The Electric Reliability Council of Texas

Utilicast Nodal Program Oversight Report No. 8

New Integrated Schedule and Budget Assessment

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Public Document

Utilicast

Contents

1. Executive Summary

Scope and Approach

The objective of Nodal Market Oversight Report Number 8 is to provide an independent assessment of the new integrated schedule and associated budget. Specifically, Utilicast has been asked to provide an opinion on the following areas:

- Is the project schedule realistic and achievable given the tasks that need to be completed?
- Is the cost estimate reasonable based on the proposed workload?

The Utilicast project team, over a six week period, conducted a high level review of the Nodal Program including objectives, plan and budget to determine if ERCOT is better positioned to successfully implement the program given the new budget and schedule. To achieve this, the project team adopted the following approach:

- Confirmed the key program objectives
- Conducted a high level assessment of current state of the nodal program
- Selected a sample of three projects from the nodal program and conducted a more detailed assessment of each project's objectives, plan and budget

- Confirmed the findings and recommendations based on detailed project assessments

Findings

The findings from this review are as follows:

Review Area	Findings
What went wrong with the original schedule and budget?	• The original program was poorly estimated. • The controls in place for the original program were inadequate for the scale and complexity of the undertaking. • The Nodal Program is more complex than originally anticipated.

What is the current state of the Nodal Program and what work needs to be completed?	• ERCOT has made progress in implementing strong program controls.
	  ◦ There is clear ownership and accountability for the delivery of the Nodal Program at executive level.
	  ◦ The Program Management Office (PMO) has been restructured and has implemented project controls consistent with the complexity and scale of the program.
	  ◦ A Nodal Program Controllers Office has been established and cost tracking and variance analysis and reporting procedures have been implemented to improve budget transparency and improve financial reporting.
	• The Nodal Program has been able to make some notable progress such as generating Locational Marginal Pricing (LMPs) and conducting mock markets.

Is the new estimate a "good" estimate?	• The new Nodal Program budget of $660 million, which includes both direct and indirect costs (indirect costs include finance charges), is a reasonable "not to exceed" estimate. • The new cost-to-complete estimate may be excessive and additional optimization is possible.

Review Area	Findings

Is the new schedule a "good" schedule?	• There are a number of risks that could impact the new Nodal Program schedule. These risks include:
	  • Integration project has been identified as the highest risk to the overall Nodal Program schedule.
	  • Scope changes may adversely impact the schedule. The Nodal Project requirements have not been finalized and locked down.
	  • Lack of available data center space to expand the current IT infrastructure (environments).
	  • Market Participants may extend the Early Delivery System (EDS) Process indefinitely and impact the go live schedule.
	  • Key Nodal Program resources may be reassigned to zonal program work.

Recommendations

Based on our findings we provide the following recommendations:

Review Area	Recommendations

Is the new estimate a "good" estimate?	1. The individual project budgets should be challenged in the following areas:
	  a. Vendor contracts
	  b. Contract staff
	  c. Internal staff

Is the new schedule a "good" schedule?	2. Given the potential risks of the integration phase of the Nodal Program, this area should be reviewed in detail and be the subject of Oversight Committee Report 9. 3. Scope for the December 2010 release of the Nodal Program should be agreed and locked down with any proposed changes subject to a strict change control process. 4. No enhancements should be made to the zonal market applications or processes unless assessed as business critical. 5. There should be immediate investment in new data center capacity to accommodate the expansion of IT infrastructure required for the Nodal Program and continuation of zonal operations. 6. Given the risks of Market Participant not accepting "Go-live" criteria, this area should be subject to a detail review.

Special Request Reviews

The Nodal Oversight Committee requested that Utilicast assist them in their due diligence of the proposed Nodal Program schedule and budget by conducting special reviews of the following areas:

- Could ERCOT save costs and improve the implementation schedule by adopting and implementing the business process and applications an existing Independent System Operator (ISO) or Regional Transmission Organization (RTO) that has a proven nodal market.

- Would the engagement of a systems integrator service provider improve the probability of the Nodal Program being completed on time and on budget?

The findings from these special reviews are as follows:

Review Area	Findings and Recommendations
Should ERCOT adopt and implementing and existing RTO's business processes and applications	• This option is not recommended at this time • Although there are benefits to adopting an existing RTO's market construct, there are a number of potential impacts to consider that may make this option prohibitive. *The benefits and potential impacts of this option are detailed in Section 6 – Special Reviews of this report.*
Should ERCOT engage a system integrator	• This option is not recommended at this time • The benefits of a system integrator are industry knowledge and experience of delivering large projects on time and on budget. • The impacts to the program schedule, the estimated transition costs and the potential impact on project resources may make this option prohibitive. *The characteristics of a System Integrator and the areas to consider for this option are detailed in Section 6 – Special Reviews of this report.*

2. Scope and Objectives

ERCOT has engaged Utilicast to perform periodic, independent reviews of its Texas Nodal Market Redesign Program (Nodal Program) that covers the program's plans, project reporting, progress in achieving milestones, and other relevant areas. The purpose of the reviews is to provide the Nodal Oversight Committee and ERCOT's Board of Directors with independent assessments on the Nodal Program and to further enhance their confidence in the Nodal Program's progress. Utilicast will also assist ERCOT's management where possible by providing recommendations to improve the program. Utilicast is to provide periodic reports and in-person monthly presentations of findings and recommendations to the Nodal Program Oversight Committee, and will timely respond to special review requests made by the Committee.

