Integrated Schedule and Budget Review

Nodal PMO

Special Board of Directors Meeting

January 21, 2009

Agenda

- Schedule
  - Developing the Nodal Integrated Master Schedule
  - Scope
  - Schedule Assumptions
  - Program Controls
  - Work Remaining

- Budget
  - Process
  - Budget Assumptions
  - Cost Elements
  - Preliminary Budget

- Questions/Comments

ERCOT

Schedule

Preliminary Nodal Integrated Master Schedule

- In June 2008, Nodal Project Managers began replanning the nodal program
  - PMO provided guidelines and training for replanning efforts
  - Project teams met extensively to understand upstream and downstream dependencies
  - Program Evaluation Review Technique (PERT) estimation (3 point estimate was used) at the activity level, based on historical data to the extent possible
  - Multiple reviews to ensure sufficient time for testing, security implementation, transition activities, project management
  - Defined the critical path of the program
  - Used Risk+ in conjunction with a program-level PERT worksheet to statistically calculate the confidence level, reaching agreement with ERCOT executives to use the schedule at the 75% confidence
- End result:
  - An improved understanding of the scope of the work required through go-live, now scheduled for Dec. 1, 2010
  - A comprehensive understanding of ~190 cross project dependencies for the nodal program
  - A detailed integrated master schedule for the nodal program that is the single source of record for all nodal work to be performed (~5400 activities)
  - Most importantly, a realistic schedule with a relatively high degree of confidence that the nodal program can be delivered on schedule

- Integrated master schedule has undergone numerous reviews and audits

- ERCOT has been using this integrated schedule and supporting reports successfully to manage the program and project critical paths since June 2008 (refer to progress in handout: nodal critical path)

- ERCOT is currently working to incorporate Market Participant activities and feedback

Scope

- Nodal program scope included in the integrated schedule
  - Approved requirements and conceptual system design documents
  - All NPRRs approved through Nov.17, 2008

- Additional scope to be included in the schedule (not on critical path)
  - Remaining business process work
  - Remaining requirements traceability work

- Note 1: No schedule contingency has been included in the integrated master schedule; any additional scope/effort that is required will go through the nodal change control process and impacts to the schedule and budget will be captured
- Note 2: Removing and/or clarifying scope that affects any of the nodal systems at this point does not necessarily decrease effort

Schedule Assumptions

- Scope is locked as of December 19, 2008
- No new software vendor releases will be required past what is already planned (remaining scheduled releases will be covered in each individual project)
- Preserved the EDS durations as defined in the handbooks
- Market participant activities that were placed on hold are not restarted until the NMMS/EMS/MMS5 systems are on a synchronized model (schema and data set) in August 2009
- Market participants will continue to participate in ongoing nodal EDS activities

Program Controls Currently in Place

- **Delivery**
  - Status reporting
    - Nodal program/project weekly status reports
    - Monthly status meetings with business
  - Schedule
    - Nodal integrated master schedule
    - Nodal program critical path
    - Nodal program near critical path activities
    - Milestone Look Ahead Report
    - Tasks Ahead of Schedule Report
    - Tasks Behind Schedule Report
  - Weekly meetings
    - Program management meetings
    - Change Control Board meeting for scope control
    - Integration release meetings
    - Program staffing
  - Integrated delivery management
    - Detailed system integration controls
    - Detailed market trials sequence and durations
    - Product defects tracking and resolution

Program Controls Currently in Place

- **Delivery (continued)**
  - Formalized risk and issue management process
  - Quality report for integrated schedule

- **Budget**
  - Integrated schedule and budget enable enhanced budget to actual variance analysis
  - Standardized project forecasting processes across the program to enable enhanced reporting and analysis
  - Monthly cost controls and reporting include:
    - Reconciliation of Purchase Orders to authorized spend
    - Reconciliation and adjustment of ERCOT internal labor
    - Program and project level variance analysis

