Nodal Program Update

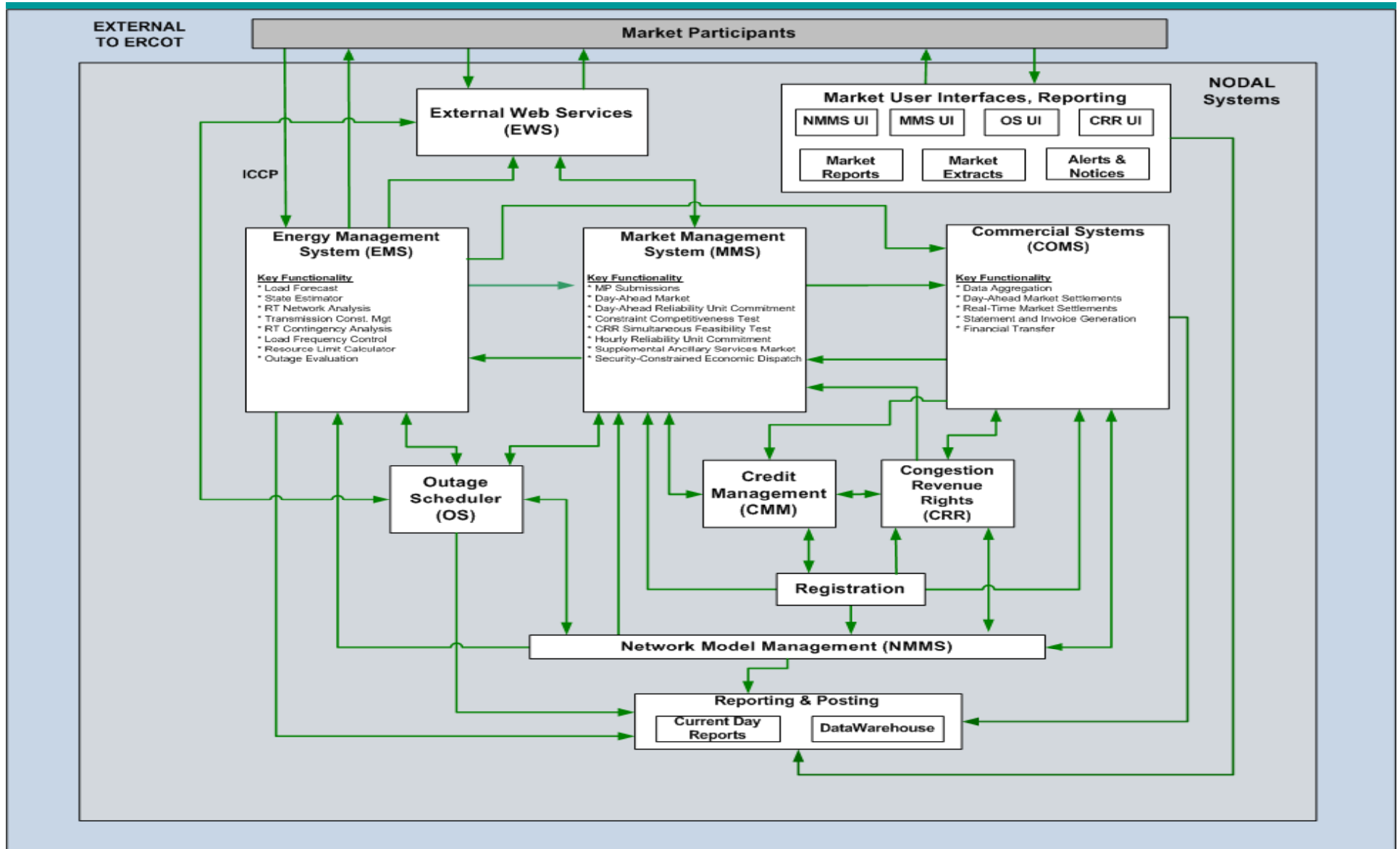**Mike Cleary**

Sr. VP and Chief Technology Officer

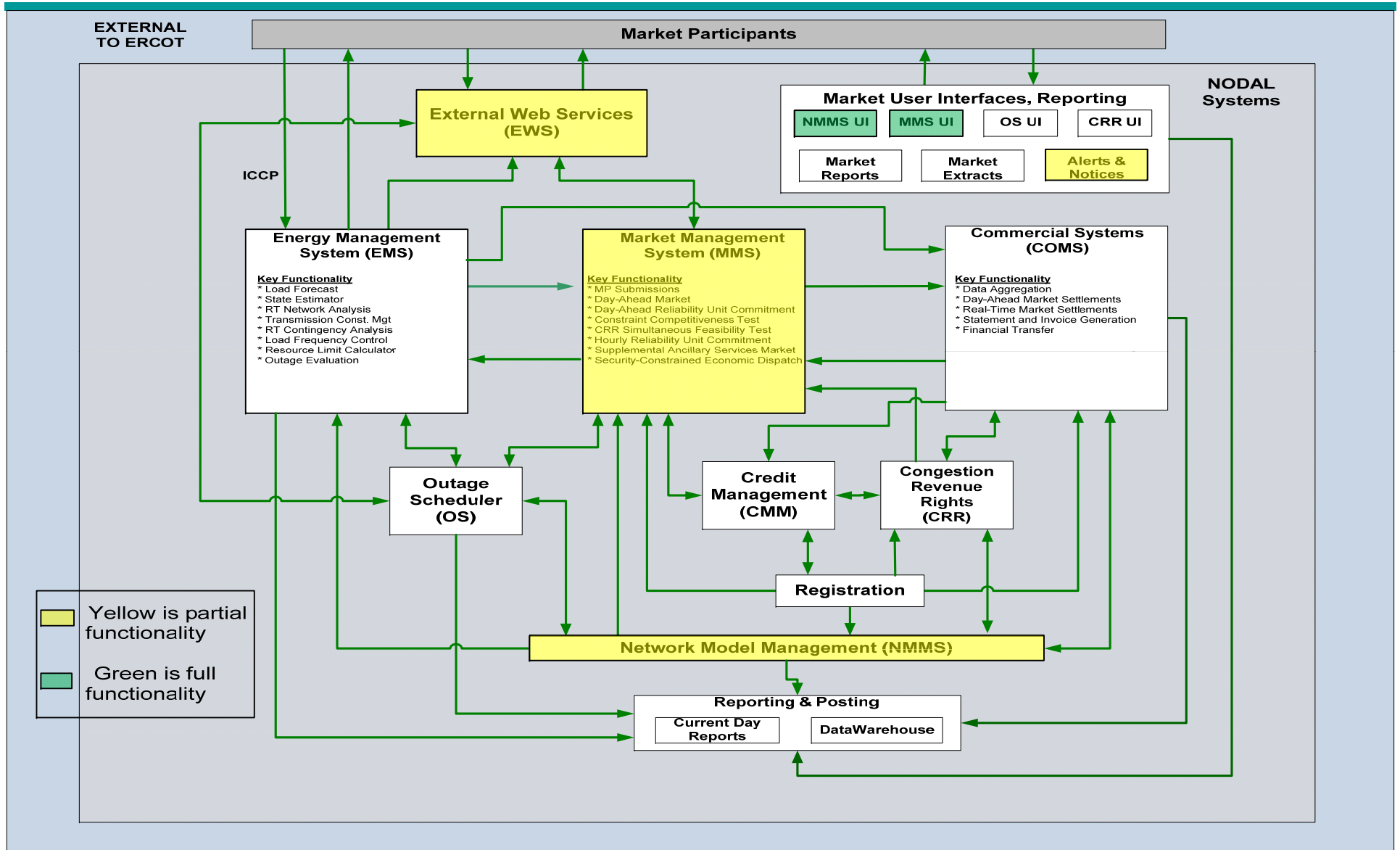**ERCOT Board of Directors**

15 December 2009

Agenda

- **Program Status**

- **Overview of Expected Nodal Performance Impacts to IT**

- **Market Readiness**
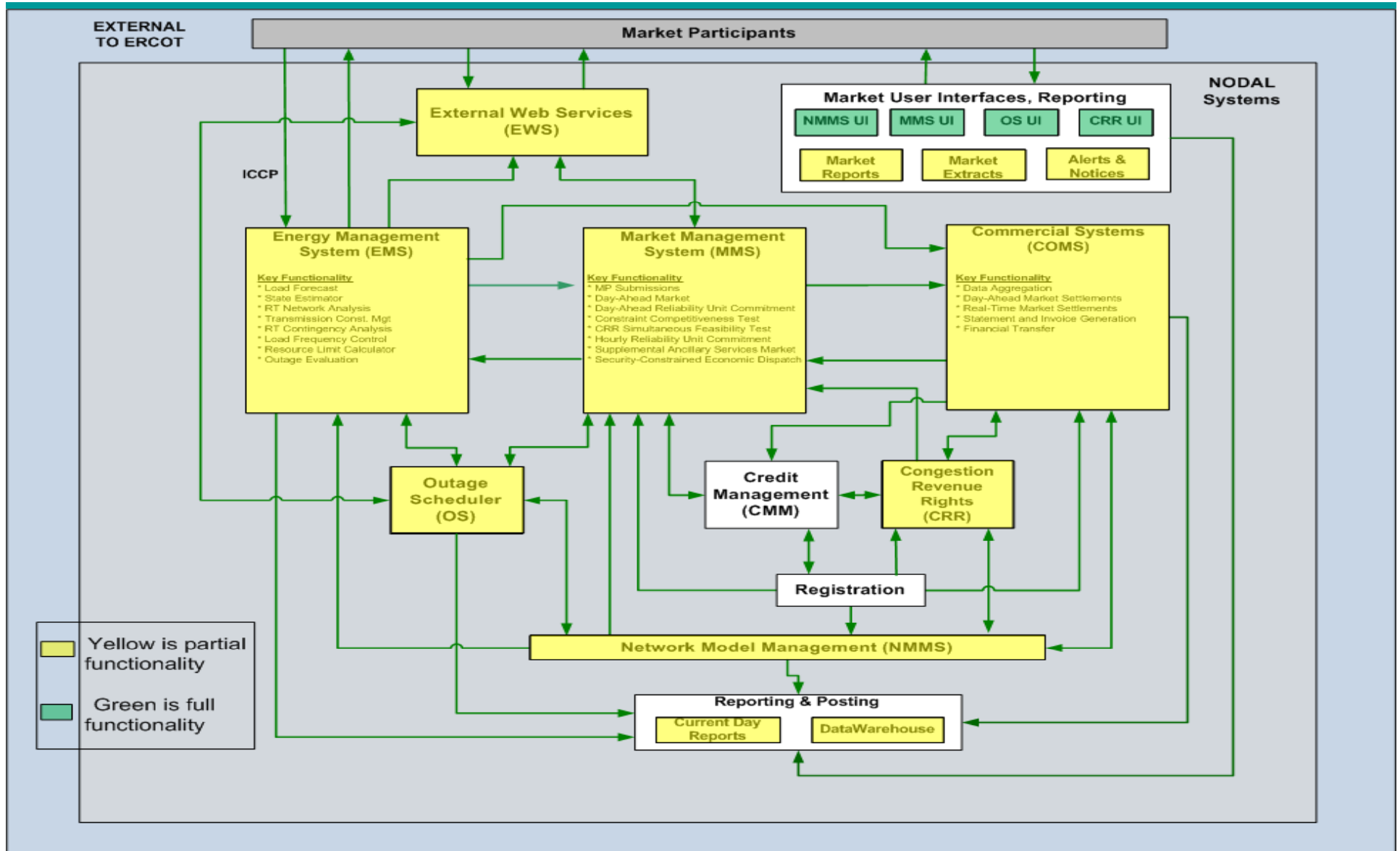
- **Financials**

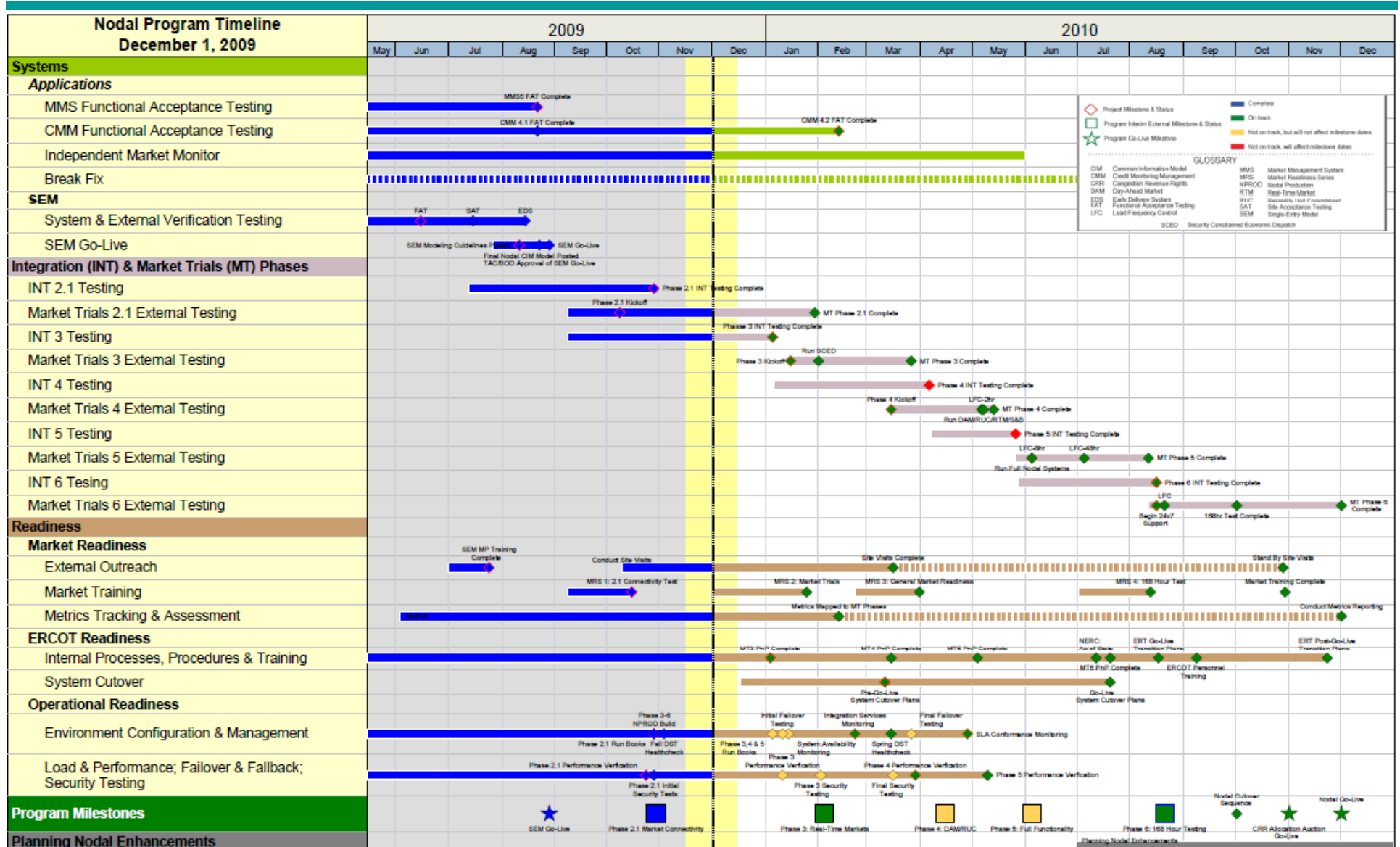- **Appendix**

Nodal Systems Blueprint

Nodal Systems Blueprint - Today

EXTERNAL TO ERCOT

NODAL Systems

Market Participants

Market User Interfaces, Reporting

| NMMS UI | MMS UI | OS UI | CRR UI |

| Market Reports | Market Extracts | Alerts & Notices |

External Web Services (EWS)

ICCP

Energy Management System (EMS)

Key Functionality
* Load Forecast
* State Estimator
* RT Network Analysis
* Transmission Const. Mgt
* RT Contingency Analysis
* Load Frequency Control
* Resource Limit Calculator
* Outage Evaluation