The objective of Nodal Market Oversight Report Number 8 is to provide an independent assessment of the new integrated schedule and associated budget. Specifically, Utilicast has been asked to provide an opinion on the following areas:

- Is the project schedule realistic and achievable given the tasks that need to be completed?
- Is the cost estimate reasonable based on the proposed workload?

Utilicast has been requested to provide the following deliverables as part of this engagement:

- Findings on the current state of the Nodal Program including level of completion to date and adequacy of the organizational and control structures in place to complete the program
- Findings and recommendations on the proposed integrated schedule and associated budget
- Improvement opportunities

This document serves as the final deliverable of Market Oversight Report Number 8 and contains the final versions of each of the project deliverables as listed above.

3. Approach

The Utilicast project team, over a six week period, conducted a high level review of the Nodal Program including objectives, plan and budget to determine if ERCOT is better positioned to successfully implement the program given the new budget and schedule. To achieve this, the project team followed the approach below:

Tasks	Description
Confirmed the key Nodal Program objectives	Confirmed with ERCOT's Management Team and the Nodal Oversight Committee the areas of focus for Nodal Program Oversight Report 8, specifically to address four fundamental questions for the ERCOT stakeholders: 1. What went wrong with the original schedule and budget? 2. What is the current state of the Nodal Program? 3. Is the new estimate a "good" estimate? 4. Is the new schedule a "good" schedule?

High level assessment of the current state of the Nodal Program	Utilicast reviewed Nodal Program and project documentation and interviewed program staff, project managers, business owners and other stakeholders to assess the following aspects of the Nodal Program.
	
	1. Program Objectives & Project Structure
	• Are the Nodal Program objectives and success criteria clearly stated?
	• Is the Nodal Program comprised of the right set of projects to achieve the stated program objectives?
	  • Are any projects missing?
	  • Are all of the projects necessary?
	  • Are the projects sequenced correctly?
	• Has accountability and executive sponsorship been clearly assigned and are program roles understood and clearly delineated?
	
	2. Program Controls:
	• Is there an integrated project schedule that is managed to a critical path?
	• Is the schedule actively monitored, updated and controlled?
	• Is there a documented change management process that is operating effectively?
	• Can project managers update and modify the schedule?
	• Are actual costs tracked and variances to the budget managed and reported on a routine basis?
	• Do project managers have visibility and accountability of costs they control?
	
	3. Project Plans:
	• Do individual project plans exist?
	• Did the project managers follow the project planning guidelines?
	• Did the project managers use an appropriate level of detail in the work breakdown structures?
	• Did the project managers use a valid method to estimate effort and duration?
	
	4. Project Estimates:
	• Do individual project budgets exist?
	• Did the project managers follow the budgeting guidelines?
	• Did the project managers use a valid method to estimate the cost?

Tasks	Description
	• Are the cost estimates consistent with the task level effort and duration estimates? **5. Resource Plans:** • Do individual project resource plans exist? • Did the project managers estimate resource requirements for each task? • Did the project managers consider the complexity and skill level required as well as number of resources required? • Does the program staffing plan reflect the requirements of the individual projects? **6. Risks:** • Does an impact analysis exist? • Are project level risks detailed and analyzed? • Are risk mitigation strategies in place? • Is contingency build into the schedule and cost estimates?
Detailed assessment of 3 projects	To validate the findings from the high level assessment in more detail, Utilicast took a sample of three Nodal Program projects. Detailed project documentation was reviewed to ensure that the status reports, cost estimates and work plans were verifiable, reasonable and realizable. The projects were selected based upon size (cost-to-complete), complexity of the work plan and importance to the overall success of the Nodal Program. The selected projects were: System Integration, Market Management System, and IT Infrastructure.
Confirm findings and recommendations	Utilicast summarized the findings from the high level and detailed assessments. The findings were then reviewed with the program sponsors and PMO leadership to gain additional insight and input. Utilicast will note any objections and/or exceptions to the findings and recommendations and included them in the final presentation.
Present findings and recommendations	Utilicast prepared and presented to the Nodal Program Oversight Committee of the Board a written report with the findings and recommendations from this review. Utilicast will also prepare a PowerPoint presentation summarizing the findings and recommendations for discussion with the Nodal Program Oversight Committee, the ERCOT Board, ERCOT Management, the Executive Steering Committee and other stakeholders.

4. Findings

The findings have been organized to address four fundamental questions for the ERCOT stakeholders:

1. What went wrong with the original schedule and budget?
2. What is the current state of the Nodal Program and what work needs to be completed?
3. Is the new estimate a "good" estimate?
4. Is the new schedule a "good" schedule?