Work Remaining – NMMS

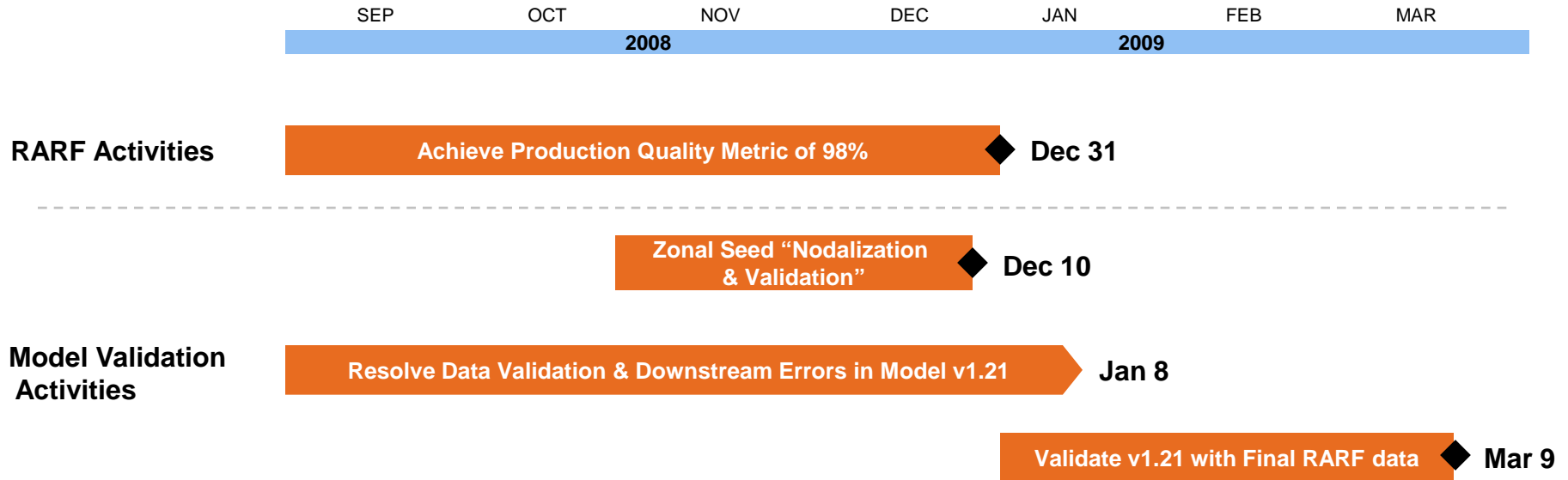JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

2008 **2009** **2010**

NMMS Remaining Releases

Release	Description	FAT/Testing Complete
NMMS 5	• Production Model to support business processes • Auto Model Scheduler integration • MIS posting folder structure • Historical models and historical NOMCR tracking • PTC screens to support PMCR linkage • Canned reports (8)	Dec 19 08
NMMS 6	• Project Tracking Coordinator screens and functionality for Model Coordinator screens • Outage clarification • Name service redesign • As Built report	Mar 17 09
NMMS 7	• Auto Model Scheduler validation	May 04 09

Key Network Model Activities

| | SEP | OCT | NOV | DEC | JAN | FEB | MAR |

RARF Activities — Achieve Production Quality Metric of 98% ◆ Dec 31

Zonal Seed "Nodalization & Validation" ◆ Dec 10

Model Validation Activities — Resolve Data Validation & Downstream Errors in Model v1.21 — Jan 8

Validate v1.21 with Final RARF data ◆ Mar 9

Dec.10: Synchronized Model (v1.21 schema and data set)

Jan. 8: Validated Model (v1.21 schema and data set)

Mar. 9: Validated Model with Final RARF data (v1.21 schema and data set)

Work Remaining – EMS

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| 2008 | 2009 | 2010 |

EMS Remaining Releases

Release	Description	FAT Complete
5.1.6	• Habitat 5.6 security patch re-test	Dec 15 08
5.1.8	• Habitat 5.7 security patch and upgrade from beta to the release version	Dec 24 08
6.1.x	• [2] NPRR 97: Section 8 Reports • [2] NPRR102: Publication of Load Resources on MIS • [2] System Implementation Guides (SIGs) implementation (0003/0022, 0006, 0011, 0020)	Jan 23 09
6.1.x	• [1] CIM importer w/ synchronized model (v1.21 schema and data set) • [1] SIGs implementation (0002, 0008) • [1] IDA 46 Net (EPS) Metering	Feb 12 09

