

The Resource Adequacy Challenge in ERCOT: *The Best Market Design Depends on the Minimum Acceptable Reserve Margin*

Prepared for:
The Harvard Electricity Policy Group

Presented by:
Sam Newell

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Agenda

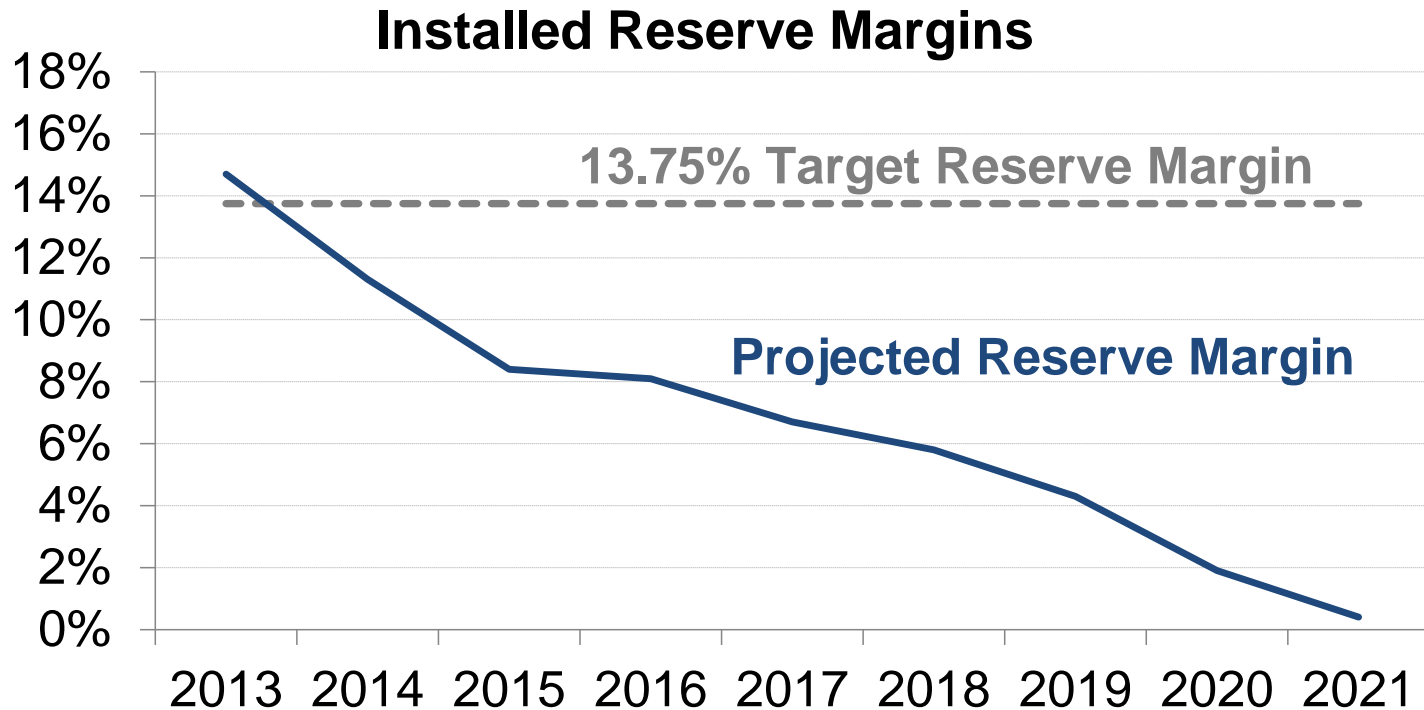
Problem Statement

Findings

Recommendations

Problem Statement

Reserve Margins Are Projected to Fall Below Target



Sources: 2013-2017, ERCOT September 2012 Reserve Margin Analysis; 2017-2021, May 2012 CDR

Note: ERCOT has recently indicated that they will likely revised the load forecast downward, and other changes to the CDR