Findings	Descriptions
1. What went wrong with the original schedule and budget?	
The original program was poorly estimated.	The objective of this assessment was to identify the root causes and issues related to the increased program budget and schedule which, if not corrected, might lead to continued schedule delays, cost overruns and missed functionality. • The original program estimate was developed when the program was at the conceptual level without a full understanding of the business processes and system requirements. – *Industry research indicates that projects estimated at the conceptual stage can be as much as 2 to 3 times above or below actual costs to complete*. • The initial assumption that the Vendors' baseline applications would align with a majority of ERCOT's Nodal Program requirements was incorrect. ERCOT has effectively custom built its core applications using the vendor baseline software as its starting point. – *Industry research indicates that applications that require the customization of vendor source code can often exceed the cost of pure custom developed applications.* • The original compartmentalized project development approach did not take into account the complexity of integrating 16 new systems with 36 interfaces and 344 functional data flows. As a result, the integration effort and costs were under estimated. – *Each additional software vendor increases the complexity of the integration effort.* • The system requirements were never agreed and locked down and a strict change control process to avoid unnecessary scope creep was not implemented. As a result, the project teams and their vendors managed a dynamic product development life cycle with an evolving set of often ambiguous requirements which has created re-work, extended delivery schedules, and increased costs. – *Industry research indicates that changing or unclear requirements is one of the top three reasons cited for projects missing schedule and overruns on budget.* • The project managers were not provided with consistent or complete project budgeting or planning guidelines resulting in cost items not being included in the original estimate.

Findings	Descriptions
The controls in place for the original program were inadequate for the scale and complexity of the undertaking.	• There was no integrated project schedule for the original Nodal Program plan. • The project schedule and budget were not properly monitored or managed. • There was no consistent or routine variance reporting process to identify missed milestones and budget overruns. • There was no transparency into the amount of work actually completed and the level of effort required to complete the implementation. • Products and vendors were selected and brought onto the project before requirements were sufficiently developed.

The Nodal Program is more complex than originally anticipated.	• By its own definition, the Nodal Program is a multifaceted set of integrated projects implementing an intricate set of business processes and supporting applications for the operation of wholesale power and ancillary services markets. The Nodal Program includes the concurrent implementation of:
	  • Nearly a full replacement of wholesale market and reliability functions - 16 systems with 36 interfaces and 344 functional data flows
	  • Multiple integrated vendor products – ERCOT introduced several new vendors to their existing set.
	  • A new integration technical architecture – TIBCO is being deployed for the first time at ERCOT.
	It is difficult to find an ISO/RTO organization either in the US or internationally, that has concurrently implemented a new Energy Management System, Real-Time Energy Market, Day-Ahead Energy, Ancillary Service Markets, Congestion Management, Market Settlements and a leading practice integration architecture, while continuing to operating existing markets. These projects are typically phased in over a number of years
	• There are also several industry firsts being implemented which adds to the program's complexity. These include:
	  • Common Information Model (CIM)
	  • Single Entry Model
	  • Automated CMM

Findings	Descriptions
2. What is the current state of the Program and what work needs to be completed?	
ERCOT has made notable progress in addressing the findings in the "what went wrong with the original schedule and budget?" Please see section above **There is clear ownership and accountability for the delivery of the Nodal Program at executive level.** **The PMO has been restructured and has implemented project controls consistent with the complexity and scale of the program.** **A Nodal Program Controllers Office has been established. Cost tracking and variance reporting procedures have been implemented to improve budget transparency and improve financial reporting.**	• The new Nodal Program schedule was developed using an integrated schedule methodology with a high level of PMO oversight. • The project managers have consistently followed and are managing the project schedule according to the PMO scheduling guidelines. • The PMO is now staffed with experienced project schedulers and the integrated schedule is being consistently controlled, managed and reported. • The integrated schedule includes intra-project predecessor and successor tasks and project linkages which provide a high degree of confidence that the projects are sequenced appropriately and that the critical path has been identified and can be managed. Project manager interviews confirm that the critical path items are communicated and understood and have a high level of accountability and ownership. • Program and project status reporting procedures have been developed, implemented and are being followed. Weekly status updates are being prepared and risks and issues are being identified, managed tracked and logged. • The PMO and Nodal Finance Office have established key controls including status reporting, schedule management and cost tracking procedures. These controls provide transparency and enable timely and accurate reporting. The new controls also enable more thorough risk and issue management.
The Nodal Program has made notable progress.	The Nodal Program has made notable progress in implementing system reliability and nodal based wholesale power and ancillary service markets. **Year** — **Accomplishments** 2007 • Real-time status and validation of generation and transmission data complete (EDS 1) • Real-time market execution and pricing operational • Real-time LMPs posted 2008 • Hardware, software and data migration complete • Mock Congestion Revenue Rights auction • Executed Day Ahead and Adjustment Period Market in May • Real Time Market and Load Frequency Control of entire ERCOT system for 2 hours in June • CIM schema finalized • State Estimator standard achieved for first time with improved telemetry, reaching the quality measure of 97% convergence

