A Tale of Two ISOs: Energy Market Design in Texas and California

**ERCOT and CAISO have differing market designs, but the same disrupter: renewables. In either case, results to date suggest market reform will be required to keep generators profitable and grids reliable.**

Wholesale energy markets are complex, as planners constantly struggle to create market designs to incentivize generators to provide affordable electricity. Grid operators need to ensure that generation will be available today, tomorrow, and in the future, supplying both energy and critically needed balancing services.

### Different Approaches to Incentivizing Generation

US wholesale energy markets have different approaches to solving this problem. They're generally bifurcated into those that allocate payments for capacity—the physical capability to generate or “steel in the ground”—and those that don't. Some markets like PJM (the mid-Atlantic power pool) hold capacity auctions three years ahead of time to establish annual values. These markets also cap wholesale energy prices at $2,000—a result of the recent FERC Order 831.

On the extreme opposite end stands the Electric Reliability Council of Texas (ERCOT), with its highly competitive, restructured retail and wholesale markets. Instead of capacity payments, ERCOT has lifted its energy prices caps to $9,000 per MWh with the notion that higher potential prices will lure new generation. While the concept makes sense, in just the past few years the entire energy landscape has tectonically shifted, owing to low-cost renewables and cheap gas, jeopardizing the concept.

The California Independent Systems Operator (CAISO) has a limited competitive retail power market, as well as a competitive wholesale market, which is greatly affected by the activities of its three main utilities. CAISO has opted to broaden its energy market to include parts of the Pacific Northwest, Arizona, and Nevada. While it does not have a formal capacity auction, it does have a specific process to address resource adequacy in the near term. Under this approach, CAISO is authorized to procure capacity in specific instances, with one-year agreements that do not participate in publicly visible bidding.

### Grid Operators in Texas and California Struggle to Address New Challenges

The recent infusion of renewables with low or even negative costs has created stresses for traditional market participants. For example, due to the Federal Production Tax Credit that pays wind generators $24 per MWh, wind generators can sell below zero and generate a positive cash flow. A recent report from the National Renewable Energy Laboratory states that variable renewable energy (VRE) “suppresses wholesale energy prices while providing relatively little capacity. This effect becomes more pronounced the higher the VRE penetration in a market.”

Because this pressure from renewables has been coupled with the arrival of fracking and cheap natural gas, ERCOT and CAISO have seen punishingly low-priced electricity markets, with spot prices languishing in the basement. According to ERCOT’s Potomac Economics report, average prices were just $24.62 in 2016. (Loss-of-load and reliability adders contributed another modest 40 cents).

The spot market price in 2016 never cleared $1,000, exceeding $300 for only 22 hours. Meanwhile, prices were negative for 133 hours. These prices are insufficient to bring in new generation. The Potomac Economics report estimates that a new gas generator needs $80–95 per kW-year to “satisfy annual fixed costs.” This contrasts with the net revenues for existing gas units of $23–29 per kW-year. There is an ancillary market, as well, but 2016 prices were modest at best. These prices are not even sufficient to pay some existing generators. In fact, in the first two weeks of October, Luminant announced the pending retirement of three coal plants totaling 4,100 MW.

Meanwhile, sun-drenched California has fared slightly better. According to CAISO, average prices for the most recent quarter ranged from $23/MWh in March to about $34 in June. Limited short-term spikes reached $200 for a five-hour period, and climbed as high as $600 for a single hour. This is, however, insufficient to attract new dispatchable generation, even as renewable additions climb: CAISO reported a new solar peak of 9,914 MW in mid-June.

This increase in solar exacerbates the infamous California duck curve by creating a greater surplus of solar energy midday, resulting in some generators having two starts each day. With the rise of renewables, CAISO is now having to increase its focus on frequency regulation (both reg up and reg down). California’s grid operator is now evaluating “flexible resource adequacy” with varying lead times to ensure capacity will be quickly available when required, according to CAISO.

### Generators Will Struggle for the Foreseeable Future

What do these varying approaches and results to date imply for generators looking to survive and thrive in these markets? They signal tough days ahead, irrespective of whether capacity prices are included in the market structure. Capacity prices are helpful, but, at current levels and combined with energy prices, they are simply insufficient to justify new entrants. Ancillaries are also insufficient at present prices to ensure profitability for many plants. Existing generators will likely remain mired in a low-cost environment for years to come as even more low-cost renewables flood the market and natural gas prices remain muted.

To survive, some plants may have to become even more flexible in order to access ancillary services markets—even with the modest ancillary prices seen today. Digitization of existing plants, combined with training focused on new operating regimes, will be critical in affecting this transition.

Longer term, as more consolidation happens and more participants exit the market, it’s possible that some sweeping fundamental changes in market rules may be necessary. The missing-money problem is simply becoming too large to ignore. Market designs must reflect current and future realities if they are to capably ensure resource adequacy—and the necessary profitability for generators—in the years to come.