Market Management System (MMS)

Key Functionality
* MP Submissions
* Day-Ahead Market
* Day-Ahead Reliability Unit Commitment
* Constraint Competitiveness Test
* CRR Simultaneous Feasibility Test
* Hourly Reliability Unit Commitment
* Supplemental Ancillary Services Market
* Security-Constrained Economic Dispatch

Commercial Systems (COMS)

Key Functionality
* Data Aggregation
* Day-Ahead Market Settlements
* Real-Time Market Settlements
* Statement and Invoice Generation
* Financial Transfer

Outage Scheduler (OS)

Credit Management (CMM)

Congestion Revenue Rights (CRR)

Registration

Yellow is partial functionality

Green is full functionality

Network Model Management (NMMS)

Reporting & Posting

| Current Day Reports | DataWarehouse |

ERCOT

Nodal Systems Blueprint - Market Trials Phase 3

Integrated Nodal Timeline

Integrated Nodal Timeline
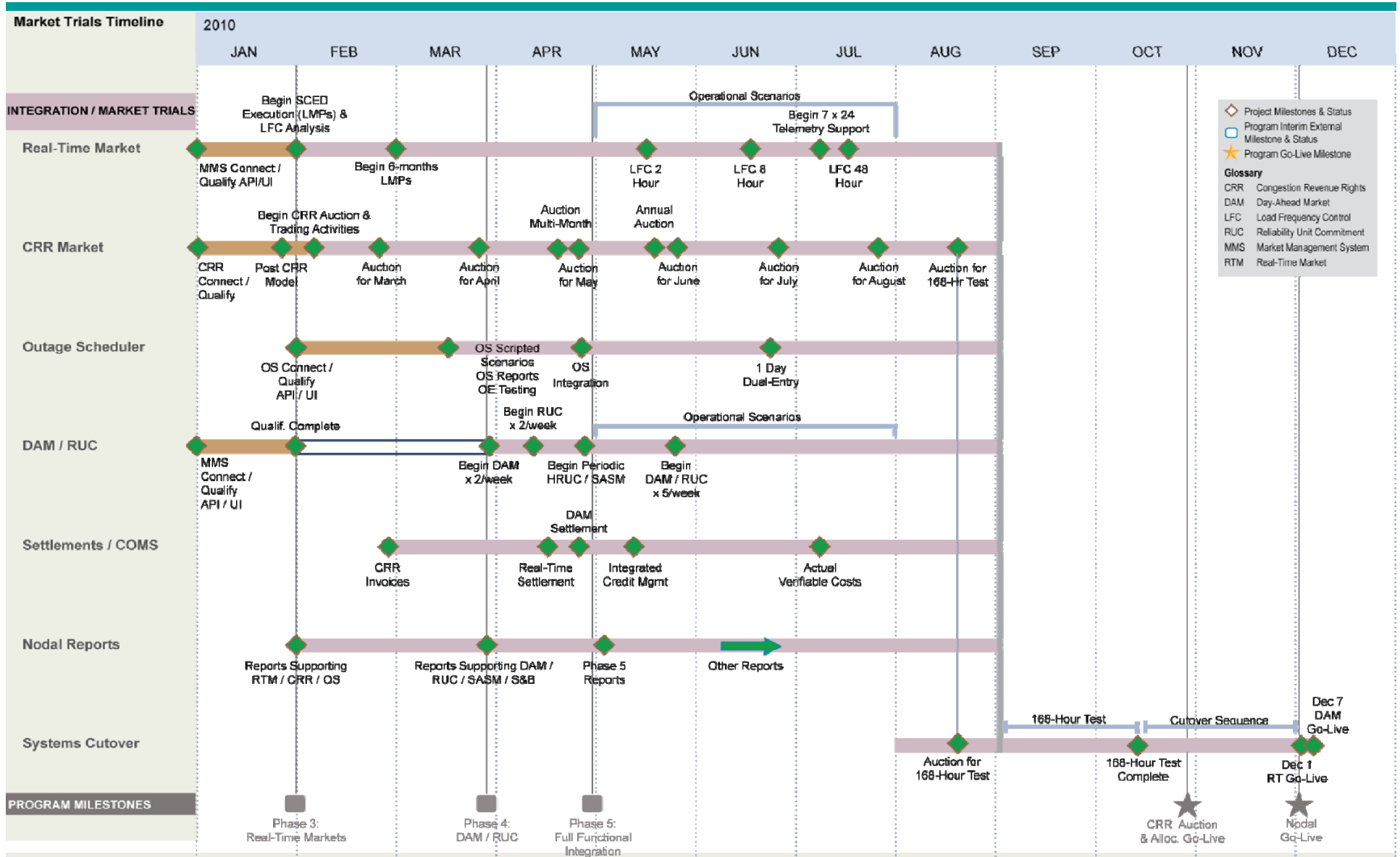
Nodal Program Dashboard