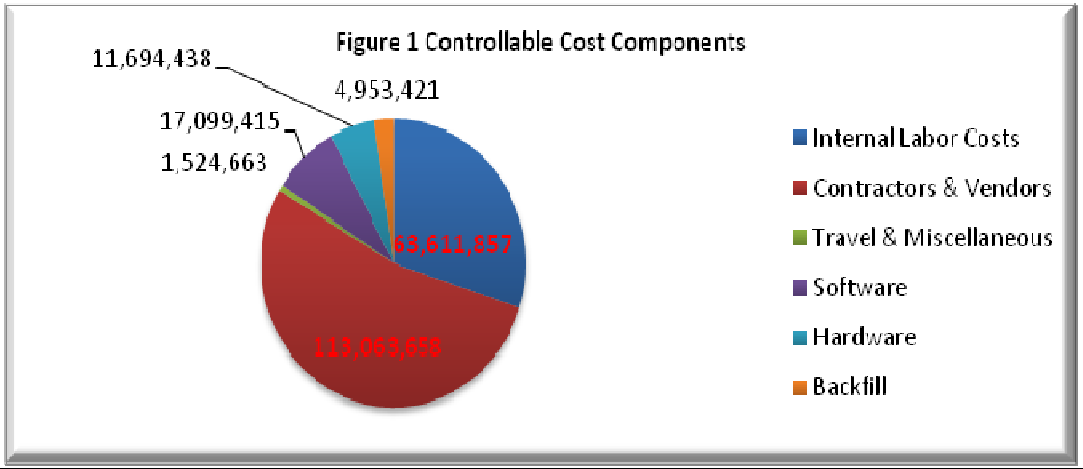
Findings	Descriptions
	• System Operations Testing Environment (SOTE) available for TSP access • 75-80% of vendor software delivered to ERCOT
What work needs to be completed? **The Nodal Program has spent $263M or 55% of the controllable cost portion of the new Estimate at Completion (EAC). $212M remains to be used. (see Table 1 below)** *Project controllable costs do not include finance charges, allocations, and program contingency.* **85% of the remaining budget forecast is comprised of internal labor, contract labor, and vendor costs.**	The following high level tasks need to be completed for the Nodal Program Implementation • Requirements and design documentation are essentially complete but are still evolving due to scope changes. • ERCOT reports that 75% of application development has been completed. • The applications are at various stages of FAT Testing. • ERCOT reports that 4% of the integration is complete – 96% to be completed. • Initial nodal overview training has been provided but the majority of the ERCOT and market participants training remains to be completed. • The majority of the infrastructure hardware and software has been purchased, but, space and power limitation must be addressed before the new infrastructure environment can be completely built out. There is currently no assessment of how much of the work has been completed. Utilicast has held discussions with the PMO and project managers and reviewed of the requirements and design documentation, schedules and budgets. These actions provide reasonable evidence that the majority of the requirements, design and development work has been completed. Completion of application development, application testing, integration, infrastructure build, and training comprise the majority of the work to be completed in 2009 and 2010. Work to establish an earned value metric, which will provide an indication of the relationship between the amounts of money spent and the work completed for each project is in progress. In addition, the PMO maintains a running log of milestones “expected to be achieved”, “milestones achieved” and “milestones missed” for each project. This log provides an indication of project progress in relation to the schedule. Utilicast will continue to work with the PMO and project managers to review the earned value metrics and maintain a reasonable estimate of the work that has been completed and the work that needs to be finished. Table 1 below provides a summary the controllable costs for each project. The table includes the total Estimate at Completion (EAC) together with the total spend to date and the remaining budget for each project. Controllable costs include internal and contract labor, vendor charges, travel, hardware, software, and backfill expenses. Finances charges, corporate allocations and program contingency have been excluded to provide a better indication of the costs that the project managers are responsible for managing. The budget amount remaining for the Nodal Program is $212M. This represents the project managers forecasted “cost-to-complete.”

Findings	Descriptions

Table 1 New Nodal Controllable EAC

Texas Nodal Project - Budget Analysis Project	Total EAC	Remaining Budget	Used Budget	% Remaining	% Used
COMS	$29,716	$13,889	$15,827	53%	47%
CRR	$8,980	$2,135	$6,845	76%	24%
EDS	$37,179	$26,769	$10,410	28%	72%
EDW	$7,128	$3,935	$3,193	45%	55%
EIP	$26,831	$7,394	$19,437	72%	28%
EMS	$36,440	$12,706	$23,734	65%	35%
ERT	$20,100	$9,404	$10,696	53%	47%
INF	$132,760	$52,461	$80,299	60%	40%
INT	$42,229	$22,233	$19,996	47%	53%
MER-TRN	$11,021	$6,051	$4,970	45%	55%
MIS	$6,096	$1,160	$4,936	81%	19%
MMS	$79,863	$33,176	$46,687	58%	42%
NMMS	$16,364	$5,138	$11,226	69%	31%
PC	$20,556	$15,554	$5,002	24%	76%
Totals	$475,263	$212,005	$263,258	55%	45%

Figure 1 below provides a breakdown of the Program EAC controllable costs components. The internal labor, external labor and vendor components represents more than 85% of the remaining forecasted expenditure and is consistent with the finding that the majority of the Hardware and Software has been purchased and the majority of the work to be completed is labor intensive testing, integration and training related.



