Nodal Program Update

Mike Cleary

Sr. VP and Chief Technology Officer

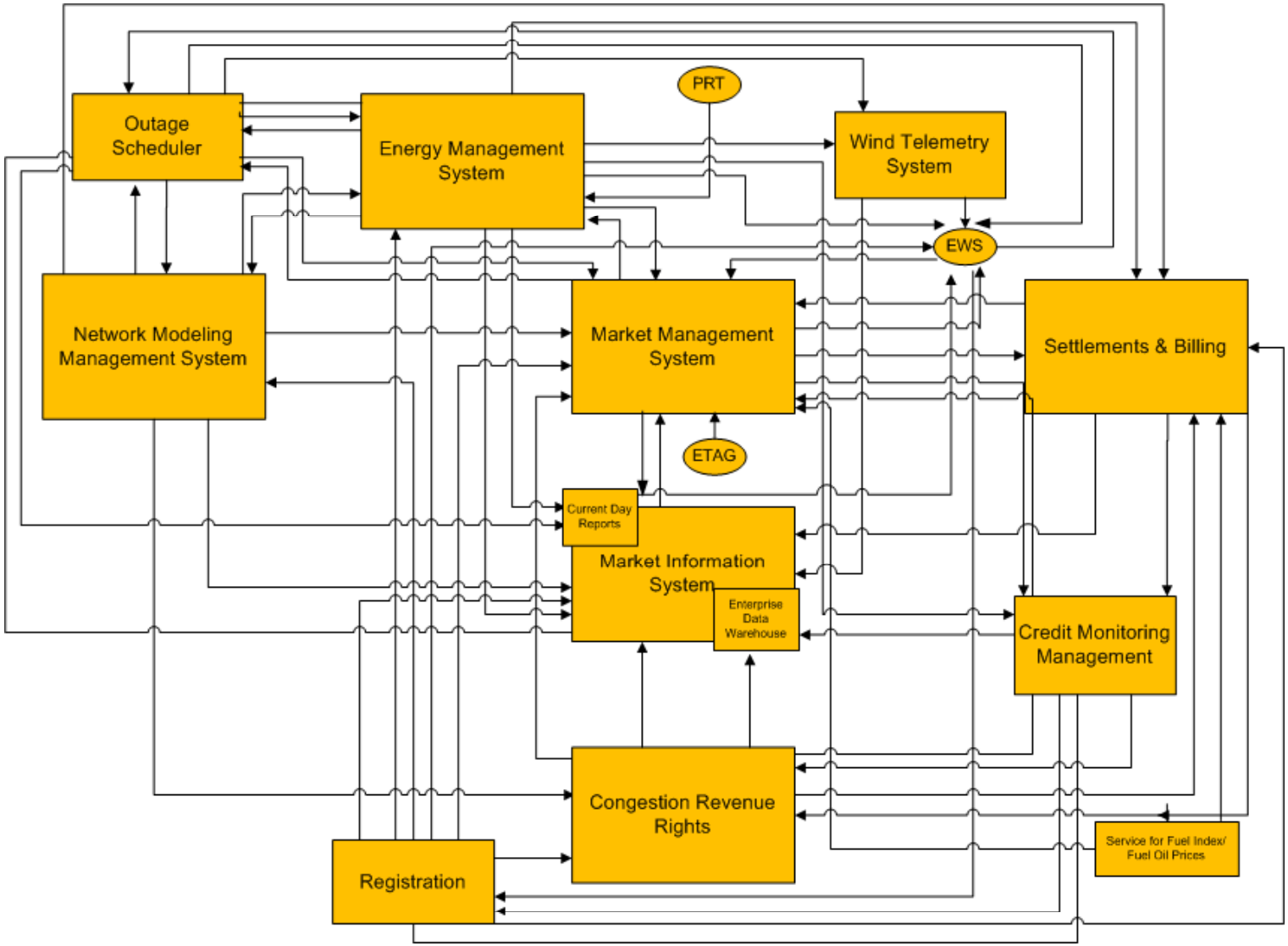
ERCOT Board of Directors

15 September 2009

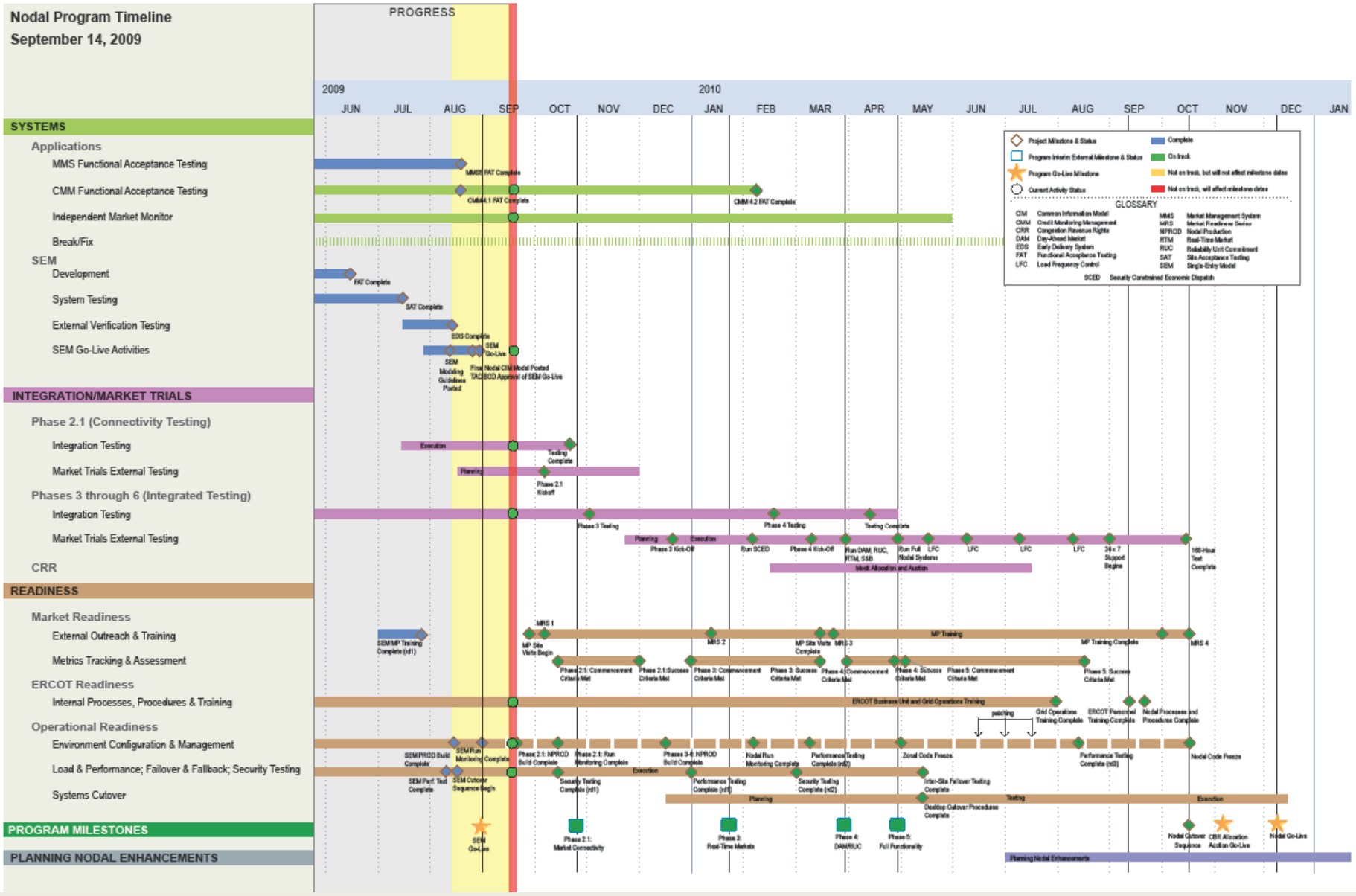
Agenda

- **Program Status**
- **Market Readiness**
- **Traceability**
- **Financials**
- **Appendix**

Nodal Systems Blueprint



Nodal Timeline



Completed Milestones

Program Milestone: SEM Go-Live

- Included the following project milestones
  - Systems/SEM/External Verification Testing
    - EDS complete
  - Systems/SEM/Go-Live Activities
    - SEM modeling guidelines posted, final nodal CIM model posted; TAC/BoD approval of SEM Go-Live
  - Readiness/Operational Readiness/Environment Configuration & Management
    - SEM PROD build complete, SEM monitoring complete
  - Readiness/Operational Readiness/Load & Performance
    - SEM performance test complete, SEM cutover sequence begins

Project Milestones

- Systems/Applications/MMS Functional Acceptance Testing
  - MMS5 FAT complete – Aug. 21
- Systems/Applications/CMM Functional Acceptance Testing
  - CMM4.1 FAT complete – Aug. 21
- Integration Testing
  - >95% of all core integration components installed in iTest; >80% technically verified (e.g., connector to connector); testing complete for all Phase 2 Market Connectivity integration components

Single-Entry Model Go-Live Update

- **SEM went live on time Aug. 31**
  - ERCOT applying NOMCRs to zonal production, nodal test systems
  - Model posting to TSPs
- **Early results (as of Sept. 10)**
  - No significant functional issues
  - 9 of 20 TSPs have submitted 203 NOMCRs
  - Majority of Help Desk tickets have been access-related
    - Week 2 tickets related to submitting data (validation rules)
  - Maximum of 20 concurrent users
    - ERCOT tested more than 50 concurrent users
  - Additional configuration and performance tuning continues to improve performance
- **Monthly touch points will be established with MPs to verify integrity of network model data**

Integration Project Testing Status

- **Currently realigning interface and adapter testing delivery to future program milestones**
  - Phase 2 (Market Connectivity)
  - Phase 3 (Real-Time Market)
  - Phase 4 (Day-Ahead Market, Reliability Unit Commitment, initial Settlements & Billing)
  - Phase 5 (Full functional integration)
- **Completed technical verification testing of Phase 2 interfaces**
  - Some technical connector testing rescheduled to align with Phase 3 and Phase 4
- **No impact to Nodal Program milestones**