	Delivery Area	Project	Milestone Description	Project Milestone Link	Schedule Date	This Weeks Status
■	Program Milestone	PMO/DA	PHASE 2.1 - MARKET CONNECTIVITY	Phase 2.1 Market Connectivity	10/28/09	Complete
◆	Integration Testing	INT	Phase 2.1 Integration Testing	MTPHASE-2.1 (EWS, MMS, UI's)	10/28/09	Complete
◆	Market Trials	MT	Phase 2.1 Kick-off Meeting	Phase 2.1 Kick-Off Meeting	10/8/09	Complete
◆	Market Training	ERT	MRS 1: 2.1 Connectivity Test	MRS 1: 2.1 Connectivty Test	10/15/09	Complete
◆	Env. & Config Management	INF/ORT	Phase 2.1 NPROD Build	NProd Build	9/25/09	Complete
◆	Env. & Config Management	INF/ORT	Phase 2.1 Run Books, Monitoring	MT 2.1 Run Books	10/28/09	Complete
◆	L&P; Failover & Fallback; Security	INF/ORT	Phase 2.1 Security Testing (rd 1)	Phase 2.1 Initial Security Tests Complete	10/28/09	Complete
◆	L&P; Failover & Fallback; Security	INF/ORT	Phase 2.1 Performance Testing	Phase 2.1 Performance Verification Complete	10/23/09	Complete
■	Program Milestone	PMO/DA	PHASE 3 - Real-Time Markets	Phase 3: Real-Time Markets	2/4/10	Green
◆	Integration Testing	INT	Phase 3 - INT Testing Complete	MTPHASE-3 (RTM, SCED, CRR)	1/4/10	Green
◆	Market Trials	MT	Phase 3 Kick-off Meeting	Phase 3 Kickoff	1/15/10	Green
◆	Market Training	ERT	MRS 2: Market Trials	MRS2: Market Trials	1/25/10	Green
◆	Internal Process, Procedures, Training	ERT	MT3 PnP Complete	Process and Procedures Drafted for MT3	3/18/10	Green
◆	Env. & Config Management	INF/ORT	Phase 3-6 NPROD Build	Phase 3-6 NPROD Build Complete	10/28/09	Complete
◆	Env. & Config Management	INF/ORT	Phase 3,4,&5 Run Books	MT 3, 4 & 5 Run books	1/5/10	Green
◆	Env. & Config Management	INF/ORT	System Availability Monitoring	System Availability Monitoring Complete	1/14/10	Green
◆	L&P; Failover & Fallback; Security	INF/ORT	Performance Verification	Phase 3 Performance Verification Complete	1/11/10	Green
◆	L&P; Failover & Fallback; Security	INF/ORT	Phase 3 Security Testing	Phase 3 Security Testing Complete	2/2/10	Yellow
■	Program Milestone	PMO/DA	PHASE 4 - DAM/RUC	Phase 4: DAM/RUC	4/14/10	Yellow
◆	Integration Testing	INT	Phase 4 - INT Testing Complete	MTPHASE-4 (DAM/RUC)	4/5/10	Red
◆	Market Trials	MT	Phase 4 Kick-off Meeting	Phase 4.0 Kickoff	3/15/10	Green
◆	Market Trials	MT	MT Phase 3 Complete	MT3-Market Trial Activities	3/16/10	Green
◆	External Outreach	ERT	Conduct Site Visits	Conduct Site Visits (Start)	3/16/10	Complete
◆	External Outreach	ERT	Site Visits Complete	Site Visits Complete	3/31/10	Green
◆	Market Training	ERT	MRS 3: General Market Readiness	MRS3: General Market Readiness	2/12/10	Green
◆	Metrics Tracking & Assessment	ERT	Metrics Mapped to MT Phase	Metrics Mapped to MT Phases	3/15/10	Green
◆	Internal Process, Procedures, Training	ERT	MT4 PnP Complete	All MT4 L-1 to L-4 Updated Process and Procedures	1/11/10	Green
◆	Env. & Config Management	INF/ORT	Initial Failover Testing	Initial Failover Testing Complete	3/26/10	Green
◆	Env. & Config Management	INF/ORT	Final Failover Testing	Final Failover Testing Complete	2/22/10	Green
◆	Env. & Config Management	INF/ORT	Integration Services Monitoring	Integration Services Monitoring Complete	3/16/10	Green
◆	L&P; Failover & Fallback; Security	INF/ORT	Final Security Testing	Final Security Testing Complete	3/29/10	Yellow
◆	L&P; Failover & Fallback; Security	INF/ORT	Phase 4 Performance Verification	Phase 4 Performance Verification Complete	3/29/10	Green
■	Program Milestone	PMO/DA	PHASE 5 - Full Functionality	Phase 5: Full Functionality	6/4/10	Yellow
◆	Integration Testing	INT	Phase 5 - Integration Testing Complete	MTPHASE-5 (FULL INTEGRATION)	5/26/10	Red
◆	Market Trials	MT	MT Phase 4 Complete	MT4-Market Trial Activities	5/13/10	Green
◆	Internal Process, Procedures, Training	ERT	MT5 PnP Complete	All MT5 L-1 to L-4 Updated Process and Procedures	5/4/10	Green
◆	Env. & Config Management	INF/ORT	Fall DST Testing	Fall DST Testing	11/3/09	Complete
◆	Env. & Config Management	INF/ORT	Spring DST Testing	Spring DST Testing	3/15/10	Green
◆	Env. & Config Management	INF/ORT	SLA Conformance Monitoring	SLA Conformance Monitoring Complete	4/28/10	Green
◆	L&P; Failover & Fallback; Security	INF/ORT	Phase 5 Performance Verification	Phase 5 Performance Verification Complete	5/10/10	Green
■	Program Milestone	PMO/DA	PHASE 6 - 168 Hour Testing	Phase 6:168 Hour Testing	8/20/10	Green

Program Milestone Schedule Mitigation

Phase 4: DAM / RUC

Integration Testing Schedule has slipped 2 weeks

Cause:

- **Environment Issues (Power Outage, Storage Issues)**

- **Planning delays due to Phase 2.1 and Phase 3 delivery focus**

Mitigation Strategy:

- Scheduled more work to occur during the holiday period slowdown(12/18-1/4)
- Authorize resource overtime for Phase 4 test execution
- Reduce the number of Operating Day (OD) runs planned through the end of the year to more effectively leverage testing and resources
- Prioritize and pull forward more comprehensive End-to-End scenarios where applicable

Phase 5: Full Functionality

Integration Testing Schedule has slipped 4 weeks

- **Schedule impact from Phase 4 slippage**

- **Phase 5 Planning delays and a large reporting scope**

- **Comprehensive Test Case development with Business**

- Continue to leverage overtime for Phase 5 test execution
- Prioritize and phase in the delivery of reports during Market Trials
- Prioritize Testing to ensure the critical functionality and reports are completed first
- Prioritize must have End-to-End scenarios

Nodal Program Risks & Issues

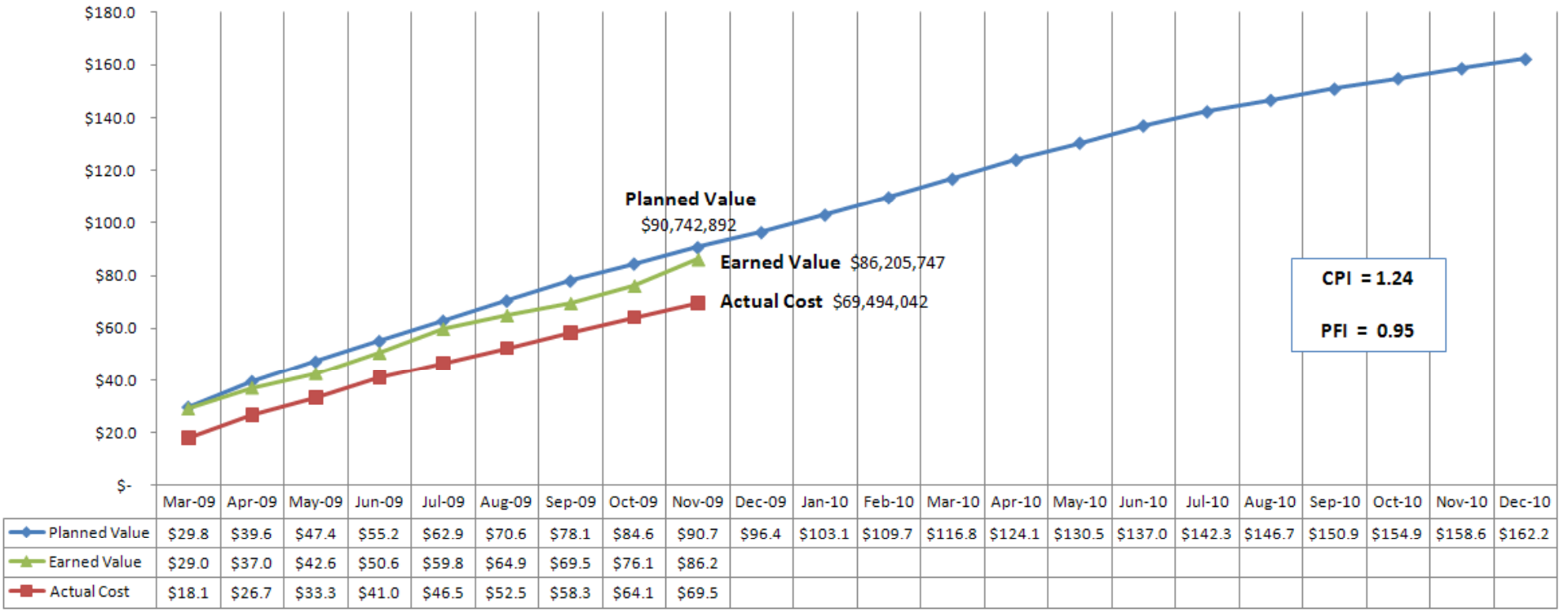| Risk/Issue	Impacted Milestone	Target	Status
Integration Testing *Continued risk around technology delivery of business systems integration due to complexity and continuing maturing of application and data dependencies.*	**Program**	**May 2010**	• Phase 3 On track; planning complete, execution in progress. • Execution of work plan, with specific focus on January Market Trials functionality, under way. • Later phase schedules have slipped due to environment issues and focus on Phase 2.1, Phase 3 delivery.
Oracle Licensing *ERCOT IT department is researching a potential Oracle Licensing compliance issue that may result in unplanned budget impacts.*	**Program**	**Feb 2010**	• ERCOT Management reviewing licensing compliance
Market Interaction Operating Level Agreements (OLAs) *Need to determine operating level agreements associated with market interactions to assist ERCOT in establishing operational thresholds. ERCOT is responsible for ensuring any market thresholds required before Go-Live are defined, managed through the appropriate stakeholder processes and communicated in a timely fashion.*	**Program**	**April/May 2010**	• On track. • Phase 2.1 OLAs established and communicated to the market during Oct. 8 Market Readiness Seminar. • Phase 3 and 4 OLA definitions in process.