(1) AREVA Development
(2) ERCOT Development

Work Remaining – MMS

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| 2008 | 2009 | 2010 |

MMS Remaining Releases

Release	Description	FAT/Testing Complete
MMS4 P6	• CIM importer additions (based on model prior to synchronization (v1.20 schema and data set)) • NPRR113 (partial) • SIG rounding paper (partial) • Bug fixes	Jan 13 09 (patch testing)
MMS4 P7	• CIM importer additions (based on synchronized model (v1.21 schema and data set)) • Bug fixes	Feb 20 09 (patch testing)
MMS5	• Last scheduled release of functionality; pre-FAT will use the Jan. 8, 2009 NMMS-delivered validated model (v1.21 schema and data set); delivery to ERCOT targeted for Apr.15, 2009; FAT will use the Mar. 9, 2009 NMMS-delivered validated model with final RARF data (v1.21 schema and data set) • CIM XML import processing and end-to-end testing • Remaining NPRRs and change items approved and to vendor by Dec. 21, 2008 (e.g., NPRR113, SIG rounding paper, NPRR154) • Bug fixes • Two patches to address defects scheduled during MMS5 FAT; additional patches are scheduled to address integration and EDS defects but are not considered part of MMS FAT	Aug 21 09 (FAT)

Work Remaining – MMS User Interface (UI)

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| **2008** | **2009** | **2010** |

MMS MM UI Remaining Releases

Release	Description	FAT/Testing Complete
MMS MM UI	• Market Manager FAT 1 – Bids and Offers, Resource-Specific Submissions, Schedules and Self-Arranged Ancillary Services	Feb 10 09
MMS MM UI	• Market Manager FAT 2 – Trades, Awards, Notices and Verbal Dispatch Instructions	Apr 10 09

Work Remaining – Outage Scheduler

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| **2008** | **2009** | **2010** |

Outage Scheduler Remaining Releases

Outage Scheduler

Release	Description	FAT/Testing Complete
2.1.0.0	• Patch installation and test	Jan 09 09

Outage Scheduler User Interface

Release	Description	FAT/Testing Complete
BUI	• Base user interface testing – Group, Opportunity, Recurring Outages	Feb 05 09
OS FP 1	• OS Feature Pack 1 – Warnings, Summary Enhancements	Mar 24 09
OS FP 2	• OS Feature Pack 2 – Copy/Print/Export, Client Side Validations	Apr 30 09

Work Remaining – CRR

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

2008   **2009**   **2010**

CRR Remaining Releases

Release	Description	FAT/Testing Complete
Patch	• Reported severity 1 and 2 defects fixed	Dec 12 08

Enhancement	• Software upgrade
	  – jBoss 4.3
	  – Java (recommending 1.7)
		Aug 31 09

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Work Remaining – COMS

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2008   **2009**   **2010**

COMS Remaining Releases

Release	Description	FAT/Testing Complete
REG/DISP	• REG4/DISP2: Migration to production – stage in current production environment	Testing completed Migration to PROD on Dec 13 08
REG/DISP	• COMS REG5/DISP3: Refactoring and Disputes API – i-Test complete	Feb 17 09
CSI5.5	• Commercial Systems Integration with S&B	Jan 23 09
CSI6.3	• Commercial Systems Integration with CMM	Jan 23 09
CSI7.0	• Commercial Systems Integration refactoring - S&B/CMM Long Day/Short Day	Apr 17 09
CMM4.1	• External reports/custom management	Mar 31 09
CMM4.2	• Internal reports/defect fixes	Apr 24 09
CMM4.3	• Upgrade 5.0/defect fixes	May 22 09
FTGUI	• Internal Financial Transfer Graphical User Interface	May 19 09

Integrated Release 4 Activities

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2008   **2009**   **2010**

Integrated Release 4 (Functional Integration Testing)

Continue technical interface and data integration (Jan. - Mar. 2009)

- Continue testing of MMS input and output interfaces

- Continue building integrated data sets

- Continue MMS to Settlements and Billing integration for the day-ahead market

- Begin operational readiness security testing

Begin functional integration testing and operational readiness (Apr. - July 2009)

- Perform NMMS, EMS and MMS functional integration testing on validated model (v1.21 schema and data set)

- Complete OS, OS and MMS UI integration testing

- Demonstrate functional integration and data flow for
    - CRR to Settlements
    - MMS to Settlements for RUC and real-time market
    - EMS to MMS for DAM and RUC
    - Credit Management

- Begin operational readiness performance testing

Integrated Release 5 Activities

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2008   **2009**   **2010**

Integrated Release 5 (Business Process Testing)

Continue functional integration testing (July - Sept. 2009)