Phase 2 Market Connectivity Defect Update

Project	Sub-Project	Status	Open Critical Defects (As of Sept. 8)			
MMS	**Core Application**	• MMS Release 5 with several patches currently being used for Phase 2 testing. • A portion of the outstanding defects have been fixed in a patch that is currently in the MMS FAT environment with testing underway. Once that testing is complete, the patch will be migrated to iTest; remaining defects have been logged with the vendor and are being worked into an upcoming patch.	**MMS5**			
			Sev 1s Sev 2s Sev3s P1/P2	0 2 33		
	MMS UI	• MMS Market Manager UI (MMS MM UI) release 1.16 currently being used for Phase 2 testing. • All outstanding defects have been logged with the in-house development team; development/testing/deployment cycles to address critical defects are in progress.	**MMS MM UI 1.16**			
			Sev 1s Sev 2s Sev 3s P1/P2	0 7 9		
EIP	**EWS-MMS Interface**	• EIP external Web Services spec release1.19 with several patches currently being used for Phase 2 testing. • All outstanding defects have been logged with the in-house development team; development/testing/deployment cycles to address critical defects are in progress.	**EIP1.19**			
			Sev 1s Sev 2s Sev 3s P1/P2	0 1 2		

Upcoming Milestones

Program Milestones

- Phase 2: Market Connectivity

Project Milestones (30 day look-ahead)

- Readiness/Market Readiness/External Outreach & Training
  - MP site visits begin
- Readiness/Operational Readiness/Environment Configuration & Management
  - Phase 2.1 NPROD build complete
- Inclusion of progress measures

Upcoming Program Milestone Definition

Phase 2: Market Connectivity

- **Scope**
  - Market Participant interface testing (API, Market Manager UI)
  - Market System Rules Validation - Phase 1*
- **Objectives**
  - Make available Market Trials environment with latest version of MMS, Market Manager UI and External Web Services
  - Provide MPs access to Market Trials environment to complete development and qualification preparation
- **Schedule**
  - Sept.-Oct.: Bi-weekly Market Calls
  - Week of Oct. 5: Kickoff meeting (MP workshop)
  - Oct. 28: Market Connectivity testing begins

*As defined in MMS – Explanation of Market Participant Submission Items v0.26 document

Upcoming Program Milestone Definition

Phase 3: Real Time Market

- **Scope**
  - MMS-SCED execution
  - SCED results and report publishing
  - CRR auction execution (CRR UI)
  - Outage Scheduler submissions (API, OS RUI)
- **Objectives**
  - Execute real-time functionality on latest versions of EMS and MMS, using common NMMS Network Model
  - Publish SCED results through ICCP and MIS
  - Provide MPs access to Market Trials environment for continued defect resolution of critical Real-Time Outputs from ERCOT systems

Upcoming Program Milestone Definition

Phase 4: Day-Ahead Market, Reliability Unit Commitment

- **Scope**
  - MMS-DAM, DRUC, HRUC, SCED execution
  - Market results and report publishing
  - Initial Settlements & Billing execution
  - Outage and CRR integration
- **Objectives**
  - Execute Nodal Markets on latest versions of EMS and MMS running on an integrated NMMS Network Model
  - Publish SCED results through ICCP and MIS
  - Provide MPs access to Market Trials environment for continued defect resolution of critical Market and Settlement outputs from ERCOT systems
  - Publish initial Settlement statements and extracts

Program Measures

- **Current baseline execution index (BEI) and earned value (EV) measures give equally weighted credit for completed tasks**
- **New performance factor will reflect task's completion percentage, with weighting factor for each task (based on the associated effort)**
- **Weighted percentage-completion data rolled up to summary**
  - Performance factor derived solely from summaries
- **Four projects part of initial performance factor index (PFI) computation**
  - Integration Testing (INT)
  - Market Trials (MT)
  - ERCOT Readiness & Transformation (ERT)
  - Operational Readiness Testing (ORT)

* Reference Appendix slides for additional details regarding PFI calculation process