Nodal Program Risks & Issues

Risk/Issue	Impacted Milestone	Target	Status
Reconciling Protocols, Systems and Market Expectations *Experience by other ISOs in deploying nodal markets has shown that expectations of the market participants are often missed, despite best efforts at defining tariffs or protocol requirements. ERCOT needs to assume such a risk exists for this nodal implementation as well.*	**Phase 3**	**Feb 2010** **(Change control submitted)**	• December 31st deadline at risk. • On track; work underway to trace protocols, requirements and business processes alignment analyses are in progress. • SMEs added to the team in May.
Internet Explorer Upgrade *Nodal Integration testing for the Market Participant (MP) User Interfaces and MIS reporting is using Internet Explorer (IE) version 6. MPs have requested ERCOT support a newer version: IE7 (IE8 is also available). If the nodal market-facing application requires certification against other IE versions, there will be internal and external costs associated with re-testing and updating the UIs.*	**Phase 6**	**July 2010**	• On track. • ERCOT Enterprise Architecture team completed initial Zonal analysis and developed options. • Nodal Impact assessment to be completed in parallel with Integration Testing over the next several weeks.

Earned Value for the Nodal Program from March - November

Nodal Program

Chart only uses the values associated with the Internal Labor Costs, External Resource Costs, Administrative & Employee Expenses, Vendor and Backfill

Planned Value $90,742,892

Earned Value $86,205,747

Actual Cost $69,494,042

CPI = 1.24

PFI = 0.95

	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10
Planned Value	$29.8	$39.6	$47.4	$55.2	$62.9	$70.6	$78.1	$84.6	$90.7	$96.4	$103.1	$109.7	$116.8	$124.1	$130.5	$137.0	$142.3	$146.7	$150.9	$154.9	$158.6	$162.2
Earned Value	$29.0	$37.0	$42.6	$50.6	$59.8	$64.9	$69.5	$76.1	$86.2													
Actual Cost	$18.1	$26.7	$33.3	$41.0	$46.5	$52.5	$58.3	$64.1	$69.5													

NOTE: Amounts in Millions

Overview of Expected Nodal Performance Impacts to IT

Ensuring reasonable, stable and explainable market outcomes (i.e. commitment, dispatch and prices) requires multiple levels of controls and support, including:

❑ **Monitoring Support**
  - ❑ **Operating Day Sequence and Checkpoints**
  - ❑ **Business Function Run-time, e.g. SCED execution time**
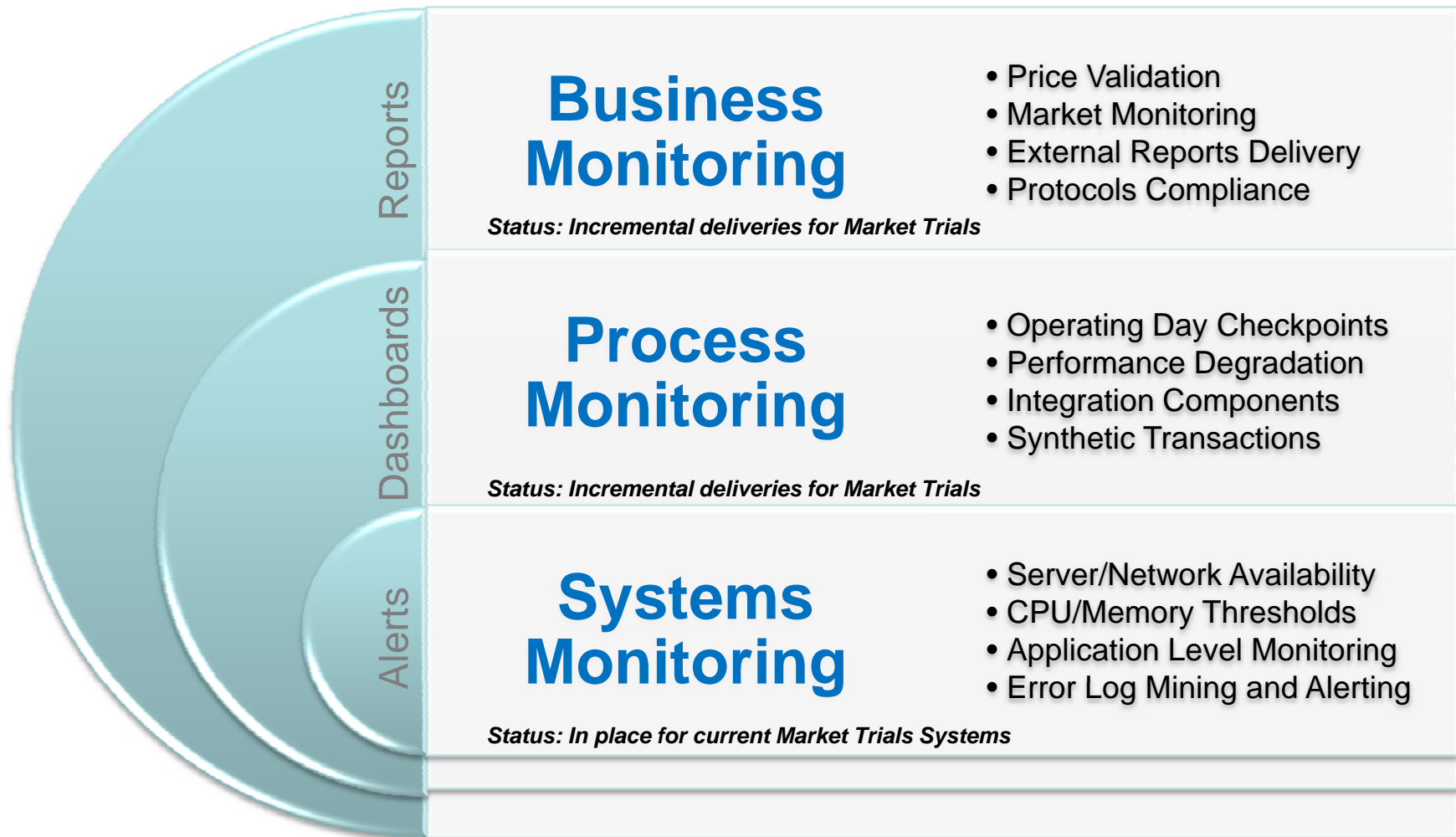 - ❑ **Output Reports Delivery**
  - ❑ **Dashboards and Metrics**

❑ **Production Support**
  - ❑ **Infrastructure Support**
  - ❑ **Application Support**
  - ❑ **Data Integration Support**
  - ❑ **Release Management Support**

❑ **Price Validation Support**
  - ❑ **Technical Readiness**
  - ❑ **Business Process Readiness**
  - ❑ **People Readiness**

Nodal Monitoring

Business Monitoring

- Price Validation
- Market Monitoring
- External Reports Delivery
- Protocols Compliance

Status: Incremental deliveries for Market Trials

Process Monitoring

- Operating Day Checkpoints
- Performance Degradation
- Integration Components
- Synthetic Transactions

Status: Incremental deliveries for Market Trials

Systems Monitoring

- Server/Network Availability
- CPU/Memory Thresholds
- Application Level Monitoring
- Error Log Mining and Alerting

Status: In place for current Market Trials Systems

Reports

Dashboards

Alerts

Production Support

❑ **Increased level of Application Support due to:**

    ❑ **Development of Business process monitoring to provide observability into Operating Day sequence and ensure meeting of established Service Level Agreements in support of Nodal timeline**

    ❑ **Increased levels of data flows and downstream application dependencies and cross impacts add to the complexity of system integration support and release management**

    ❑ **Additional Nodal business application support needs (i.e. additional price validation tools, enhanced RARF database)**

Price Validation Support

❑ **Technical Readiness**

  ❑ **Price validation tools defined, developed and tested (complete by Feb 1, 2010)**

❑ **Business Process Readiness**

  ❑ **DAM price validation procedures defined (complete)**

  ❑ **SASM price validation procedures defined**

  ❑ **RTM price validation procedures defined (complete by Feb 1, 2010)**

❑ **People Readiness**

  ❑ **Roles and Responsibilities defined (complete)**

  ❑ **Training testing and skill sets defined via Quality of Solution analysis testing effort and validated via Market Trials testing effort (complete by Feb 1, 2010)**

Participant Readiness Touch Points

	2009/2010			
	December	January	February	March
Meetings	• NATF 12/8	• NATF 1/5	• NATF 2/2	• NATF TBD
Training	• Nodal 101 • LSE 201 • Generation 101, 201 • Basic Training • Economics of LMP • Transmission 101 ◆ Settlement Workshop	• Nodal 101 • LSE 201 • Generation 101, 201 • CRR – online ◆ Settlement Workshop	• Nodal 101 • LSE 201 • Basic Training • Generation 101, 201 • CRR – instructor-led ◆ Settlement Workshop • Operations Seminar • Economics of LMP	• Nodal 101 • LSE 201 • Basic Training • Generation 101, 201 • CRR – instructor-led ◆ Settlement Workshop • Operations Seminar
Outreach	• 5 site visits • Metrics mapped to future phases	• 7 site visits • Initiate Phase 3 metrics ◆ MRS #2	• 5 site visits • Standby site visit mitigation approach documented	• 4 site visits • Scheduled Site Visits conclude
Market trials	• CRRAH Kickoff: 12/11 • 2.1 environment closed • Sandbox decommissioned • MP Handbooks • *SCED/LFC & CRR*	• Start weekly calls ■ Mandatory QSE/CRRAH re-qualification begins	• Weekly calls • Phase 3 Market Trials initiates • QSE OS qualification	• Weekly calls • Phase 3 Execution