- Continue system-to-system functional integration for DAM

- Continue work on integrated data set required for business scenario testing

- Test for first time all completed nodal systems

Begin business scenario testing (Oct. 2009 - Feb 2010)

- Regression test functional data flows where required

- Conduct bid-to-bill business scenario testing

- Validate end-to-end performance of nodal market timeline

- Complete operational readiness testing

- Complete system and data readiness to move to EDS

Operational Readiness Activities

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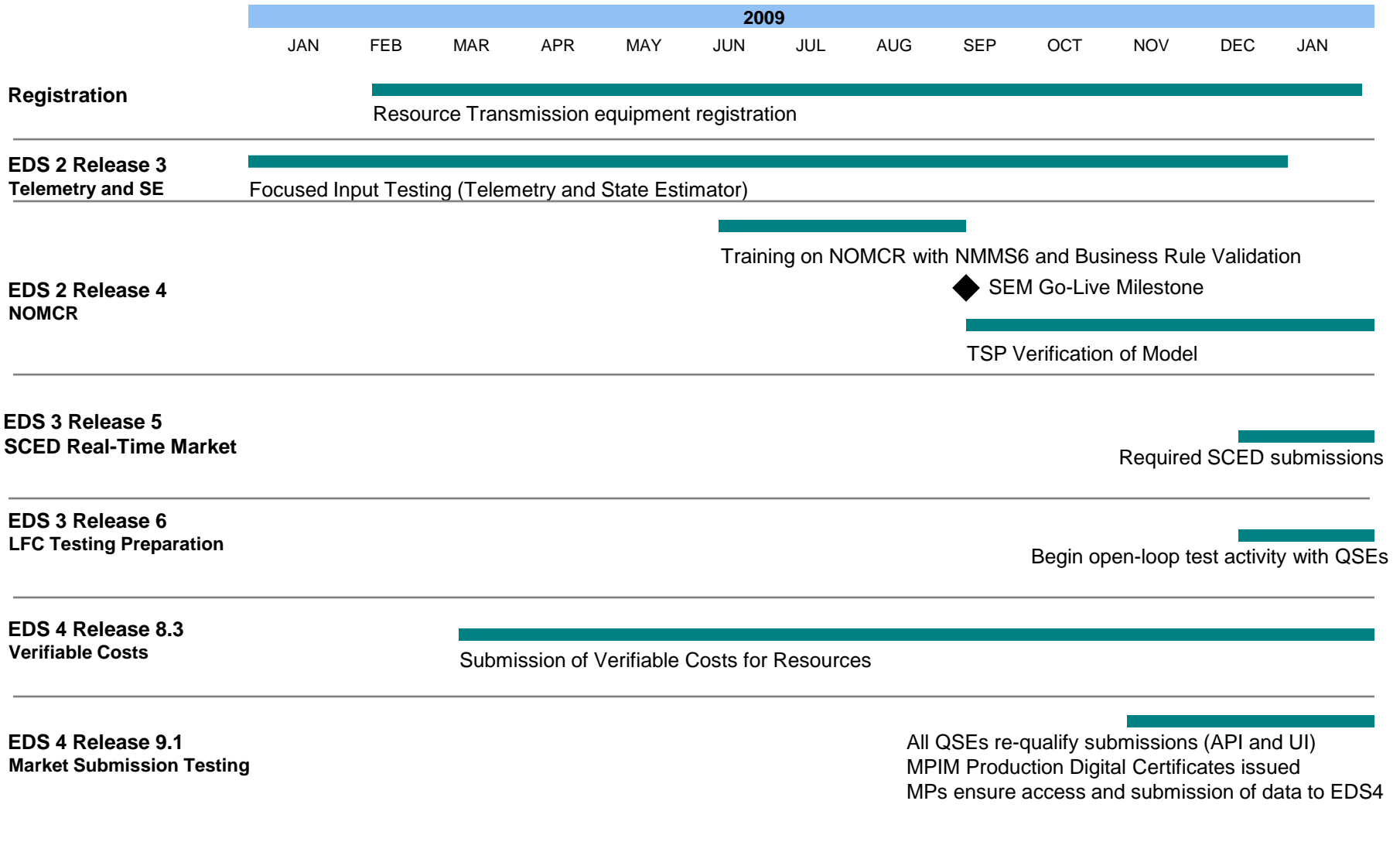
| 2008 | 2009 | 2010 |

