



OPINION

The state of US wholesale power markets: Is reliability at risk from low prices?

Robbie Orvis from Energy Innovation explores why generator revenues are shrinking and how the decline isn't a problem for reliability

By Robbie Orvis • May 22, 2017

Editor's note: The following is the first part of a three-part guest post series from Robbie Orvis, the Policy Design Projects Manager for Energy Innovation.

In early May, the Federal Energy Regulatory Commission's (FERC) technical conference explored problems in U.S. wholesale markets, specifically how new state policies impact and interact with wholesale power markets in the U.S. The conference included written statements and testimony by dozens of panelists, many from companies that own power plants and operate in regional markets.

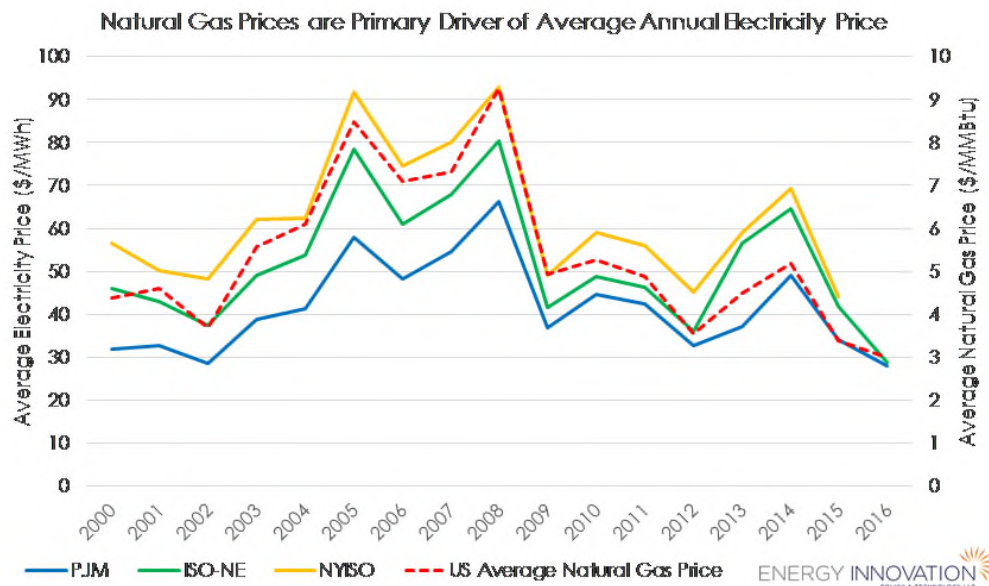
While the conference did not produce a solution to the problem, one reality became abundantly clear: Generators are concerned about falling revenues making their plants uneconomic and want market modifications to remedy this situation. Many attendees, including state regulators, market operators, and FERC commissioners and staff, seemed receptive to this complaint.

But a closer look at data from several of the nation's wholesale power markets indicates a "problem" does not actually exist at all; wholesale markets are operating as intended. In part one of this three-part series, we evaluate why generator revenues are shrinking, and why the consequences of falling revenues aren't actually a problem.

Natural gas is largely responsible for shrinking revenue in the energy market

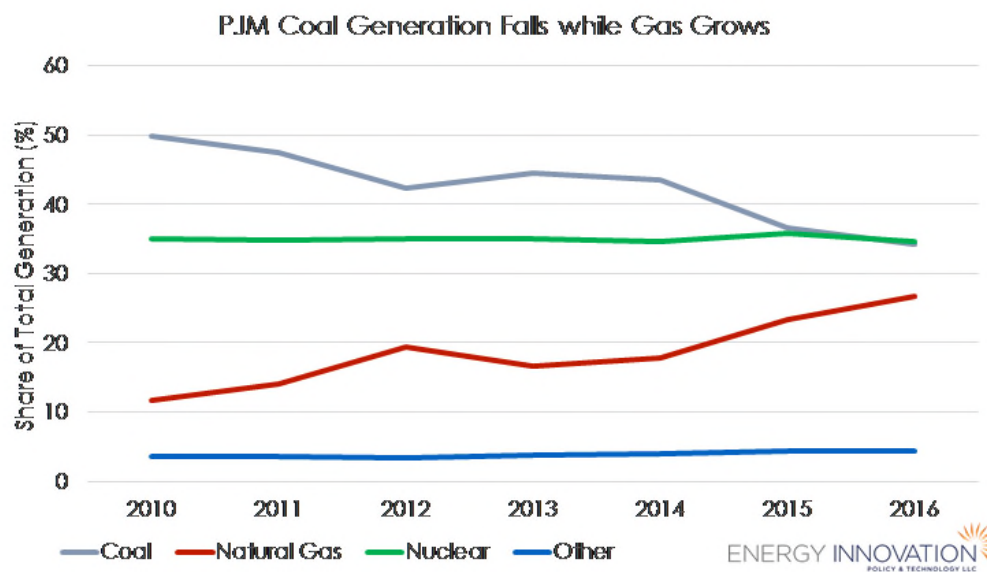
There's no denying that prices in U.S. wholesale power markets have been steadily declining for several years. In PJM, prices have dropped by more than 40 percent since 2014, falling from \$49 to \$29. ISO-NE has experienced a similar drop of 55 percent, down from \$65 in 2014 to \$29 in 2016. In both PJM and ISO-NE, 2016 prices were the lowest since the markets were initially created.