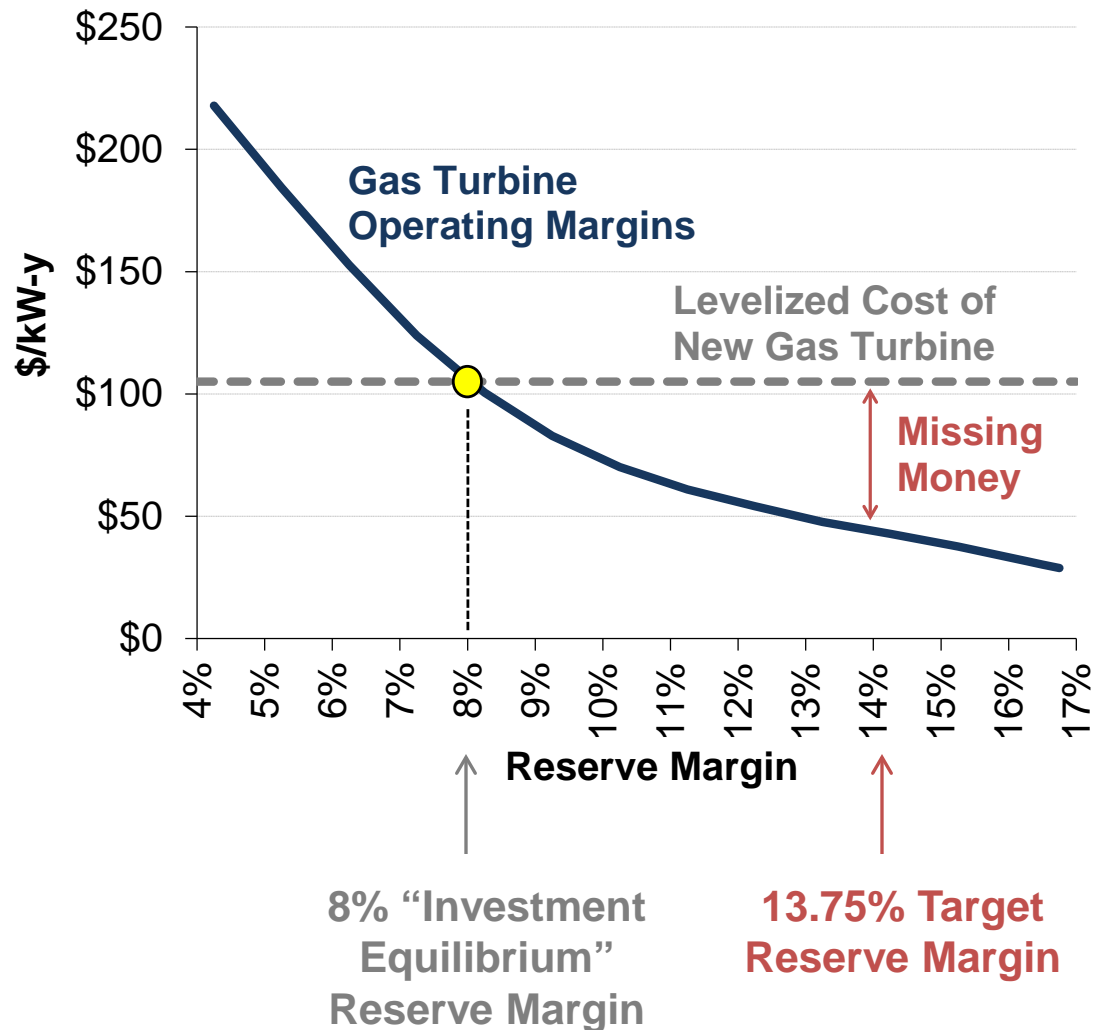
- ◆ There is little new investment in the face of high load growth
- ◆ There is no mechanism to enforce meeting the resource adequacy “target” in ERCOT
- ◆ The Texas PUC has already acted to increase administrative scarcity prices to incent investment, but will it be enough to meet the target? If not, what are the PUC’s options?

