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Public Utility Commission of Texas

Memorandum

TO: Chairman Peter M. Lake
Commissioner Will McAdams
Commissioner Lori Cobos
Commissioner Jimmy Glotfelty
Commissioner Kathleen Jackson

FROM: Werner Roth, Market Analysis

DATE: January 5, 2023

RE: Project No. 54335- Review of Market Reform Assessment Produced by Energy and Environmental Economics, Inc. (E3)

On November 10, 2022, the Commission released a report from Energy and Environmental Economics, Inc. (E3) titled Assessment of Market Reform Options to Enhance Reliability of the ERCOT System (E3 Report).[1] The Commission requested written comments on the report and posed 12 specific questions. Commenters submitted 115 separate documents in response to the Commission's request, totaling more than 1,100 pages. Comments were received from the general public, consumer advocates, independent energy consultants, energy-related trade associations, generators, retail electric providers, municipally owned utilities, cooperatives, individual consumers, those with academic interest in the energy sector (both individuals and institutions), Potomac Economics (the Independent Market Monitor), environmental groups, public policy groups, ERCOT, and OPUC.

Commission staff reviewed each comment filed and produced this memo to facilitate discussion at the January 12, 2023 Commission work session. Staff recommendations on key policy options are based on Staff's understanding of the legislative requirements, the Market Design Blueprint approved by the Commissioners in December 2021, the E3 Report, and comments received. Staff has also included recommended next steps.

Several commenters raised issues with the models used in the E3 Report. This memo does not specifically respond to those comments. However, Staff wishes to clarify that E3 subcontracted with Astrapé Consulting to simulate model outcomes using the Strategic Energy & Risk Valuation Model (SERVM) at the Commission's request. The SERVM model used for the E3 Report is the proprietary version developed specifically for ERCOT.

This memo is divided into the following sections:

I. Defining the problem

[1] Assessment of Market Reform Options to Enhance Reliability of the ERCOT System, Energy and Environmental Economics, Inc., November 2022 (E3 Report)

- Examining what grid reliability problem the Commission is trying to solve to achieve the legislative requirements in Senate Bill (SB) 3

II. Performance Credit Mechanism (PCM)
- Outlining policy decisions that the Commission should consider if implementing the PCM design

III. Need for a "bridge"
- Exploring the need and different options for a "bridge"

IV. Next steps
- Recommending topics to be addressed prior to any implementation of the PCM design

I. DEFINING THE PROBLEM

There was a common theme throughout the comments filed in response to the E3 report: *What is the grid reliability problem that the Commission is trying to solve to achieve the legislative requirements in SB3?* The discussion broke into two primary categories:

Real-Time Market (RTM) Operational Flexibility: The existing energy only market design with the Operating Reserve Demand Curve (ORDC) retains and attracts sufficient installed capacity in the ERCOT power region. However, increased penetration by wind, solar, and battery resources necessitate more operational flexibility.

Resource Adequacy: The existing energy only market design, even with ORDC, is insufficient to retain existing dispatchable generation and incentivize new dispatchable generation due to volatility in revenue streams. In other words, ERCOT has a long-term resource adequacy problem.

RTM Operational Flexibility

Solutions focused on operational reliability and flexibility concerns pointed to the difficulty in forecasting changes in load, renewable output, and forced thermal generation outages. Each of these factors correlate very closely with weather. Without sufficient flexible dispatchable generation available in real-time, ERCOT has increasingly relied on out-of-market Reliability Unit Commitment (RUC). Proponents of operational solutions argue that this practice has resulted in inefficiently increasing market costs that are difficult to hedge by Load Serving Entities (LSEs).

While some commenters suggested that ERCOT should increase the procurement of existing ancillary service products to help address some of these concerns, others have proposed the creation of brand-new ancillary service products.

Uncertainty Product

The IMM has proposed a new ancillary service called an "Uncertainty Product"[2] to address increasing uncertainty due to forecasts (load and renewable output) and thermal outages. To provide this service a resource should be able to come online within two hours (two hours lead-time) of ERCOT instruction (deployment) and stay online and produce energy up to four hours (four-hour service). This service would be procured in the Day Ahead Market (DAM). ERCOT would make a daily determination of the quantity needed and would deploy the Uncertainty Product when uncertainty results in tight real-time conditions. The maximum lead time of the current ancillary service products is only 30 minutes. Having this tool could allow ERCOT to bring longer lead-time resources online when operating conditions are departing from expected conditions.

