PUBLIC

Item 9: Stakeholder Engagement Topic – Real-Time Co-Optimization plus Batteries (RTC+B)

Keith Collins
Vice President, Commercial Operations

Rebecca Zerwas
Director of State Policy and PUC Relations, Board Liaison

Board of Directors Meeting
September 22-23, 2025

- **Purpose**
  For ERCOT Members to provide the Board of Directors additional perspective and insight on how selected key issues in the ERCOT Region impact different types of Market Participants.

- **Questions for the Board**
  What lessons can be learned as we move towards RTC+B go-live and what market design discussions should be prioritized after implementation?

Key Takeaways

- RTC+B is a major ERCOT market design change that will impact each Segment in unique ways.
- Speakers have been selected to provide perspective for their respective Segments and views expressed are their own.

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RTC+B – Membership Segments

Independent Retail Electric Provider

- Bill Barnes, NRG
  - *Senior Director, Regulatory Affairs*
- Jay Harpole, APG&E
  - *Chief Executive Officer*

Independent Power Marketer

- Seth Cochran, Vitol
  - *Head of Strategic Market Policy;*
- Jeremy Carpenter, Tenaska Power Services
  - *Vice President, Energy Management and Operations*

Municipal

- David Kee, CPS Energy
  - *Director, Energy Market Policy*
- Taylor Kilroy, Texas Public Power Association
  - *Executive Director*

Real-Time Co-Optimization + Batteries (RTC+B)
Stakeholder Engagement
Independent Retail Electric Providers

Bill Barnes, Reliant Energy

- *Senior Director, Regulatory Affairs*

Jay Harpole, APG&E

- *Chief Executive Officer*

ERCOT Board of Directors Meeting
Monday, September 22nd, 2025

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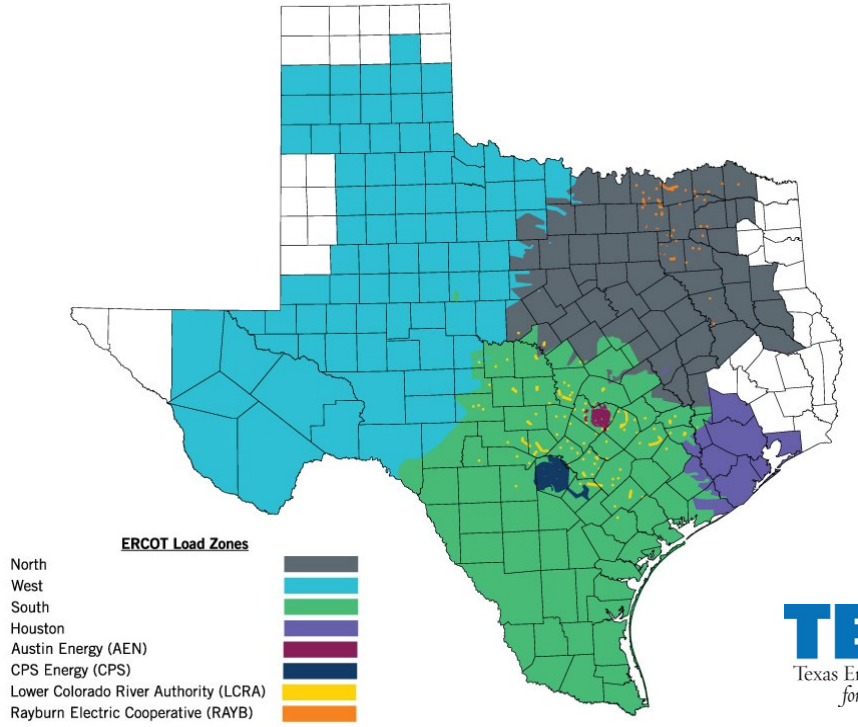
Texas Energy Association *for* Marketers

COMPETITIVE RETAIL MARKET IN ERCOT

- ERCOT was certified by the Public Utility Commission of Texas (PUCT) in 2000 to perform the four functions required by Public Utilities Regulatory Authority (PURA):
  - System reliability
  - Competitive wholesale market
  - Open access to transmission
  - **Competitive retail market**
- ERCOT's competitive retail market is the most successful restructured retail electricity market in the world
  - Open, competitive pricing
  - Regulation focused on customer disclosures
  - Enrollment and switching activity facilitated by ERCOT as the Registration Agent
  - Product innovation by Retail Electric Providers (REPs)
- 139 licensed REPs at the PUCT
- The results speak for themselves: As of 9/2/25, 97% of customers in the competitive territories have switched or affirmatively chosen their provider (+8.5M)