Findings	Descriptions
3. Is the new estimate a "good" estimate?	
The new Nodal Program budget is a reasonable "not to exceed" estimate. **The new "cost-to-complete" estimate may be excessive and additional optimization is possible.** **Vendors are currently on 'product delivery contracts' that do not recognize their long-term financial and strategic relationship with ERCOT.**	• The new Nodal Program budget was developed using a well defined and managed "bottoms up" estimating process. The Nodal Finance Office developed and communicated budgeting guidelines, which were consistently followed and implemented by the project managers. Detailed EACs were developed using monthly resource requirements, and reasonable internal and external labor rates. • Project Managers estimated the effort required to complete each task. While there was no standard process for estimating the effort required based upon complexity of the task or the quality and skills of resources available, project manager interviews confirmed that the project level estimating processes were reasonable. • The budgeting guidelines encouraged project managers to "keep cost-consciousness" in mind and avoid a "finish at all cost" or "cost is no object" mentality, however, a "top down" challenge process was not used to ensure that project level 'padding of the budgets' did not occur. This lack of challenge and budget verification together with the allocation of the majority of the project staffing resources to the Integration budget (for the entire integration test and EDS project periods) without a corresponding task assignments and work flow plan is a concern that excessive labor expenses may be included in the Integration and EDS EACs. • Analysis of the monthly program resources forecasts for 2009 and 2010 indicates that on average 250 ERCOT Full Time Equivalents (FTEs) are allocated to the project through the end of 2010. The external contract FTEs are forecasted at a high of 220 in early 2009 and slowly reduces to 60 at the end of the project. These forecasts are based on the assumption that a large number of resources are required for integration and that each project must retain a core team of dedicated developers and testers for the fixes required during integration test and EDS. There was limited analysis of the workflow and resources required for integration testing phase of the program and there has been no determination of what skills sets are required to complete the designated tasks. Experience suggested that a project team in excess of 100 FTEs may not be warranted for this integration and that a process to aggressively manage the roll-off of contract labor and the engagement and training of EROCT employees to their operations roles during integration is a more effective use of resources. • The internal, contract labor and vendor costs-to-complete were reviewed. The vendor budgets for the Nodal Program have increased by 40% rising from $60M to more than $98M with the introduction of the new budget. The majority of the vendor contracts are time and material based fees with higher than expected blended resources rates. In the detailed assessment we found that a key vendor with a current spend rate in excess of $300,000 per week was seeking to increase their blended rate by an estimated 11%. These contracts are designed for a once off delivery of the application and do recognize that most of these vendors will be in a long-term relationships with ECORT (estimated at 3-5 years), guaranteeing long-term revenues to develop, maintain, support and enhance their products. ERCOT should consider renegotiating its contracts to reflect the strategic nature of its vendor relationships.

Findings	Descriptions
4. Is the new schedule a "good" schedule	
There are a number of risks that should they crystallize will impact the new Nodal Program schedule. The risks identified during this assessment are as follows: • **There is a high risk that integration project may impact overall project schedule.** *The integration timeline is aggressive and the project does not have a clearly defined work and resource plan* • **Scope creep may adversely impact the schedule. The Nodal Project requirements have not been agreed, finalized and locked down.** - *Industry Analysis indicates that more than 50% of Information Technology development and implementation projects fail to meet schedule, budget or functionality commitments. Two of the top three reasons cited for project failure are incomplete requirements or specification and changing requirements or specifications. – FERC Report on IT Management Best Practices for Power System Operators.* • **Stability and the ability to physically expand the current IT infrastructure (environments) is a risk to the Nodal Program schedule.**	A detailed integrated project schedule has been developed and appropriate controls have been established to ensure that the program schedule and budget can be effectively managed, however, the complexities of the integration process, infrastructure constraints, competing zonal enhancement priorities, changes in system requirements, uncertainty regarding EDS exit and go-live criteria, and post-go-live resource constraints introduce significant schedule risk (and corresponding budget risk), which must be addressed. Industry experience, PMO, project managers, and other stakeholder interviews, corroborated by schedule and project design reviews confirm that Integration is considered to be a high risk for the Nodal Program. There are several factors, which lead to this conclusion: • Although the integration team is developing an implementation plan, the plan has yet to be completed. • Integration has not been a priority of the nodal project teams and vendors. The integration approach does not assign enough integration testing and planning responsibility and accountability to the individual projects. • The resource plan has not been refined to reflect the number of FTEs or skills required for a successful integration project. • The integration technical approach (TIBCO) has not been fully proven at ERCOT and there are questions over its viability. • The "to be" nodal business processes have not been completely defined making the sourcing of test data and the development of end-to-end integration test cases and scripts difficult. There are 90 business days allocated in the integrated project schedule to complete end-to-end integration testing prior to the start of the EDS period. The complexity of the Nodal Program raises concerns that 90 business days will not be sufficient if : 1. Integration testing does not commence during application development and testing. 2. Issues raised on the viability of integration technical solution are not resolved. 3. Detailed and resource specific integration testing plan is not developed and approved. The Nodal Program requirements continue to change and evolve resulting in application requirements changes that impact setting a firm schedule and accurate budget. • More than 160 Nodal Protocol Revision Requests (NPRRs) have been introduced since the original Nodal Protocols were approved. While these NPRRs have been approved and factored into the current application designs, schedules and budgets, there is a high risk that new NPRRs will continue to be introduced during integration and in particular EDS. There has