Dispatchable Reliability Reserve Service

A coalition of stakeholders proposed a concept very similar to the Uncertainty Product called Dispatchable Reliability Reserve Service (DRRS).[3] Like the Uncertainty Product, DRRS would be procured in the DAM. However, the total quantity of DRRS could be set in advance (such as year-ahead) rather than daily. To provide DRRS, a resource must be available for dispatch within two hours of deployment and must be able to provide the service for four hours. DRRS would ensure dispatchable generation is available in real-time to cover operational gaps caused by the uncertainty around renewable generation variability, load variability, and unforeseen thermal generation outages.

Commenters advocating for an operational solution, like a new ancillary service, asserted that none of the proposed load side reliability obligation constructs like PCM, Load Serving Entity Reliability Obligation (LSERO) or Forward Reliability Mechanism (FRM) would address the real time operational issues ERCOT is facing today. They believe new products like the DRRS would directly address those issues that have led to the recent increased use of RUC. Additionally, these commenters also state that this product would create targeted price signals and new revenue streams for new and existing dispatchable generation.

Resource Adequacy

[2] 2021 State of the Market Report for the ERCOT Electricity Markets, Potomac Economics, Page 23
[3] Project 52373 Review of Wholesale Electric Market Design, AIS Item No 384

Many commenters assert that there is a fundamental resource adequacy problem in ERCOT and structural reform of the market design is necessary to ensure resource adequacy in the ERCOT power region. The current market design relies on high energy prices during scarcity conditions to drive long-term reliability. This design offers no assurances that ERCOT will retain and procure sufficient levels of dispatchable generation capacity to meet the desired reliability levels for the ERCOT power region. These commenters also emphasize that increased procurement of ancillary services or development of a new ancillary service product fails to incentivize investment in new dispatchable generation.

The existing market design has significant year-to-year variability in the revenues to generators. As a result, it is difficult to secure the financing necessary to build dispatchable generation resources. The ORDC can be designed to achieve a target level of reliability standard and level of revenue, but the actual revenue in any given year would be less predictable. The E3 Report recognizes this concern and compares the annual system cost volatility under each design.[4][1]

Over the last several years, ERCOT has experienced an unprecedented level of growth in the interconnection of renewable generation. The latest Generator Interconnection Status Report from ERCOT shows that over 7,500 MW of new wind generation and over 23,000 MW of new solar generation have completed the requisite studies for interconnection and have an interconnection agreement in place.[5][2] With the recently approved federal incentives in the Inflation Reduction Act, this trend will continue.

Load-Side Reliability Construct

Within the comments that identified resource adequacy as a problem, there was general agreement that the PCM could be the load side reliability construct that provides the necessary level of certainty to make financing new dispatchable generation viable. The PCM requires market performance from generation and incentivizes customers to reduce costs through demand response. These commenters believe that a properly implemented PCM would provide the ERCOT market with the regulatory certainty it needs to see meaningful, long-term investment in dispatchable generation construction.

Staff Response: ***The ERCOT market has both an operational flexibility problem AND a resource adequacy problem. No single solution tailored to one of the problems will result in an efficient outcome.***

[4] E3 Report, Page 62

[5] ERCOT Generator Interconnection Status Report – December 2022

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In Phase I of the Market Design Blueprint,[6] the Commission has already directed enhancements to ancillary services and improvements to price signals and operational flexibility. Specifically:

- Modifications to the ORDC
- Adopting changes to allow for more targeted demand response to increase utilization of load resources for grid reliability.
- Emergency Response Service (ERS) reform
- Enhancing the existing package of ancillary and reliability services, including Fast Frequency Response Service (FFRS), a Firm Fuel Product, Voltage Support Compensation, and the ERCOT Contingency Reserve Service (ECRS)

Further refinement of existing ancillary service products will address the identified real-time market operational reliability issues. However, these changes will not alone provide the necessary incentives to ensure the long-term resource adequacy needs of the ERCOT power region. A broader capacity construct is unlikely to fully address real-time market operational issues across the ERCOT power region. Market-based supply side options and demand side solutions must both be employed to achieve optimal flexibility for the ERCOT grid to address known and unknown future risks. Demand side solutions, like energy efficiency and demand response, also help mitigate the cost impact to consumers of market design changes.

Other Regional Transmission Organizations (RTOs) are also targeting both long-term resource adequacy solutions and implementing new ancillary services to address the two different problems. RTOs have no control of the resource fuel mix and must manage the grid based on the fuel mix present. RTOs typically address day-to-day uncertainties with the available mix using ancillary services. However, to attract and retain capacity, longer term resource adequacy solutions are required.