- Competitive vs. Non-Competitive Service Territories
  - Investor-Owned Utility vs. Municipal Utility and Electric Cooperatives
- ~75% of ERCOT's power consumption is within the competitive retail market



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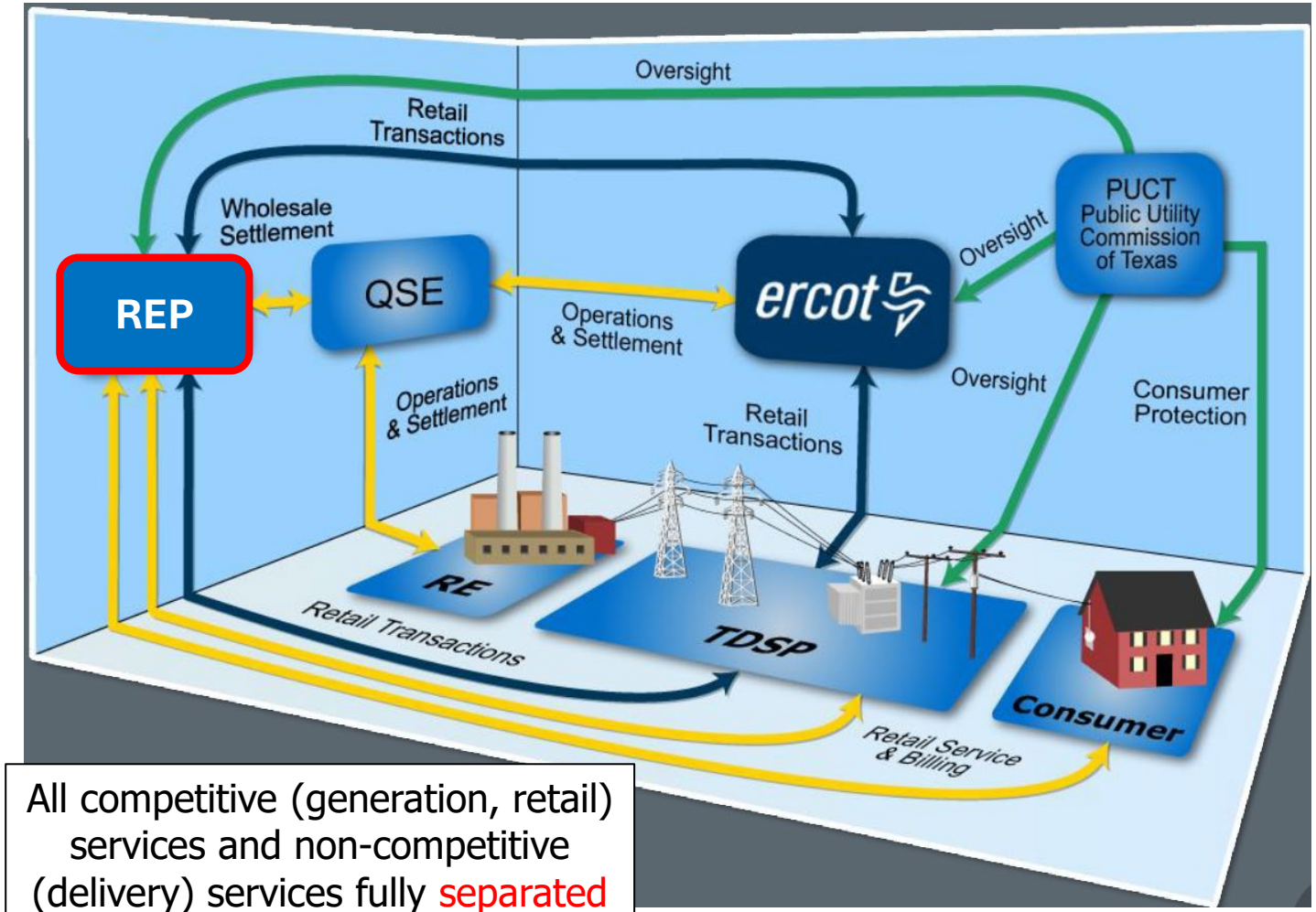
COMPETITIVE RETAIL MARKET IN ERCOT



All competitive (generation, retail) services and non-competitive (delivery) services fully separated

Definitions:

- QSE = Qualified Scheduling Entity
- REP = Retail Electric Provider
- RE = Resource Entity (Generator)
- TDSP = Transmission and Distribution Service Provider

➢ REPs offer various types of retail products to customers including fixed price products, time-of-use, demand response/virtual power plants, peak rebates, etc.