Operational Readiness

- Performance Testing
  - System processing, system-to-system data flow, end-to-end business scenarios
- Security
  - Application-level compliance and vulnerability, access control (authentication and authorization)
- Monitoring
  - Infrastructure and server health
  - Application availability, performance and business-level events
- Fail-over
  - Localized and data center (geographic) fail-over
- Daylight Savings Testing
  - Long day/Short day

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Work Remaining - EDS and Market Activities 2009

	2009											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN

Registration

Resource Transmission equipment registration

EDS 2 Release 3
Telemetry and SE

Focused Input Testing (Telemetry and State Estimator)

EDS 2 Release 4
NOMCR

Training on NOMCR with NMMS6 and Business Rule Validation

◆ SEM Go-Live Milestone

TSP Verification of Model

EDS 3 Release 5
SCED Real-Time Market

Required SCED submissions

EDS 3 Release 6
LFC Testing Preparation

Begin open-loop test activity with QSEs

EDS 4 Release 8.3
Verifiable Costs

Submission of Verifiable Costs for Resources

EDS 4 Release 9.1
Market Submission Testing

All QSEs re-qualify submissions (API and UI)
MPIM Production Digital Certificates issued
MPs ensure access and submission of data to EDS4

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EDS activities
- Execute SCED with the objective of publishing LMPs for 6 months
- Publish SCED reports (RT LMPs etc)

- Test communication of DAM inputs and outputs
- Execute DAM 2 days per week with Market Data
- Post AS Obligation, QSE Load Ratio Share, AS plan
- Issue DAM Awards and Notifications (Awarded AS, Awarded Energy bid etc)
- Publish DAM hourly reports (DAM LMPs, DAM MCPC etc)

- Conduct mock CRR annual auction
- Publish CRR auction results

- Outage Scheduler open to MPs for submissions
- Perform Outage Evaluation testing
- Publish Outage Scheduler reports (Approved outages, rejected etc)

- Publish Available Credit Limit on MIS
- Seek TPTF approval for test Network Model to be used for Settlements testing

EDS activities
- Continue execution of SCED for publishing LMPs for 6 months and publish reports
- Continue execution of DAM 2 days per week with Market Data, issue notifications and publish results

- Conduct 2 hour LFC test with CIM

- Execute HRUC and DRUC 2 days per week with Market Data
- Publish RUC results
  - Committed and decommitted units
  - Active binding transmission constraints used in RUC
- Publish Settlement Statements, Invoices and Extracts for DAM
  - DAM Settlement and Resettlement Statement
  - CRR Balancing Account Invoices
  - DAM Invoice
  - CARD Invoices
  - DAM Resettlement Invoice
  - DAM Late Fee Invoices
  - DAM Consolidated Operating Day Extracts
  - DAM Market Operating Day Extracts
  - Public Reference Data Extract
  - Settlement Input Data Extract

- Conduct OS Performance test

- Publish test CRR annual auction results
- Conduct Integrated CRR monthly auction

EDS activities

- Continue execution of SCED for publishing LMPs for 6 months and publish reports

- Publish mock Integrated CRR auction results

- Conduct 8 hour LFC test with CIM

- Execute DAM and DRUC 5 days per week, issue notifications and publish results
- Execute HRUC 4 days per week
- Begin SASM execution
- Issue SASM notifications
  - Awarded AS offers
- Publish SASM reports
  - SASM MCPC
  - Total Ancillary Service procured
  - Aggregated Ancillary Service Offer
- Publish Settlement Statements, Invoices and Extracts for RTM and DAM
  - RTM Initial, Final, True-up and Resettlement Statement
  - RTM Initial, Final, True-up and Resettlement Invoice
  - RTM Consolidated Operating Day Extract (RTM CODE)
  - RTM Market Operating Day Extract (RTM MODE)
  - Public Reference Data Extract (PRDE)
  - Settlement Input Data Extract
- Begin testing of Disputes submission process through UI and API

EDS activities

- Continue execution of SCED for publishing LMPs for 6 months and publish reports

- LFC test analysis and reporting of results to Market Participants

- Continue execution of DAM and DRUC 5 days per week, issue notifications and publish results

- Continue execution of HRUC 4 days per week

- Continue SASM execution

- Continue publishing of DAM and RTM Settlement Statements, Invoices and extracts