Findings	Descriptions
• **There is a risk that Market Participants may extend the EDS Process indefinitely and impact the go live schedule. -** *Market Participants who are not ready to operate in the Nodal Market or not 100% satisfied with the Nodal design may extend EDS.* • **There is a risk that key Nodal Program resources may be reassigned to zonal operations enhancements and potentially impacting the Nodal Program schedule.**	not been a declaration that Nodal Protocols have been agreed and 'locked down' to limit the changes in requirements, defer enhancements and provide a stable set of requirements for the December 2010 "go-live". • White papers and System Implementation Group (SIG) Papers with requirements impacts continue to surface can require significant design changes. Again there has not been a declaration to limit the changes in requirements, defer enhancements and provide a stable set of requirements for the December 2010 "go-live". • The applications requirements were derived directly from the Nodal Protocols and existing zonal business processes not from a detailed analysis of "to be" nodal business processes. The number of design iterations and project level impact analyses preformed over the past two years suggest that no significant business requirements have been missed, but, this will not be confirmed until the nodal business process traceability work and end-to-end 'bid-to-bill' integration testing is complete. Utilicast interviews with ERCOT IT leadership, a walkthrough of the Taylor data centers, and reviews of both internal and external documentation found that ERCOT has reached its maximum capacity of available data center space. New capacity is required to support the Nodal Program. The need to extend the Nodal Program "go-live" to December of 2010 requires ERCOT to maintain the zonal environments for another two years; this yields increased severity and risk to the data center capacity issue. The 'corrugated blue building' at the Taylor site has been utilized as a temporary solution, however, this facility is already at full capacity and the building is not constructed to data center standards (tin roof, concrete floor and low power per square foot and poor cooling capabilities). A plan to provide an additional 2,000 sq feet of capacity at Taylor has been developed and should be aggressively pursued. ERCOT does not have a data life cycle management strategy to manage the retention and disposal of data. Data is collected and stored on a daily basis and retained indefinitely. As a result data storage capacity requirements continue to grow. The life cycle management program will establish retention periods and storage media requirements consistent with the priority and criticality of the data. The life cycle management program should continue to be implemented as a priority by ERCOT. A review of the nodal transition plan has identified concerns that the market participants (through the TPTF) have a high level of influence over determining when the nodal project goes live. While it is normal practice for market participants to provide input to the market design of a program of this nature, determination of when readiness and go-live decisions rest with the ISO management team to ensure accountability, fairness and efficiency. The budget and schedule may be adversely impacted if specific groups of market participants attempt to avoid go-live by requesting continual re-work or extended testing periods. To protect the budget and provide a reasonable chance of meeting the

Findings	Descriptions
	schedule the ISO should be empowered to make the go-live decision once the agreed upon, objective, acceptance criteria have been met. The zonal market has undergone continuous change since its inception. As evidence the Board of Directors reviewed recommended zonal change 777 during the December 2008 Board meeting. A number of requested zonal changes have been surfaced during the past year but were delayed anticipating 2008 Nodal Program implementation. The two year delay in the implementation of the Nodal Program will introduce pressure for the zonal revisions and enhancements which could result in key Nodal Program resources being diverted to zonal enhancement work.

5. Recommendations

Based on our findings we make the following recommendations:

Recommendations	Descriptions
Is the new estimate a "good" estimate?	
1. The individual project budget should be challenged in the following areas **a. Vendor contracts** **b. Contract staff** **c. Internal staff**	To better control project and program spending the following areas should be examined and reviewed for cost savings: a) Vendor contracts should be renegotiated based on a strategic 3-5 year partnership as opposed to a single once-off product delivery contract. The negotiation should take into account ERCOT's long-term business and financial relationship with its vendors for application development, enhancements, maintenance and support over a 3-5 year period. This guaranteed vendor revenue provides an opportunity to renegotiate more favorable long-term contract terms. b) Resource plans should be challenged to ensure contract staff is effectively utilized and required skill sets and knowledge are available to complete the Nodal Program implementation. This includes the management of: • Contract labor roll off schedule and costs • Resource planning for integration test, and EDS • Maintenance of applications through go-live • Transition from project to operations • Staffing of future enhancement projects • Project to operations transition, knowledge transfer, c) Internal staffing plans need to be reviewed to ensure that the proper transition plans are in place to support nodal operations.
Is the new schedule a "good" schedule?	
2. Given the high risks of the integration phase of the Nodal Program, this area should be reviewed in detail and be the subject of Nodal Oversight Report 9.	Based on the high level and more detailed assessments, integration was identified as the highest risk to the Nodal Program schedule and budget. In recommending this as the subject matter for Nodal Oversight Report Number 9, our approach will be to review the following: • Integration approach • Responsibility/accountability • Technical solution • Testing approach • Project requirements, resource plans, schedule and budget