Findings

There is “Missing Money” at the Target Reserve Margin

- ♦ Generators cannot earn enough with low gas prices and low market heat rates
- ♦ At high reserve margins, there is almost always more than enough supply, so scarcity-driven high prices are rare, hence “missing money”
- ♦ We expect the reserve margin to fall to approximately 8% before energy prices can support investment of new plant (apart from some limited low-cost opportunities)
- ♦ Reliability could improve if large amounts of DR develop (unlikely to happen quickly)

Generators Earn Less at High Reserve Margins



Note: based on a \$4,500 price cap and gradual scarcity pricing

The PUC Faces a Difficult Choice

Because the current market design will not support the reliability target under current market conditions, the Commission faces a difficult choice:

1

Maintain the current design and accept declining reserve margins

or

2

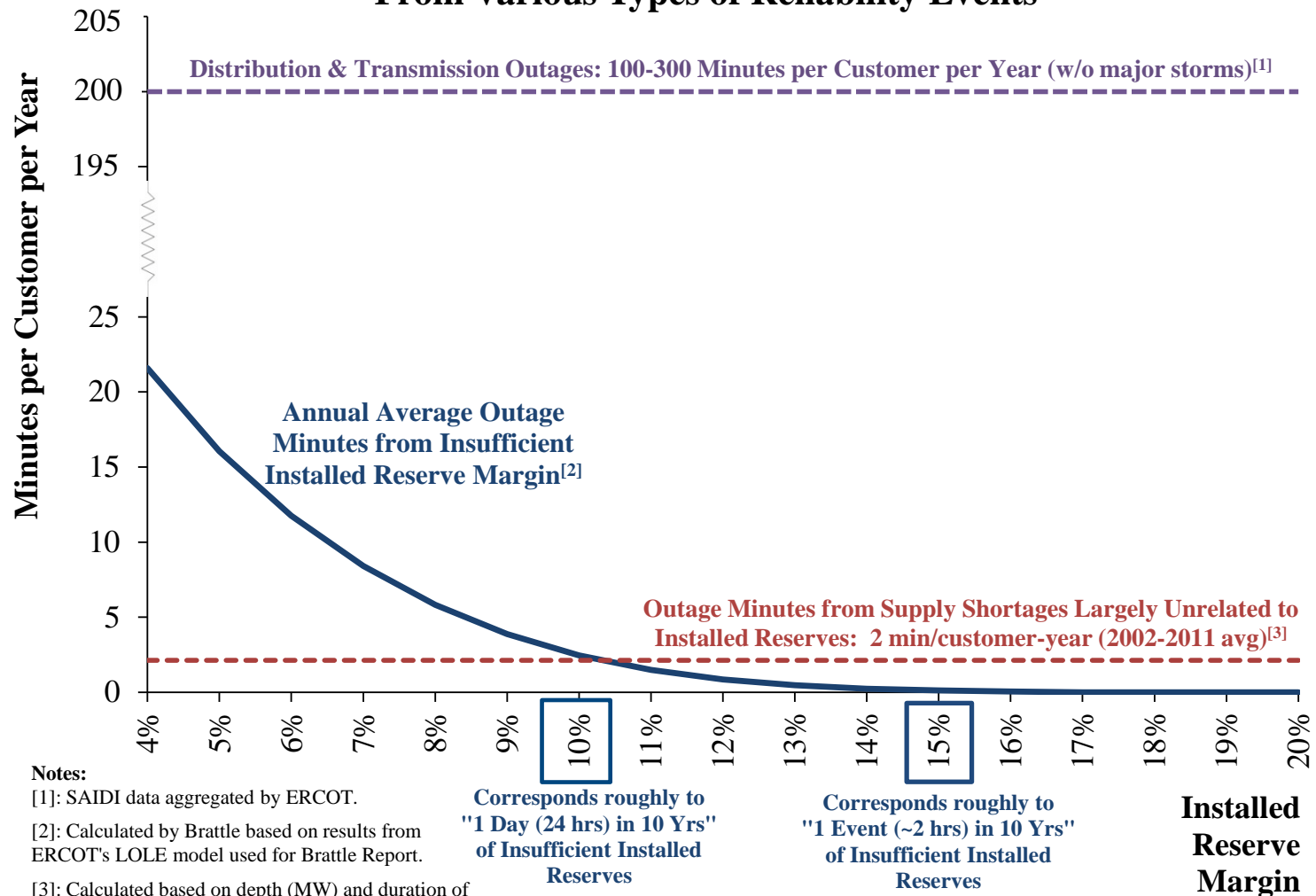
Change the market design to maintain the current (or other high) reserve margin

