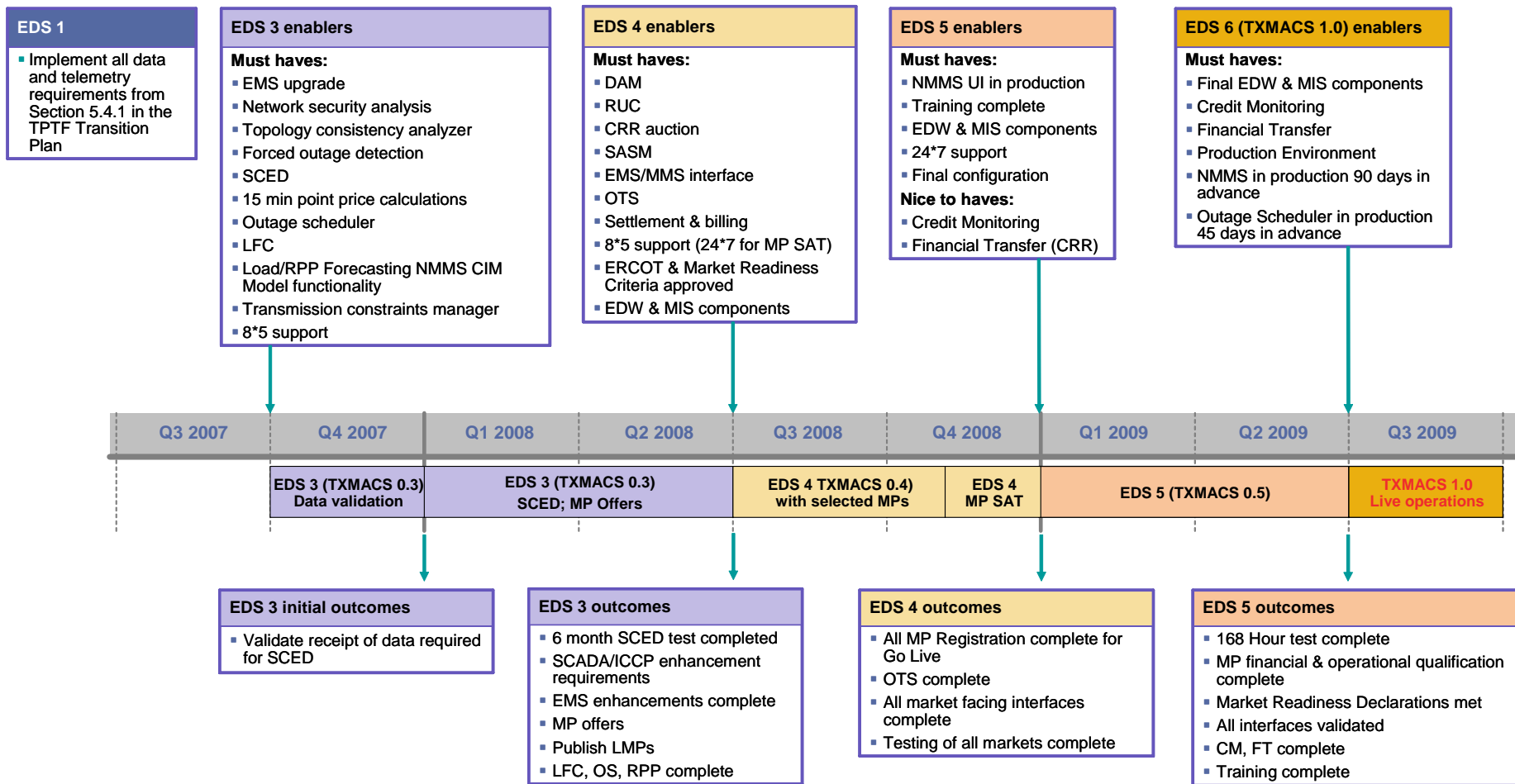
Program Overview – organizational model



Note – this is a simplified diagram:

1. Projects will deliver in accordance with the EDS Strategy, with additional development releases to reduce risk consistent with RUP iterative development. FAT will be on ERCOT premises.
2. Business & IT Operations will have substantial involvement prior to “go Live” in readiness preparations, business trials etc and will, for example, provide support for Early Delivery Systems (EDS) as they are established.

