



Market Flaws and Distortions in Competitive Electricity Markets: Preserving Grid Reliability and Protecting U.S. Climate Goals

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This is the first in a series of ConsumerGrams designed to discuss the serious challenges facing competitive electricity markets. This first piece focuses on the problems confronting baseload power generation, including structural problems and market distortions that threaten grid reliability, energy security, and the nation's climate change mitigation and environmental quality goals. This ConsumerGram summarizes discussion and findings from our Capitol Hill event on June 3, 2014.¹

Background

The threat of a premature shutdown of baseload generation, resulting from market design flaws and distortions in competitive electricity markets, is one of the most important energy challenges that the United States currently faces.² Structural problems with capacity and energy markets pose a threat to grid reliability and risk undermining the nation's climate mitigation goals.

Competitive markets remain a work in progress. Although energy markets are fairly well understood and transmission planning continues to evolve, the functioning of capacity markets is probably the single most contested issue at present. While many grid experts agree that there is a problem with how baseload electric generation is compensated in capacity markets, they are left without a consensus as to the solution. Should there be a separate non-market payment for baseload?

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¹ The event – “What is Happening to Baseload Power Generation in U.S. Electricity Markets” – was held on June 3, 2014 on Capitol Hill. The panel consisted of Patrick J. McCormick III (*Minority Chief Counsel, US Senate Committee on Energy & Natural Resources*), Lara Pierpoint (*Special Advisor, Energy Policy and Systems Analysis, US Department of Energy*), Bill Berg (*Vice President, Wholesale Market Development, Exelon Corporation*), Donald Moul (*Vice President, Commodity Operations, FirstEnergy Solutions*), and the panel was moderated by Rod Kuckro (*Reporter, EnergyWire*). The views and findings expressed here are solely of the author's and not necessary those of the panelists.

² As a general matter, in competitive markets, generators respond to market demand and sell their electricity at the going market price. In states that have “unbundled” electric service and adopted retail competition, these wholesale prices are carried more directly into retail bills. In contrast, “bundled” electricity suppliers generators in states with traditionally regulated retail electric service receive cost-based rates approved by state regulatory authorities, which allows them to recover the cost of their investment, plus an authorized return. Consequently, price transparency is greater in unbundled states with retail competition and participating in organized wholesale markets than in bundled states with traditional regulation and comparatively less influence from wholesale markets. Frequently, companies serving traditionally regulated states participate in wholesale bilateral markets. .

Should the amount of capacity payments depend on the positive attributes of certain generation (e.g., on-site fuel)? Do capacity markets, such as in the PJM RTO, need a longer horizon than three years?³

The United States needs a solution quickly. Well-functioning electricity markets are vital to U.S. economic competitiveness and indispensable to providing reliable, affordable electricity supply. Over 35 percent of the country's population lives in states with full customer choice at the retail level where retail competition has been the choice of state policymakers. In addition, at least another third of the U.S. population partly depends on wholesale electricity markets. Moreover, competitive retail states are host to about one third of U.S. manufacturing.

There is a significant risk that last year's announcement of the early retirement of two solid-performing nuclear reactors, Vermont Yankee and Kewaunee, foreshadow the fate of many of our nuclear units. In a report last year, the Center for Strategic and International Studies (CSIS) warned that the U.S. civil nuclear fleet is likely to contract sharply by 20 percent between now and 2030 absent a substantial policy shift at federal and state levels.⁴

Market monitors have echoed this concern. According to the [2013 State of the Market Report for PJM](#), “[p]rice suppression leads to premature and uneconomic retirements and the failure to make economic investments.⁵ Coal units and nuclear units are under stress in PJM markets.” Analysts further assert that nearly 15,000 MW of capacity in PJM are at risk of retirement in addition to the roughly 25,000 MW that are shutting down because of compliance with EPA regulation of mercury and air toxics. The combined total of roughly 40,000 megawatts is enough to power nearly 36 million homes.

Given EPA's proposal to regulate greenhouse gas emissions from existing power plants, states with reactors vulnerable to these economic stresses should be highly concerned. Retiring nuclear reactors would make it nearly impossible for states to achieve their emission targets. More broadly, removing a large amount of nuclear energy from the grid would seriously threaten reliability. Nuclear plants, which provide about 20 percent of the nation's electricity supply, produce benefits that cannot easily be replaced. With an average capacity factor of 85 to 90 percent – which is the highest of any source of electricity, nuclear power is the most efficient and reliable source of clean electricity around the clock, operating in all weather conditions.

Capacity Markets are Broken

Capacity markets are designed to ensure an adequate supply of electricity to meet expected customer needs plus reserve capacity to meet unexpected demand caused by events such as extreme weather conditions.⁶ Capacity payments are essentially “insurance premiums” for power markets.⁷ For regulated electric utilities, the “capacity premium” is built into rates set by the state utility commissions

³ PJM is a regional transmission organization (RTO) stretching from Illinois to Delaware. It is the largest competitive wholesale electricity market in the world.