Reconsider Reliability Objectives

- ◆ **The threshold question** is what is the minimum acceptable installed reserve margin?
 - If the minimum is very low, no action would be needed other than continuing to ensure that energy prices are right, i.e., reflecting marginal system costs
- ◆ The “**minimum acceptable reserve margin**” should reflect the level that current/future regulators would find sufficient without intervening in the market
 - This is different from the “economically optimal” reserve margin, which the energy-only market can theoretically provide if energy prices are right
 - Reserve margins below the “minimum acceptable” level would create substantial risk of outages that the public would presumably not tolerate, even if the level of reserves was economically optimal
- ◆ But keep in mind the following **perspective on reliability**:
 - Installed reserve margins and “1-in-10”-type resource adequacy standards only focus on keeping the lights on during peak load conditions
 - They do not address T&D reliability, operational reliability, common-mode failure events such as in Feb. 2011, nor grid stability
 - Overall reliability goals should consider all types of events

Perspective on Reliability (cont.): Higher Reserve Margins Improve Only Some Aspects of Reliability

Minutes of Outages per Customer per Year From Various Types of Reliability Events



**Installed
Reserve
Margin**

Recommendations

Consider Three Primary Market Design Options

<div>Objective</div> <div>Option</div>	Reliability adequate summer peak capacity	Cost and Economic Efficiency	Regulatory Stability and Investor Risk	Implementation Complexity
Energy-Only Prices must reflect marginal system costs	Achieves lower reserve margins than typical targets because prices must reach scarcity levels often enough to support investment More exposure than politically sustainable?	Efficiently incentivizes investment at the “economic optimum” reserve margin, where the marginal cost of capacity equals the marginal system benefit, and no more Maintains efficient incentives for generation and DR performance	Future regulators may be tempted to intervene when reserve margins are low, especially in response to rotating outages and extreme price events This possibility increases investor risk and associated costs	Simplest; no major changes needed Continue with refinements recommended in the <i>Brattle</i> Report
Energy-Only with Support Subsidize DR and possibly commit to admin. withholding through op. reserves	Can add several percentage points to the Energy-Only equilibrium reserve margin, but uncertain	Additional reserves cost marginally more, especially if higher cost DR is procured Administrative withholding creates some operational inefficiency	Same as above but worse if administrative holding is relied upon (future regulators may be tempted to release withheld reserves at lower prices)	Need to develop way to solicit and fund new DR May need to establish and maintain admin. withholding
Resource Adequacy Requirement e.g. “Texas Capacity Market”	Can dependably achieve a higher reserve margin than other approaches	Mandated reserve margin may cost marginally more than the “economic optimum” (not accounting for lower investor risk) All resources compete to meet the required reserve margin at least cost	At higher reserve margins, less threat of future intervention associated with reliability events and extreme price outcomes The potential for changes in administrative parameters creates uncertainty for investors	Most complex, with many administrative parameters subject to litigation, lobbying influence, and potential delays