		• MP Handbooks
		  • *DAM/RUC*
		  • *Outage Scheduler*
		  • *COMS*		

Market Participant Site Visits

15 Outreach Site Visits have been completed

	Entity	Date		Entity	Date
☑	LOWER COLORADO RIVER AUTHORITY	9-Oct	☑	NRG TEXAS POWER	15-Dec
☑	CALPINE CORP	14-Oct	☐	DIRECT ENERGY LP	5-Jan
☑	AUSTIN ENERGY	20-Oct	☐	CPS ENERGY	6-Jan
☑	CITY OF GARLAND	21-Oct	☐	BRAZOS ELECTRIC	10-Mar
☑	GDF SUEZ ENERGY MARKETING	29-Oct	☐	BTU (Bryan Texas Utilities) SERVICES	13-Jan
☑	ANP FUNDING	3-Nov	☐	TOPAZ POWER MANAGEMENT	19-Jan
☑	LUMINANT ENERGY	5-Nov	☐	OCCIDENTAL	20-Jan
☑	INVENERGY WIND DEVELOPMENT	10-Nov	☐	SHELL ENERGY	21-Jan
☑	EXELON	11-Nov	☐	TENASKA POWER SERVICES	26-Jan
☑	AMERICAN ELECTRIC POWER SERVICE	12-Nov	☐	OPTIM ENERGY	27-Jan
☑	CONSTELLATION ENERGY	17-Nov	☐	APX	3-Feb
☑	PSEG ENERGY RESOURCES	18-Nov	☐	NEXTERA ENERGY	11-Feb
☑	J ARON	19-Nov	☐	WIND PANEL (Houston)	16-Feb
☑	FULCRUM POWER	2-Dec	☐	RETAIL PANEL (Houston)	17-Feb
☑	EAGLE ENERGY PARTNERS I LP	3-Dec	☐	TRI-EAGLE ENERGY	18-Feb
☑	STEC	9-Dec	☐	XTEND ENERGY LP	2-Mar
☑	BP ENERGY COMPANY	10-Dec	☐	EC AND R QSE	9-Mar
			☐	WESTAR ENERGY SERVICES	TBD

ERCOT Readiness: Outreach Visits

We are 49% through the site visits

Highlights and Key Findings:	If not receiving a one-on-one visit, you can:
• "Like that it spells out what a QSE needs to do for each stage of Market Trials" • "Helps me to budget for 2010 and get the team [re]engaged" • Every MP has selected Day Ahead Market Implementation as a topic	• Review presentation materials at nodal.ercot.com/readiness/outreach/index.html • Attend scheduled training and upcoming Market Readiness Series • Participate in Wind or Retail Panel on 2/16 and 2/17, respectively

ERCOT Readiness: RTO Site Visits
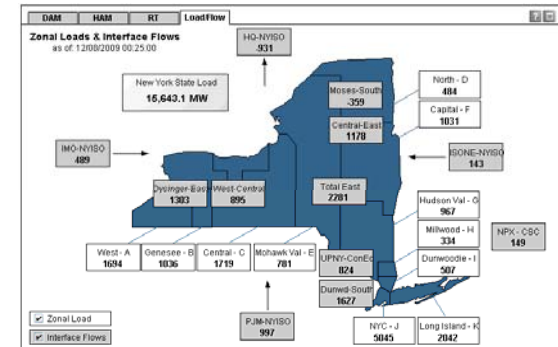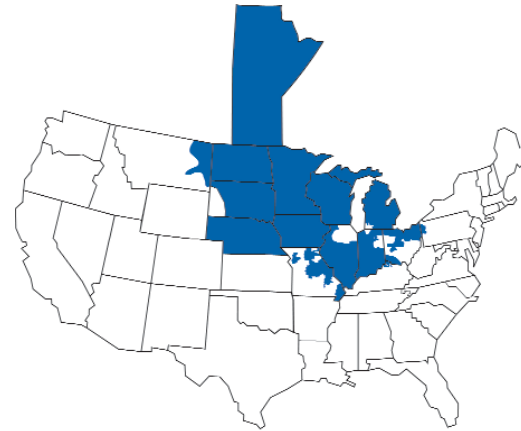
Site visits with:

- CAISO

- Midwest ISO

- NYISO

Lessons Learned from the visits:

- Possible control room configurations and staffing considerations
- Transmission modeling and outage management
- Market processes and day ahead procedures
- Exception handling, data transparency, and reliability
- Market cutover and market participant activity
  - Communications at all levels within the stakeholder organizations is a key factor for success

RARF Status Update

BOSQUE POWER COMPANY LLC ▼
BRAZOS WIND LP ▼
BUFFALO GAP WIND FARM 2 LLC ▼
BUFFALO GAP WIND FARM 3 LLC ▼
BUFFALO GAP WIND FARM LLC ▼
BULL CREEK WIND LLC ▼
CHAMPION WIND FARM LLC ▼
EC AND R PANTHER CREEK WIND ▼
EC AND R PANTHER CREEK WIND ▼
EC AND R PAPALOTE CREEK I ▼
EC AND R PAPALOTE CREEK I ▼
FOREST CREEK WIND FARM LLC ▼
GREGORY POWER PARTNERS LP ▼
INADALE WIND FARM LLC ▼
NAVASOTA ODESSA ENERGY ▼
NAVASOTA WHARTON ENERGY ▼
PYRON WIND FARM LLC ▼
ROSCOE WIND FARM LLC ▼
SAND BLUFF WIND FARM LLC ▼
SNYDER WIND FARM LLC ■
TICONA POLYMER INC ▼

Tag	MP11
Metric Description	This metric shall measure whether Market Participants have completed the resource registration activities required for the Nodal program.
Criteria	Criteria: MP Readiness will be achieved when the MP has completed the required resource registration activities including: - Transmission Asset Registration 11/16/2009 - 12/1/2009 - RARF True-up: Resource Entities complete schedule RARF submittals with updated business rule validations 1/4/2010 - 4/1/2010 - Resource Entities complete refresh of declaration of Resource Decision Making Authority for each network modeled Generation Resource 12/1/2009 - 1/29/2010 - Resource Entities sign-off on verification of Resource Node and Meter Mapping 12/1/2009 - 5/1/2010 RAG Rules||MPs QSERs will be scored based on status of resource registration for all resources represented Red - No submittals have been received according to schedule and/or not responding to escalation calls after the target completion date. Amber - Demonstrating progress in making corrections after target completion date. Score will change to RED after 30-days past target completion date if no corrections are received. Green - All forms received and accepted

Monthly Financial Review

Don Jefferis

Interim Director – Nodal Financial Management Office

15 December 2009

Financial Review – November 2009 Performance

Nodal Program
Approved Forecast to Actual Comparison
Month of November 2009

Line	Cost Summary	Forecast	Actual	Forecast Variance	Forecast Cumulative Variance (Pending Contingency Mgmt Disposition)
1	Internal Labor Costs	$2.1	$2.1	$0.0	($0.1)
2	Backfill Labor Costs	0.1	0.1	0.0	0.0
3	External Resource Costs	3.9	3.1	0.8	1.6
4	Software & Software Maintenance	1.8	1.9	(0.1)	0.9
5	Hardware & Hardware Maintenance	0.5	0.2	0.3	0.1
6	Other	0.0	0.0	0.0	0.0
7	**Sub-total Direct Project Costs**	**$8.4**	**$7.4**	**$1.0**	**$2.5**
8	**Board Discretionary Fund**	**$0.0**	**$0.0**	**$0.0**	**$0.0**
9	Allocations	$0.4	$0.4	$0.0	($0.1)
10	Finance Charges	1.8	1.8	0.0	0.0
11	**Sub-total Indirect Project Costs**	**$2.2**	**$2.2**	**$0.0**	**($0.1)**
12					
13	**Total**	**$10.6**	**$9.6**	**$1.0**	**$2.4**

Amounts in millions
Favorable / (Unfavorable)

Financial Review - LTD Performance through

Nodal Program

Approved Forecast to Actual Comparison

Life-to-Date through November 2009

Line	Cost Summary	Forecast	Actual	Variance	Forecast Remaining
1	Internal Labor Costs	$53.9	$54.0	($0.1)	$33.3
2	Backfill Labor Costs	5.2	5.2	0.0	2.1
3	External Resource Costs	253.3	251.7	1.6	35.5
4	Software & Software Maintenance	25.9	25.0	0.9	4.3
5	Hardware & Hardware Maintenance	50.5	50.4	0.1	3.7
6	Other	1.9	1.9	0.0	2.9
7	**Sub-total Direct Project Costs**	**$390.7**	**$388.2**	**$2.5**	**$81.8**
8	**Board Discretionary Fund**	**$0.0**	**$0.0**	**$0.0**	**$84.8**
9	Allocations	$19.6	$19.7	($0.1)	$4.0
10	Finance Charges	24.5	24.5	0.0	38.3
11	**Sub-total Indirect Project Costs**	**$44.1**	**$44.2**	**($0.1)**	**$42.3**
12					
13	**Total**	**$434.8**	**$432.4**	**$2.4**	**$208.9**

Amounts in millions

Favorable / (Unfavorable)

Note 1: Forecast consists of actuals through September 2009 and re-forecast for October & November