➢ REPs shield residential customers from volatility in the wholesale market.

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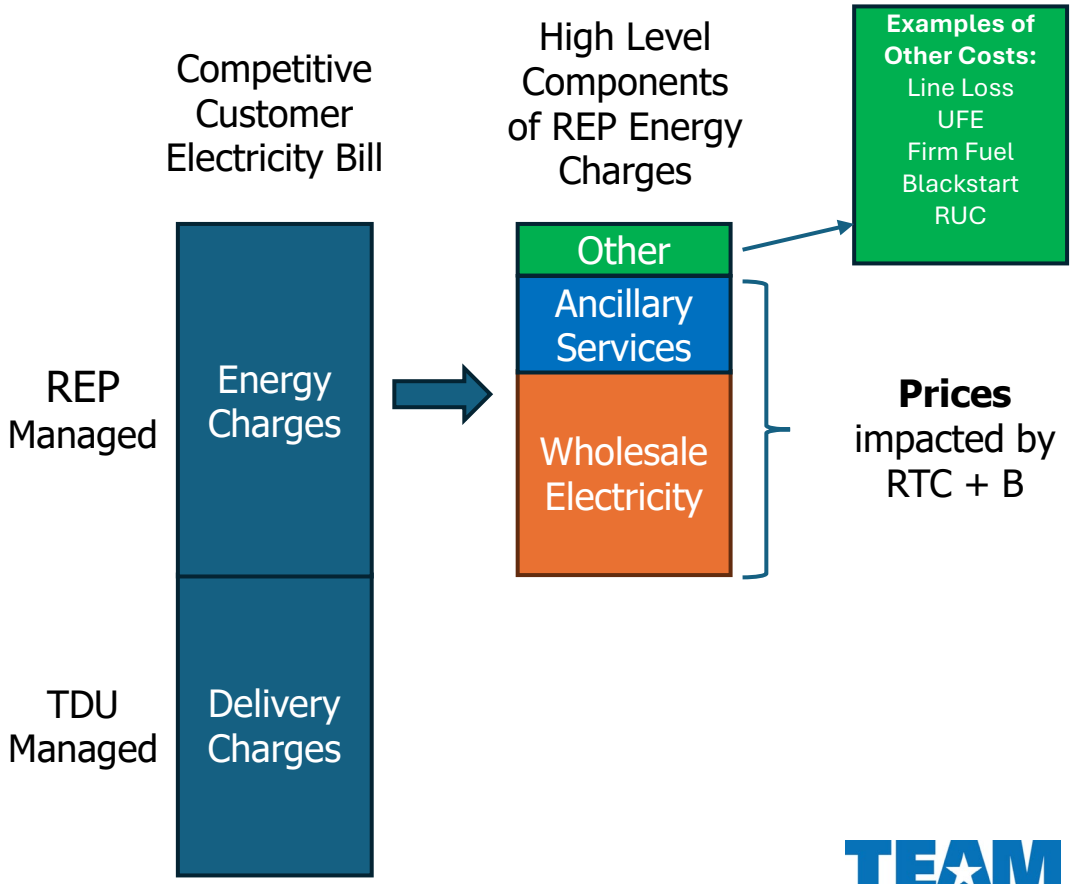
WHY RTC+B MATTERS TO REPs

- REPs are concerned about the **Quantity** of Electricity and Ancillary Services they must buy and the **Price** of those items
- RTC+B will change how **Prices** are formed for Electricity and Ancillary Services
- RTC+B is not expected to impact **Quantities** of Electricity or Ancillary Services*
- For years, the forward electricity and ancillary services markets have been taking into account how they expect RTC+B to impact prices and reflecting that in the forward market **Prices**
- Standard REP best practice is to hedge projected **Quantities** at market **Prices** near the time they execute customer contracts using Term Hedges
- REPs following best practices should thus be mostly insulated from any major financial impacts of RTC+B on the price of energy or ancillary services as they are mostly using the Real Time market just for unanticipated scheduling fluctuations (~1%-5% of a REPs total forecasted load)