The best design hinges on reliability if that’s a threshold criterion

subject to a *minimum acceptable* installed reserve margin *The Brattle Group*

The Best Market Design Hinges on the Minimum Acceptable Reserve Margin

◆ Energy-Only Market

- Under current market structure and fundamentals, the reserve margin is likely to drift below 10% on average (but variable and uncertain)
- Could be economically optimal but may dip below the minimum acceptable level

◆ Energy-Only with Support

- Subsidizing reasonable-cost DR and possibly withholding generation administratively through higher operating reserves could increase achieved reserve margins by several percentage points while mostly maintaining the current market design
- But much higher min. reserve margin goals would stretch the viability of this approach, as economic inefficiencies and/or regulatory instability increase, and meeting reliability goals becomes less certain, as described in our October 25 workshop presentation (which assumed the current target was the min. acceptable)

◆ A “Texas Capacity Market”

- Adding a resource adequacy requirement facilitated by a centralized forward capacity market could achieve high minimum reserve margins more dependably than other approaches while pitting all resources to compete to meet the need at least cost
- But taking on the implementation complexity, administrative intensity, and contentiousness of this approach may be unnecessary if the minimum acceptable reserve margin is lower

Recommendations

The Best Market Design Hinges on the Minimum Acceptable Reserve Margin (cont.)

For a given “Minimum Acceptable Installed Reserve Margin,” which market design is best?

Solid fill indicates where each design may best meet 4 decision criteria (reliability, regulatory stability, cost/efficiency, and implementation complexity)

Faded areas reflect uncertainty in outcomes and subjective relative weights on decision criteria

Assumes a time frame after load growth exhausts low-cost supply options and the market reaches “equilibrium”

Energy-Only Market

Well-designed Energy-Only Markets can be very efficient...

...and can support higher reliability as more DR develops naturally

Energy-Only with Support

Reasonable-cost DR and limited administrative withholding can add several percentage points to Energy-Only reserve margins

Much higher min. reserve margin goals would stretch the viability of Energy-Only with Support, as regulatory instability and inefficiencies increase

Resource Adequacy Requirement (e.g. “Texas Capacity Market”)

If the min acceptable reserve margin is lower, a capacity market’s benefits are likely to be outweighed by its disadvantages

The advantages we’ve outlined for capacity markets likely dominate if the min acceptable reserve margin is at or above the “1-in-10” target

0 2 4 6 8 10 12 14 16 18 20

“Minimum Acceptable” Reserve Margin (%)

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The Brattle Group provides consulting and expert testimony in economics, finance, and regulation to corporations, law firms, and governmental agencies worldwide.

We combine in-depth industry experience and rigorous analyses to help clients answer complex economic and financial questions in litigation and regulation, develop strategies for changing markets, and make critical business decisions.

Our services to the electric power industry include:

- Climate Change Policy and Planning
- Cost of Capital
- Demand Forecasting Methodology
- Demand Response and Energy Efficiency
- Electricity Market Modeling
- Energy Asset Valuation
- Energy Contract Litigation
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About the Presenter



Samuel A. Newell

Principal

Cambridge Office

Samuel.Newell@brattle.com

O: +1.617.234.5725

M: +1.781.801.2652

Samuel Newell is a Principal of *The Brattle Group*. He is an economist and engineer with 13 years of experience in electricity wholesale markets, the transmission system, and RTO rules. He is also an expert in locational energy and capacity market simulation modeling.

Dr. Newell supports clients throughout the U.S. in regulatory, litigation, and business strategy matters involving wholesale market design, generation asset valuation, transmission development, integrated resource planning, demand response programs, and contract disputes. He has written expert reports for RTOs and provided testimony before state regulatory commissions and the FERC.

Dr. Newell earned a Ph.D. in technology management and policy from the Massachusetts Institute of Technology, a M.S. in materials science and engineering from Stanford University, and a B.A. in chemistry and physics from Harvard College.