- Execute full Market timeline for 7 seven days

- Produce Settlement statements for the full market timeline

- One day dual entry of Outages into Zonal and Nodal systems

EDS activities

- Publish RT and DAM settlements for Full market timeline

- Execute 48 hour LFC test

- Execute EECP test

- Continue execution of SCED for publishing LMPs for 6 months and publish reports

- Continue execution of DAM and DRUC 5 days per week

- Continue execution of HRUC 4 days per week

- Continue publishing of DAM and RTM Settlement Statements, Invoices and extracts

- Conduct CIM business process testing

- 7*24 support of Nodal systems

- Validate EDW Compliance Data Access

EDS activities

- Continue execution of SCED for publishing LMPs for 6 months and publish reports

- Complete posting of LMPs for 6 months

- Continue execution of DAM and DRUC 5 days per week

- Continue execution of HRUC 4 days per week

- Continue publishing of DAM and RTM Settlement Statements, Invoices and extracts

- Execute DAM/RUC/SCED performance test

- Conduct DST Test with Market Participants

- Begin verification of MIS compliance with Requirements

- Conduct fail-over test(s)

EDS activities

- Continue DAM/RUC/SCED performance tests

- Execute DST test

- Execute 48 hours of full market timeline without Sev 1 or Sev 2 errors

- Complete verification of MIS compliance to Requirements

- Complete execution of Fail-over tests

- Complete verification of Dispute Process

- 7 day forecast validations/retraining

- Conduct test monthly CRR auction for 168-Hour test

- Align for 168-Hour Test

- Qualification - QSE declaration of intent to participate in Nodal

- Upon successful completion of the 168-Hour test, the Texas Nodal Go-Live Procedure will come into effect.

- Activities include
  - Start of Go-Live Period

  - Readiness declarations by ERCOT and Market Participants

  - First binding monthly CRR auction

  - Go-Live Sequence

  - First binding SASM

  - Nodal Go-Live

  - First binding DAM

Budget

Budgeting Process

- **The revised preliminary budget is based on the integrated project schedule, when the preliminary schedule was complete the budgeting process began**

- **Project managers were given budgeting guidelines and program level budget assumptions:**

  - The budget is task based and was built on activities identifiable in project plans and schedules

  - Simply extending the timeline and estimating expenses was not acceptable

  - A 'bottom up' budget development process was used

- **The budget was created over a period of two months through an iterative process consuming thousands of hours of staff time**

- **Each sub-project created their own budget and endured extensive reviews and changes**

  - Every ERCOT manager with employees working on Nodal reviewed and approved the internal labor hours to be charged to the Nodal program

  - These hours were cross-checked with ERCOT's Zonal project office to avoid over allocating employees time

Nodal Program Budget Assumptions

- **Internal and External Labor:**
  - Internal labor hours are determined by resources required to complete tasks in the integrated schedule and project plans and budgeted at the average hourly internal labor rate for that project
    - 3% escalator in April of each year for salary increases was included in the labor estimates
  - External labor hours are determined by evaluating if the skill set needed is available from ERCOT staff in the quantities required to complete the tasks
    - If external resources are required, they are to be budgeted at the known rate if known, and unidentified contractors are budgeted at the rate determined by ERCOT Contract Administration for that type of resource

- **Administrative & Employee Expenses:**
  - Travel costs were trended based on historical averages

Nodal Program Budget Assumptions

- **Hardware/Software Maintenance & Support**
  - Maintenance and support are budgeted based on existing contracts and any forecasted hardware/software purchases

- **Overhead Costs:**
  - Support allocation is 3.8% of total project expenditures (less support costs)
  - Backfill equals total backfill hours time the incremental rate by project
  - Facilities allocation is calculated by Nodal program headcount and ft^2 utilized by the Nodal program

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Cost Elements

- **Internal Labor Costs**
  - Labor costs of ERCOT employees who are working on the Nodal program.
- **External Resource Costs**
  - Includes both contractor and vendor expenses. Examples of the two types of expenses would be contingent labor contracted to work on the Nodal program, and also software development expenses from the software vendors (ABB, AREVA, etc…). Contractor labor is for staff augmentation where ERCOT does not have the number of employees required to perform the additional Nodal project work or where ERCOT does not have employees with the skills to perform the work.
- **Administrative & Employee Expenses**
  - Equipment, tools, office materials & supplies. Also includes ERCOT employee expenses. For example, the expenses for trips by ERCOT employees to vendor sites to supervise software development would fall into this category.
- **Software**
  - Expenses for purchased 3rd party software not being developed solely for the Nodal program. For example, this would include a wide variety of software ranging from Oracle database licenses to Microsoft Windows Server licenses. Also in this cost category are the maintenance expenses associated with the software licenses.
- **Hardware**
  - Includes all computer hardware purchased to enable the Nodal market and the future maintenance on this equipment. Examples would be servers, data storage hardware and networking equipment.