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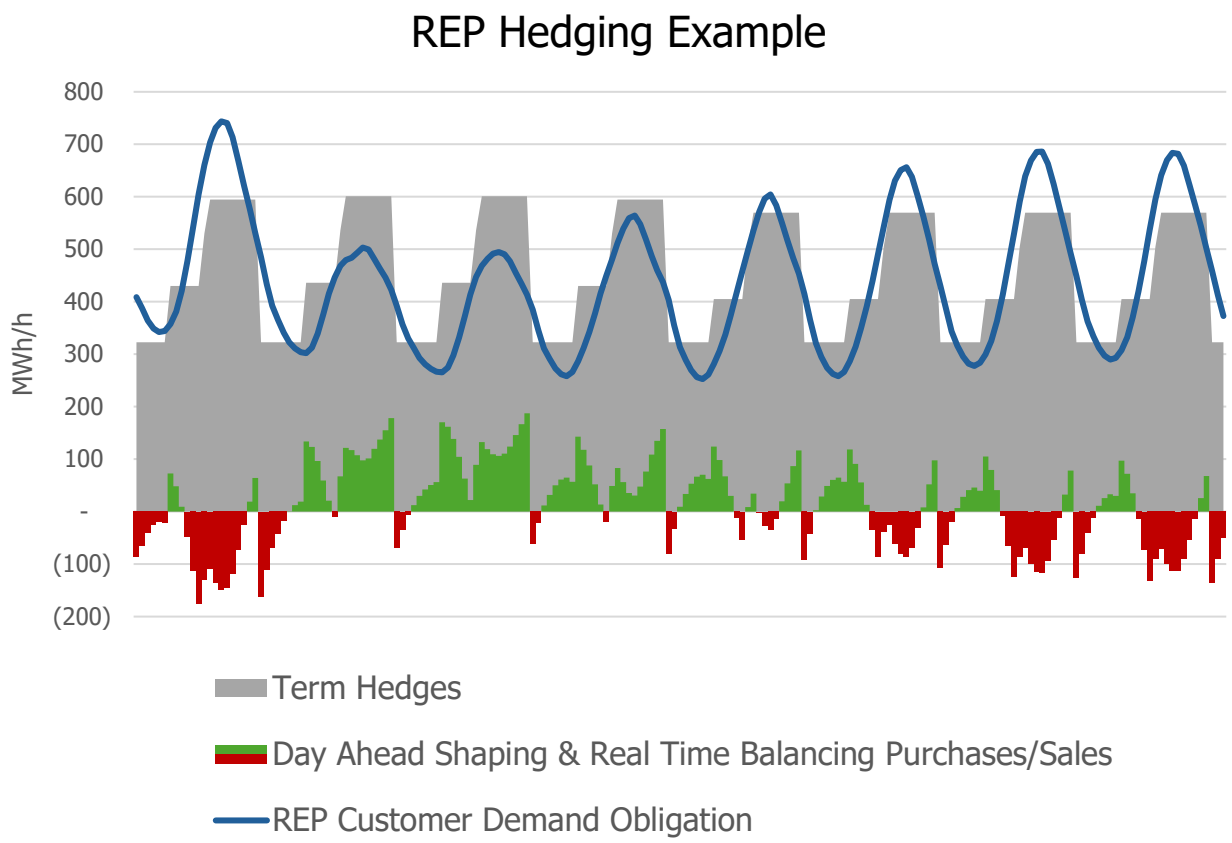
*RTC+B was not mentioned by ERCOT as a factor in their proposed 2026 ancillary services quantities procurement plan

WHY RTC+B MATTERS TO REPs (continued)



- Term Hedges for wholesale energy costs made up to ~5 years in advance
  - Liquid term hedges are On-Peak and Off-Peak (i.e. not hourly shaped)
- Day Ahead (DA) hedges made to buy and sell around hourly shaped forecasted customer demand
- Real Time (RT) purchases and sales will be done at **Prices directly impacted by RTC+B**
  - For a REP following best practices, this would only impact a small percentage of their total purchases (e.g. 1-5%) to account for scheduling error

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RTC+B IMPACT ON REPs

Technical Impacts

- Real-Time Co-optimization involves complicated systems that require extensive testing by ERCOT and Market Participants.
  - Internal resources, IT vendors, dedicated testing environments
- New dispatch requirements for resources, including Non-Controllable Load Resources
  - Self-Provisioning