Program Overview – Early Delivery System releases drive the implementation timeline



Note: All dates are latest start (not earliest)

Program Review – Project summaries

Project area: Integration and Design Authority

Description: Business and technical architecture, design standards and design assurance for the Program

Project Manager: Jeyant Tamby

Vendor(s): N/A

Budget: TBD

Actuals YTD: TBD

Actuals Total: TBD

Key deliverables/short term deliverables:

- Overall business and technical architecture
- Strategies & Roadmaps – Integration, EDW, MIS
- RUP artifacts and training
- Internal and external interface specifications
- User Interface standards

Key Assumptions:

- Current top-level business architecture is solid
- There are no technical risks beyond integration
- All systems will conform with the integrated Data Dictionary/ECIM

Challenges/Risks:

- Integration – across multiple projects, vendors and applications
- Quality and rework due to complexity and changes
- Testing Strategy for complex overall Nodal “system”

Comments:

- Complexity of the system engineering effort needed is not yet understood

Project Title: Network Model Management system

Description: Capability to generate Planning and Network Models for Real-Time, Day-Ahead and Future applications and studies

Project Manager: Raj Chudgar

Vendor(s): Siemens Power T&D, Inc. (NMMS);
Nexant, Inc. (Network Modeling & Telemetry)

Budget: TBD

Actuals YTD: TBD

Actuals Total: TBD

Key deliverables/short term deliverables:

- Naming Conventions
- State Estimator Criteria
- Requirements for TPTF approval
- Conceptual System Design for TPTF approval
- Time based Network Operations and Planning Model Management System

Key Assumptions:

- Factory Acceptance Testing – Pre-FAT on vendor premises; FAT on ERCOT premises
- Zero severity 1 or 2 bugs coming out of FAT or SAT

Challenges/Risks:

- Integration - multiple interface, one-liner and data dependencies (MMS, EMS, CRR, outage scheduler, registration)
- There are no vendors with prior experience with development of time-based models

Comments:

- ERCOT will be the first ISO to utilize time-based model functionality for down-stream applications

Program Review – Project summaries

Project area: Market Management System

Description: Business processes and systems for the Nodal Real-Time and Day-Ahead Energy and AS Markets

Project Manager: Al Hirsch

Vendor(s): ABB, Inc.

Budget: TBD

Actuals YTD: TBD

Actuals Total: TBD

Key deliverables/short term deliverables:

- Requirements for TPTF approval
- Conceptual System Design for TPTF approval
- Day Ahead Market capability
- Supplemental AS Market capability
- Reliability Unit Commitment capability
- Security Constrained Economic Dispatch (Real Time Market) capability
- DC Tie
- Data for Wholesale Market Monitoring

Key Assumptions:

- Factory Acceptance Testing – Pre-FAT on vendor premises; FAT on ERCOT premises
- Zero severity 1 or 2 bugs coming out of FAT or SAT

Challenges/Risks:

- Integration - multiple interface and data dependencies (NMMS, EMS, MIS, Commercial Systems)
- Substantial rework over the extended life of the project due to directed changes

Comments:

- ABB has fully stepped up as a member of the joint project team

Project area: Energy Management System

Description: Upgrades to ERCOT’s current Energy Management System (EMS), Outage Scheduler (OS), Load Forecast and implementation of the Renewal Production Potential (RPP) capability

Project Manager: Carlos Gonzales-Perez

Vendor(s): AREVA T&D, Inc. (EMS, LF); ABB (OS), AWS Truewind (RPP)

Budget: TBD

Actuals YTD: TBD

Actuals Total: TBD

Key deliverables/short term deliverables:

- Requirements for TPTF approval
- Conceptual System Design for TPTF approval
- EMS platform upgrade & ERCOT customizations
- Migration of enhanced Zonal Load Forecast to Nodal
- Replacement OS & new RPP
- Operator Training Simulator (OTS)