Board Discretionary Fund

Amounts in millions

Legend: Potential Board Discretionary Fund — Board Discretionary Fund

Chart data labels: $87.2, $84.8, $58.6
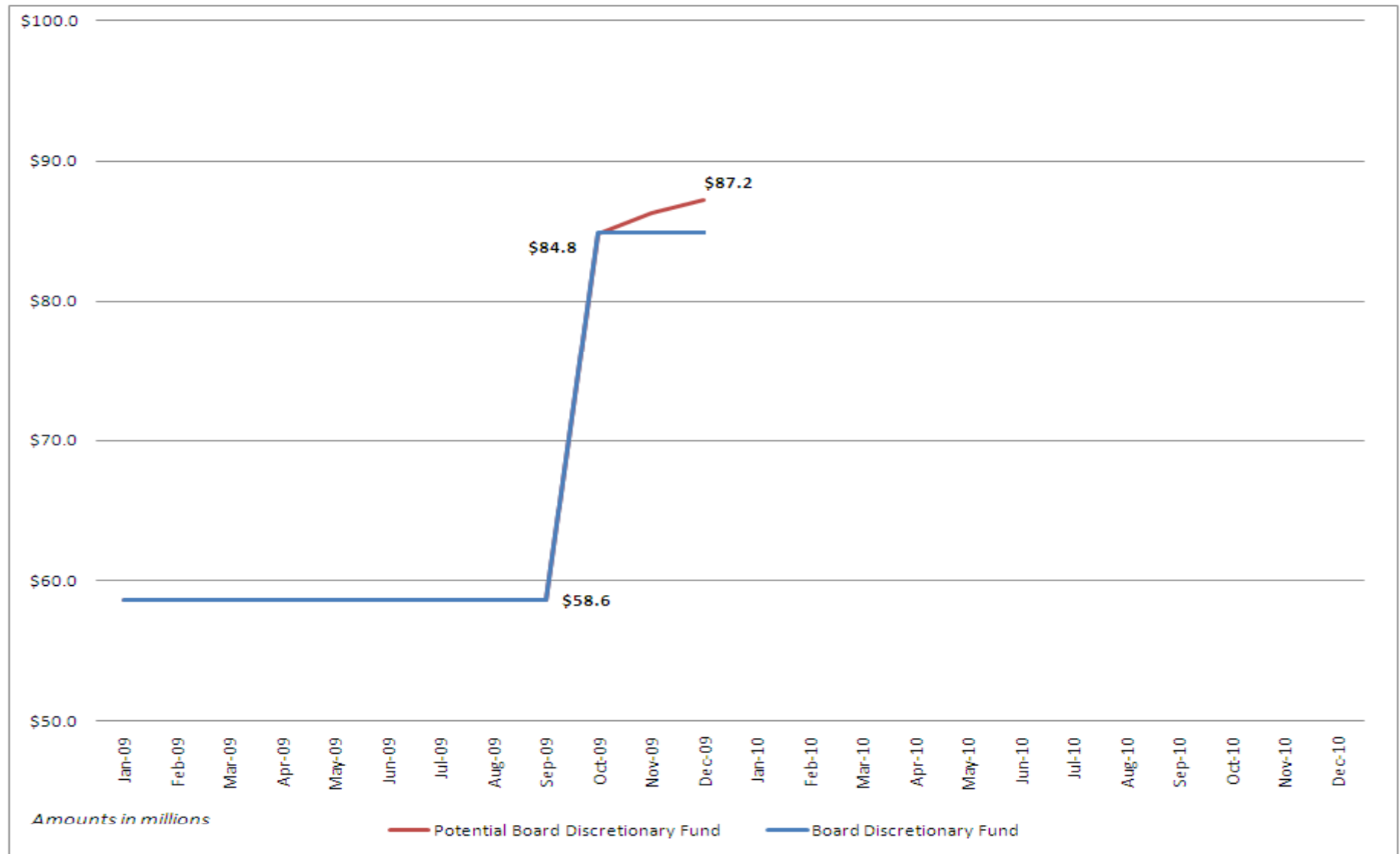
Program Cost Management

Monthly Budget, Forecast and Actual Analysis
(Amounts in millions)

Legend:
- Monthly ReForecast
- Monthly Actual
- Cumulative Reforecast
- Cumulative Spend
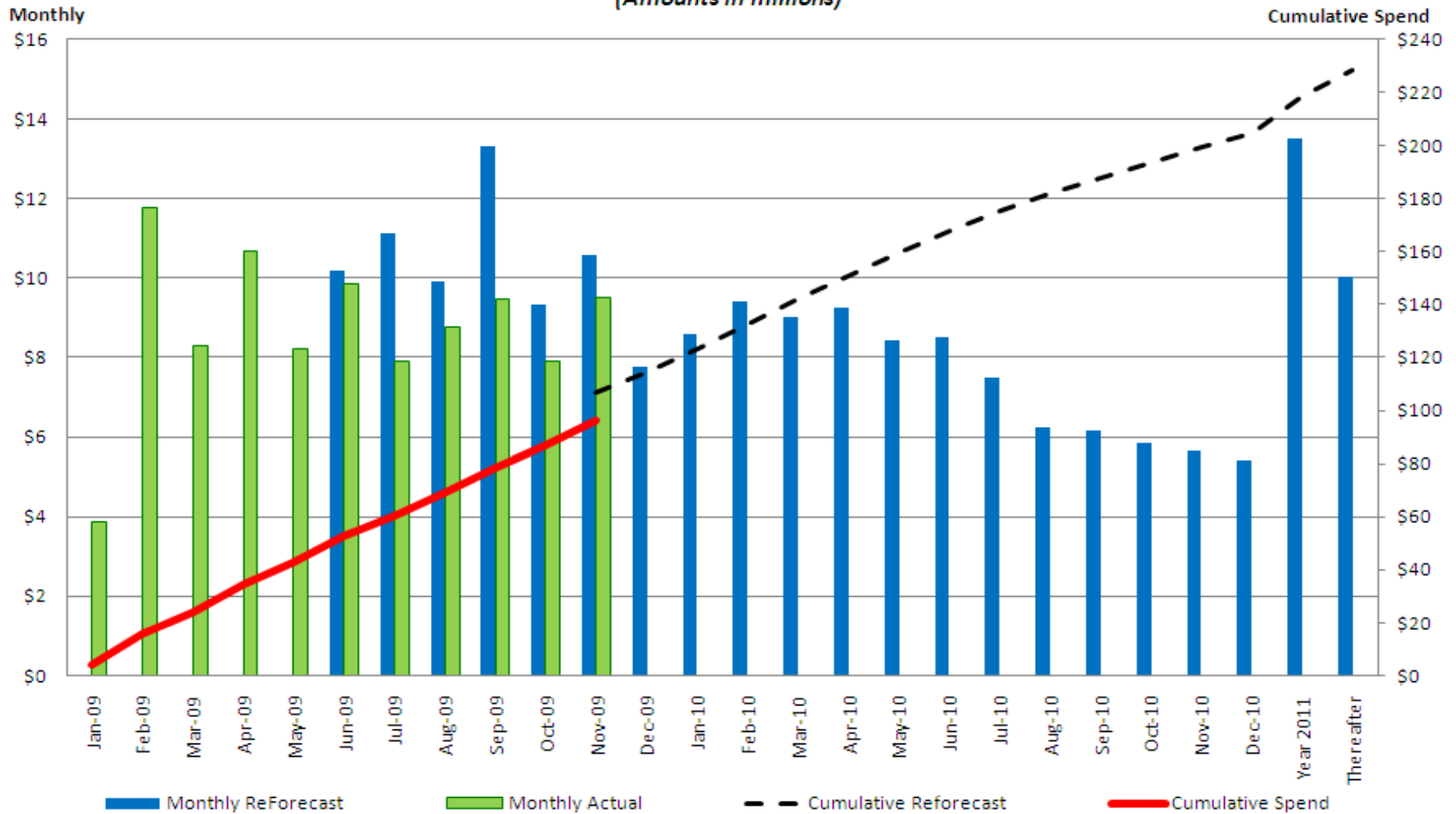
Status Update

- **EAC Q1 2010 Reforecast Preliminary Work Complete**
  - A baseline integrated schedule
  - A baseline budget from the Q4 EAC review
  - Implemented new change controls to assess impact to scope, schedule, and budget
- **EAC Q1 2010 Reforecast Underway**
- **Interest Charge Synchronization**

Questions?

Appendix

Market Operating Level Agreement (OLA) Discussion

Betty Day

Nodal Advisory Task Force

8 December 2009

What issue are we trying to address?

- **Transactional challenges:**
  - Hundreds of Market Participants
  - Significant number of permutations/combinations of transactions possible
  - Defined Operating Day timelines

- **Program constraints:**
  - Schedule
  - Budget

Need to be able to manage across the entire technical solution

Solution: Operating Level Agreements

Approach to Establishing Operational Thresholds

- **ERCOT needs to determine operating level agreements associated with market interactions to assist in establishing operational thresholds. ERCOT is responsible for ensuring any market thresholds required before Go-Live are defined, managed through the appropriate stakeholder processes and communicated in a timely fashion**

- **ERCOT is working within the established market timelines to develop functional SLAs**
  - Within these SLAs, acceptable use thresholds may be established to ensure the market timeline is achievable
  - ERCOT will continue to work through NATF to develop the thresholds around market interactions

Operational Day Process Timeline

Click the subprocess to see the graphical dependency for each sub process

● Operating Day Market Open	● Publish CRR Credit Limit	Perform Pre DAM Market Calculations Publish DAM Results	● Open Adjustment Window	Submit
	● Publish MMS Credit Limit	Execute DAM	● Create DAILY_DAM_INPUT Bill Determinants	Disclose
	● Publish CRR Ownership to CMM MMS	Perform SFT and POD	● Create DAILY_DAM_SFTOUTPUT Bill Determinants Perform
● Calculate Credit Limit	● Perform DAM Market Input Validation	● Create DAILY_DAM_OUTPUT Bill Determinants	Submit
Publish MP Details Integration	● Perform DAM Pre Market Publishing	● Create DAILY_DAM Credit Determinants	Execute
Publish MP Resource Params Integration	Submit DAM Input to MMS Post Pre Market Publishing	● Publish DRUC Results	Publish

Submit DRUC Input to MMS Post Pre Market Publishing   Submit Post DRUC COP   Internal

● Verify Pre DAM Market Data Integrity   Execute DRUC   Create H

Publish Network Model to MMS and EMS   Submit Post DAM COP   Create H

Submit DRUC Input to MMS Post Pre Market Publishing   Submit HRUC Input to MMS

start OD+1 (April 22nd)

● Publish RMR Contract Data to MMS   Execute HRUC

● Publish Capacity Factors to MMS   Publish HRUC Results   start OD (April 23rd)

● Publish Verifiable Costs to MMS   Submit Post HRUC COP

● Publish Load Ratio Share to MMS   Submit SASM Input to MMS

● Create DAILY_CRROWNERSHIP Bill Determinants   Execute SASM as required

Post Short Term System Adequacy Reports to MIS Secure Area   Create H

CRR CMM Bilateral Trade Approval Process   Create H

Retrieve FIP, FOP from Platts and post to MMS SB   Publish SASM Results

Submit DAM Input to MMS   Submit Post SASM COP

Submit DRUC Input to MMS   Close Adjustment Window (hourly)

● Create DAILY_DAM_PODOUTPUT Bill Determinants

Retrieve ETAG information from OATI

Topics For Discussion

- **Submit CRR Input**
- **Submit DAM Input to MMS**
- Reporting
- Settlements

- Settlement Disputes
- Outage Schedules

CRR Guidelines Supporting OLA Development

- **Nodal Protocol Section 7.5.2**
  - No later than six months prior to the Texas Nodal Market Implementation Date, ERCOT shall report to TAC about whether a limit on bid volume or a nominal transaction charge for each bid submitted would benefit the auction process. Recommendations from TAC must be approved by the ERCOT Board and may be implemented without further revision to these Protocols.