Cost Elements (continued)

- **Backfill**
  - This category represents the difference between ERCOT's labor expense for an internal employee and a contractor hired to perform that employee's duties while that employee is working on the Nodal program. For example, if the fully loaded cost to ERCOT for an employee was $50/hr and that employee was reassigned from ERCOT base operations to the Nodal program and a contractor was hired at $70/hr to perform the base operations duties while the employee is working on the Nodal program, the cost to the Nodal program is the difference between the two expenses, in this case $20/hr.

- **Indirect Support Costs**
  - Several ERCOT administrative departments charge the Nodal program an allocation for services provided to Nodal. For example, ERCOT Procurement, Finance, Legal, and some others provide their services to the Nodal program. The amount charged to the Nodal program is based on an allocation that has been audited and approved.

- **Facilities Allocation**
  - Similar to the Indirect Support Costs category, the Facilities Allocation is a reimbursement to ERCOT base operations from the Nodal program for the facilities space and services provided by ERCOT to the Nodal program.

- **Finance Charge**
  - Interest expenses related to debt incurred to finance the Nodal program.
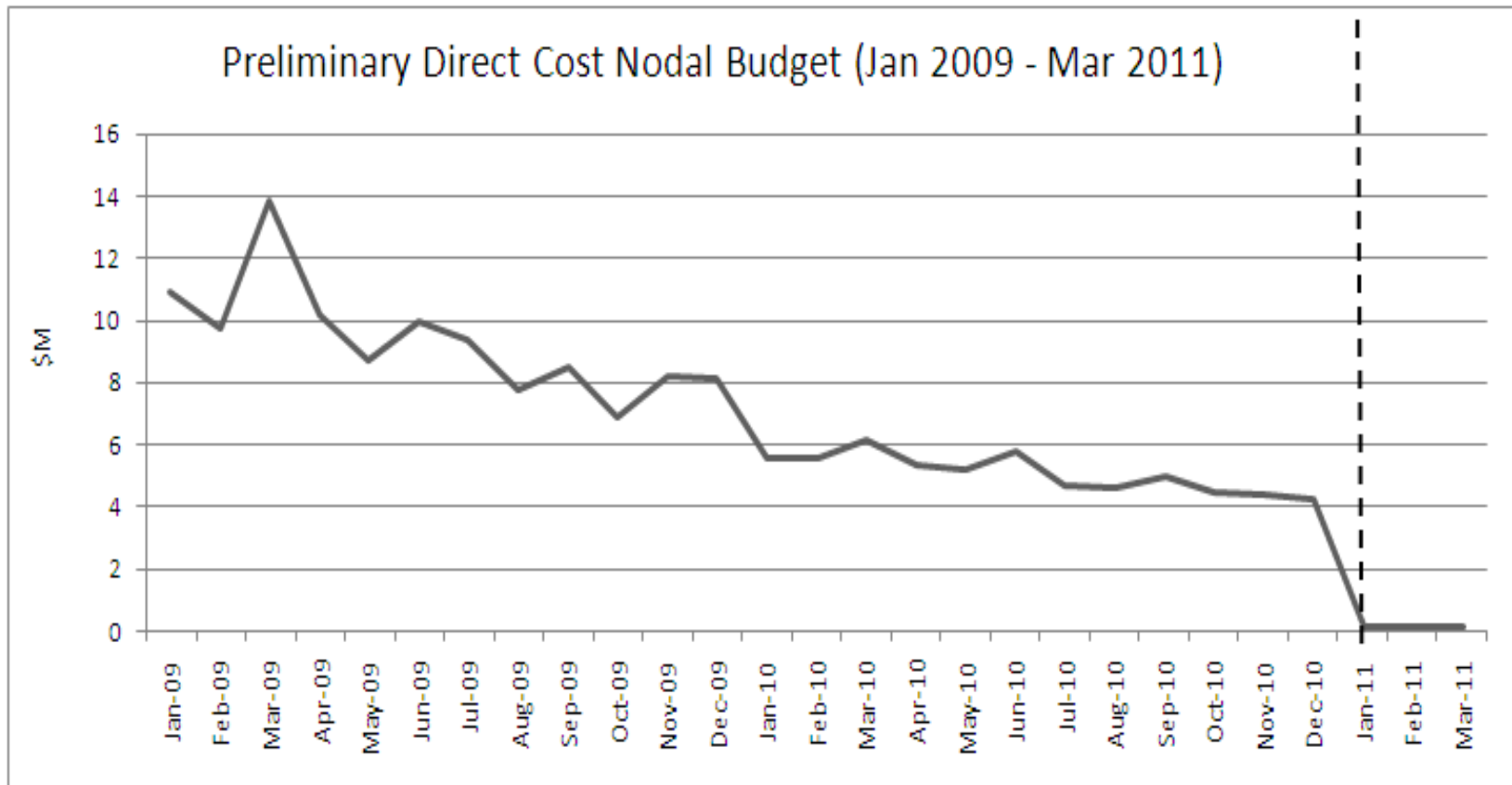
Nodal Program Revised Preliminary Budget