⁴ See <http://csis.org/publication/market-distorting-policies-will-lead-us-nuclear-reactor-shutdowns>.

⁵ See http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2013.shtml.

⁶ Capacity is distinct from energy. It is the brick and mortar, the equipment that one needs to generate electricity, which is a fixed cost.

⁷ Some competitive markets do not have capacity payments. Instead, those markets allow much higher prices in the energy markets during periods of extreme demand, thereby generating enough revenue that offsets the need for capacity. Capacity markets are designed, in part, to smooth out such price swings.

and passed to customers; for competitive generation suppliers, capacity payments are determined through an auction. This process was initially designed to ensure that competitive suppliers receive an appropriate level of compensation for the fixed costs of maintaining needed capacity similar to the level that regulated utilities receive through set rates.

In PJM, the grid operator conducts a capacity auction every May to secure generating capacity resources for a 12-month period, 3-years in the future. Unfortunately, auctions over the past several years indicate a disturbing trend: PJM is increasingly reliant on less dependable sources of energy – specifically renewables, electricity imported from outside the PJM region, and demand response (DR), which involves contracts with retail manufacturing customers asking them to reduce their demand for electricity during peak periods.⁸ Since 2009, the portion of these less reliable and non-physical sources that clear PJM’s capacity auctions has increased by a staggering 300 percent.

Grid reliability requires an adequate supply of baseload generation. Unfortunately, PJM’s capacity market does not adequately compensate the fixed cost of operating competitive baseload plants, which undermines the economic competitiveness of these units. In the latest PJM auction, capacity prices roughly doubled – but that increase is still not enough to produce the investment that is needed to preserve baseload generation.

Certain areas of the United States are already experiencing the impact of a less reliable grid, especially in those markets that use demand response contracts. Since June 1, 2013, manufacturing customers participating in demand response (DR) programs in Ohio were called upon to cut their usage of electricity seven times – in contrast to no emergency curtailments over the previous four years. DR is the most expensive capacity resource available – increasing to \$1,800 per megawatt hour in January 2014, compared to the PJM cap of \$1,000 per megawatt for generation. Given the amount of likely retirement of coal generation in the coming years, those markets that substantially depend on demand response will grow increasingly vulnerable to the threat of DR participants pulling out of their programs, resulting in even higher prices for demand response.

Recent positive developments may reduce the market’s reliance on demand response. In May, the [DC Circuit Court of Appeals](#) found that DR is a retail service and should not receive compensation in non-retail markets.⁹ The ruling may also pave the way for a re-evaluation of the treatment of energy efficiency as a retail product – a development that could help ensure the proper functioning of markets. Demand response and energy efficiency have important roles to play, but should not be given equal value to baseload capacity.

The extreme cold weather in January 2014 exposed major vulnerabilities in the country’s natural gas system, including infrastructure that is not adequate to replace retiring baseload in the near future. These and other factors led to severe spikes in the cost of wholesale power. On January 7, more than 15,000 megawatts – a staggering 30 percent of gas-fired capacity in PJM – experienced outages, while

⁸ Demand side resources lower the demand that is on the system by preventing the use of a megawatt; they do not generate voltage. Baseload generation provides voltage that keeps the grid operating.

⁹ See <http://www.cadc.uscourts.gov/internet/opinions.nsf/DE531DBFA7DE1ABE85257CE1004F4C53/%24file/11-1486-1494281.pdf>.

wind operated at about one quarter of its capacity.¹⁰ Natural gas infrastructure was stressed with pipelines and storage facilities not always able to accommodate the needs of gas-fired plants during peak demand periods. In contrast, all baseload resources proved essential to grid reliability. The nuclear fleet had significantly lower forced outage rates than any other energy source – with a very high capacity factor averaging 95 percent, and coal units – a number of which will be retired because of current EPA regulations – played an indispensable role in helping prevent widespread outages.

Certainly, onsite fuel – such as coal stacks and a core full of nuclear fuel – bolster the nation’s ability to withstand extreme events. Unlike gas supplies that can be interrupted for storage or for local distribution company usage, onsite fuel sources at coal and nuclear plants are controlled and owned by the local generator; they are located at the power plant, and serve as a vital backstop for reliability. This type of reliability and benefit of dependable storage should be valued appropriately in the markets.

If a generating resource does not have an assured fuel supply, it should not be valued the same as generation that has that capability. Combined-cycle natural gas units, for instance, typically have a high capacity factor and some baseload-type characteristics, but fuel unavailability can pose significant problems. The absence of natural gas units during the polar vortex resulted from the lack of firm transportation. This is solvable on paper, but it would require a substantial build out of infrastructure and a restructuring of how the delivery of gas is prioritized.