Performance Factor Index (PFI) Current Status

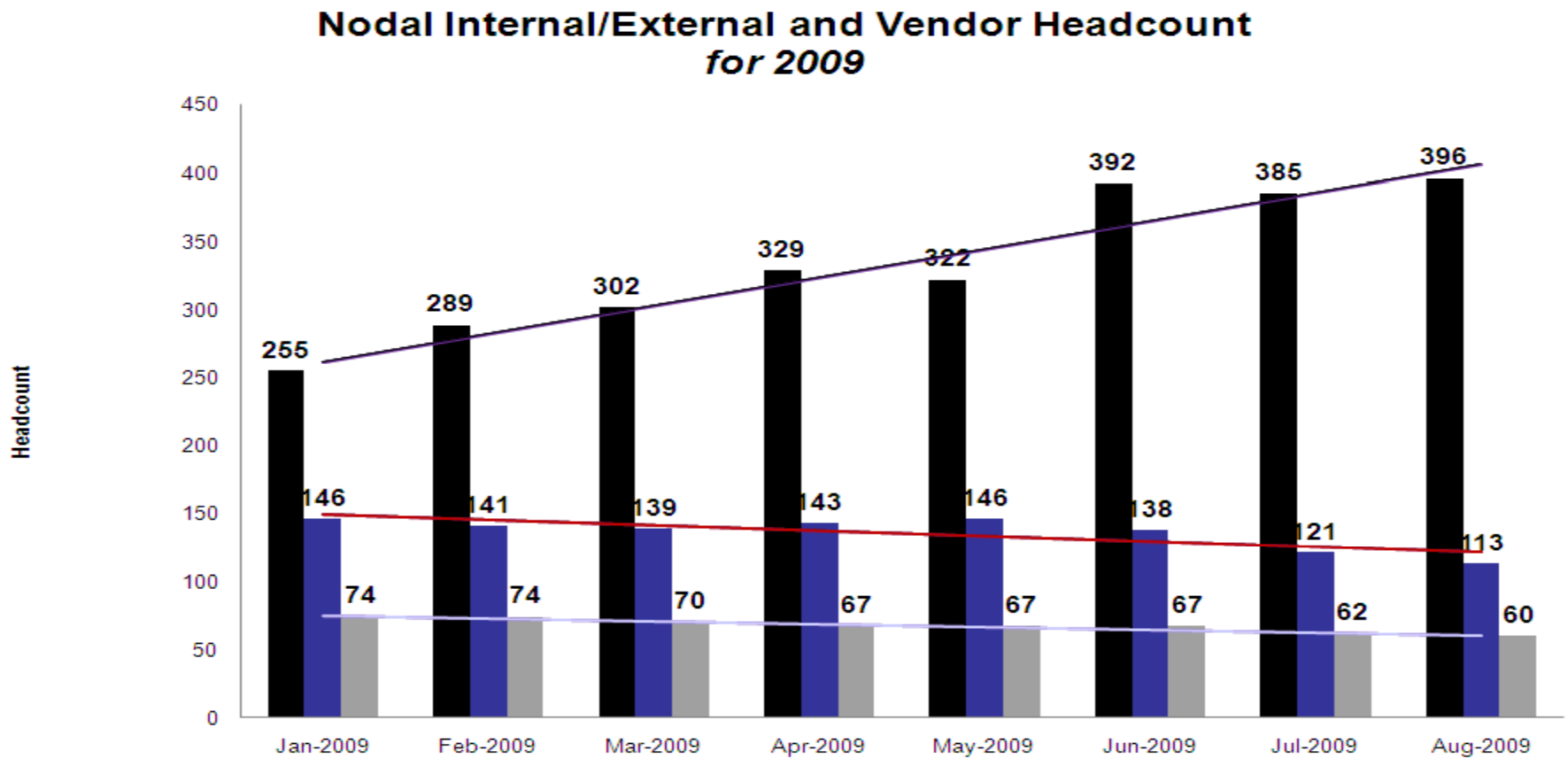
- **Initial baselines and weighting (weighting will be based on initial estimates of effort/work required)**

Project	Weight	Forecast %	Est %	PFI*	Forecast Wgt.*	Est. Wgt.*
ERT	127,359	11.65%	14%	1.20	14,838	17,830
INF	236,728	17.08%	14%	0.82	40,440	33,142
MT	174,399	0%	0%	0.00	0	0
INT	95,145	0%	0%	0.00	0	0
Program	633,631			0.92	55,278	50,972
				** As of July*		

  - PFI 1.00: optimum; shows program effort on track according to estimated work
  - PFI <1.00: program's performance behind budgeted effort; work is slipping based on estimated work
  - PFI >1.00: program's performance ahead of the budgeted effort; work is ahead of budgeted work
  - PFI should be as near to 1.00 as possible (strong estimation, efficient delivery)

NOTE: *PFI data preliminary from PMO ground-up planning efforts; currently being validated by FMO as part of October budget updates.*

Nodal Internal/External and Vendor Headcount for 2009



	Jan-2009	Feb-2009	Mar-2009	Apr-2009	May-2009	Jun-2009	Jul-2009	Aug-2009
ERCOT Employees	255	289	302	329	322	392	385	396
Contingent Labor	146	141	139	143	146	138	121	113
Vendor Labor	74	74	70	67	67	67	62	60

Nodal Program Risks & Issues

- **Immediate**
  - Risk: Reconciling protocols, systems and market expectations
  - Risk: Integration Testing