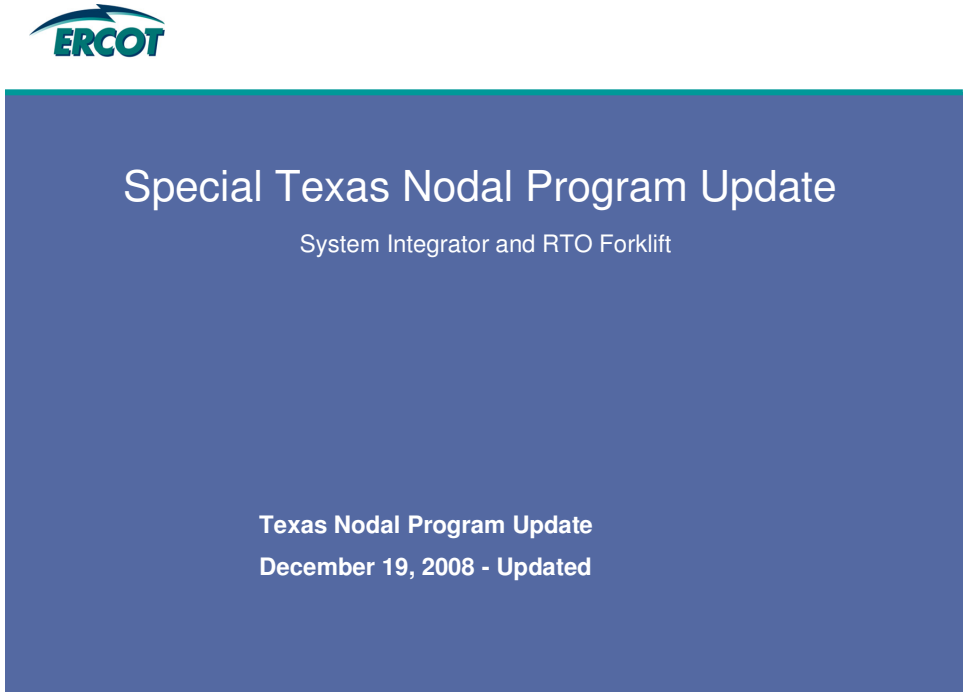
Recommendations	Descriptions
3. Scope for the December 2010 release of the Nodal Program should be locked down with any proposed changes subject to a strict change control process.	At this advanced stage of application development, the project cannot tolerate changes to the nodal market protocols resulting in changes in application requirements. It is recommended that the protocols and requirements be' locked down' to limit requirement changes and any proposed modifications or enhancements be deferred to future nodal releases post go-live (December 2010). Any proposed changes that impact schedule and budget should be subject to a strict change control process up to and including ERCOT Board of Director approval. Only changes that are critical to market operations should be considered such as: • Fundamental market design issues, • Mitigation of market power • Regulatory requirements
4. No enhancements should be considered for zonal market applications or processes unless assessed as business critical.	Zonal market modifications or enhancements that require Nodal Program resources for implement must be carefully analyzed for impacts to the Nodal Program schedule and budget. Any proposed changes that the Nodal Program impact schedule and budget should be subject to a strict change control process up to and including ERCOT Board of Director approval. Only changes that are critical to zonal market operations should be considered such as: • The market will fail to clear • Market is subject to market power • Regulatory requirements
5. There should be immediate investment in new data center capacity to allow for expansion of IT Infrastructure to support the Nodal Program.	ERCOT is at maximum capacity of its infrastructure capacity in both the Taylor and MET Data Centers. Given the technical requirements of the Nodal Program coupled with the extended operations of the zonal market for two years to 2010, additional data center capacity is urgently required.
6. Given the risks of market readiness and market participants potentially delaying "go-live" due to ambiguous EDS exit criteria, this area should be subject to a detail review.	Utilicast recommends that given the risks related to this area, a reassessment of ERCOT & Market Participant Readiness should be the subject of Utilicast's Nodal Oversight Report Number 10 (rather than as scheduled - Nodal Oversight Report 11).

6. Special Review Requests

The Nodal Oversight Committee requested that Utilicast assist them in their due diligence of the proposed Nodal Program schedule and budget by conducting special reviews of the following areas:

- Could ERCOT save costs and improve the implementation schedule by adopting and implementing the business process and applications an existing ISO or RTO that has a proven nodal market.
- Would the engagement of a systems integrator service provider improve the probability of the Nodal Program being completed on time and on budget?