Energy Markets are Distorted

Baseload units rely heavily on revenue streams from energy markets. A nuclear plant, for instance, obtains 75 to 85 percent of its total revenues from the energy markets with the balance coming from capacity markets.¹¹ The combination of low natural gas prices and low load growth has driven down wholesale electricity prices, but subsidies for other forms of generation have further suppressed prices, compounding the economic stress faced by baseload power.

Policies such as the federal wind production tax credit (PTC), as well as state renewable mandates, push wholesale prices even lower. Organized markets are also distorted by government-backed contracts for natural gas and out-of-market payments that reduce energy revenues for baseload resources.

In states with substantial levels of renewable penetration and limited transmission capability to move the power where it is needed, bottlenecks result, particularly in the off-peak hours when demand is at the lowest. In Illinois, for example, subsidized generation has resulted in a wide divergence of wholesale electricity prices across the state in the past six years. At the western fringes of the northern Illinois footprint, spot prices are sometimes 25 to 30 percent lower than in other parts of the state, placing significant stress on nuclear generation located there.

¹⁰ The current capacity market was specifically developed to meet the summer peak, but a number of those resources cannot operate in bitter wintry conditions.

¹¹ In 2013, energy made up 73 percent of the total costs of providing electricity in PJM. Capacity made up 13 percent, transmission about 10 percent, and the rest in ancillary. Capacity payments, while a very important revenue stream, is a small part of the overall equation.

The impact of the artificial suppression of prices in the energy markets on the competitiveness of nuclear power was seen in the latest capacity auction in PJM. For the first time, there were 7,000 megawatts of nuclear capacity that did not clear that auction, including four units at Byron and Quad Cities, both of which are located in Illinois. Because revenues from energy markets have dropped substantially and the cost of regulatory compliance has increased, those reactors required significant capacity payments, over and beyond what the market was willing to pay, to cover operational costs. No decisions are expected to be made by Exelon, the owner of these units, until June 2015 on the continued operation of the plants, but all options – including retirement – will be considered if there is no long-term path to sustainable profitability.

Competitive electricity markets are meant to encourage greater efficiency and lower prices for consumers. Baseload operators will react to market signals and make efficient use of abundant supplies of shale gas, but the market should be allowed to evolve naturally; it should not be tilted one way or another by the government. The market is in a far better position than civil servants or legislators to determine how the sector can achieve security of electricity supply that complies with EPA air quality regulation – if policymakers recognize the value of reliability.

Federal Policymaking is Evolving

The Office of Energy Policy and Systems Analysis (EPSA) at the Department of Energy (DOE), in conjunction with the Office of Nuclear Energy (NE), has been tasked by Secretary Ernest Moniz to understand why baseload units, including coal and nuclear, are retiring prematurely. EPSA is also studying the implications of nuclear shutdowns on carbon emissions. To date, these modeling exercises have indicated substantial negative impacts on the country's climate mitigation goals. DOE is considering a range of policy options as well as technical assistance to the States.

Congress, for its part, is unlikely to adopt legislation addressing this issue for the balance of this year, but continued Congressional oversight is expected. A consensus exists in the Senate Energy & Natural Resources (ENR) Committee that the United States needs well-functioning electricity markets that render reliable service at affordable prices.¹² The Committee has historically deferred to states as to which the form of retail regulation they prefer and has through several major federal energy laws opted for competition in federally-regulated wholesale markets, whether bilateral or organized. That the choice to participate in an RTO should be voluntary is also a well-established consensus principle for the Committee. Senator Lisa Murkowski, ranking member of ENR, has said that no person should be a victim or the beneficiary of undue discrimination as a result of federal law; consequently, Congress should reform or repeal federal policies that create market distortions.

Summary

Well-functioning competitive markets are crucial to U.S. economic competitiveness. These markets are relatively new and will remain a work in progress for some time. As they evolve, it is important to keep further government intervention to a minimum, particularly when that out-of-market action suppresses prices and undermines baseload power.

¹² ENR held a hearing on the reliability of the grid on April 10th at <http://www.energy.senate.gov/public/index.cfm/hearings-and-business-meetings?ID=791ff8ea-66db-4a9f-987c-c15bfef8be41>. Also see <http://www.energy.senate.gov/public/index.cfm/powering-the-future>.

Owners and operators of generation are in a far better position to determine how grid reliability can be maintained while complying with anti-pollution requirements. Moreover, pipelines and power lines do not get built over night. Markets will drive the right result if they are constructed properly and incent the right behavior from generators and utilities.

Consumers expect the lights to turn on when they hit the light switch. They don't expect variability. They demand a very reliable system with around-the-clock lighting, air conditioning in the summer, and heating in bitter winters. Not all generation resources are created equal in this regard and they should not be treated equally in capacity markets.