- **Long-Term**
  - Risk: Data Center capacity concerns

Participant Readiness Touch Points

	2009			
	September	October	November	December
Meetings	• NATF 9/1 • NATF 9/29	• NATF 10/27		• NATF 12/8
Training	• Nodal 101 • LSE 201	• Nodal 101 • LSE 201 • Generation 101 • Basic Training	• Nodal 101 • LSE 201 • Generation 101, 201 • Economics of LMP • Transmission 101 ◆ Settlement Workshops	• Nodal 101 • LSE 201 • Generation 101, 201 • Basic Training • Economics of LMP • Transmission 101
Outreach	• Material preparation • Full schedule confirmation ◆ 3 site visits: w/o 9/28	◆ Readiness Center • Limited ERCOT metrics • 6 site visits	• Additional ERCOT & MP metrics • 6 site visits	• 3 site visits
Market trials	• Last Resource registration data collection window open • Bi-weekly market calls	• Bi-weekly calls ◆ 2010 Market Trials Roadmap: w/o 10/5 ◆ Technical Workshop ■ Market Connectivity open to MPs	• Bi-weekly calls • Voluntary MP connectivity testing ◆ MP Handbooks • *SCED/LFC* • *CRR* • *DAM/RUC*	• Bi-weekly calls • *Outage Scheduler* • *Settlement*

Protocol Traceability Effort Update

Tier 1 Sections				
	Definition	**SME Analysis/Validation**	**Begin Reviews w/Business**	**Target for Reports to NATF**
Section 7	Congestion Revenue Rights	**85-90%**	**In progress**	**Sept**
Section 8	Performance Monitoring	**75%**	**In progress**	**Nov***
Section 3	Management Activities for the ERCOT system	**50%**	**9/15**	**Nov**
Section 4	Day Ahead Operations	**5%**	**9/22**	**Nov (revised)**
Section 5	Transmission Security Analysis and RUC	**5%**	**9/29**	**Nov**
Section 9	Settlement & Billing	**5%**	**10/01**	**Nov**
Section 6	Adjustment Period and Real-Time Operations	**15%**	**10/20**	**Dec**
Section 17	Market Monitoring and Data Collection	**0%**	**10/22**	**Dec**
Section 16.11	Financial Security for Counter-Parties	**0%**	**10/27**	**Dec**

Tier 2 (Moderate Impact): 10, 11, 12, 13, 20, 22 (Dec. '09 completion target)
Tier 3 (Low Impact): 1, 2, 14, 15, 18, 19, 21, 23, 24 (Nov. '09 completion target)

* Delays in approving performance criteria may affect date.

Monthly Financial Review

Steve Byone

Monthly Financial Review: August 2009 Performance

Nodal Program
Approved Forecast to Actual Comparison
Month of August 2009

Line	Cost Summary	Forecast	Actual	Forecast Variance	Forecast Cumulative Variance *(Pending Contingency Mgmt Disposition)*
1	Internal Labor Costs	$2.1	$2.2	-$0.1	$3.5
2	Backfill Labor Costs	0.1	0.1	0.0	-0.2
3	External Resource Costs	5.3	3.6	1.7	11.9
4	Software & Software Maintenance	0.7	1.1	-0.4	0.5
5	Hardware & Hardware Maintenance	0.3	0.4	-0.1	1.9
6	Other	0.0	0.0	0.0	0.4
7	**Sub-total Direct Project Costs**	**$8.5**	**$7.4**	**$1.1**	**$18.0**
8	**Contingency Costs**	**$0.0**	**$0.0**	**$0.0**	**$0.0**
9	Allocations	$0.4	$0.3	$0.1	$1.7
10	Finance Charges	0.9	1.0	-0.1	0.8
11	**Sub-total Indirect Project Costs**	**$1.3**	**$1.3**	**$0.0**	**$2.5**
12					
13	**Total**	**$9.8**	**$8.7**	**$1.1**	**$20.5**

Amounts in millions

Monthly Financial Review
LTD Performance through August 2009

Nodal Program
Approved Forecast to Actual Comparison
Life-to-Date through August 2009

Line	Cost Summary	Forecast	Actual	Forecast Cumulative Variance *(June,July & Aug)*	Forecast Remaining
1	Internal Labor Costs	$47.6	$47.3	$0.3	$37.0
2	Backfill Labor Costs	4.9	4.9	0.0	2.8
3	External Resource Costs	240.6	237.1	3.5	48.4
4	Software & Software Maintenance	28.1	27.1	1.0	10.0
5	Hardware & Hardware Maintenance	48.0	48.1	-0.1	8.0
6	Other	2.0	1.9	0.1	0.6
7	**Sub-total Direct Project Costs**	**$371.2**	**$366.4**	**$4.8**	**$106.9**
8	**Contingency Costs**	**$0.0**	**$0.0**	**$0.0**	**$58.6**
9	Allocations	$18.5	$18.6	-$0.1	
10	Finance Charges	20.6	20.7	-0.1	
11	**Sub-total Indirect Project Costs**	**$39.1**	**$39.3**	**-$0.2**	
12					
13	**Total**	**$410.3**	**$405.7**	**$4.6**	