Key Assumptions:

- Factory Acceptance Testing – Pre-FAT on vendor premises; FAT on ERCOT premises
- Zero severity 1 or 2 bugs coming out of FAT or SAT

Challenges/Risks:

- Resource bottlenecks are delaying completion of business requirements for this critical path project
- Integration - multiple interfaces and data dependencies between the EMS and other systems (MMS, NMMS, Settlements, OS, etc)

Comments:

- Short-term efforts to alleviate EMS requirements resource shortfall impacts other projects. Mid-term solution involves sourcing from all industry EMS vendors and contracting firms
- Existing EMS vendor retained (AREVA); OS vendor selection governed by selection of MMS (ABB)

Project area: Congestion Revenue Rights

Description: Business processes and systems to allow the CRR Owner to be charged or receive compensation for congestion rents that arise when the ERCOT Transmission Grid is congested in the Day-Ahead Market (DAM) or in Real-Time

Project Manager: Shawna Jirasek

Vendor(s): Nexant, Inc.

Budget: TBD

Actuals YTD: TBD

Actuals Total: TBD

Key deliverables/short term deliverables:

- Requirements for TPTF approval
- PCRR and MCFRI allocation capability
- CRR auction capability
- CRR ownership tracking capability

Key Assumptions:

- Factory Acceptance Testing – Pre-FAT on vendor premises; FAT on ERCOT premises
- Zero severity 1 or 2 bugs coming out of FAT or SAT

Challenges/Risks:

- Late identification of issues - Nodal CRR process is new and significantly different than the current TCR process
- Integration - multiple interface and data dependencies (NMMS, MMS, Registration, Settlement, Credit Monitoring)

Comments:

- Market Participant specialist on board and integrated in the project team

Program Review – Project summaries

Project area: Commercial Systems

Description: Business processes and systems for Settlements and Billing, Data Aggregation, Metering, Load Profiling, Credit Monitoring, Registration, Disputes, Financial Transfer

Project Manager: Raj Chudgar

Vendor(s): ROME (credit monitoring)

Budget: TBD

Actuals YTD: TBD

Actuals Total: TBD

Key deliverables/short term deliverables:

- Requirements for TPTF approval
- Settlement payments and charges for Day Ahead, RUC, Real Time, Ancillary Services, and CRRs
- Credit monitoring and management capabilities
- Invoicing capabilities
- Registration capabilities
- Disputes capabilities
- Financial Transfer capabilities

Key Assumptions:

- Zero severity 1 or 2 bugs coming out of FAT or SAT

Challenges/Risks:

- Integration - multiple interface and data dependencies
- Probability of substantial re-work due to scope changes/clarifications introduced in Real-Time and Day-Ahead requirements

Comments:

- Nodal necessitates a complete re-write of Settlement due to volume of data and new methods of calculation
- ERCOT is leading the Settlement development internally

Program Review – Project summaries

Project area: *Enterprise Data Warehouse*

Description: *Capability to collect and provide historic data to MPs, PUCT, WEMM and FERC, perform data analysis.*

Project Manager: *Sylvia Shiroyama*

Vendor(s): *N/A*

Budget: *TBD*

Actuals YTD: *TBD*

Actuals Total: *TBD*

Key deliverables/short term deliverables:

- *EDW strategy and roadmap*
- *Requirements for TPTF approval*
- *Project mobilization*

Key Assumptions:

- *EDW is a shared asset across ERCOT*
- *Zero severity 1 or 2 bugs coming out of FAT or SAT*

Challenges/Risks:

- *Impact of extensive schema changes will require all output types to change*
- *EDW governance*

Comments:

- *EDW Project Manager will start in 2 weeks*
- *ERCOT is leading the EDW development internally*

Program Review – Project summaries

Project area: Integration

Description: Messaging capability to loosely couple ERCOT applications through web services, transforming interfaces into messages

Project Manager: TBD

Vendor(s): TBD

Budget: TBD

Actuals YTD: TBD

Actuals Total: TBD

Key deliverables/short term deliverables:

- Integration strategy and roadmap
- Integration Vendor procurement
- Project mobilization