Market Impacts

- New pricing points and products (i.e. Real-Time Ancillary Service Prices)
- Limited ability to hedge forward/lack of liquidity
- Unknown impact of future valuations of energy and AS that REPs bear, although expectation is lower prices after RTC due to efficiencies of dispatch
- Contracts and hedges

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Real- Time Co - Optimization + Batteries (RTC+B)
Board Update
IPM Segment

ERCOT Board of Directors
September 2025

Image Courtesy of

RTC+B OVERVIEW & MARKET IMPACTS

- Go-Live: Operating Day December 5, 2025

CORE DESIGN FEATURES

- 5-minute co-optimization of Energy & Ancillary Services (AS)
- Financial-only DAM AS awards (no physical must-offer)
- Unified single-model batteries with state-of-charge optimization

EXPECTED MARKET IMPACTS

- Greater efficiency and flexibility in dispatch
- Increased participation and liquidity in AS markets
- Scarcity pricing shifts from ORDC adders into AS Demand Curves

Day-to-Day Operational Changes

OPERATIONAL TEMPO

- Portfolios managed to 5-minute co-optimized outcomes
- Greater automation required

RESOURCE MANAGEMENT

- Reduced manual COP adjustments
- AS awards managed through offers

REPORTING & SETTLEMENTS

- New real-time AS MCPCs
- Updated statements
- Final production report formats pending

BATTERY PARTICIPATION

- Single ESR model eliminates conflicting GEN/CLR instructions
- Dispatch instructions feasible through explicit SoC modeling

IMPLEMENTATION STATUS

TESTING & CUTOVER

- Connectivity and parallel trials completed (May–Aug 2025)
- First closed-loop LFC simulation scheduled for September; additional rounds possible into October
- Cutover confirmation notice due November 5, 2025
- Cutover December 5, 2025

REPORTING READINESS

- Trial-format settlement and operational reports available (XML/CSV)
- Final production templates and settlement matrix not yet published

PROTOCOLS, TELEMETRY & CHALLENGES

PROTOCOL FINALIZATION

- NPRRs/NOGRRs largely in place to support RTC+B
- Some post go - live revisions and discussions may be necessary (e.g., NPRR 1282 on AS duration)
- Certain operating procedures and detailed practices remain under development

EXPECTED MARKET IMPACTS

- Expanded telemetry requirements for ESRs and AS capability points now in effect
- Increased scrutiny on telemetry accuracy and validation in trials, given its direct role in SCED feasibility and settlements

OPERATIONAL CONSIDERATIONS AHEAD OF GO-LIVE

PRICE FORMATION

Transition from ORDC adders to AS Demand Curves will be closely monitored for volatility effects

DELIVERABILITY

Risk of AS awards on constrained resources underscores need for guardrails in SCED