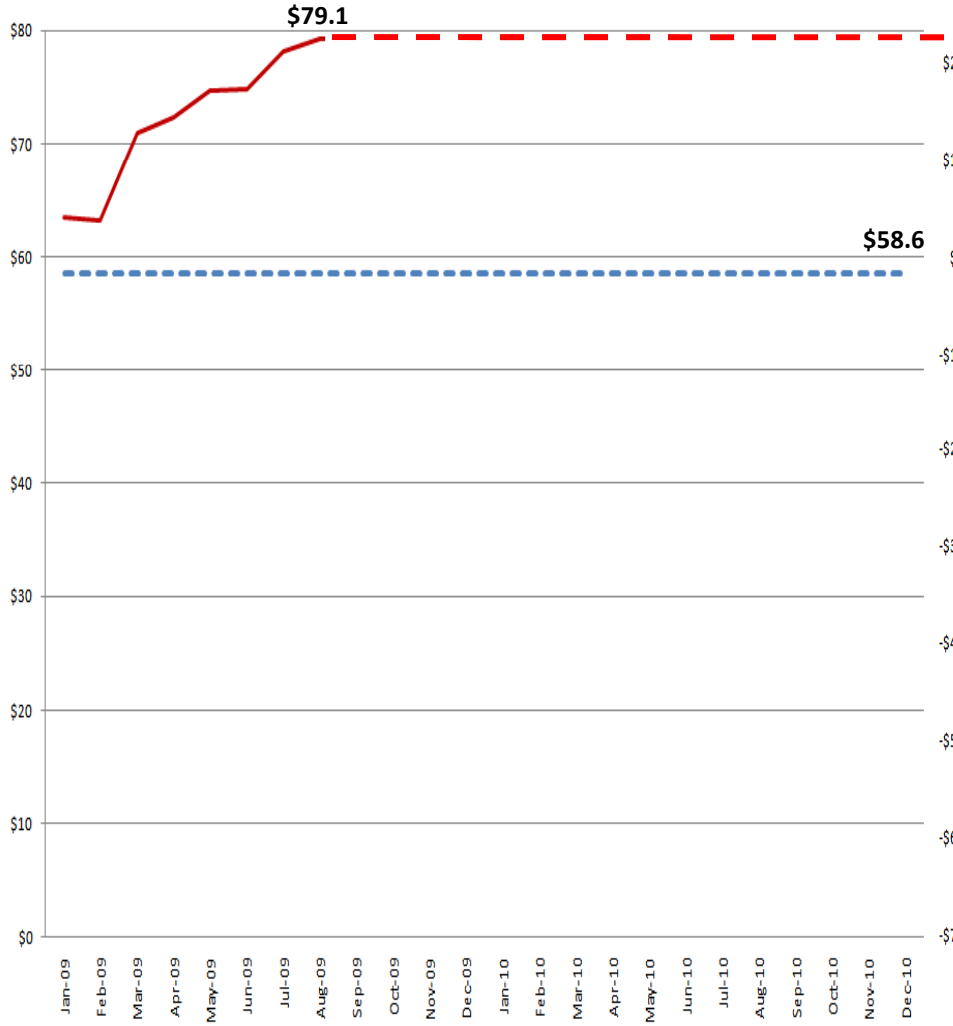
Amounts in millions

Note 1: "Forecast Remaining" allocations and finance charges will be determined upon final program EAC.

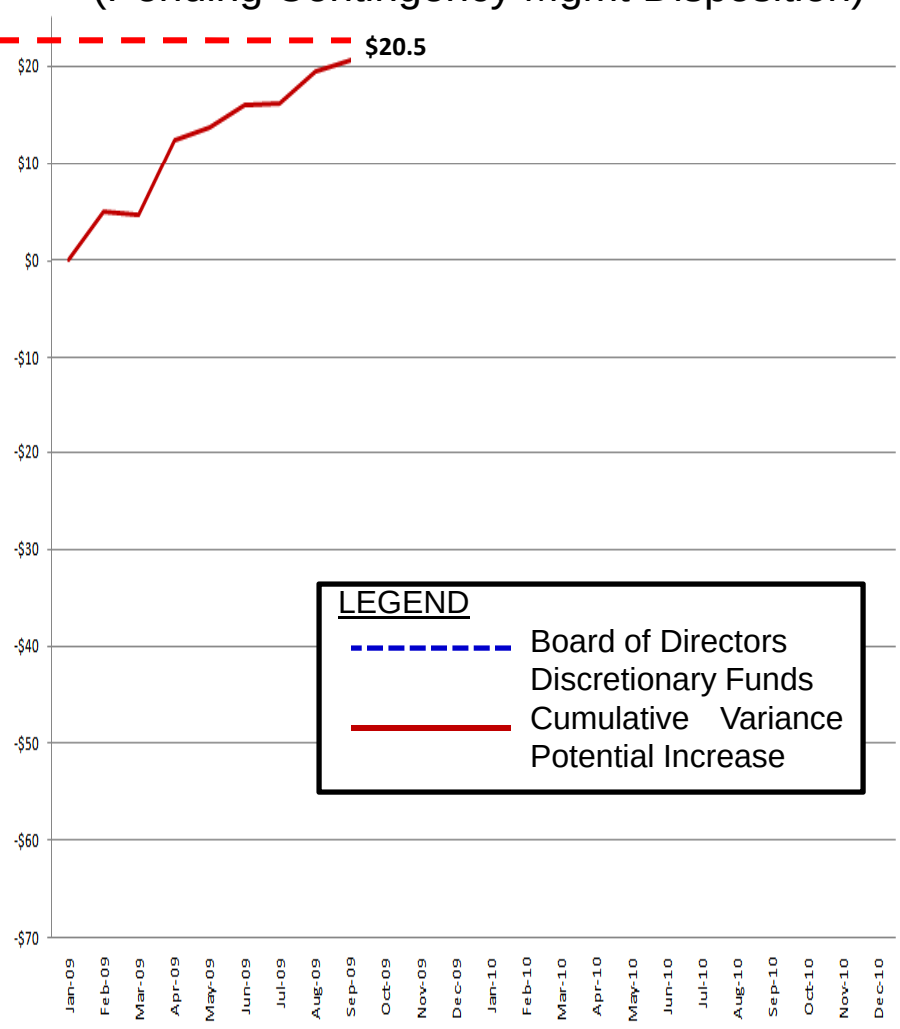
Note 2: June-Aug Forecast Cumulative variance column represents comparison of actual costs incurred to the reforecast budget developed in June 2009.