Below is the presentation made by Utilicast to the Nodal Oversight Committee and the ERCOT Board of Directors on December 8th and 9th respectively, detailing the findings and recommendations related to these special reviews. Note – the presentation has been updated to reflect clarification request by the ERCOT Board of Directors.



Other Considerations – PJM Forklift Option

Although there are benefits to adopting an existing RTO's market construct, there are a number of potential impacts to consider that may make this option prohibitive

Benefits	• Market construct is tried and tested. Limits the risk of flaws in the market design with the benefit of established Market Monitoring oversight providing market confidence. • Vendor applications are implemented and tested limiting the amount of rework and testing. • Market participants should adapt quickly as they have experience operating and interfacing in this market construct. • As the processes and applications are developed and operating successfully, there is the potential for ERCOT to implement quicker and cheaper.
Potential Impacts	• There will not be a 'perfect fit'. For example - there are fundamental differences between the PJM's market rules and ERCOT's market protocols including: • FERC's pro-forma Transmission Tariff is not applicable to ERCOT • Capacity markets are not required for ERCOT market operations • Limited ancillary services market required in the ERCOT model • Complex congestion revenue rights processes in ERCOT- NOIE, options and obligations, settlement • Retail choice services provided are larger and more complex at ERCOT than PJM • Day ahead market requirements are different – co optimization of markets, price caps • LMP calculated at ERCOT using average losses while PJM uses marginal losses • Market Settlement requirements are unique for each RTO

Other Considerations – PJM Forklift Option *(continued)*

Potential Impacts *(Continued)*	• A lengthy stakeholder process will be required to review and accept the new market construct (Market Participants and PUCT). • Limited reuse of current applications (75% developed) resulting in loss on investment – applications and processes would need to be reengineered to PJM market and reliability construct. • Market participants will need to reconfigure their applications consistent the new market construct resulting in increased cost.
High Level Approach	To provide an insight on the work effort required, the following high level tasks would need to be completed to implement PJM's market construct: •Conduct a detailed impact assessment to identify differences in: Market Rules, Network Model, Business Processes, Applications, Infrastructure Requirements, Data Requirements, Support Tools and Training •Initiate the stakeholder process to gain approval from the market participants and PUCT based on the impact analysis •Procure the new nodal processes and applications from PJM and its vendors •Assemble and deploy the implementation team •Design, configure, test, integration test and deploy processes, applications and infrastructure •Manage participant readiness •Run new market trails •Train ERCOT staff and market participants on the new applications

Other Considerations – System Integrator

The impact of engaging a Systems Integrator at this stage of the implementation would adversely impact the budget and schedule of the Nodal Program

Characteristics of a good Systems Integrator	• Provide industry knowledge - understanding of wholesale energy markets and reliability, assess business requirements, capabilities and processes. • Provide a single point of responsibility with overall accountability to configure, test and implement the selected technology solutions, consistent with the required business processes, on time and on budget • Operates the Program Management Office to provide centralized management and progress reporting of project deliverables • Educates and develops the relevant client personnel in the new business processes and applications
Areas to consider	• The System Integrator is not a systems integration testing service provider. They provide complete business solution implementation from requirements definition to post production support. • To commit to an on-time on-budget implementation, the System Integrator requires a model that gives ownership and control over the complete implementation including PMO and core projects. This usually means a contingent of their staff managing and implementing the solution – this would require a replacement of resources currently working on the Nodal Program. • Taking on a program near completion is not a preferred model for a System integrators - tend to add more value and reduce risk when engaged from the beginning of the program where they can partner with vendors and manage the setup of the PMO.

Other Considerations – System Integrator *(continued)*

Areas to consider	• There are limited vendors with the experience and credentials to be the system integrator for the ERCOT Nodal Program – Accenture, Deloitte, Structure Group • There would be transition costs and a learning curve for the System Integrator that will impact the project schedule and budget. • The RFP process to engage the System Integrator can be time consuming and may impact the project schedule by as much as 8-10 months. • The System Integrator fees will most likely be based on a Statement of Work (SOW) covering the Program requirements known at the date of the contract with any subsequent changes to the requirements being negotiated as a separate SOW. This approach may impact the Program budget. • There is a high risk that the introduction of a System Integrator could result in loss of key contractor resources because of job security concerns. This short-term 'knowledge drain' may extend the System Integrators transition period and impact the Program schedule.
High Level Approach	The following are the high level tasks required to engage a System Integrator • Initiate an RFP process including, develop and issue an RFI, develop and issue an RFP, manage vendor inquiries and clarifications, assess RFP responses, select vendor and negotiate and award contracts. • Replace or supplement the PMO and core project teams with System Integrator staff. • Implement project management procedures including performance metrics and deliverables consistent with System Integration contract. • Educate System Integration team on requirements and implementation progress to date. • Assign responsibility for PMO and vendor management and program delivery to the System Integrator .