CRR Submission Threshold Status

- **Current Testing Threshold**
  - 200,000 Bids (Number of existing CRRs plus Number of bids for an auction) impacted by:
    - Credit screening not done during submission of bids but rather enforced during optimization
    - CRR Account Holders trying to approximate curves by submitting numerous blocks to build curves
    - Risk of high numbers of low bids looking for "almost free" CRRs

- **Target Testing Threshold**
  - Remains at 200,000 Bids
  - Market Submission Analysis
    - # of existing CRRs ~50k for monthly, ~1k for annual
    - # CRR Account Holders - ~150
    - Hence Bid Limit ~ 1000 for monthly, 1300 for annual

DAM Guidelines Supporting OLA Development

- **ERCOT Nodal Protocols:**
  - Section 4.1.1: Day-Ahead Timeline Summary
  - Section 4.4: Inputs into DAM and Other Trades
    - 4.4.6: PTP Obligation Bids
    - 4.4.7: Ancillary Service Supplied and Traded
    - 4.4.9: Energy Offers and Bids
  - Section 4.5: DAM Execution and Results

- **The higher the volume of submissions the longer the execution process takes**
  - A 3½ hour window exists to execute, troubleshoot and review results of DAM application

DAM Submission Threshold Status

- **Current and Target Testing Threshold**
  - 5000 Energy-Only Bids/Offers & 5000 PTP Obligation Bids; impacted by:
    - Time taken for DAM clearing process exponentially increases as the number of variables/equations to solve increases.
    - A large number of DAM Energy-Only Offers, DAM Energy-Only Bids and PTP Obligation Bids are the main cause of increasing number of variables/equations to solve.
  - Same volume of submissions as MISO or larger
    - Market Submission Analysis
      - Target is to achieve DAM execution timeline with transaction volumes for DAM Energy-Only Offers /Bids and PTP Obligation Bids
      - DAM currently supports transaction volumes consistent with MISO transaction volumes (MISO Virtual Bids)
        - 5000 * 24 = 120k/day
          - Assumes single transaction submission contain up to 24hr of data per commercial node

Next Steps

- **ERCOT**
  - Continue to report to market on the progress of threshold testing as part of Nodal Program status reporting
  - Continue to report on additional topics surrounding the Operational Day in which ERCOT needs feedback from Market Participants

- **Market Participants**
  - Facilitate feedback from Market Participants via NATF regarding potential changes to current target testing thresholds

Defect Definitions

Severity	Definition
Severity 1: Data loss/critical error	Defects that render unavailable the critical functions of the system under test. These include errors such as system errors, application failures, loss of data, incorrect calculations, inability to transfer data, failure to access database, and inability to display information to the user.
Severity 2: Loss of functionality w/o workaround	Defects that render unavailable partial functionality of the system under test with no workaround available. These include errors such as incorrect information displayed to the user, information not updating correctly, extracts failing, and missing export files.
Severity 3: Loss of functionality with workaround	Defects that render unavailable partial functionality of the system under test with a workaround available. These include errors such as incorrect message displayed, optional information missing or not displayed correctly, not receiving e-mail notifications, and incorrect defaults.
Severity 4: Partial loss of a feature set	Defects that affect a feature that is not executed on a frequent basis and there is not a significant impact on the system. These include errors such as help information, filtering, and consistent naming.
Severity 5: Cosmetic/documentation error	Defects that are cosmetic and need to be resolved, but are not a factor in the functionality or stability of the system. These include errors such as field alignment, report formatting, drop down list order, fonts, column order and documentation that is inconsistent with the system(s) as tested.

	Prescription in Quality Center
Priority 1	Must fix ASAP
Priority 2	Must fix prior to Go-Live
Priority 3	Not critical to fix before Go-Live
Priority 4	Minor system/user impact
Priority 5	No system/user impact

Protocol Traceability Effort Update

Tier 1 Sections					
	PTE Traced Items	Research Items	In Progress: Business Procedures	In Progress: Reports/ Extracts	PTE Alignment Items
Section 3 – Management Activities for the ERCOT system (Dec NATF)	927	201	509	196	TBD
Section 4 – Day Ahead Operations (Nov NATF)	635	65	65	75	3
Section 5 – Transmission Security Analysis and RUC (Nov NATF)	167	28	75	18	9
Section 6 – Adjustment Period and Real-Time Operations (Dec NATF)	930	180	468	52	TBD
Section 7 – Congestion Revenue Rights (Oct NATF)	445	55	26	27	1
Section 8 – Performance Monitoring (Dec NATF)	225	155	150	2	TBD
Section 9 – Settlement & Billing (Nov NATF)	407	0	131	60	2
Section 16.11 – Financial Security for Counter Parties (Dec NATF)	200	112	69	24	TBD
Section 17 – Market Monitoring & Data Collection (Dec NATF)	25	9	21	1	TBD
Total	3961	805	1547	455	TBD

Protocol Traceability Results Update

- **Status as of December 11th 2009:**
  - **Reported to NATF on Sections 4, 5, 7, & 9**
  - **15 Alignment items identified to date**
    - **Proposed action on Alignment items:**
      - **6 – revise business procedure**
      - **7 – NPRR**
      - **1 – handbook**
      - **1 – revise business requirement**

  - **Sections 3, 16.11, 17 will be presented to NATF on 12/18**
  - **Sections 6 and 8 will be presented to NATF in January**

Requirements to Test Artifact Tracing

- ## Status as of December 1st 2009:

Requirements to Test Artifacts			
Project	# of Requirements	# and Type of Traced Test Artifacts	Comments
Energy Management System (EMS)	192	*427 Test Cases/Scripts	Complete as of July 2009 - numbers pending final analysis
Market Management System (MMS)	*231	*1328 Test Cases/Scripts	Complete as of Oct. 2009 - numbers pending final analysis
Outage Scheduler (OS)	*21	*9 Test Cases	Complete as of Jan. 2009 – final analysis in review
Commercial Systems (COMS)	*2160	*8444 Test Cases/Scripts	Under analysis – pending team review of Registration and Commercial Systems Integration Information artifacts
Congestion Revenue Rights (CRR)	50	32 Test Cases	Complete as of Nov. 2009
Credit Monitoring Management (CMM)	*1300	*3000 Test Scripts	In progress - CMM Build 4.2 to be finalized for final analysis of number of requirements & test artifacts
Network Model Management System (NMMS)	*152	*210 Test Cases	Team review of existing documents in progress
Market Information Systems (MIS)	*345	*1235 Test Scripts	Being Reviewed for Final Analysis
Reports and Extracts (EDW, CDR)	*55	*1200 Test Scripts	Team review of existing documents in progress
*indicates that number of requirements or test artifacts are subject to change with completion of artifact tracing			

Protocol Section 4 PTE Trace Report Executive Summary

Section 4 Traceability Overview				
	PTE Traced Items	In Progress Research items (Business / PTE team)	PTE Alignment Items	Full Trace Report
Section 4 Day Ahead Operations	635	60 / 128 Total - 188	3	Posted 11/23/09

Section 4 Alignment Item Review		
#	Summary of Alignment Issue	Resolution Status
A31	**MMS DA SPP Calculations for Resource Nodes, Load Zones, and Hubs** **(sec 4.6.1)**	**Resolution Identified – change functional requirement** **No change control should be required as the system has demonstrated the functionality, at least in testing to date. While the change will likely be done earlier, it should be done by phase 5 market trials.**
A78	**Virtual/Emergency QSE Bid/Offer Limitations** **(sec 4.4.10 / 16.2.6.2(3))**	**Discussed Business Procedure** **Business Procedure needed for Phase 5 of market trials**
A80	**Combined Cycle Modeling in Protocol Sections 4 and 5** **(sec 4.4.9.2.3)**	**Discussed Protocol change** **NPRR to be submitted in January**

Protocol Section 5 PTE Trace Report Executive Summary

Section 5 Traceability Overview				
	PTE Traced Items	**In Progress** **Research items (Business / PTE team)**	**PTE Alignment Items**	**Full Trace Report**
Section 5 - Transmission Security Analysis and RUC	167	26 / 91 **Total - 117**	9	**Posted 11/23/09**

Section 5 Alignment Item Review		
#	**Summary of Alignment Issue**	**Resolution Status**
A54	**Unacceptable Use of Modified Load Forecast in RUC (sec 5.5.2(9)(b))**	**Resolution Identified – address in a Business Procedure**
A55	**Unacceptable Use of Modified Generic Limits in RUC (sec 5.5.2(8)(b))**	**Resolution Identified – address in a Business Procedure**

Protocol Section 5 PTE Trace Report Executive Summary

	Section 5 Alignment Item Review - Continued	
#	**Summary of Alignment Issue**	**Resolution Status**
A56	**Administrative Controls for Use of Updated Load Forecast (sec 5.5.2(8)(b))**	**Resolution Identified – address in a Business Procedure**
A57	**Control of Operator Updates to the Load Forecast (sec 5.5.2(8)(b))**	**Resolution Identified – address in a Business Procedure**
A58	**Use of Different Computational Modules to Perform the RT/DA/HA Security Analysis (sec 5.5.1(2))**	**Resolution Identified – Submit NPRR**
A81	**DRUC Execution when DAM Fails (sec 5.5.2(1), 5.1(3))**	**Resolution Identified – Submit NPRR to allow execution of DRUC when DAM fails** **Will bring to NATF for discussion**
A82	**Combined Cycle Additions to Section 5 (sec 5.5.2(5))**	**Resolution Identified – Submit NPRR to address handling on Combined Cycle in RUC** **Will bring to NATF for discussion**
A83	**Default for Resource Status when COP is Not Available (sec 5.5.2(9)(a))**	**Resolution Identified – Submit NPRR to address how Resources will be considered when COP is not available**

Protocol Section 5 PTE Trace Report Executive Summary

Section 5 Alignment Item Review - Continued		
#	**Summary of Alignment Issue**	**Resolution Status**
A91	**QSE Failure to Respond to 5 Year Verifiable Cost Update** **(sec 5.6.1(9))**	**Business will develop a Procedure and validate internal system processing to address resetting a Resource's verifiable cost to generic cost when the Market Participant fails to respond to ERCOT's request to file a verifiable cost update following the 5 year anniversary of it's Verifiable Cost approval.** **Will bring to NATF for discussion**