Board Discretionary Fund

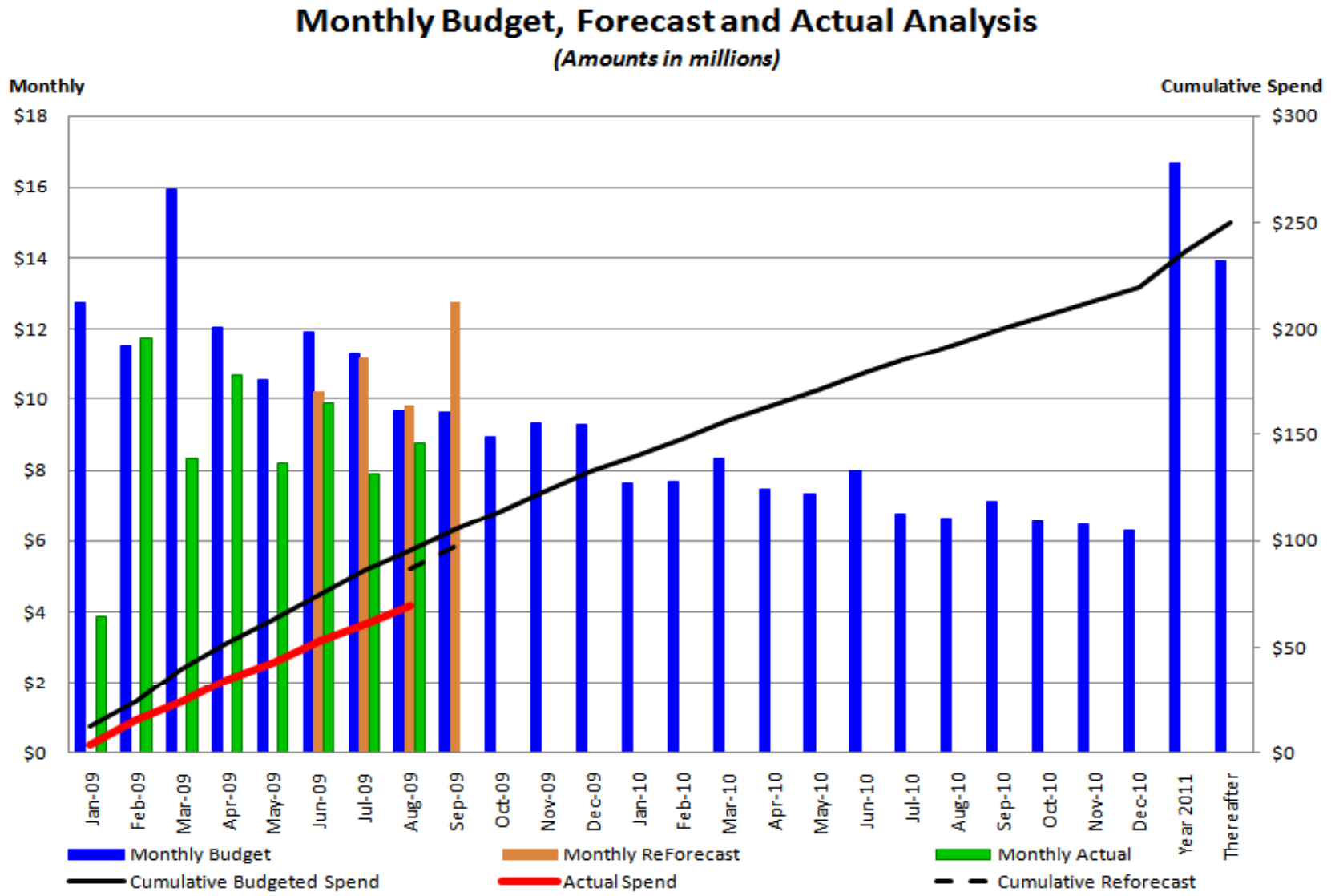
Current View



Detail of Cumulative Variance (Pending Contingency Mgmt Disposition)



Program Cost Management



Questions?