Key Assumptions:

- Full technical integration (including point-to-point solutions, web services and manual disaster recovery)

Challenges/Risks:

- Transformation layer requires ERCOT extended CIM (ECIM)
- Balance of point-to-point solutions (for bulk data) with web services (messaging)

Comments:

- Preferred vendors can all support the web services strategy using widely adopted open standards (i.e. xml, soap, wsdl, uddi)
- Procurement of a specialist IT integration vendor delayed – bidders proposals unacceptable

Program Review – Project summaries

Project area: Infrastructure

Description: Provision of development, testing, EDS and production environments across the Program

Project Manager: David Forfia

Vendor(s): IBM

Budget: TBD

Actuals YTD: TBD

Actuals Total: TBD

Key deliverables/short term deliverables:

- Hardware specifications
- Hardware procurement
- IT Services Catalogue
- Service Level Agreements for all Nodal projects
- Project development & test (FAT) environments
- Integration testing (SAT) environments
- EDS environments
- Production environments

Key Assumptions:

- Infrastructure capacity can be added incrementally as the project progresses using IBM's capacity upgrade on-demand model
- Data center capacity issues will be resolved in the next 90 days

Challenges/Risks:

- Existing Data Center capacity (power)

Comments:

- IT Operations will be the first ERCOT function to transition to Nodal operations, starting with setting up development environments

Program Review – Project summaries

Project area: Integration Testing

Description: Site Acceptance Testing (SAT) of integrated applications from multiple projects and vendors

Project Manager: Glen Wingerd

Vendor(s): N/A

Budget: TBD

Actuals YTD: TBD

Actuals Total: TBD

Key deliverables/short term deliverables:

- Sustainable testing tools, procedures and methodologies
- Smoke, Performance, Integration, and Regression Test scripts
- SAT entrance criteria
- SAT exit criteria
- Test Results and sign-off

Key Assumptions:

- Zero severity 1 or 2 errors are accepted into Integration Testing

Challenges/Risks:

- Multiple dependencies on upstream projects and applications
- Demonstration of Nodal TXMACS overall system performance

Comments:

- ERCOT is leading the integration Testing internally
- This project will establish an ongoing testing capability for Nodal

Project area: Market Participant Engagement and Readiness

Description: Market Participant approval of Nodal designs, preparation for and participation in testing and trials, training and readiness live nodal operations.

Project Manager: Trip Doggett

Vendor(s): N/A

Budget: TBD

Actuals YTD: TBD

Actuals Total: TBD

Key deliverables/short term deliverables:

- Training design & delivery
- Communications
- ERCOT.com & MIS enhancements
- Market Readiness Criteria, status reporting & Declarations

Key Assumptions:

- TPTF is the primary MP representative body for Nodal

Challenges/Risks:

- MP mobilization and active engagement in support of overall nodal project
- Anti-trust concerns due to number and heterogeneity of MPs, their needs & capabilities
- Competing demands – including training development – for SME resource bottlenecks

Comments:

- MP Accountable Executive concept being implemented
- Breadth of TPTF participation is inadequate

Program Review – Project summaries

Project area: Integrated ERCOT Readiness and Transition Project

Description: Preparation of the ERCOT organization and final verification of all parties' readiness to operate under the Nodal Protocols in live operations.

Project Manager: Steve Grendel

Vendor(s): N/A

Budget: TBD

Actuals YTD: TBD

Actuals Total: TBD

Key deliverables/short term deliverables:

- Early Delivery System (EDS) strategy and plans
- ERCOT Readiness Criteria
- ERCOT Readiness & Transition Plans (by function)
- ERCOT readiness preparations
- EDS Market Trials
- ERCOT Readiness Declarations

Key Assumptions:

- Management of the EDS trials will be the responsibility of the IRT Project Team
- Planning and preparations for each ERCOT function will be the responsibility of the respective ERCOT Director

Challenges/Risks:

- Balance of staffing (including contractors and employees) between Zonal, Nodal program and Nodal transition activities

Comments:

- ERCOT staff transition plans due 8/31/2006