Protocol Section 7 PTE Trace Report Executive Summary

Section 7 Traceability Overview				
	PTE Traced Items	In Progress Research items (Business / PTE team)	PTE Alignment Items	Full Trace Report
Section 7 Congestion Revenue Rights	**445**	**88 / 82** **Total - 170**	**1**	**Update posted 11/23/09**

Section 7 Alignment Item Review		
#	**Summary of Alignment Issue**	**Resolution Status**
A20	**CRR Market User Interface Handbook (sec 7.5.3(3))**	**Resolution Identified – Create and publish a CRR Market User Handbook** **Handbook needed for Phase 3 of Market Trials**

Protocol Section 9 PTE Trace Report Executive Summary

Section 9 Traceability Overview				
	PTE Traced Items	In Progress Research items (Business / PTE team)	PTE Alignment Items	Full Trace Report
Section 9 Settlements and Billing	**407**	**0 / 185** **Total - 185**	**2**	**Posted 11/23/09**

Section 9 Alignment Item Review		
#	**Summary of Alignment Issue**	**Resolution Status**
A62	**DAM Short Pay Process (sec 9.7.3(e)(ii))**	**Resolution Identified – Short paid DAM Invoices to be addressed in NPRR147**
A72	**Missing Reject Status for Disputes (sec 9.14.2(3), 9.14.2(4), 9.14.2(5), 9.14.3.(1))**	**Resolution Identified – NPRR to be submitted to add the Reject status category**

Next Steps

- **Questions about a research item or alignment item should be forwarded via e-mail to NodalMarketTransition@ercot.com. Subject line "Protocol Traceability Question"**

- **Planned dates for Web Ex review**
  - Dec 18 – 9:30 am – 3:30pm – sections 3, 16.11, 17
  - Mid-January – sections 6 & 8

Nodal Internal/External and Vendor Headcount for 2009

Nodal Internal/External and Vendor Headcount for 2009
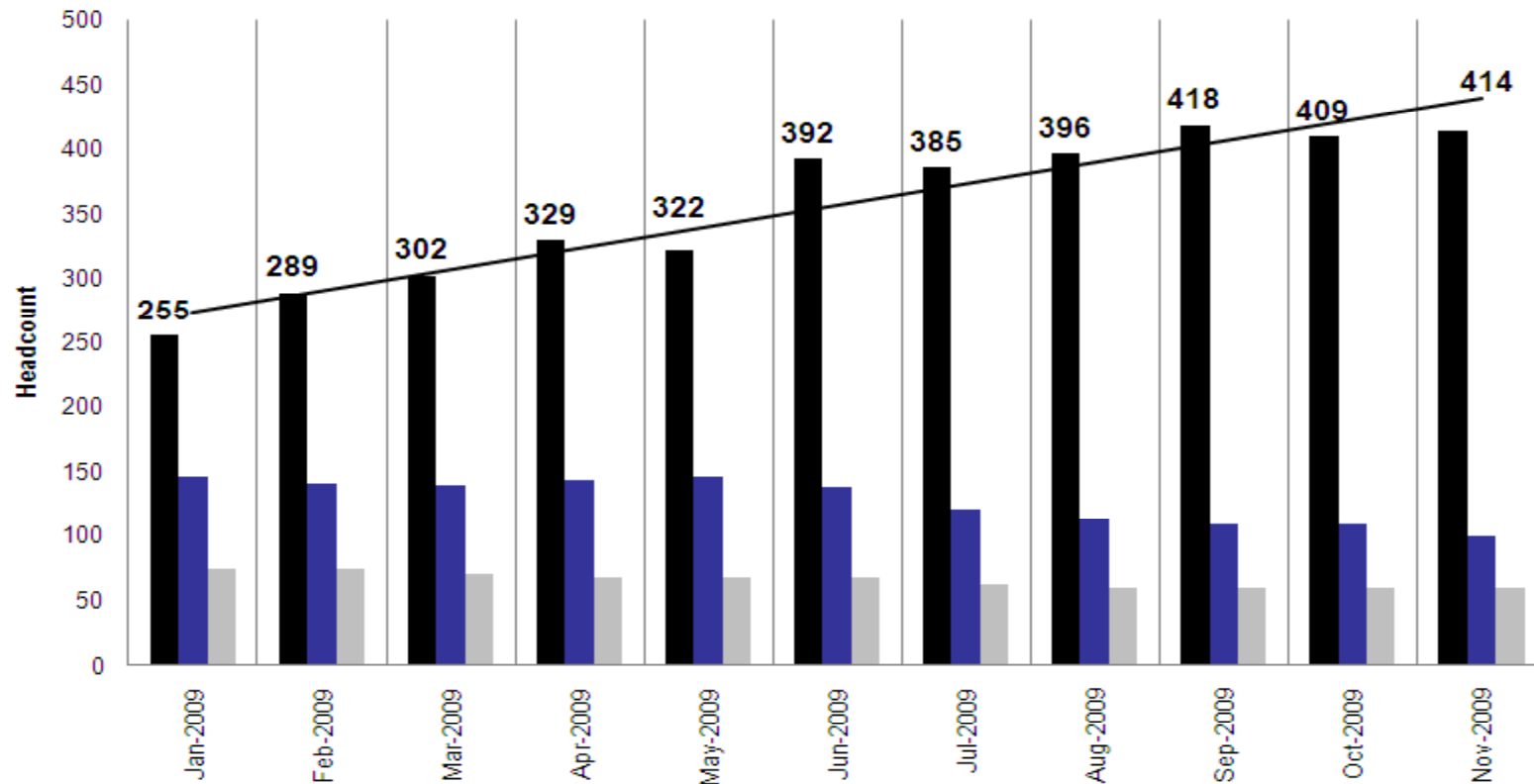
	Jan-2009	Feb-2009	Mar-2009	Apr-2009	May-2009	Jun-2009	Jul-2009	Aug-2009	Sep-2009	Oct-2009	Nov-2009
ERCOT Employees	255	289	302	329	322	392	385	396	418	409	414
Contingent Labor	146	141	139	143	146	138	121	113	108	108	99
Vendor Labor	74	74	70	67	67	67	62	60	60	60	59

Program Issue:
Market Interaction Operating Level Agreements

◇ **Potential Milestone Impact: Phase 3 RTM, Phase 4 DAM/RUC, Phase 5 Full, Go-Live**

ISSUE: **Market Interaction OLA**	Need to determine service level agreements associated with market interactions to assist ERCOT in establishing operational thresholds. ERCOT is responsible for ensuring any market thresholds required before Go-Live are defined, managed through the appropriate stakeholder processes and communicated in a timely fashion.			
Life Cycle State				
Plan · Manage				

Mitigation Plans	Who	Target Date	Current Status
1. ORT to define OLA with business and the market for each phase.	ORT, Market Trials	January	The team has already established an OLA for the Phase 2.1 release and is continuing to define Market OLAs for all subsequent Market Trial Phases as part of the ORT project plan. Phase 3 & 4 OLA Definitions in Progress.
2. PMO working with ORT to ensure consistent communications and work planning is in place to deliver the appropriate OLA and market throttling recommendations for each market release.	PMO, ORT, Market Trials	January, April, May, August	Continuous communication will be delivered to the internal and external stakeholders in support of each market delivery.

Program Risk:
Integration Testing

◇ **Potential Milestone Impact: Market Trials**

Risk: Integration Testing	Continued risk around technology delivery of business systems integration due to complexity and continuing maturing of application and data dependencies.		

Risk Life Cycle State			
Define	Plan	**Manage**	Watch

Mitigation Plans	Who	Target Date	Current Status
• Planned Integration Test phases and associated functional and technology components. • Created effort-based testing delivery work plan to prioritize and align deliverables to key external milestones. • Instituted daily PMO meetings to manage and mitigate day-to-day risks to scope and schedule deliverables.	PMO	Ongoing	Nodal Program Release Scope and Schedule defined to ensure delivery. Program Status Report and Dashboard in place to track progress.

Program Risk:
Internet Explorer 6 Upgrade

◇ **Potential Milestone Impact: Phase 5 Full Functionality**

Risk: Internet Explorer 6 Upgrade				Nodal Integration testing for the Market Participant (MP) User Interfaces and MIS reporting is using Internet Explorer (IE) version 6. MPs have requested ERCOT support a newer version, IE7. In addition, IE8 is also available. If the Nodal Market-Facing application requires certification against other IE versions, there will be internal and external costs associated with re-testing and updating the web-user interfaces.
Risk Life Cycle State				
Define	**Plan**	Manage	Watch	
Mitigation Plans		Who	Target Date	Current Status
Nodal Impact assessment to be completed in parallel with Integration Testing over the next several weeks.		T. Baum	Complete	Resource assignments will be assigned and load balanced within current Phase 3 Integration Testing activities.
Update Nodal Change Request.		J. Dreyer	12/31/09	Updating based on assessment and impact analysis.
Complete Development Changes		Systems	TBD	Pending Change Request Approval
Complete Regression Testing		INT	TBD	Pending Change Request Approval

Program Risk:
Reconciling Protocols, Systems and Market Expectations

◇ **Potential Milestone Impact: Market Trials**

Risk: Reconciling Protocols, Systems and Market Expectations			Experience with deploying nodal markets by other ISOs has shown that expectations of the market participants are often missed, despite best efforts at defining tariffs or protocol requirements. ERCOT needs to assume such a risk exists for this nodal implementation as well.
Risk Life Cycle State			
Define	Plan	**Manage**	Watch
Mitigation Plans	**Who**	**Target Date**	**Current Status**
1. Assess maturity and readiness of software in the initial nodal release, focusing on new/tailored capability for Texas Nodal.	B. Day K. Farley	2/28/10	12/10/09 – SME continue work with business teams. Number of items for research taking longer than estimated. NATF web ex for 12/18/09 and mid-Jan to review full trace reports with Market Participants for Tier 1 sections.
2. Add team members to the nodal program with Texas market experience to ensure readiness for Market Trials. SMEs to discussion alignment issues with ERCOT business owners. SMEs to report the results of the assessment to the ERCOT business owners for resolution.	B. Day K. Farley	Ongoing	12/10/09 – Work is underway to trace protocols, requirements and business processes alignment analyses are in progress.
3. Keep the oversight groups apprised of progress.	M. Cleary	Ongoing	12/10/09 – status reports provided to program, NATF, TAC, Special Nodal Committee monthly.