Appendix

Outreach Candidates

ERCOT is proactively contacting the following entities to request a site visit. Additional participants will be accommodated where the schedule permits.*

- **AEP**
- **ANP**
- **APX**
- **Austin Energy**
- **BP**
- **Brazos**
- **BTU**
- **Calpine**
- **CPS Energy**
- **Constellation**
- **Direct Energy**
- **Eagle Energy**
- **Exelon**
- **Garland**
- **LCRA**
- **Luminant**
- **Nextera/FPL Energy**
- **NRG Texas**
- **Occidental**
- **Shell**
- **STEC**
- **Suez**
- **Tenaska**
- **Topaz Energy**

* Represents:
  - Level IV QSE
  - NATF participation
  - Vendor diversity

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	Tier 1: 10/5/09 Tier 2: 12/15/09 Tier 3: 11/30/09	8/7/09 – Work is underway to trace protocols, requirements and business processes alignment analyses are in progress.
2. Add team members to the nodal program with Texas market experience to ensure readiness for Market Trials. SMEs will report requirements to testing traceability gaps to ERCOT business owners for resolution.	B. Day K. Farley	Ongoing	8/7/09 – SMEs were added to the team in May. 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	4/13/09 Risk incorporated into the set being reported externally; will be maintained actively.

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	9/2/09 – Planning of Test phases and associated work plan has been completed Execution of work plan, with specific focus on October Market Trials functionality has begun

ERCOT-Wide Risk:
Data Center Capacity Concerns

◇ Potential Milestone Impact: Nodal Go-Live

Risk: Data Center Capacity Space Concerns	Data center capacity, space, and power may be inadequate for Nodal go-live, unless plans for expansion are adequate.

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

Mitigation Plans	Who	Target Date	Current Status
1. Establish an Information Lifecycle Management approach to manage the life cycle of data being managed.	D. Forfia	Implementation expected Q1 2010 for Retail Applications	ERCOT project PR 90006_01 Commercial Systems Information Lifecycle Management Project will be presenting as an update during the October Board of Directors Meeting, and will request Execution and Funding approval at the November Board of Directors Meeting.
2. Expand current data center space, and build out new data center, to increase ERCOT data center capacity.	D. Forfia	TCC1 build out is complete Bastrop DC in production mid - 2011 TCC3 in production mid-2011	TCC Expansion commissioned as of 9/2/09. TCC1 expansion and risk-mitigation steps for Met Data Center provide sufficient space for Nodal Go-Live in December 2010. Relocation to the new data centers occurs in mid-2011 after Nodal Go-Live.
3. Validate and monitor Nodal data capacity assumptions for Go Live	D. Forfia	Ongoing	7/17/09 Status reports are provided to the Board of Directors in executive sessions.

PFI Calculation Process: Step 1

- For each project *Forecasted Hours to Date* and *Total Forecasted Hours* will be transferred from the EAC (i.e., budget) documentation, from which a *Forecast Percent Complete* will be computed

Project	BL Start	BL Finish	Weight	Fcst Hrs to Date	Total Fcst Hrs	Fcst %
ERT	1-Jun-09	31-Dec-10	127,359	14,838	127,359	11.65%
ORT	1-Jun-09	31-Dec-10	236,728	40,440	236,728	17.08%
MT	1-Oct-09	1-Dec-10	174,399	0	174,399	0.00%
INT	1-Sep-09	31-Jul-10	95,145	0	95,145	0.00%

NOTE: *PFI data preliminary from PMO ground-up planning efforts; currently being validated by FMO as part of October budget updates.*

PFI Calculation Process: Step 2

- At the end of each month the PMs will use agreed upon criteria to determine their *Estimated Percent Complete*, which when divided by the *Forecast Percent Complete* will determine the *PFI* for each project

Project	Fcst %	Est %	PFI
ERT	11.65%	14.00%	1.20
ORT	17.08%	14.00%	0.82
MT	0.00%	0.00%	0.00
INT	0.00%	0.00%	0.00

- It is critical that these *Estimated Percent Completes* are arrived at using agreed upon definitive criteria so that they accurately represent the status of the project

NOTE: *PFI data preliminary from PMO ground-up planning efforts; currently being validated by FMO as part of October budget updates.*

PFI Calculation Process: Step 3

- The individual *PFIs* for each project will be used to compute the *Nodal Program PFI* by applying an hours based weighting factor for each project
- *Forecast Weight* will be determined by multiplying the *Forecast Percent Complete* by the *Weight* (Work) for the project
- *Estimated Weight* will be determined by multiplying the *Estimated Percent Complete* by the *Weight* (Work) for the project
- These 2 weights will be totaled for the Nodal program and the *Estimate Weight* divided by the *Forecast Weight* will produce the *Nodal Program PFI*

Project	Weight	Fcst %	Est %	PFI	Fcst Wgt	Est Wgt
ERT	127,359	11.65%	14.00%	1.20	14,838	17,830
ORT	236,728	17.08%	14.00%	0.82	40,440	33,142
MT	174,399	0.00%	0.00%	0.00	0	0
INT	95,145	0.00%	0.00%	0.00	0	0
Program	633,631			0.92	55,278	50,972

NOTE: *PFI data preliminary from PMO ground-up planning efforts; currently being validated by FMO as part of October budget updates.*