Role and Value of Scarcity Pricing and How The Energy Market Addresses Missing Money Problem

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ERCOT Wholesale and Retail Markets Designed To Operate As A Unified Whole

"The Texas electricity wholesale and retail markets were designed at the onset as a unified whole to support the development of efficient markets in each."

"Texas' wholesale market was designed in conjunction with its retail market, with an array of policies put in place to ensure that market participants would have access to systems and facilities needed to participate in the market. Three aspects of the market design – tied to unbundling and divestiture, transmission access and cost-allocation, and market administration – are notable in this regard."

"Texas designed its power market with the customer as its focal point ... Customer choice is considered both a right and responsibility, in ways more akin to the expectations of customers in other types of markets than in traditional electric service arrangements provided by monopoly utility companies."

- Susan F. Tierney, Ph. D. *ERCOT Texas' Competitive Power Experience: A View from the Outside Looking In*, October 2008.

FOUNDATION OF ERCOT'S MARKET DESIGN

The Bases of ERCOT's Energy-only Market Design:

- Robust open access regime to transmission (All investor owned utilities are unbundled; ERCOT-wide load pays for transmission under a postage stamp method.)
- Retail competition implemented in all former IOU service territories (75% of ERCOT load as of March 2017); regulated distribution and transmission utilities prohibited from offering competitive products or services including default service.
- From inception the ERCOT wholesale and retail markets were envisioned and designed as an integrated market.
- There is no mandatory capacity reserve margin. Instead a decision was made to rely on the market to provide long-term reliability.
- Reliance upon market based scarcity pricing (high system-wide offer caps, (SWOC)) and the use of a scarcity pricing mechanism (operating reserve demand curve, (ORDC)) to value operating reserves explicitly, thus providing proper price signals to market participants and ultimately sufficient revenue.

Relying on Scarcity Pricing Market Principles (and the resulting price risk) Creates Value:

- From Resources, we see improved operational reliability from units because owners have strong incentives, both negative and positive, to be available when system conditions warrant.
- From Loads and Load Serving Entities, we see increasing efforts to manage consumption and price risk and even to monetize their risk-management, through various strategies and techniques such as shifting load off peak, bilateral contracting and self-curtailing economically when prices so justify. Increased investment in demand response and distributed energy resources, both aggregated and stand-alone, is encouraged. This results in a more efficient system.
- For all market participants, scarcity pricing strongly encourages bilateral arrangements both to manage price risk and provide stable revenue. In ERCOT it is estimated that approximately 90% of power is sold pursuant to such arrangements.

ERCOT's Reserve Margin (or lack thereof)

- Why does the ERCOT model work?
  - No mandatory minimum capacity reserve margin.
  - There has never been a mandatory reserve margin.
    - At most, ERCOT had a target reserve margin for about 14 years based upon the quaint and antiquated Loss of Load Expectation (LOLE) 1 in 10 standard.
  - Following the January 31, 2014 Brattle study performed for ERCOT, the commission opened the Reliability Standard Project, Project No. 42032.
  - After 30 months of review, no credible basis for the 1 in 10 standard other than "rule of thumb"* could be determined.
  - The Public Utility Commission of Texas (PUCT) decided that neither a reliability standard nor "target" reserve margin is necessary because the energy-only market, with the possibility of high scarcity prices, will produce an optimal market based reserve margin. The PUCT directed ERCOT to determine and publish every two years the then expected economically optimal reserve margin and then expected equilibrium reserve margin and to convert those results into expected unserved energy values in order to inform market participants and the PUCT as to the state of the market.

*Lyman, W.J., *Fundamental Considerations in Preparing Master System Plan*, Electrical World, Vol. 101, no. 24 June 17, 1933 788-92. "...the standards of spare capacity used in the past have in reality been "rule-of-thumb" probability solutions. It is evident that 100 percent continuous service cannot in any case be guaranteed, but that this goal can be approached in a definite way by reducing the probability of outage."

*Smith, Jr. S.A., *Service Reliability Measured by Probabilities of Outage; Spare Capacity Fixed by Probabilities of Outage*, Electrical World, Feb 10, 1934, 222-25, and Mar 10, 1934. "In practice the answer to the question of how much spare to install is usually provided by some rule of thumb or "policy," based to a degree on actual experience, but more often founded on some tradition, the origin of which is obscure or forgotten." "How reliable shall the service be? What expectation of load outage in a year shall be deemed satisfactory? The desirability of determining such a value to be set up as a standard of service reliability should be emphasized." (emphasis added) at 224.

Maintaining Long-term Resource Adequacy Through Generator Operational Reliability and Load Behavior

- The importance of operational reliability was summarized in 1891 at the 14th National Electric Light Association (NELA) convention by T. Carpenter Smith, "The question whether your light will be reliable or not has a great deal more to do with the way in which it is run than the system used, and I think that is a point which is not nearly enough considered." — 14th NELA Convention transcripts at 208, Montreal Sept 7 – 10, 1891.

- Operational reliability is related to the forced outage rate. If the forced outage rate is 2%, then operational reliability is 98%.
  - "A more rigid preventive maintenance program lowered the forced outage rate from the national average of 2% to 1%." Leonard Arnoff and John Chambers, *Operations Research Determination of Generation Reserves*, AIEE Transactions, Vol. 76 Part III, June 1957 at 323. (Thus improving operational reliability to 99%.)

- Exposure to high scarcity pricing incents owners of generating resources to invest in proper maintenance of their plants and training of their operators. Similarly, larger load serving entities are incented to invest in a variety of programs to manage their energy consumption, including the opportunity to monetize their energy consumption savings.

Exposure To High Scarcity Pricing Produces Higher Operational Reliability

- Resource adequacy is NOT just a system's reserve margin.
- For a system to provide resource adequacy efficiently, it must incent behavior that emphasizes high operational reliability. This is achieved by exposure to high scarcity pricing.
- A capacity market is not needed and actually is detrimental to price formation, thus detrimental to operational reliability and consequently, resource adequacy, because it places the risk of a capacity shortfall on the backs of consumers, and not on generating and load resources.

Lessons Learned From ERCOT

- ERCOT's experience shows that operational reliability is much more important than installed generating capacity in keeping the lights on. As evidenced by 2011 and 2014, operational reliability can deteriorate or improve dramatically overnight. A market based approach providing proper scarcity pricing will incent generators and load to provide *consistent* operational reliability.

- The increase in the SWOC and implementation of the ORDC and the resulting proper scarcity pricing is critical to ensuring operational reliability.

- For example, in PJM "The winter issue... Incentives are clearly not adequate, a 40% outage rate is unacceptable, incentives need to look like an all energy market." Joseph Bowring, Market Monitor for PJM market during UBS conference call, May 28, 2014 describing the polar vortex event of January 2014 and the outage rate suffered by the PJM market.

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