Line	Expense Category		Approved Budget		Revised Preliminary Budget		Variance
1	Internal Labor Costs	$	35,858,381	$	86,140,621	$	50,282,239
2	External Resource Costs		175,093,797		292,559,312		117,465,515
3	Administrative & Employee Expenses		7,614,628		3,078,690		(4,535,938)
4	Software & Software Maintenance		17,053,096		37,131,338		20,078,241
5	Hardware & Hardware Maintenance		42,103,029		54,417,538		12,314,509
6	Contingency		15,000,000		58,627,636		43,627,636
7	Subtotal - Direct Costs		292,722,931		531,955,134		239,232,203
8							
9	Backfill		1,422,626		8,479,263		7,056,638
10	Indirect Support Costs		10,589,195		17,803,472		7,214,277
11	Facilities Allocation		4,126,574		7,856,531		3,729,957
12	Subtotal - Overhead Costs		16,138,395		34,139,266		18,000,871
13							
14	Financing Costs		42,154,600		93,905,600		51,751,000
15							
16	**Total - Nodal Program Costs**	**$**	**351,015,926**	**$**	**660,000,000**	**$**	**308,984,074**
17							
18	Less: Zonal/Nodal Interdependencies		(39,720,226)		(39,720,226)		-
19							
20	**Amount to be Recovered from Nodal Surcharge**	**$**	**311,295,700**	**$**	**620,279,774**	**$**	**308,984,074**
21							
22	NOTE:						
23	Approved budget reflects authorization approved by the Public Utility Commission on May 13, 2008 per Docket 35428.						

Nodal Program Preliminary Budget by Project

Project	Current Approved Budget	Preliminary Revised Budget	Variance
IT Infrastructure and Operations (INF)	65,400,015	131,510,128	101.1%
Market Management System (MMS)	50,527,343	79,187,884	56.7%
Integration Testing (INT)	17,907,527	40,208,318	124.5%
Early Delivery System (EDS)	19,311,548	34,990,107	81.2%
Energy Management System (EMS)	20,913,735	34,003,122	62.6%
Commercial Systems (COMS)	16,022,542	28,173,603	75.8%
Enterprise Integration (EIP)	18,963,151	27,100,067	42.9%
Program Control (PC)	9,092,381	20,305,002	123.3%
ERCOT Readiness (ERT)	6,767,763	18,817,827	178.0%
Network Model (NMMS)	13,709,494	15,691,492	14.5%
MER – Training	9,137,503	11,834,859	29.5%
Integration Design (IDA)	8,876,607	11,183,882	26.0%
Congestion Revenue Rights (CRR)	7,605,047	9,112,429	15.4%
Enterprise Data Warehouse (EDW)	3,655,570	6,756,221	84.8%
Market Information System Portal (MIS)	9,255,331	6,040,725	-34.7%
Administration	16,715,769	32,551,098	94.7%
Contingency	15,000,000	58,627,636	290.8%
Finance Charges	42,154,600	93,905,600	122.8%
Total	**351,015,926**	**660,000,000**	**88.0%**

Preliminary Direct Cost Nodal Budget (Jan 2009 - Mar 2011)

Questions / Comments