CUTOVER RISK

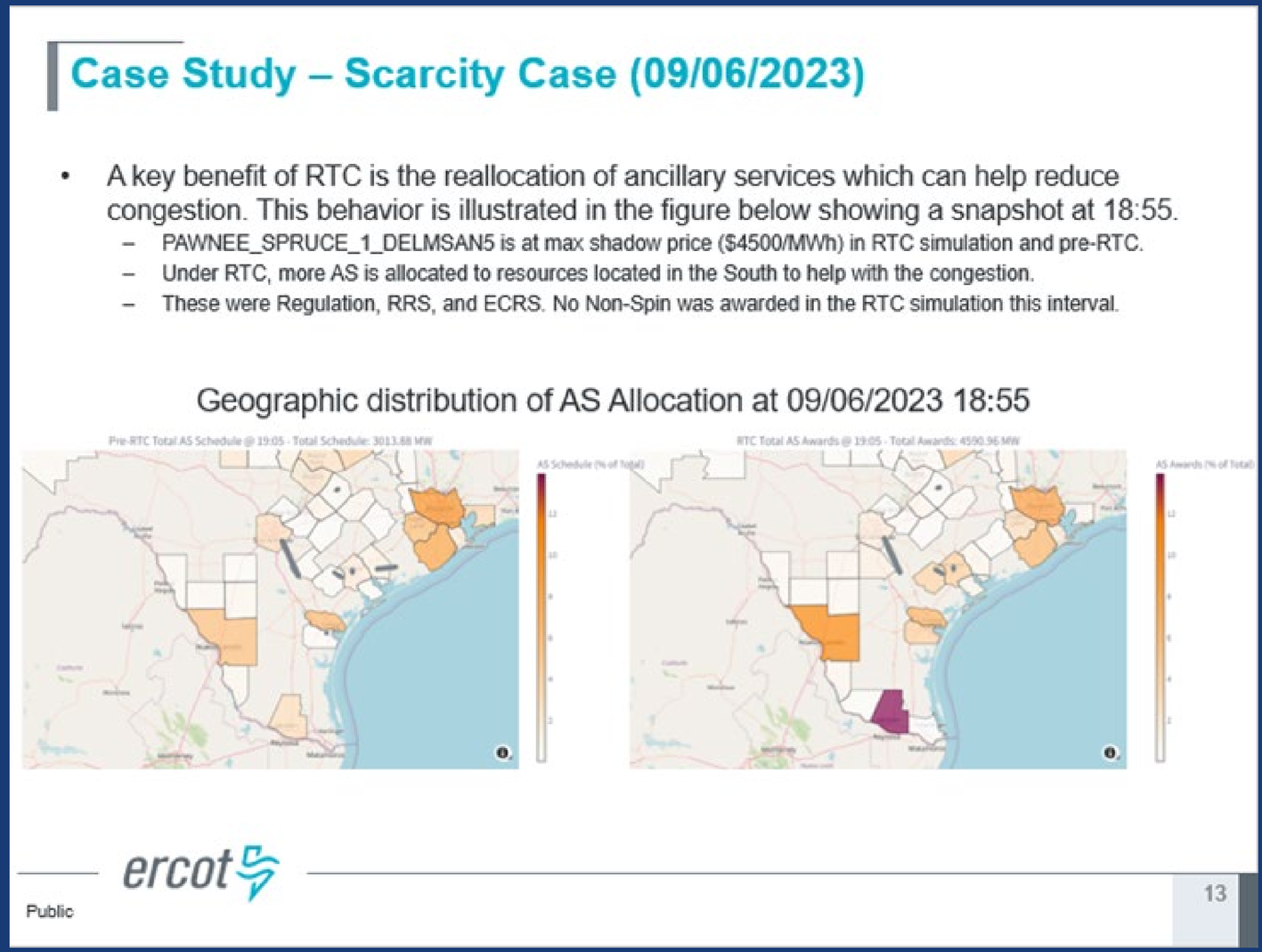
Importance of a clear runbook, rollback procedures, and stabilization period following go- live

STAKEHOLDER ENGAGEMENT

Continued dialogue needed as final reports, cutover specifics, and practices are clarified

REAL- TIME CO- OPTIMIZATION IMPROVES CONGESTION MANAGEMENT

- More efficient congestion management resulting from the ability to use a wider variety of resources to solve transmission constraints
- RTC test case for Operating Day 9/6/2023 demonstrated that moving reserve obligations co - optimization can free resource to produce more energy on the helping side of constraint and resolve the constraint
- In actual operations manual actions were taken to resolve the constraint



source https://www.ercot.com/calendar/10222024 - RTCBTF Meeting

REAL-TIME CO-OPTIMIZATION PERFORMANCE SHOULD BE MONITORED CLOSELY POST DEPLOYMENT

RTC AS DESIGNED DOES NOT CONSIDER ANCILLARY SERVICE DELIVERABILITY

- During times of high congestion, low-cost resources behind transmission constraint may receive upward ancillary service awards
- Leads to lower cost, but may award reserve obligations that are not deliverable
- Issue occurred in MISO with its co-optimized Up Ramp Capability product (FERC Docket No. ER23-1195)
- CAISO'S existing flexible ramp product seeks to address this concern by including transmission constraints in its procurement

LOOKING BEYOND RTC DEPLOYMENT THERE ARE NUMEROUS INITIATIVES WITH SIGNIFICANT POTENTIAL BENEFITS TO THE ERCOT MARKET

ANCILLARY SERVICE DEMAND CURVES WILL NEED TO BE REVIEWED TO ENSURE RESERVE SHORTAGES ARE APPROPRIATELY VALUED

- Maintaining the effectiveness of the energy-only market through co-optimized solutions
- Superior way to achieve resource adequacy objectives compared to Dispatchable Reliability Reserve Service

MULTI-INTERVAL REAL-TIME MARKET

- Optimize dispatch over multi-intervals
  - More efficiently meet net load ramps
  - Optimize state of charge over many intervals

REAL-TIME PRICE DEPLOYMENT PRICE ADDER ADJUSTMENT TO REFLECT LOCATIONAL PRICING IMPACTS OF OUT-OF-MARKET INTERVENTIONS (I.E., NPRR 1214)

- Sends correct price signals by reflecting the full LMP solution
- Aligns pricing incentives with efficient market behavior

QUESTIONS?