The price decline is due in large part to the falling cost of natural gas, which sets prices during the most profitable hours in the energy market. As shown in the figure below, annual average electricity prices in PJM, ISO-NE, and NYISO clearly mirror the price of gas.



Sources: PJM Annual State of the Market Reports, NYISO Power Trends Reports, ISO-NE Annual Markets Reports, ISO-NE Press Release, US EIA Average Annual Electric Power Sector Natural Gas Price *Credit: Energy Innovation*

As natural gas prices have fallen over the past 5-10 years, so too have average wholesale electricity prices (2014's Polar Vortex, which heavily skewed the annual average, was an outlier). Because gas generation has become so cheap, it has displaced significant coal generation. For example, in PJM, coal's share of generation has fallen from 50 percent in 2010 to less than 35 percent today. Gas has made up this difference, increasing from 12 percent of the generation mix to 27 percent over the same period. Renewables have remained less than 3 percent of PJM's mix over the whole period.



Credit: Source: PJM Generation Attribute Tracking System

Declining prices exert outsized pressure on coal and nuclear units. Coal not only makes less revenue per unit of electricity it generates as prices drop, but also generates less electricity overall as cheaper natural gas units take its place. Nuclear units tend to have very high fixed annual costs and rely on higher average prices to recover these costs. Because nuclear plants are much cleaner but struggle with low prices, several states including Illinois and New York have passed policies to support nuclear plants by paying for their zero carbon attributes. Regardless, the net effect is that falling natural gas prices have significantly lowered the amount of revenue in the energy market flowing to all generators, especially coal and nuclear plants.

Markets continue to deliver more capacity, despite oversupply

FERC's conference focused on three regions in particular with market operators that administer forward capacity markets (FCMs): ISO-NE, PJM, and NYISO. FCMs are auctions for capacity (megawatts) - as opposed to generation (megawatt-hours) - guaranteeing a fixed payment to generators over a future time period for being available to generate electricity.

The FCM mechanism was developed by grid operators to address the missing money problem, where price caps and other electricity market shortfalls lower the total amount of revenue available to generators. In theory, capacity markets were designed to provide new and existing generators with revenue missing due to price caps and other volatility

reduction measures, which leave energy market revenues short of covering generators' going-forward costs.

Wholesale power markets were designed to facilitate generation competition and shift the risk of overpaying for capacity or over-procuring capacity from electricity customers onto independent power producers (IPPs). To accomplish these goals, wholesale power markets should to provide investment signals for entry *and exit* based on market supply and demand. That means, especially for the capacity market, that prices should increase and incent new generation when the prospect exists for insufficient supply. Similarly, when supply is too high, prices should decrease and incent units to retire, whether or not they have reached the end of their useful lives. This is part of the risk that IPPs take on by choosing to participate in a competitive market.

Consider the current level of capacity in each of the U.S. markets relative to the required reserve margins:

Market	2016 Anticipated Reserve Margin	2016 Required Reference Margin Level	2016 Capacity Above Reserve Margin
MISO	18%	15.2%	2.80% (3.4 GW)
ISO-NE	19.67%	17.6%	2.07% (0.5 GW)
NYISO	25.51%	17.5%	8.01% (2.6 GW)
PJM	28.85%	16.4%	12.45% (17.8 GW)
SPP	27.65%	13.6%	14.05% (7.4 GW)
ERCOT	15.51%	13.75%	1.76% (1.2 GW)
CAISO	24.4%	15%	9.40% (4.5 GW)

Credit: Energy Innovation

Every wholesale power market in the U.S. is supplied above its reserve margin, which is the minimum amount of extra capacity needed to comply with national reliability standards.. In some instances, like in PJM, markets have *almost double* the amount of excess capacity needed to meet reliability standards, the cost of which is being passed through to electricity customers. Well-intentioned state policies supporting nuclear units that would otherwise retire are only reinforcing an existing trend, not defining it.