<u>Options for Action on the Real-Time Market Operational Flexibility</u>

- Allow additional time for Phase I market enhancements to work and review need for additional refinements at a future date
- Provide direction for the IMM's Uncertainty Project or DRRS proposal to go through the ERCOT stakeholder process
- Open a new Project to dive further into identified operational reliability issues
- Review the conservative operations and RUCs holistically to replace with market-based solutions to incent self-commitments
- Direct ERCOT to accelerate Real-Time Co-optimization (RTC) as new AS products without RTC would not provide the best value intended

<u>Options for Action on the Resource Adequacy Problem</u>

- Direct additional analysis on the load-side reliability mechanisms, including the "backcast" analysis of the PCM requested by several stakeholders
- Move forward with a phased in approval of the PCM or the FRM

[6] Project 52373 Review of Wholesale Electric Market Design, AIS Item No 336

II. PERFORMANCE CREDIT MECHANISM

Staff continues to believe the PCM design both (1) fulfills the requirements of SB 3 to meet the reliability needs of the ERCOT power region and (2) accomplishes the principles of a load-side reliability mechanism as defined in Phase II of the Market Design Blueprint. If the Commission chooses to move forward with the PCM, several outstanding policy decisions must be made before implementation.

Reliability Standard

The E3 Report used the traditional industry standard of 0.1 day/year Loss of Load Expectation (LOLE) in its analysis of the various load-side reliability mechanisms. However, in previous PUC projects reviewing the reliability standard,[7] the Commission has reviewed whether this was the appropriate reliability standard for the ERCOT power region. While some commenters supported the adoption of this standard, several commenters also highlighted that the use of LOLE as a standalone metric is dated and fails to capture the depth and duration of events.

***Staff recommendation:* The Commission should open a project to determine the appropriate reliability metrics and set the reliability standard for the ERCOT power region.**

Hours of Highest Reliability Risk

The E3 Report considers the 30 hours with the lowest incremental available operating reserves over a calendar year. However, neither this specific number of hours nor this definition of reserves is fundamental to the operation of the PCM. Rather, these are parameters that may be adjusted to achieve the Commission's policy goals.

There are three options to define the lowest incremental reserves:

1. Physical Responsive Capability (PRC)
2. Reserves as calculated for the Operating Reserve Demand Curve (ORDC)
3. Gross load minus renewables (Peak Net Load)

Any RTO faces three fundamental risks daily: load forecast variability, renewable forecast variability, and forced thermal unit outages. Staff agrees with the IMM and E3 that using PRC as the metric for highest reliability risk, which is a metric specifically designed to capture reliability risk, incorporates these risks that lead to low reserves. PRC also would be the most straightforward option for ERCOT to monitor and track. However, the direction from the Legislature to the Commission was to focus on ensuring reliability during times of low non-dispatchable power production in ERCOT.[8] Using peak net load as the metric to determine the hours of highest reliability risk captures when dispatchable generation is needed most.

[7] Project 42302 Review of the Reliability Standard in the ERCOT Region

[8] Senate Bill 3 (87th Legislature, Regular Session)

Staff recommendation: ***The Commission should direct development of the PCM using peak net load to determine the hours of highest reliability risk. The number of hours designated merits additional discussion.***

Seasonality

Comments on the frequency of the risk hours varied widely, with commenters advocating for daily, monthly, or seasonal frequencies. However, there was little support for assessing and assigning Performance Credits on an annual basis. One concern is the potential for concentration of Performance Credit hours in the summer months, despite potential reliability risk during other parts of the year. Further, predicting Performance Credit hours a year in advance would be difficult for both generators and load serving entities. This difficulty could lead to an additional risk premium for non-performance in generators' offers into the forward market, increasing costs.

More granular settlement periods were proposed, ranging from seasonally all the way down to daily. A daily assessment would depart from the goal of having a resource adequacy construct that evaluates performance during the hours with highest material risk to reliability. Daily assessment would frequently measure performance on hours with no reliability risk. Either a monthly or seasonal approach strikes a balance among the concerns expressed. Once the frequency of the assessment is determined, then the appropriate number of hours for assigning Performance Credits within a given month or season and the settlement process can be finalized.

Staff recommendation: ***A seasonal determination of the hours of highest reliability risk would best fit the ERCOT region and align generator performance with the highest risk periods of extreme cold and heat. It may also alleviate the concerns about credit and collateral requirements for market participants.***

Market Power Concerns

While there was general consensus that a centrally cleared construct with market monitor oversight was an improvement over a bilateral-only construct as modeled in LSERO, more refinement of the PCM will be needed to effectively alleviate market power concerns. All market designs present some potential for the exercise of market power. Moreover, because the PCM is a relatively novel concept, a thorough stakeholder process will be necessary to minimize possibilities for abuse.