Image Courtesy of ERC

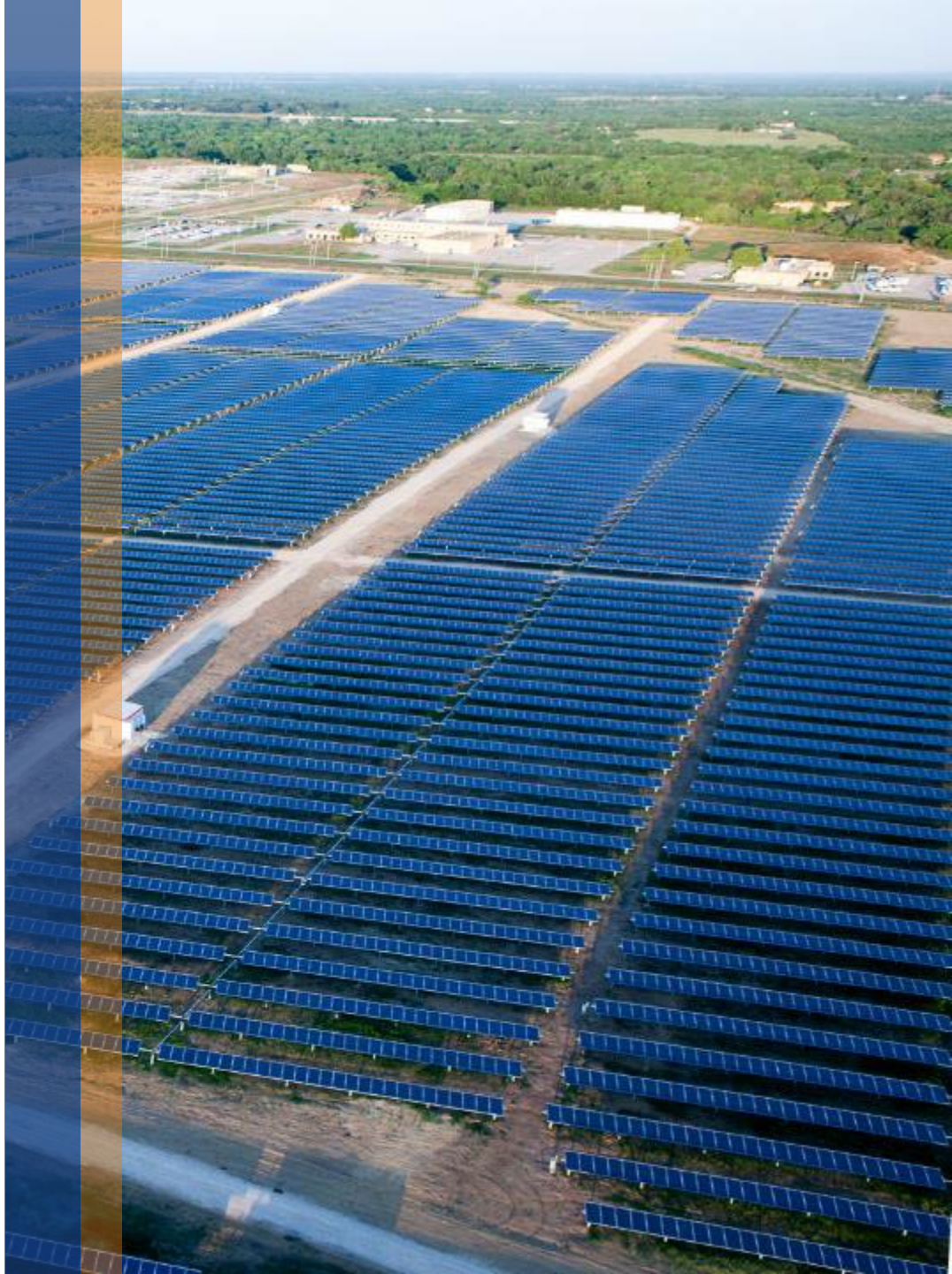
MOU PERSPECTIVE ON RTC

PRESENTED BY:

David Kee
Director, Energy Market Policy

Taylor Kilroy
Executive Director, Texas Public Power Association

September 22, 2025
Informational Update



MOU VALUES

SERVING OUR CUSTOMERS

City owned – customer focused

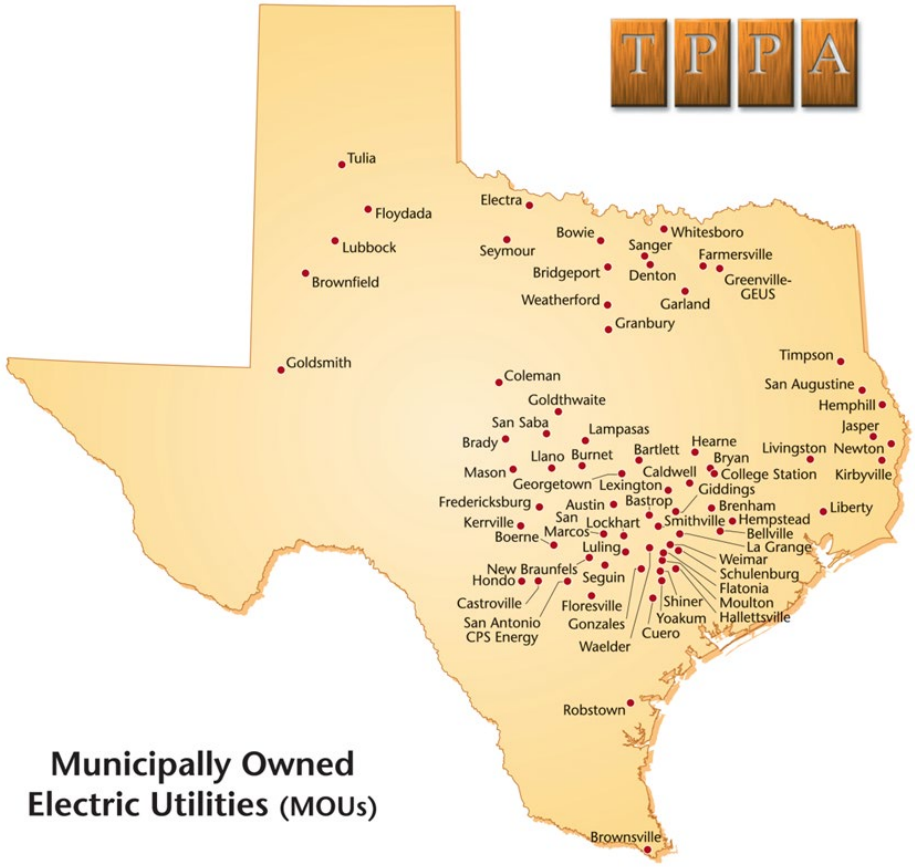
- Cities fully support the MOU core purpose to serve their communities

Not-for-profit – cost recovery utility

- Revenues support cities & offset customer costs

Power supply – impact to customer costs

- MOU Generation owners can serve at or below production costs
- Long term bilateral contracts allow for power supply cost certainty



We exist to serve our customers & we are active participants in the ERCOT wholesale market.
Our participation contributes to the reliability of the grid and the efficiency of the wholesale market.

HOW WE SERVE

BY THE NUMBERS

LARGEST

Municipally Owned
Electric & Natural
Gas Utility in the U.S.

165

Years of Serving
San Antonio

10+

Gigawatts
Total Generating Capacity

4th

Largest generation provider in ERCOT

Credit Ratings*

	Senior	Junior
S&P	AA-	A+
Fitch	AA-	AA-
Moody's	Aa2	Aa3

$15.5B

Total Assets

24.7

Billion Cubic Feet in Gas Sales

Horizon 2050 Mission

To safely power our community with reliable, affordable, and cleaner energy.

5,835

Megawatts

Peak Demand
on August 21, 2024

*As of January 31, 2025

PERSPECTIVE ON RTC & WHOLESALE MARKET

Segment impact – generally positive, short-term economic benefits due to lower congestion costs & increased market efficiencies, prices reflect scarcity

Challenges – technical, strategy, forecasting, resource adequacy impacts

Concerns – minor at this point, we expect test windows to show improvement in market outcomes

RTC updates post go-live – Review & refinement of: Ancillary Service procurement quantities, Ancillary Service Demand Curves, Price formation outcomes

Policy Priorities – SB6/TCOS updates & market impacts, conservative operations impacts, Market design improvements to support Resource Adequacy

MOUs generally support an optimized and efficient wholesale market. We balance customer costs by investing in Generation Resources, long-term power purchase agreements, and wholesale power supply agreements.

THANK YOU