Some may claim these policies interfere with “price formation” in wholesale power markets. However the primary outcome of such policies is to keep capacity around that is providing uncompensated value (e.g. zero-carbon electricity) and would otherwise retire. By encouraging otherwise uneconomic plants to stay in service, the impact of such policies is keeping additional capacity online, adding to the overcapacity problem across U.S. markets.

Given the very high levels of excess capacity in some U.S. markets, it's unsurprising that generators are worried about collecting revenue from the capacity market. But it's important to remember that the energy and capacity markets, working in tandem, should incentivize units to leave the market when too much capacity exists.

We are seeing precisely these signals in regions where markets are oversupplied with capacity and have flat or shrinking demand. Prices are decreasing, indicating that the markets are functioning correctly. Low prices should force some uneconomic excess capacity offline, ensuring that customers are receiving an acceptable level of reliability without overpaying for resources they don't need.

Despite such high levels of oversupply and overall low prices, wholesale markets are still incenting new capacity. For example, in PJM's last auction, nearly 5 gigawatts of new natural gas combined cycle capacity cleared the capacity market. Other markets continue to procure new resources as well, with ISO-NE clearing 904 megawatts of new capacity in its most recent capacity auction. Even though generators are worried about energy market and capacity clearing prices, and even though all the markets in the U.S. are oversupplied, wholesale power markets continue to attract new investment, undermining concerns about reliability.

Retirements indicate a properly functioning market

In light of falling energy and capacity prices, many generators are insisting that without immediate policy intervention, some units will be forced to retire. This, the claim goes, will in turn threaten grid reliability. In the words of FERC conference participant Sam Newell: "We've got so much capacity, we might run out."

However, a quick look at the amount of oversupply in the nation's wholesale markets from the table above suggests that even with retirements, *reliability is not at risk*. No persistent market failure needs to be fixed, because the market is functioning as designed. At most, regulators could establish a short-term policy intervention providing a nudge out the door to a few generators, to more quickly restore market balance.

Framing potential retirements as a "reliability risk" is often misleading – energy and, especially, capacity markets should not prop up existing generators when they become uneconomic, unnecessary for reliable service, or don't serve any public policy goals. A primary goal of functioning wholesale markets is shifting risk of uneconomic generators from consumers back on to the generators and their investors.

In fact, allowing units to retire should help fix the “problem” of low energy prices. With fewer units available in the energy market, prices will increase across the board as a new equilibrium is reached. This is true even if some units justifiably receive out-of-market support for legitimate public policy reasons. Eventually capacity prices will increase after enough units leave the market.

As policymakers field concerns from power plant owners, they must remember the reason markets were originally adopted. Attempts to keep uneconomic capacity online, including scapegoating legitimate state policies as a rationale for extracting artificial increases in revenue within the markets, will result in continued depressed prices and fail to address the problem.

In part two of this series on wholesale power markets, we will examine why the proposed solutions in ISO-NE and PJM are poor options for addressing wholesale market inadequacies. In part three, we will examine solutions that could help solve short term issues in wholesale markets while setting up markets for the grid of the future.

MOST POPULAR

- 1 FEATURE**
Power & Gas Index: Enjoy the shoulder season — natural gas prices are about to rise
May 22

- 2 FEATURE**
Brattle: Wider electrification key to averting both climate change and utility death spiral
May 24

- 3**
Westinghouse will not object to unsealing contract for VC Summer nuclear project
May 22

- 4 OPINION**
The state of US wholesale power markets: Is reliability at risk from low prices?

May 22

5 FEATURE

As solar matures, rate design and incentive debates grow ever more complex

May 23

 **STAFF PICKS**

The top 10 trends transforming the electric power sector

The next generation utility business model — what you need to know

Inside construction of the world's largest lithium ion battery storage facility

The 2016 Dive Awards for the utility industry

How President Trump could upend Obama's climate and energy legacy