If the Performance Credit hours are determined by the hours with the tightest levels of operating reserves, some commenters expressed concern that generators with large fleets could create artificial scarcity events by influencing the level of operating reserves available. This opportunity would be even more significant for large market participants that own both generation and load serving entities. Such activity would adversely impact the ERCOT competitive retail market.

Some commenters pointed to the need for Commission to address whether to allow virtual-only parties to participate in the Performance Credit forward market. The IMM highlighted the value that virtual participation can provide through added liquidity and mitigating market power in the voluntary forward market.

Staff recommendation: ***Any new market design must have robust guardrails and tools to enable the IMM and the Commission to track and monitor market power in retail and wholesale markets. Staff recommends that the Commission direct the IMM to develop a comprehensive road map with necessary rule and protocol changes specific to PCM, including any revisions that may be needed to Voluntary Mitigation Plans (VMPs).***

III. NEED FOR A "BRIDGE"

The Commission requested comments on whether a short-term "bridge" product or service is necessary if any selected market design requires a multi-year implementation.

Procuring additional Ancillary Services

Several commenters mentioned procuring additional ancillary services as a "bridge" solution. The proposed solutions varied across the comments and included:

- Procuring additional non-spin and ECRS
- Procuring certain services on a longer-term basis, such as the Firm Fuel Supply Service
- Expanding the resources that are eligible to participate in providing certain ancillary service products
- Developing a new technology-neutral ancillary service product

Staff recommendation: ***Further refinement of ERCOT's ancillary services is a worthwhile pursuit to address operational flexibility concerns. However, pursuing these changes as a "bridge" to a long-term resource adequacy solution is not appropriate.***

Backstop Reliability Service (BRS)

Some commenters noted that BRS could be the cheapest and fastest option to implement as a bridge. Other commenters suggested that there was no need to create a new "bridge" between approval of a new market design and its implementation because ERCOT already has the tools necessary to avoid the retirement of generation needed to ensure reliability. Resources that intend to retire must provide notification so that ERCOT can determine whether the resource is necessary to ensure system reliability. If a resource is necessary, a Reliability Must Run (RMR) contract is required, and the resource is guaranteed cost recovery until an alternate solution is implemented.

Staff recommendation: ***It may be beneficial for the Commission to clarify that ERCOT can offer RMR contracts to dispatchable resources deciding to retire for economic reasons if such resource capacity is needed to meet Commission-set reliability standard over a***

predetermined time horizon. The Commission can direct ERCOT to make an expedited protocol change that will allow ERCOT to use RMR as a backstop for resource adequacy.

Phase-In Implementation of PCM

Some commenters suggested that the Commission phase-in the implementation of the PCM to serve as a transition to full implementation. To utilize this approach, the commenters proposed that the Commission instruct ERCOT to prioritize and implement the look-back mechanism first to determine what generation was available during the designated tightest hours. The Commission would determine a fixed price for Performance Credits in the interim, and the demand curve and voluntary forward market would be developed as part of the full implementation.

***Staff recommendation:* This option could be worthy of further evaluation. It would allow ERCOT to focus on implementing RTC and other market enhancing projects already in progress. The E3 report and its conclusions assume that RTC exists.**

IV. NEXT STEPS

There are many other PCM parameters/key principles and timelines to develop them to be worked out before implementation such as described in Section 8.2 of the E3 Report:

- Net Cost of New Entry (CONE) calculation
- Shape of Demand Curve
- Collateral requirements
- Penalties for non-performance
- Value of Lost Load (VOLL)/System-Wide Offer Cap (SWOC)
- Eliminate or keep ORDC/Conservative Operations
- Participation and design of the forward market
- Transmission constraints/deliverability
- Determination of total Performance Credits

***Staff recommendation:* The Commission should develop a detailed list of key principles for implementation through the stakeholder process at ERCOT. These changes are subject to approval by the Commission. A separate set of principles should be developed for implementation through the Commission's rulemaking process.**

In addition, the Commission should also provide clarity if the DEC and LSERO options are still on the table or can be eliminated as viable options.

Finally, the Commission should provide clear guidance to ERCOT on how to prioritize RTC and remaining Phase I initiatives with a parallel PCM implementation. This would provide regulatory certainty that many commenters desire.