

**PROJECT NO. 40000**

**COMMISSION PROCEEDING TO  
ENSURE RESOURCE ADEQUACY IN  
TEXAS**

**§ PUBLIC UTILITY COMMISSION  
§  
§ OF TEXAS**

**ERCOT'S IMPACT ASSESSMENT OF REAL-TIME  
ENERGY & ANCILLARY SERVICES CO-OPTIMIZATION**

**COMES NOW,** Electric Reliability Council of Texas, Inc. (ERCOT) and provides an Impact Assessment summarizing the approximate cost and time to implement real-time energy and ancillary services co-optimization (RTEAC) in the ERCOT Market (Attachment A). ERCOT prepared the Impact Assessment pursuant to the Commission's request and instructions at its July 19, 2013 Open Meeting.

ERCOT staff is available to respond to questions about the Impact Assessment, as requested by the Commission.

Respectfully submitted,

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## **ERCOT'S IMPACT ASSESSMENT OF REAL-TIME ENERGY & ANCILLARY SERVICES CO-OPTIMIZATION**

As requested by the Public Utility Commission of Texas (PUCT), ERCOT provides the following summary of the approximate cost and time to implement real-time co-optimization in the ERCOT market.

### Background

ERCOT reviewed two possible real-time co-optimization configurations:

- A “minimum” real-time co-optimization approach
  - Co-optimizes Responsive Reserve Service (RRS) only
  - Uses single interval real-time dispatch optimization
- A “maximum” real-time co-optimization approach
  - Co-optimizes RRS, Online Non-Spin, Offline Non-Spin, Regulation Up and Regulation Down
    - Uses a multi-interval optimization engine in 5 minute increments
    - Optimizes real-time dispatch and real-time commitment for current and future intervals
  - Establishes a separate Operating Reserve Demand Curve (ORDC) for each Ancillary Service (AS)
  - Includes regional AS requirements
  - Allows AS substitution

### Summary Findings

Without detailed implementation requirements for real-time co-optimization, ERCOT surveyed other ISOs which undertook similar projects and incorporated its experience with implementing large integrated projects. Vendors with experience in this area were also consulted and high-level estimates of co-optimization development costs in other markets were collected. However, vendors noted that substantial market design differences exist between the ERCOT market and other markets that have implemented co-optimization.

ERCOT used recent project experience to estimate the costs to customize these vendor software products. Additionally, ERCOT estimated costs to manage, test and implement system changes (including costs to change ERCOT-developed software products and create new reports), as well as costs for computing hardware, market trials, stabilization, and third-party software and licenses.

ERCOT's findings for a “minimum” real-time co-optimization approach are summarized below:

<b>“Minimum” Real-Time Co-optimization</b>	<b>Minimum Estimated Cost</b>	<b>Estimated Duration</b>
Vendor selection and requirements development	\$0.5 M	0.5 yr
<b>Vendor Cost Estimate</b>		
Software development	\$ 11.0 M	1.5 yrs
<b>ERCOT Cost Estimate</b>		
Software development	\$ 5.5 M	1.5 yrs
Application integration	\$ 1.0 M	0.5 yr
Integrated testing	\$ 1.0 M	0.5 yr
Report/extract development	\$ 1.0 M	0.5 yr
Market trials	\$ 1.0 M	0.5 yr
Stabilization	\$ 1.0 M	0.5 yr
Computing hardware	\$ 2.0 M	n/a
Software licenses	\$ 1.0 M	n/a
<b>Total Cost Estimate</b>		<b>\$ 25.0 M</b>
		<b>3-4 years</b>

ERCOT's findings for a “maximum” real-time co-optimization approach are summarized below:

<b>“Maximum” Real-Time Co-optimization</b>	<b>Minimum Estimated Cost</b>	<b>Estimated Duration</b>
Vendor selection and requirements development	\$0.5 M	0.5 yr
<b>Vendor Cost Estimate</b>		
Software development	\$ 15.0 M	2.0 yrs
<b>ERCOT Cost Estimate</b>		
Software development	\$ 8.0 M	2.0 yrs
Application integration	\$ 3.0 M	0.5 yr
Integrated testing	\$ 3.0 M	0.5 yr
Report/extract development	\$ 3.0 M	1.0 yr
Market trials	\$ 3.0 M	1.0 yr
Stabilization	\$ 2.0 M	0.5 yr
Computing hardware	\$ 3.0 M	n/a
Software licenses	\$ 2.0 M	n/a
<b>Total Cost Estimate</b>		<b>\$ 42.5 M</b>
		<b>3-5 years</b>

Based on ERCOT's analysis, the cost to implement real-time co-optimization would not be less than \$25M to be implemented over a 3-5 year timeframe once requirements have been established. As additional features and customization are included, the cost and time to deliver would also be expected to increase. In addition, a project of this size would have a substantial impact on other projects in the work queue. It is also important to note that this estimate does not include software development, testing and deployment costs for the Market Participants throughout the ERCOT region.

#### Key Factors Impacting Cost and Timeline Estimate

1. Project cost estimates are greatly limited by the large number of potential delivery approaches due to the lack of specific requirements.
2. Project duration will be impacted by project priority. ERCOT will seek direction on whether this should be approached similar to the Nodal program where FTEs are allocated 100% to the effort and arrangements are made to backfill their current responsibilities. The project duration estimate assumes some amount of project resource balancing between multiple in-flight projects.
3. The project duration estimate does not include the time to revise Protocols.

#### Cost Estimation Assumptions/Approach

1. ERCOT project costs have been estimated using past ERCOT experience and vendor estimates.
2. Vendor estimates are based on implementations in other markets and were extrapolated to estimate the cost to deploy real-time co-optimization in ERCOT.
3. Only some ERCOT and vendor application development can take place simultaneously.
4. Based on previous experience with projects that have substantial vendor development, a proportional amount of ERCOT software development labor is expected for modifications to existing applications.
5. Contract resources would be required to complete this project.
6. Delivering a real-time co-optimization system enhancement would result in a significant change to market data reports and extracts.
7. A market trial period of at least 6-9 months would be required to ensure that Market Participant systems can interface with new ERCOT systems.
8. Load Frequency Control may change, resulting in the need for an extended market trial period.
9. An integration testing effort comparable to the final 1.5 years of the Nodal program would be necessary to ensure a quality delivery.
10. ERCOT would set up a development computing environment at the vendor site.
11. Additional test environments would need to be constructed.
12. System changes will not create current application performance issues; therefore, the estimate does not include a cost for a major hardware redesign.

13. New vendor system components would require the purchase of new 3<sup>rd</sup> party software licenses.
14. A stabilization period after go-live would be required to resolve issues.
15. The following potential cost items are not included in ERCOT's estimate:
  - a. Changes to the Day Ahead Market.
  - b. Potential future staffing costs that may be required due to changes in business processes. These impacts will be dependent on the specific requirements of the co-optimization approach. Areas that may have staffing impacts include Price Validation, Market Analysis, Compliance, and Settlements & Billing.
  - c. Increased future support and enhancement costs due to added system complexity.